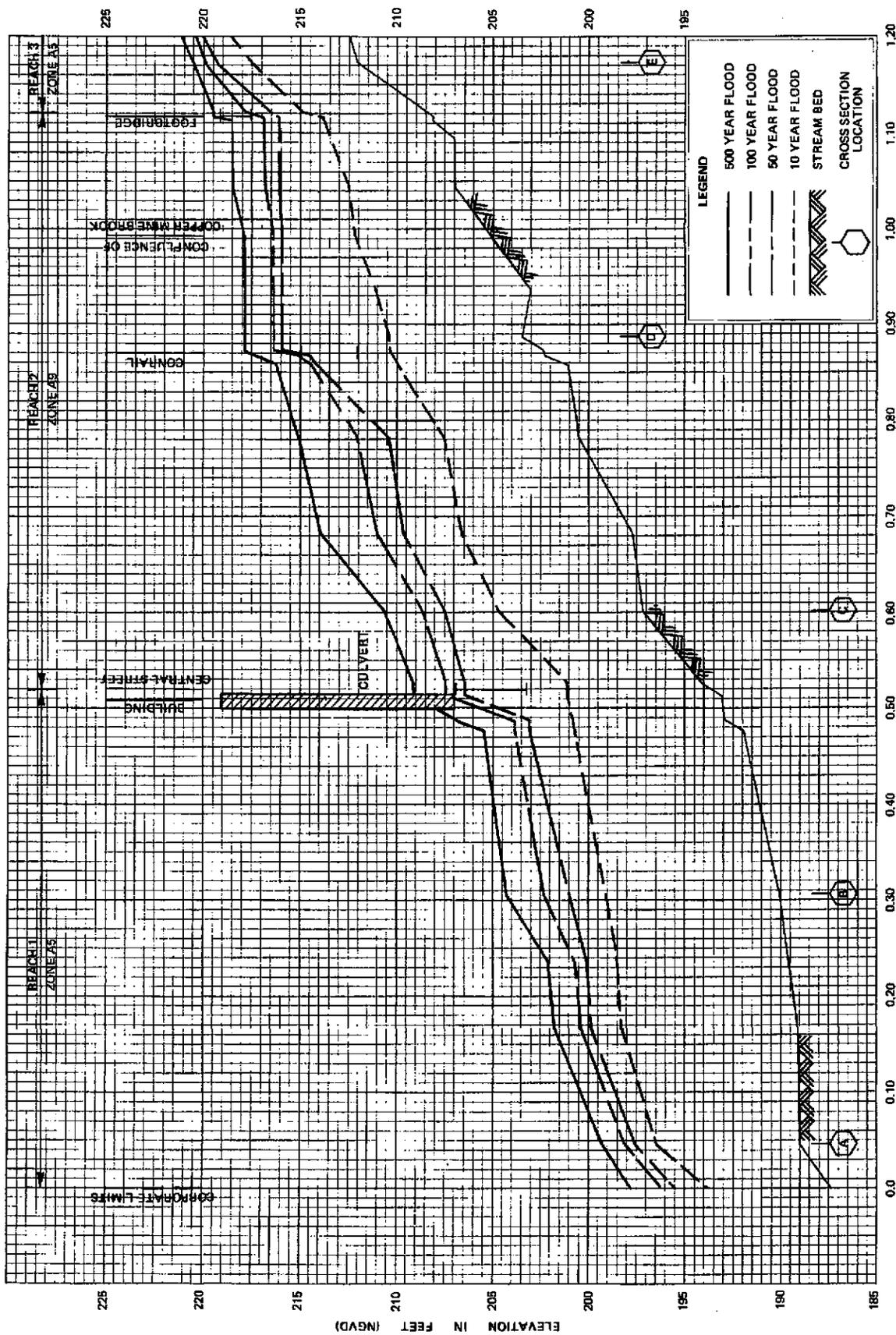


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**APPENDIX A**  
**FEMA PROFILE OF THE PEQUABUCK RIVER**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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STREAM DISTANCE IN MILES ABOVE CORPORATE LIMITS

ELEVATION IN FEET (NGVD)

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**APPENDIX B**  
**NRCS APPROVAL OF MMI RUNOFF CURVE NUMBERS**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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## MEMORANDUM

TO: DEP Hydrology Research Committee

FROM: James G. MacBroom, P.E.  
Milone & MacBroom, Inc.

DATE: August 13, 1998

RE: Applied Single Runoff Event Simulation (Hydrology) Computer Models

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### A. Introduction

Single event simulation computer models such as the NRCS "TR-20 Hydrology" and U.S. Army Corps of Engineers "HEC-1" are in widespread use to determine peak flow rates in ungauged watersheds.

The models are used for the planning and design of dams, bridges, culverts, channels, and flood storage detention basins, plus are used for regulatory permit applications.

They continue to have broad support among the regulatory agencies and municipal engineers, even though there is a general consensus that peak flow results are often higher than analysis of stream gauge results. A careful review of the literature, instruction manuals, and review of actual models indicates many users are not utilizing the model's flexible input options, resulting in excessively high flow predictions. Consequently, it is important to be aware of specific methods of developing input data to best represent watershed runoff conditions and to minimize overly conservative or unreasonable assumptions.

The comments below are applicable to the TR-20 model and to the HEC-1 model when using the curve number (CN) input data option. They are intended as guidelines on how to develop custom site specific input data to improve watershed parameters and to re-emphasize basic modeling procedures. For example, in many cases, the user manuals allow and encourage development of custom CN parameters, but most users opt for the higher default values.

Note that it is always desirable to check computer model results against nearby gauging stations and their statistical flood frequency analysis prepared by USGS. In large watersheds with little storage, the USGS regression equations may also be used. For small watersheds under 200 acres in size and with little storage, the Rational method remains viable for determining peak flows.

## B. Subwatersheds

1. Computer model results appear to improve when large watersheds are subdivided into numerous small subwatersheds. Special care should be used to emphasize homogeneous watersheds with similar soils, land use, and topography. On watersheds with diverse CN values, it may be desirable to split the watershed into smaller areas rather than use the average CN value.
2. There are hydrologists who believe that the directly connected impervious cover in a basin should be considered separately from pervious areas (Golding, 1997). A single subwatershed with dispersed impervious cover may be represented by using two separate hydrographs, one for pervious areas and one for impervious areas (with separate CN, TC values) and then combining them. By evaluating pervious and impervious areas separately, the errors in averaging their CN and TC values can be minimized.
3. The "reservoir routing" of hydrographs through impoundments, lakes, wetlands and constricted areas is an important part of the models. A review of numerous models indicates users often omit potential storage areas. The modeler should attempt to evaluate all possible storage areas as they have a large influence on the final results. Note that in some cases road culverts with high embankments may delay runoff and should be treated as a reservoir.
4. The use of the channel routing techniques are specially important when using small subwatershed with limited time of concentrations and where overbank flow occurs on floodplains. The SCS TR-20 channel routing procedure (ATKIN) is awkward but technically sound. It reduces peak flows due to both channel storage and travel time through the reach.

The size of the simplistic prismatic cross section used to determine the X and M coefficients should represent the cross section at the estimated flow rate. The cross section values for a two-year flood contained in a channel are not always suitable for a 100-year event that flows on a broad floodplain. In the latter case, the "channel" width used in the computations approaches the floodplain width. Typical values of "X" range from 0.01 to 10, with the lower values representing lower velocities and increased attenuation. The values of "M" range from 1 to 2. The lower values of M represent lower velocities. The reach lengths should be over 500 feet. Small reach lengths do not provide attenuation and may have a travel time less than  $\Delta t$  main time increment.

5. The HEC-1 model provides five alternate methods of routing hydrographs through channel reaches. A careful review of the channel characteristics is necessary to

select the most appropriate method. The attached table (USACOE, 1996) provides some guidelines. The "Munsingum-Cunge" method is generally preferred.

6. Some watersheds have very irregular topography that may have areas draining to isolated depressions or vernal pools without any type of discharge to riverine systems and which are not visible on standard USGS topographic maps. The TR-20 and HEC-1 user manuals do not address this condition. This situation can be handled by reducing the watershed area to reflect only the effective runoff producing area.

### C. Runoff Curve Numbers

The SCS runoff curve number (CN) is an empirical system to determine surface runoff volumes from specified rainfall. While there are questions about the fundamental theory for the curve number, this topic is beyond the scope of this paper. However, there is much that can be done to improve their application. SCS publications provide recommended values of CN as a function of soil types, vegetation, and land use. The TR-20 model user manual does not provide data on how to develop CN values, so most engineers use the TR-55 tables. However, earlier SCS publications (NEH4, 1972) provide the raw data. Unfortunately, the original research of the CN values was rather limited and poorly documented (Hjelmfelt, 1991). In urban areas, the published values are using conservative assumptions. Therefore, skilled modelers need to understand how CN values are established and use their judgment in adjusting them for specific watersheds. Use of a fixed CN value is questionable because the percentage of precipitation that becomes runoff should vary with rainfall intensity.

A revised form has been prepared for use in computing the subwatershed runoff curve numbers (CN). The revised form provides space for adjusting the hydrologic soil group for disturbed or urban conditions, and for modifying the CN value for disconnected impervious areas. The following comments on determining the CN value should be considered:

1. The TR-55 manual (June 1986) allows one to deviate from the published natural soil types in urban areas where the soil profiles and infiltration rates have been modified. For example, a natural type D soil may be cut, filled, or regraded, then covered with a pervious type B topsoil. TR-55 appendix A, page A-1, recommends the following adjusted soil types in disturbed areas:

<u>HSG</u>	<u>Soil Textures</u>	<u>Runoff Potential</u>
A	Sand, loamy sand, or sandy loam	Low
B	Silt loam or loam	Moderate
C	Sandy clay loam	High when saturated
D	Clay loam, silty clay loam, sandy clay, silty clay or clay	High

2. The CN value for ponds and lakes is 98.
3. The SCS recommended CN values published in TR-55 for developed areas assume relatively high levels of impervious cover. The percentage of impervious cover assumed for each land use in the TR-55 manual are tabulated below. A literature and site plan review indicates that the TR-55 published CN values for residential areas are consistently higher than local land use practice in suburban Connecticut towns.

Site specific CN values can be measured or computed for specific watersheds, based on zoning, rather than using default values. MMI has computed impervious cover values for residential areas based on typical Connecticut site plans and zoning as noted below. The values are compared with TR-55 and other published studies. The results below suggest that the impervious cover levels used in TR-55 and other SCS publications to determine CN values are generally on the high side, leading to high CN values.

<u>Land Use</u>	<u>Total Impervious Cover, % of Watershed</u>			
	<u>SCS TR-55</u>	<u>Debo &amp; Reese (1995)</u>	<u>Alley &amp; Veenhuls (1982)</u>	<u>MMI</u>
1/8 acre. Res.	65		30-49	40
1/4 acre Res.	38		30-49	31
1/3 acre Res.	30		22-31	24
1/2 acre Res.	25	30	13-16	20
1 acre Res.	20	12	13-16	13
2 acre Res.	12	6		11
Commercial	85	75	88	Varies
Industrial	72	90	60	60
Apartment		60	60	Varies

4. A U.S. Geological Survey study performed in conjunction with the New Jersey Department of Environmental Protection (Stankowski, 1972) also studied the range of watershed total impervious cover levels as a function of land use with the following findings:

<u>Land Use</u>	<u>Total Impervious Cover, Percent of Watershed for Various Densities</u>		
	<u>Low</u>	<u>Medium</u>	<u>High</u>
Single-family Residential	12	25	40
Multiple-family Residential	60	70	80
Commercial	80	90	100
Industrial	40	70	90
Open Space, Recreational	0	0	0

The highest impervious cover values were found in higher density urban centers, and the lowest values in rural areas. The New Jersey USGS impervious cover range in residential areas is consistent with MMI computations and the data by Alley and Veenhuls. The data indicates that the SCS TR-55 assumed impervious cover values are generally higher than published data.

5. Field observations and published literature indicates that many impervious areas drain onto pervious soils that allow some infiltration to occur, thereby reducing the effect of impervious areas. For developed areas, the SCS curve numbers in TR-55 assume that all impervious areas are connected to and discharge directly into drainage systems, or have concentrated shallow flow to a drainage system preventing subsequent infiltration into pervious soils (See TR-55 Table 2-2a, footnote 2).

If the runoff from the impervious area passes over a pervious area as sheet flow, it will be subject to infiltration and surface storage and is not considered as an effective impervious area (Prandit and Gopalakrishnan).

New CN values can be computed with the effective impervious cover, or Figure 2-4 in TR-55 can be used to reduce CN values for watersheds with extensive "Disconnected" impervious areas. This often applies to parking lots without curbs or catch basins, and roof runoff discharging overland. The key issue is to determine what percentage of the total impervious cover is effective in producing runoff.

- a. MMI has recomputed residential CN values for each soil type based upon the assumption that the road and driveway impervious areas are effective and connected directly to drain systems, but the roofs are not connected to a central storm drain system. This is a very common condition, especially for larger lots.

CN Values  
Residential Areas

<u>Land Use</u>	<u>Standard</u>				<u>MMI Values, With</u>			
	<u>SCS TR-55 Values</u>				<u>Disconnected</u>			
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
1/8 acre. Res.	77	85	90	92	52	68	78	84
1/4 acre Res.	61	75	83	87	50	68	77	84
1/3 acre Res.	57	72	81	86				
1/2 acre Res.	54	70	80	85	47	66	77	83
1 acre Res.	51	68	79	84	43	64	75	81
2 acre Res.	46	65	77	82	40	60	74	80

- b. In an article published in the ASCE Journal of Hydraulic Engineering, two USGS researchers (Alley and Veenhuls) tabulated the impervious cover and effective impervious cover for 19 urban watersheds near Denver. Their data suggests that the effective impervious area in residential areas is only about 60% of the total impervious cover.

Their equation for effective impervious area (EIA) is:

$$EIA = 0.15 (TIA)^{1.41}$$

TIA = Total Impervious Area, % of watershed

The article indicates that the use of TIA instead of EIA in hydrologic models will overestimate runoff volumes and peak flows for ungauged watersheds.

- c. Sutherland (Fall 1995) provides a summary of USGS research on effective impervious cover in 40 watersheds in Oregon. In order to get more accurate estimates of runoff, ineffective impervious areas that do not contribute to runoff should be subtracted from the total impervious area to get the effective value. Using USGS data, Sutherland developed a series of equations to estimate the effective impervious cover in four types of basins:

- Highly Connected Basins - Roads with curbs and storm drains, no drywells or infiltration units, roof runoff connected to storm drains or to street. This is typical of many urban areas.

$$EIA = 0.4 (TIA)^{1.2}$$

- Average Basins – Roads with curbs and storm drains, no dry wells or infiltration units, few roof runoff connections to storm drains. This is typical of many suburban areas with modern curbed roadways with storm drains, but where the driveways and roads do not necessarily drain directly to the road or storm drain.

$$EIA = 0.1 (TIA)^{1.5}$$

- Moderate Connected Basins – 50% of urban areas are without storm drains, some swales and ditches in use, most rooftops not connected to storm drains, few drywells or infiltration units. This condition is typical of many older neighborhoods where many streets lack curbs or storm drains.

$$EIA = 0.04 (TIA)^{1.7}$$

- Low Connected Basins – Few urban areas with storm drains, or 70% of areas drain to drywells or infiltration areas.

$$EIA = 0.01 (TIA)^{2.0}$$

6. The total impervious cover areas determined by MMI for residential areas (paragraph C3) have been combined with the Sutherland (1995) equations to estimate the effective impervious area corresponding to four levels of connectivity, as noted below:

Residential Land Use	MMI TIA, %	Effective Impervious Cover, % of Watershed				USGS Denver Range**
		Highly Connected*	Average Basins*	Moderately Connected*	Low Connectivity*	
1/8 Ac	40	33.4	25.3	21.2	16.0	18-32
1/4 Ac	31	24.6	17.3	13.7	9.6	11-19
1/3 Ac	24	18.1	11.8	8.9	5.8	11-19
1/2 Ac	20	14.6	8.9	6.5	4.0	7-10
1 Ac	13	8.7	4.7	3.1	1.7	7-10
2 Ac	11	7.1	3.6	2.4	1.2	
Formula		$0.4(T)^{1.2}$	$0.1 (S)^{1.5}$	$0.04(T)^{1.7}$	$0.01(T)^{2.0}$	

\* Computed based upon the Sutherland equation using MMI TIA.

\*\* Range of values found in Denver watersheds by Alley & Veenhuls.

The effective impervious cover results for basins with Sutherland's "average connectivity" are very similar to the range of values found in the Denver area USGS study (Alley and Veenhuls, 1983). As expected, the effective impervious cover values for basins with moderate and low levels of connectivity are below the range of values in Denver.

7. MMI has recomputed composite CN values for residential land uses and soil types. They are based upon the MMI estimated impervious cover (paragraph C3) modified by Sutherland's net effective impervious areas, with average connectivity. The CN values for the pervious areas of building lots less than one acre are based on SCS open space CN values, while larger lots assume that the pervious area is 25% wooded.

MMI Composite CN Values\*  
Effective Impervious Area Plus Pervious Areas, Average Connectivity

Lot Size	MMI EIA %	CN Values by Soil Types			
		A	B	C	D
1/8 Ac	25.3	54	70	80	85
1/4 Ac	17.3	49	67	78	83
1/3 Ac	11.8	46	65	77	82
1/2 Ac	8.9	44	64	76	82
1 Ac	4.7	40	61	74	80
2 Ac	3.6	39	60	73	80

\*  $CN = [(EIA)98] + (100 - EIA) (Pervious\ CN) \div 100.$

The above values are quite similar to those determined in paragraph C5A.

Similarly, residential CN values may be computed for watersheds with higher or lower connectivity.

8. The SCS CN values used in TR-55 Table 2-2a for open space (lawns, parks, golf courses, cemeteries) are based upon poor, fair, and good pasture conditions. The three CN classes are listed at <50%, 50% to 75%, and >75% ground cover.

The TR-55 CN values for open space have been found to correspond exactly with Figure 22-23 from Chow's Handbook of Applied Hydrology, using assumed ground cover densities of 30%, 65%, and 90% cover. In Connecticut, where grass lawns are seldom in the form of pastures and are usually providing full ground cover with few,

if any, areas of bare soil, it will often be appropriate to use the Chow Figure 22-23 CN values for 100% ground cover rather than the higher SCS CN values for >75% ground cover as shown below.

	Ground Cover Actual %	CN Values by Soil Type			
		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
		Open Space (lawns, parks, golf courses, cemeteries, etc.)			
TR-55 Poor Condition (grass cover < 50%)	(30%)	68	79	86	89
TR-55 Fair Condition (grass cover 50% to 75%)	(65%)	49	69	79	84
TR-55 Good Condition (grass cover > 75%)	(90%)	39	61	74	80
MMI Excellent Condition	100%	36	55	70	80

The above table indicates that the reasonable assumption of 100% ground cover in most open space areas will reduce the CN values for open grass areas on A, B, and C soils.

9. Connecticut has extensive woodlands with both tree canopies and shrub layers with ground cover. Common practice in use of hydrology models is to assign CN values to these areas based upon the published TR-55 values for "woods." A review indicates these values may overestimate runoff in Connecticut forest lands.

The published CN values for "woods" in the TR-55 Table 2-2c are based upon small farm wood lots, occasionally grazed or cut for firewood. This represents a disturbed woodland, similar to small wooded areas in residential neighborhoods. The values do not correspond to a mature forest land cover as found in rural areas of Connecticut and will overestimate CN values. Other references are available.

The SCS Hydrology Manual (NEH4) and Chow's Handbook of Applied Hydrology (1964) both provide guidance on selecting CN values for humid forested areas. The key factors are soil types and the thickness and condition of the humus organic material on the forest floor. The humus consists of porous partially decomposed organic material, mixed with mineral soils, in the O1 and A1 horizons. A review of the county soils surveys indicates Connecticut woodland soils typically have three to eight inches of humus. Based upon an assumed four inches of a loose humus, the hydrologic condition is IV, with the following CN values (NEH#4, Fig. 9.2):

	CN Values by Soil Type			
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
Forest, 4" Humus	30	50	60	67
TR-55 Woods, Good Condition	30	55	70	77

The above CN values for forest with four inches of humus are much lower than the commonly used TR-55 values. CN values for forests with other humus conditions can be obtained from the attached figure.

#### **D. Time of Concentration**

The time of concentration (TC) input data for the TR-20 and HEC-1 models is an important input variable and has a significant impact on the final computed peak flow rates. In small watersheds, the overland flow component of the TC is critical. In larger watersheds, the channel travel times and routings tend to dominate overall lag periods.

The preferred procedure is to utilize a modified version of the three step "velocity method" as described in TR-55. The recommended procedure is:

1. The "sheet flow" (also called overland flow) component is used as per TR-55. The flow length varies, from as little as 100 feet in irregular topography that channelizes the water, to several hundred feet on smooth permeable soils that delay concentrated flow. SCS suggests a 300-foot limit, while Haan (1982) recommends up to 450 feet, depending on site conditions.
2. The "shallow concentrated flow" component of the time of concentration can be determined with or without using TR-55 figure 3.1. The figure is based on the Manning equation with fixed predetermined values of Manning Equation Roughness factor "N" and hydraulic radius "R". Instead of using these fixed values, one may use the Manning equation with appropriate values of "N" and "R". The attached page from the King County (Washington) Surface Water Design Manual provides suggested values.
3. The "channel flow" velocities should normally be computed with the Manning equation as in TR-55, with special attention to selecting appropriate "N" values and depths for each channel segment.

In computing the channel slope, it is important to omit the vertical grade differences that occur over short lengths, such as waterfalls, rapids, and sudden drops, because their inclusion would alter the mean channel slope (Chow, 1964).

4. It is important to use multiple stream reaches for determining flow velocities with the Manning equation, each with a uniform slope, rather than averaging overall slopes. The sum of travel times for a steep segment and a flat segment is much greater than the composite travel time of an equivalent average slope segment due to the non-linear terms in the Mannings equation.

5. For large floods, much of the water flow is on the vegetated overbank floodplains rather than in the comparatively smooth channel. Use the appropriate composite friction coefficient for computing the time of travel.
6. The flow velocities of a two-year flood in a channel are different than for a 100-year overbank flood. It is not always appropriate to use a single TC value for a wide range of flood depths.
7. The computed flow velocities should be checked by comparing them to the threshold velocity of the observed bed material. For example, computed velocities of five feet per second are not reasonable on a fine sandy bed which would have been eroded.
8. Do not use the SCS Lag method of TC.
9. The time of travel through small ponds and lakes is zero. For large lakes, use the wave equation to determine the lake's wave velocity and travel time. The following velocities result:

<u>Water</u> <u>Depth, FT</u>	<u>Velocity, FPS</u>
2	8.0
4	11.3
8	16.0

10. Many natural channels in the upland portions of Connecticut have relatively steep gradients. The computation of mean velocities for use in the time of concentration, using standard steady state uniform flow techniques (Mannings equation) can lead to supercritical flow conditions and velocities, with a rapid time of concentration leading to high peak flow predictions.

Research shows that supercritical flow in natural channels seldom occurs over long reaches (Trieste, 1992). This is due to high friction roughness, formation of riffles or chutes with mild gradient pools, and energy dissipating hydraulic jumps.

Channels with Froude numbers over 1.0 (supercritical) are very erosive and tend to readjust into cascades/riffles with flat pools (Anderson et al, 1996). This reduces mean velocities and increases TC. Reasonable mean channel velocities can be assumed to have an upper limit at critical depth. For steep sheds, this is approximated by:

$$V = 3.81 R^{0.83} S^{0.12}$$

**E. Precipitation**

1. Rainfall totals used in the TR-20 model are not automatically adjusted for annual or partial duration data sets. The conversion from annual data series to partial-duration series is:

<u>Frequency</u>	<u>Conversion Multiplier</u>
2	1.13
5	1.04
10	1.01
25	1.00

2. The point rainfall data from publications such as TP-40 and HMR-35 should have a watershed area adjustment for basins greater than 10 square miles. The HEC-1 model has an optional step to do this. In the TR-20 model, it can be done manually using the adjustment factors in the HEC-1 manual. This adjustment reduces the net rainfall depths because intense storm cells have a discrete size and seldom cover large watersheds uniformly.
3. The TR-20 model has seven pre-coded rainfall distributions. The Type III storm pattern is used as the standard in Connecticut, and reviewers generally object to use of alternatives. The precipitation data in TP-40 and HMR-35 can be used to create site specific rain distributions in lieu of the standard SCS Type III.

**F. Time Increment**

1. The main time increment affects the number of points used to define hydrographs. The TR-20 and HEC-1 models both have a limit of 300 points which may not allow use of small  $\Delta T$  values for long duration storms. Ideally, the  $\Delta t$  value should be 0.1 to 0.3 TC so that the rising limb of the hydrograph has several computed points. It is difficult to select an ideal  $\Delta t$  value when the subwatersheds vary in size. For very small subareas,  $\Delta t$  maximum is 0.5 TC of smallest subarea. Typical values are 0.1 to 1.0 hours.
2. Avoid use of subwatersheds with a larger TC range, particularly with the TR-20 model, as the computer may not evaluate the peak points on small hydrographs.
3. The  $\Delta t$  value may be changed (increased) part way through a run by using a new increment card in the TR-50 model.

### G. Lag Time

The SCS hydrology methods use the watershed's time of concentration as a key input data relating to unit hydrograph development. Internally, the TR-20 program computes unit hydrographs based on watershed lag. The watershed lag is generally defined as the time interval between the centroid of rainfall to the center of mass of runoff, or peak of unit hydrograph. It may be thought of as a weighted time of travel.

It can be expressed as:

$$\text{Lag} = K \text{ TC (SCS, NEH4)}$$

K = Coefficient less than 1.0

In the TR-20 program, a value  $K = 0.6$  is used (Han, 1982) based upon empirical data. It may vary depending on watershed characteristics. In a "frying pan" shaped watershed, with an outlet at the end of handle, K may approach 1.0. In small basins with simple drainage patterns, the time of concentration may be very close to the lag time of peak flow (Chow, 1964). This adjustment would tend to decrease predicted peak flows.

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**APPENDIX C**  
**EXISTING CONDITIONS RUNOFF CURVE NUMBERS**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-60

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	WOODS - GOOD	30			10.17	305.10
B	1 AC RESIDENTIAL	61			0.14	8.54
B	4 AC RESIDENTIAL	62			0.60	37.20
B	COMMERCIAL	92			1.45	133.40
B	OPEN SPACE - GOOD	55			2.28	125.40
B	WOODS - GOOD	50			11.67	583.50
C	1 AC RESIDENTIAL	74			22.95	1,698.30
C	4 AC RESIDENTIAL	73			5.13	374.49
C	BRUSH - GOOD	65			3.91	254.15
C	OPEN SPACE - GOOD	74			0.34	25.16
C	WOODS - GOOD	70			65.90	4,613.00
D	1 AC RESIDENTIAL	80			18.58	1,486.40
D	4 AC RESIDENTIAL	79			38.99	3,080.21
D	COMMERCIAL	95			0.10	9.50
D	BRUSH - GOOD	73			8.59	627.07
D	OPEN SPACE - GOOD	80			0.14	11.20
D	WOODS - GOOD	67			200.55	13,436.85
I	IMPERVIOUS	98			7.54	738.92
W	WATER	98			0.31	30.38
Totals =					399.34	27,578.77

<sup>1.</sup> Use only one CN value source per line.

( 0.62397 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{27,578.77}{399.34} \quad \text{Use CN} = \boxed{69}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-50

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	MARSH/MEADOW - GOOD	62			0.05	3.10
A	WOODS - GOOD	30			97.61	2,928.30
B	1 AC RESIDENTIAL	61			5.53	337.33
B	COMMERCIAL	92			1.13	103.96
B	BRUSH - GOOD	30			0.04	1.20
B	MEADOW - GOOD	58			0.02	1.16
B	WOODS - GOOD	50			9.58	479.00
C	1/4 AC RESIDENTIAL	78			0.58	45.24
C	1 AC RESIDENTIAL	74			15.85	1,172.90
C	2 AC RESIDENTIAL	73			1.95	142.35
C	BRUSH - GOOD	65			11.35	737.75
C	MEADOW - GOOD	71			2.83	200.93
C	WOODS - FAIR	73			6.52	475.96
C	WOODS - GOOD	70			100.23	7,016.10
D	1 AC RESIDENTIAL	80			30.80	2,464.00
D	2 AC RESIDENTIAL	80			0.27	21.60
D	4 AC RESIDENTIAL	79			14.30	1,129.70
D	MEADOW - GOOD	78			0.29	22.62
D	BRUSH - GOOD	73			0.47	34.31
D	MARSH/MEADOW - GOOD	85			14.89	1,265.65
D	WOODS - FAIR	79			0.45	35.55
D	WOODS - GOOD	67			392.66	26,308.22
I	IMPERVIOUS	98			7.20	705.60
W	WATER	98			0.81	79.38
Totals =					715.41	45,711.91

<sup>1.</sup> Use only one CN value source per line.

( 1.11783 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{45,711.91}{715.41} \quad \text{Use CN} = \boxed{64}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-40

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			0.10	4.00
A	MARSH/MEADOW - GOOD	62			0.09	5.58
A	BRUSH - GOOD	30			4.32	129.60
A	WOODS - GOOD	30			42.69	1,280.70
B	1 AC RESIDENTIAL	61			8.67	528.87
B	4 AC RESIDENTIAL	62			4.68	290.16
B	BRUSH - GOOD	30			4.83	144.90
B	WOODS - GOOD	50			70.43	3,521.50
C	1 AC RESIDENTIAL	74			0.22	16.28
C	4 AC RESIDENTIAL	73			19.02	1,388.46
C	BRUSH - GOOD	65			7.25	471.25
C	WOODS - GOOD	70			211.60	14,812.00
D	1 AC RESIDENTIAL	80			11.96	956.80
D	4 AC RESIDENTIAL	79			28.03	2,214.37
D	MEADOW - GOOD	78			2.34	182.52
D	BRUSH - GOOD	73			7.83	571.59
D	MARSH/MEADOW - GOOD	85			3.26	277.10
D	WOODS - GOOD	67			185.25	12,411.75
I	IMPERVIOUS	98			5.59	547.82
W	WATER	98			0.00	0.00

<sup>1.</sup> Use only one CN value source per line.

Totals = 618.16 39,755.25  
 ( 0.96588 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{39,755.25}{618.16} \text{ Use CN} = \boxed{64}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-30

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	WOODS - GOOD	30			58.12	1,743.60
B	1 AC RESIDENTIAL	61			10.70	652.70
B	WOODS - GOOD	50			68.02	3,401.00
D	1 AC RESIDENTIAL	80			31.18	2,494.40
D	WOODS - GOOD	67			205.87	13,793.29
I	IMPERVIOUS	98			0.00	0.00
Totals =					373.89	22,084.99

<sup>1.</sup> Use only one CN value source per line.

( 0.58420 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{22,084.99}{373.89} \text{ Use CN} = \boxed{59}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-20

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	COMMERCIAL	89			1.17	104.13
A	OPEN SPACE- GOOD	36			1.53	55.08
A	WOODS - GOOD	30			248.71	7,461.30
B	COMMERCIAL	92			1.46	134.32
B	WOODS - GOOD	50			69.61	3,480.50
C	WOODS - GOOD	70			7.91	553.70
D	1 AC RESIDENTIAL	80			5.79	463.20
D	WOODS - GOOD	67			101.20	6,780.40
I	IMPERVIOUS	98			8.78	860.44
W	WATER	98			11.24	1,101.52
Totals =					457.40	20,994.59

<sup>1.</sup> Use only one CN value source per line.

( 0.71469 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{20,994.59}{457.40} \quad \text{Use CN} = \boxed{46}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-10

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			24.94	997.60
A	BARREN	72			0.52	37.44
A	MEADOW - GOOD	30			11.28	338.40
A	WOODS - GOOD	30			62.37	1,871.10
B	1 AC RESIDENTIAL	61			42.06	2,565.66
B	MEADOW - GOOD	58			29.49	1,710.42
B	BARREN	82			0.11	9.02
B	OPEN SPACE- GOOD	55			0.59	32.45
B	WOODS - GOOD	50			48.24	2,412.00
C	1 AC RESIDENTIAL	74			5.65	418.10
C	MEADOW - GOOD	71			2.71	192.41
C	OPEN SPACE- GOOD	74			0.95	70.30
C	WOODS - GOOD	70			16.31	1,141.70
D	1 AC RESIDENTIAL	80			25.42	2,033.60
D	MEADOW - GOOD	78			4.08	318.24
D	BARREN	89			0.09	8.01
D	OPEN SPACE- GOOD	80			2.09	167.20
D	WOODS - GOOD	67			115.43	7,733.81
I	IMPERVIOUS	98			7.04	689.92
W	WATER	98			0.29	28.42
Totals =					399.66	22,775.80
					( 0.62447	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{22,775.80}{399.66} \text{ Use CN} = \boxed{57}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WIB-30

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			35.52	1,420.80
A	WOODS - GOOD	30			1.63	48.90
B	1 AC RESIDENTIAL	61			134.51	8,205.11
B	WOODS - GOOD	50			207.55	10,377.50
D	1 AC RESIDENTIAL	80			87.31	6,984.80
D	WOODS - GOOD	67			265.75	17,805.25
I	IMPERVIOUS	98			8.00	784.00
W	WATER	98			0.00	0.00
Totals =					740.27	45,626.36

<sup>1.</sup> Use only one CN value source per line.

( 1.15667 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{45,626.36}{740.27} \quad \text{Use CN} = \boxed{62}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WIB-20

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			0.05	2.00
A	WOODS - GOOD	30			20.75	622.50
B	1 AC RESIDENTIAL	61			20.65	1,259.65
B	3 AC RESIDENTIAL	62			8.89	551.18
B	WOODS - GOOD	50			172.09	8,604.50
D	1 AC RESIDENTIAL	80			5.49	439.20
D	WOODS - GOOD	67			190.16	12,740.72
I	IMPERVIOUS	98			4.43	434.14
W	WATER	98			0.00	0.00
Totals =					422.51	24,653.89

<sup>1.</sup> Use only one CN value source per line.

( 0.66017 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{24,653.89}{422.51} \text{ Use CN} = \boxed{58}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WIB-10

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			2.10	84.00
A	MEADOW - GOOD	30			3.41	102.30
A	WOODS - GOOD	30			7.89	236.70
B	1 AC RESIDENTIAL	61			81.14	4,949.54
B	BRUSH - GOOD	30			1.58	47.40
B	MEADOW - GOOD	58			15.94	924.52
B	WOODS - GOOD	50			45.73	2,286.50
D	1 AC RESIDENTIAL	80			62.38	4,990.40
D	BRUSH - GOOD	73			0.23	16.79
D	MEADOW - GOOD	78			6.46	503.88
D	WOODS - GOOD	67			45.26	3,032.42
I	IMPERVIOUS	98			5.17	506.66
W	WATER	98			0.22	21.56
Totals =					277.51	17,702.67

<sup>1.</sup> Use only one CN value source per line.

( 0.43361 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{17,702.67}{277.51} \quad \text{Use CN} = \boxed{64}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed NHB-40

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	WOODS - GOOD	30			2.68	80.40
B	1 AC RESIDENTIAL	64			19.12	1,223.68
B	MEADOW - GOOD	58			2.68	155.44
B	WOODS - GOOD	50			11.31	565.50
C	1 AC RESIDENTIAL	74			18.45	1,365.30
C	MARSH/MEADOW - GOOD	74			0.71	52.54
C	WOODS - GOOD	50			61.57	3,078.50
D	1 AC RESIDENTIAL	80			56.14	4,491.20
D	COMMERCIAL	95			1.33	126.35
D	MEADOW - GOOD	78			1.13	88.14
D	MARSH/MEADOW - GOOD	85			9.42	800.70
D	WOODS - GOOD	67			387.61	25,969.87
I	IMPERVIOUS	98			11.09	1,086.82
W	WATER	98			39.67	3,887.66
Totals =					622.91	42,972.10

<sup>1.</sup> Use only one CN value source per line.

( 0.97330 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{42,972.10}{622.91} \text{ Use CN} = \boxed{69}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed NHB-30

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  (Acres) Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			46.51	1,860.40
A	COMMERCIAL	89			1.54	137.06
A	MEADOW - GOOD	30			14.53	435.90
A	WOODS - GOOD	30			308.82	9,264.60
B	1/2 AC RESIDENTIAL	66			3.44	227.04
B	1 AC RESIDENTIAL	64			48.64	3,112.96
B	COMMERCIAL	92			0.41	37.72
B	MEADOW - GOOD	58			16.47	955.26
B	WOODS - GOOD	50			68.51	3,425.50
C	1 AC RESIDENTIAL	74			28.94	2,141.56
C	MEADOW - GOOD	71			7.30	518.30
C	WOODS - GOOD	50			34.91	1,745.50
D	1/2 AC RESIDENTIAL	83			0.10	8.30
D	1 AC RESIDENTIAL	80			17.01	1,360.80
D	COMMERCIAL	95			0.81	76.95
D	MEADOW - GOOD	78			10.98	856.44
D	WOODS - GOOD	67			275.98	18,490.66
I	IMPERVIOUS	98			13.15	1,288.70
W	WATER	98			5.74	562.52
Totals =					903.79	46,506.17
					( 1.41217	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{46,506.17}{903.79} \quad \text{Use CN} = \boxed{51}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed NHB-20

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/2 AC RESIDENTIAL	47			0.07	3.29
A	3/4 AC RESIDENTIAL	42			0.03	1.26
A	1 AC RESIDENTIAL	40			84.43	3,377.20
A	MEADOW - GOOD	30			0.04	1.20
A	WOODS - GOOD	30			5.08	152.40
B	1 AC RESIDENTIAL	64			13.56	867.84
B	WOODS - GOOD	50			1.53	76.50
C	1/2 AC RESIDENTIAL	76			0.62	47.12
C	1 AC RESIDENTIAL	74			14.36	1,062.64
C	BRUSH - GOOD	65			1.34	87.10
C	MEADOW - GOOD	71			1.67	118.57
C	WOODS - GOOD	50			15.30	765.00
D	1 AC RESIDENTIAL	80			42.22	3,377.60
D	MEADOW - GOOD	78			2.02	157.56
D	WOODS - GOOD	67			56.48	3,784.16
I	IMPERVIOUS	98			0.75	73.50
W	WATER	98			0.59	57.82
Totals =					240.09	14,010.76

<sup>1.</sup> Use only one CN value source per line.

( 0.37514 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{14,010.76}{240.09} \text{ Use CN} = \boxed{58}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed NHB-10

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	54			0.71	38.34
A	1/4 AC RESIDENTIAL	49			46.51	2,278.99
A	1/3 AC RESIDENTIAL	49			21.42	1,049.58
A	1/2 AC RESIDENTIAL	47			65.73	3,089.31
A	3/4 AC RESIDENTIAL	42			0.76	31.92
A	1 AC RESIDENTIAL	40			26.62	1,064.80
A	MEADOW - GOOD	30			6.11	183.30
A	PASTURE - POOR	68			0.07	4.76
A	OPEN SPACE - GOOD	36			4.84	174.24
A	WOODS - GOOD	30			87.97	2,639.10
B	1/8 AC RESIDENTIAL	68			7.27	494.36
B	1/4 AC RESIDENTIAL	68			6.23	423.64
B	1/3 AC RESIDENTIAL	67			4.44	297.48
B	1/2 AC RESIDENTIAL	66			18.78	1,239.48
B	1 AC RESIDENTIAL	64			3.37	215.68
B	MEADOW - GOOD	58			0.18	10.44
B	PASTURE - POOR	79			2.52	199.08
B	OPEN SPACE- GOOD	61			2.79	170.19
B	WOODS - GOOD	50			31.50	1,575.00
D	1/8 AC RESIDENTIAL	84			0.05	4.20
D	1/4 AC RESIDENTIAL	84			3.46	290.64
D	1/3 AC RESIDENTIAL	84			7.54	633.36
D	1/2 AC RESIDENTIAL	83			3.51	291.33
D	1 AC RESIDENTIAL	80			2.62	209.60
D	PASTURE - POOR	89			0.07	6.23
D	OPEN SPACE- GOOD	89			0.03	2.67
D	WOODS - GOOD	67			43.09	2,887.03
I	IMPERVIOUS	98			6.11	598.78
W	WATER	98			0.10	9.80
Totals =					404.40	20,113.33
					( 0.63188	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{20,113.33}{404.40} \quad \text{Use CN} = \boxed{50}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed POB-40

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/2 AC RESIDENTIAL	47			1.48	69.56
A	3/4 AC RESIDENTIAL	42			19.14	803.88
A	1 AC RESIDENTIAL	40			1.82	72.80
A	OPEN SPACE- GOOD	36			0.79	28.44
A	WOODS - GOOD	30			15.59	467.70
B	1/2 AC RESIDENTIAL	66			11.53	760.98
B	3/4 AC RESIDENTIAL	65			14.34	932.10
B	1 AC RESIDENTIAL	61			0.32	19.52
B	MEADOW - GOOD	58			0.29	16.82
B	WOODS - GOOD	50			17.90	895.00
C	1/2 AC RESIDENTIAL	76			28.21	2,143.96
C	3/4 AC RESIDENTIAL	75			20.31	1,523.25
C	1 AC RESIDENTIAL	74			92.47	6,842.78
C	MEADOW - GOOD	71			8.81	625.51
C	OPEN SPACE- GOOD	74			0.07	5.18
C	WOODS - GOOD	70			122.91	8,603.70
D	1/2 AC RESIDENTIAL	83			6.19	513.77
D	3/4 AC RESIDENTIAL	82			9.03	740.46
D	1 AC RESIDENTIAL	80			7.34	587.20
D	MEADOW - GOOD	78			1.11	86.58
D	WOODS - GOOD	67			77.98	5,224.66
I	IMPERVIOUS	98			2.97	291.06
W	WATER	98			0.37	36.26

<sup>1.</sup> Use only one CN value source per line.

Totals = 460.97     31,291.17  
 ( 0.72027 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{31,291.17}{460.97} \quad \text{Use CN} = \span style="border: 2px solid black; padding: 5px;">68$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed POB-30

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/4 AC RESIDENTIAL	49			2.66	130.34
A	1/3 AC RESIDENTIAL	49			62.84	3,079.16
A	1/2 AC RESIDENTIAL	47			116.38	5,469.86
A	3/4 AC RESIDENTIAL	42			8.06	338.52
A	1 AC RESIDENTIAL	40			23.93	957.20
A	COMMERCIAL	89			2.36	210.04
A	BRUSH - GOOD	30			0.20	6.00
A	MEADOW - GOOD	30			13.71	411.30
A	OPEN SPACE- GOOD	36			2.45	88.20
A	WOODS - GOOD	30			21.93	657.90
B	1/3 AC RESIDENTIAL	67			48.02	3,217.34
B	1/2 AC RESIDENTIAL	66			91.36	6,029.76
B	3/4 AC RESIDENTIAL	65			0.01	0.65
B	1 AC RESIDENTIAL	61			18.63	1,136.43
B	BRUSH - GOOD	48			3.78	181.44
B	MEADOW - GOOD	58			2.89	167.62
B	OPEN SPACE- GOOD	55			0.20	11.00
B	WOODS - GOOD	50			34.99	1,749.50
C	1/2 AC RESIDENTIAL	76			74.92	5,693.92
C	3/4 AC RESIDENTIAL	75			49.33	3,699.75
C	1 AC RESIDENTIAL	74			32.57	2,410.18
C	COMMERCIAL	94			4.31	405.14
C	BRUSH - GOOD	65			13.61	884.65
C	MEADOW - GOOD	71			2.27	161.17
C	OPEN SPACE- GOOD	74			3.09	228.66
C	PASTURE - GOOD	74			1.78	131.72
C	WOODS - GOOD	70			21.77	1,523.90
D	1/3 AC RESIDENTIAL	84			4.03	338.52
D	1/2 AC RESIDENTIAL	83			25.62	2,126.46
D	3/4 AC RESIDENTIAL	82			8.02	657.64
D	1 AC RESIDENTIAL	80			10.73	858.40
D	BRUSH - GOOD	73			1.25	91.25
D	MEADOW - GOOD	78			3.38	283.64
D	OPEN SPACE- FAIR	84			0.05	4.20
D	OPEN SPACE- GOOD	80			1.89	151.20
D	WOODS - GOOD	67			27.13	1,817.71
I	IMPERVIOUS	98			14.53	1,423.94
W	WATER	98			3.19	312.62
Totals =					757.87	47,026.93

<sup>1</sup> Use only one CN value source per line.

( 1.18417 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{47,026.93}{757.87} \quad \text{Use CN} = \boxed{62}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 03/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed POB-20

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	54			19.29	1,041.66
A	1/4 AC RESIDENTIAL	50			7.00	350.00
A	1/3 AC RESIDENTIAL	49			32.19	1,577.31
A	1/2 AC RESIDENTIAL	47			58.12	2,731.64
A	1 AC RESIDENTIAL	40			23.69	947.60
A	COMMERCIAL	89			1.26	112.14
A	BRUSH - GOOD	30			2.09	62.70
A	MEADOW - GOOD	30			0.74	22.20
A	MARSH/MEADOW - GOOD	50			0.24	12.00
A	OPEN SPACE- GOOD	36			10.28	370.08
A	WOODS - GOOD	30			31.25	937.50
B	1/8 AC RESIDENTIAL	68			15.69	1,066.92
B	1/4 AC RESIDENTIAL	67			5.03	337.01
B	1/3 AC RESIDENTIAL	67			4.83	323.61
B	1/2 AC RESIDENTIAL	66			47.33	3,123.78
B	1 AC RESIDENTIAL	61			12.38	755.18
B	COMMERCIAL	92			2.41	221.72
B	BRUSH - GOOD	48			7.42	356.16
B	OPEN SPACE- GOOD	55			20.04	1,102.20
B	WOODS - GOOD	50			74.59	3,729.50
D	1/8 AC RESIDENTIAL	85			0.32	27.20
D	1/4 AC RESIDENTIAL	84			1.13	94.92
D	1/3 AC RESIDENTIAL	84			0.11	9.24
D	1/2 AC RESIDENTIAL	83			8.39	696.37
D	1 AC RESIDENTIAL	80			0.05	4.00
D	BRUSH - GOOD	73			1.06	77.38
D	MARSH/MEADOW - GOOD	85			5.39	458.15
D	OPEN SPACE- GOOD	80			3.13	250.40
D	WOODS - GOOD	67			30.86	2,067.62
I	IMPERVIOUS	98			17.39	1,704.22
W	WATER	98			1.08	105.84
Totals =					444.78	24,676.25
					(	0.69497 sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{24,676.25}{444.78} \quad \text{Use CN} = \boxed{55}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 03/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed POB-10

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/2 AC RESIDENTIAL	47			0.85	39.95
A	OPEN SPACE- GOOD	36			0.35	12.60
A	WOODS - GOOD	30			7.08	212.40
B	1/4 AC RESIDENTIAL	68			5.41	367.88
B	1/3 AC RESIDENTIAL	67			12.76	854.92
B	1/2 AC RESIDENTIAL	66			0.69	45.54
B	OPEN SPACE- GOOD	55			0.09	4.95
B	WOODS - GOOD	50			2.27	113.50
D	1/4 AC RESIDENTIAL	84			0.05	4.20
D	1/3 AC RESIDENTIAL	84			0.68	57.12
D	1/2 AC RESIDENTIAL	83			0.72	59.76
D	OPEN SPACE- GOOD	80			0.41	32.80
D	WOODS - GOOD	67			7.58	507.86
I	IMPERVIOUS	98			2.48	243.04
W	WATER	98			0.63	61.74
Totals =					42.05	2,618.26
					( 0.06570	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{2,618.26}{42.05} \quad \text{Use CN} = \boxed{62}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4)  
 Location: Bristol & Burlington, CT  
 Circle one: Present    Developed

By: MJS    Date: 03/03/08  
 Checked: \_\_\_\_\_    Date: \_\_\_\_\_  
 Watershed: Watershed CMB-110

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  (Acres) Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	54			0.12	6.48
A	1/3 AC RESIDENTIAL	49			23.62	1,157.38
A	1/2 AC RESIDENTIAL	47			57.15	2,686.05
A	3/4 AC RESIDENTIAL	42			12.36	519.12
A	1 AC RESIDENTIAL	40			49.17	1,966.80
A	BRUSH - POOR	48			1.73	83.04
A	MEADOW - GOOD	30			1.34	40.20
A	PASTURE - POOR	68			9.91	673.88
A	OPEN SPACE - GOOD	36			2.51	90.36
A	WOODS - GOOD	30			48.77	1,463.10
B	1/8 AC RESIDENTIAL	68			5.17	351.56
B	1/3 AC RESIDENTIAL	67			11.85	793.95
B	1/2 AC RESIDENTIAL	66			14.87	981.42
B	3/4 AC RESIDENTIAL	65			4.78	310.70
B	1 AC RESIDENTIAL	64			25.49	1,631.36
B	BRUSH - POOR	67			4.45	298.15
B	MEADOW - GOOD	58			2.18	126.44
B	PASTURE - POOR	79			2.26	178.54
B	OPEN SPACE- GOOD	61			1.57	95.77
B	WOODS - GOOD	50			35.93	1,796.50
D	1/3 AC RESIDENTIAL	84			3.43	288.12
D	1/2 AC RESIDENTIAL	83			18.09	1,501.47
D	3/4 AC RESIDENTIAL	82			1.60	131.20
D	1 AC RESIDENTIAL	80			34.91	2,792.80
D	PASTURE - POOR	89			0.27	24.03
D	MEADOW - GOOD	78			0.09	7.02
D	OPEN SPACE- POOR	89			0.74	65.86
D	WOODS - GOOD	67			75.76	5,075.92
I	IMPERVIOUS	98			7.19	704.62
Totals =					457.31	25,841.84
					( 0.71455	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{25,841.84}{457.31} \quad \text{Use CN} = \boxed{57}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 03/18/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-105

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/3 AC RESIDENTIAL	49			13.47	660.03
A	1/2 AC RESIDENTIAL	47			7.24	340.28
A	1 AC RESIDENTIAL	40			2.83	113.20
A	WOODS - GOOD	30			1.67	50.10
A	COMMERCIAL	89			1.44	128.16
B	1/3 AC RESIDENTIAL	67			4.06	272.02
B	1/2 AC RESIDENTIAL	66			2.65	174.90
B	1 AC RESIDENTIAL	64			2.39	152.96
B	COMMERCIAL	92			6.07	558.44
B	BARREN - FAIR	82			0.62	50.84
B	WOODS - GOOD	50			2.66	133.00
D	WOODS - GOOD	67			7.69	515.23
I	IMPERVIOUS	98			1.45	142.10
Totals =					54.24	3,291.26

<sup>1.</sup> Use only one CN value source per line.

( 0.08475 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{3,291.26}{54.24} \quad \text{Use CN} = \boxed{61}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 03/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-100

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	54			6.68	360.72
A	1/4 AC RESIDENTIAL	49			1.46	71.54
A	1/3 AC RESIDENTIAL	49			23.66	1,159.34
A	1/2 AC RESIDENTIAL	47			9.56	449.32
A	WOODS - GOOD	30			5.46	163.80
A	COMMERCIAL	89			0.22	19.58
B	1/8 AC RESIDENTIAL	68			10.81	735.08
B	1/4 AC RESIDENTIAL	68			4.42	300.56
B	1/3 AC RESIDENTIAL	67			39.30	2,633.10
B	1/2 AC RESIDENTIAL	66			19.03	1,255.98
B	1 AC RESIDENTIAL	64			2.01	128.64
B	COMMERCIAL	92			2.68	246.56
B	BARREN - FAIR	82			2.94	241.08
B	BRUSH - GOOD	48			2.90	139.20
B	MEADOW - GOOD	58			3.74	216.92
B	OPEN SPACE- POOR	79			1.84	145.36
B	WOODS - GOOD	50			6.24	312.00
D	1/8 AC RESIDENTIAL	85			1.80	153.00
D	1/3 AC RESIDENTIAL	84			3.81	320.04
D	1/2 AC RESIDENTIAL	83			4.29	356.07
D	BRUSH - GOOD	73			2.43	177.39
D	MEADOW - GOOD	78			0.50	39.00
D	OPEN SPACE- POOR	89			0.34	30.26
D	WOODS - GOOD	67			5.04	337.68
I	IMPERVIOUS	98			4.23	414.54
Totals =					165.39	10,406.76
					( 0.25842	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{10,406.76}{165.39} \quad \text{Use CN} = \boxed{63}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 03/18/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-90

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	54			0.78	42.12
A	1/3 AC RESIDENTIAL	49			30.57	1,497.93
A	1/2 AC RESIDENTIAL	47			0.89	41.83
A	MEADOW - GOOD	30			0.89	26.70
A	WOODS - GOOD	30			44.48	1,334.40
B	1/8 AC RESIDENTIAL	68			0.71	48.28
B	1/3 AC RESIDENTIAL	67			84.35	5,651.45
B	1/2 AC RESIDENTIAL	66			19.25	1,270.50
B	3/4 AC RESIDENTIAL	65			8.32	540.80
B	1 AC RESIDENTIAL	64			2.57	164.48
B	COMMERCIAL	92			2.52	231.84
B	OPEN SPACE- GOOD	55			1.01	55.55
B	WOODS - GOOD	50			30.35	1,517.50
C	1/2 AC RESIDENTIAL	76			0.87	66.12
C	1/3 AC RESIDENTIAL	77			29.22	2,249.94
C	1 AC RESIDENTIAL	74			3.24	239.76
C	COMMERCIAL	94			0.03	2.82
C	OPEN SPACE- GOOD	74			0.06	4.44
C	WOODS - GOOD	70			3.10	217.00
D	1/3 AC RESIDENTIAL	84			6.99	587.16
D	1/2 AC RESIDENTIAL	83			4.19	347.77
D	3/4 AC RESIDENTIAL	82			1.34	109.88
D	1 AC RESIDENTIAL	80			0.27	21.60
D	COMMERCIAL	95			0.29	27.55
D	OPEN SPACE- GOOD	80			0.82	65.60
D	WOODS - GOOD	67			51.26	3,434.42
I	IMPERVIOUS	98			10.20	999.60
Totals =					337.79	20,754.92
					( 0.52780	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{20,754.92}{337.79} \quad \text{Use CN} = \boxed{61}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-80

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/3 AC RESIDENTIAL	49			4.82	236.18
A	1/2 AC RESIDENTIAL	47			0.69	32.43
A	1 AC RESIDENTIAL	40			0.99	39.60
A	WOODS - GOOD	30			9.70	291.00
A	OPEN SPACE- GOOD	36			0.34	12.24
B	1/3 AC RESIDENTIAL	67			16.71	1,119.57
B	1/2 AC RESIDENTIAL	66			3.70	244.20
B	3/4 AC RESIDENTIAL	65			3.11	202.15
B	1 AC RESIDENTIAL	64			0.82	52.48
B	COMMERCIAL	92			2.48	228.16
B	OPEN SPACE- GOOD	55			29.24	1,608.20
B	WOODS - GOOD	50			27.57	1,378.50
C	1/2 AC RESIDENTIAL	76			0.12	9.12
C	3/4 AC RESIDENTIAL	75			3.62	271.50
C	COMMERCIAL	94			2.94	276.36
C	OPEN SPACE- GOOD	74			2.30	170.20
C	WOODS - GOOD	70			4.72	330.40
D	1/3 AC RESIDENTIAL	84			0.28	23.52
D	1/2 AC RESIDENTIAL	83			0.03	2.49
D	3/4 AC RESIDENTIAL	82			0.00	0.00
D	COMMERCIAL	95			0.33	31.35
D	OPEN SPACE- GOOD	80			3.06	244.80
D	WOODS - GOOD	67			51.54	3,453.18
I	IMPERVIOUS	98			17.66	1,730.68
W	WATER	98			0.87	85.26
						0.00
Totals =					187.64	12,073.57

<sup>1.</sup> Use only one CN value source per line.

( 0.29319 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{12,073.57}{187.64} \quad \text{Use CN} = \boxed{64}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-70

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	WOODS - GOOD	30			1.72	51.60
B	1/8 AC RESIDENTIAL	68			12.82	871.76
B	1/4 AC RESIDENTIAL	68			2.06	140.08
B	1/3 AC RESIDENTIAL	67			233.02	15,612.34
B	1/2 AC RESIDENTIAL	66			17.38	1,147.08
B	COMMERCIAL	92			7.89	725.88
B	OPEN SPACE- GOOD	55			10.87	597.85
B	WOODS - GOOD	50			15.39	769.50
C	1/3 AC RESIDENTIAL	77			16.63	1,280.51
C	1/2 AC RESIDENTIAL	76			0.89	67.64
C	WOODS - GOOD	70			2.52	176.40
D	1/8 AC RESIDENTIAL	84			8.42	707.28
D	1/4 AC RESIDENTIAL	84			1.07	89.88
D	1/3 AC RESIDENTIAL	84			2.84	238.56
D	1/2 AC RESIDENTIAL	83			0.17	14.11
D	COMMERCIAL	95			4.98	473.10
D	OPEN SPACE- GOOD	80			1.31	104.80
D	WOODS - GOOD	67			20.58	1,378.86
I	IMPERVIOUS	98			24.78	2,428.44
W	WATER	98			2.74	268.52
						0.00
Totals =					388.08	27,144.19
					( 0.60638	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{27,144.19}{388.08} \quad \text{Use CN} = \boxed{70}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-60

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
B	1/8 AC RESIDENTIAL	68			32.80	2,230.40
B	1/4 AC RESIDENTIAL	68			9.74	662.32
B	1/3 AC RESIDENTIAL	67			40.60	2,720.20
B	1/2 AC RESIDENTIAL	66			18.30	1,207.80
B	3/4 AC RESIDENTIAL	65			2.76	179.40
B	1 AC RESIDENTIAL	64			3.05	195.20
B	COMMERCIAL	92			22.78	2,095.76
B	BRUSH - GOOD	48			3.32	159.36
B	MEADOW - GOOD	58			6.64	385.12
B	OPEN SPACE- FAIR	69			0.31	21.39
B	OPEN SPACE- GOOD	55			9.55	525.25
B	WOODS - FAIR	60			2.91	174.60
B	WOODS - GOOD	50			20.95	1,047.50
D	1/8 AC RESIDENTIAL	84			0.81	68.04
D	1/3 AC RESIDENTIAL	84			0.63	52.92
D	1/2 AC RESIDENTIAL	83			5.60	464.80
D	BRUSH - GOOD	73			0.03	2.19
D	COMMERCIAL	95			0.03	2.85
D	MEADOW- GOOD	78			0.40	31.20
D	WOODS - GOOD	67			21.67	1,451.89
I	IMPERVIOUS	98			45.47	4,456.06
						0.00
						0.00
Totals =					248.35	18,134.25
					( 0.38805	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{18,134.25}{248.35} \text{ Use CN} = \boxed{73}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-50

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Acres</span> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/3 AC RESIDENTIAL	49			2.02	98.98
A	3/4 AC RESIDENTIAL	45			0.92	41.40
A	WOODS - GOOD	30			1.67	50.10
B	1/8 AC RESIDENTIAL	68			4.90	333.20
B	1/4 AC RESIDENTIAL	68			69.34	4,715.12
B	1/3 AC RESIDENTIAL	67			111.34	7,459.78
B	3/4 AC RESIDENTIAL	65			3.64	236.60
B	COMMERCIAL	92			22.42	2,062.64
B	OPEN SPACE- GOOD	55			8.40	462.00
B	WOODS - GOOD	50			20.18	1,009.00
D	1/8 AC RESIDENTIAL	84			0.44	36.96
D	1/3 AC RESIDENTIAL	84			0.01	0.84
D	3/4 AC RESIDENTIAL	82			0.69	56.58
D	COMMERCIAL	95			0.08	7.60
D	WOODS - GOOD	67			11.18	749.06
I	IMPERVIOUS	98			17.71	1,735.58
						0.00
						0.00
Totals =					274.94	19,055.44

<sup>1.</sup> Use only one CN value source per line.

( 0.42959 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{19,055.44}{274.94} \quad \text{Use CN} = \boxed{69}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-40

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
B	1/8 AC RESIDENTIAL	68			25.53	1,736.04
B	1/4 AC RESIDENTIAL	68			135.38	9,205.84
B	1/3 AC RESIDENTIAL	67			128.05	8,579.35
B	1/2 AC RESIDENTIAL	66			48.51	3,201.66
B	3/4 AC RESIDENTIAL	65			4.08	265.20
B	1 AC RESIDENTIAL	64			6.70	428.80
B	COMMERCIAL	92			3.77	346.84
B	BRUSH - GOOD	48			1.29	61.92
B	MEADOW - GOOD	58			6.69	388.02
B	OPEN SPACE- GOOD	55			4.45	244.75
B	WOODS - GOOD	50			13.59	679.50
C	1/4 AC RESIDENTIAL	77			12.03	926.31
C	1/3 AC RESIDENTIAL	77			1.25	96.25
D	1/8 AC RESIDENTIAL	84			3.15	264.60
D	1/4 AC RESIDENTIAL	84			2.93	246.12
D	1/3 AC RESIDENTIAL	84			3.13	262.92
D	1/2 AC RESIDENTIAL	83			3.27	271.41
D	3/4 AC RESIDENTIAL	82			0.11	9.02
D	MEADOW - GOOD	78			1.08	84.24
D	OPEN SPACE- GOOD	80			1.69	135.20
D	WOODS - GOOD	67			7.35	492.45
I	IMPERVIOUS	98			23.59	2,311.82
W	WATER	98			1.26	123.48
						0.00
Totals =					438.88	30,361.74

<sup>1.</sup> Use only one CN value source per line.

( 0.68575 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{30,361.74}{438.88} \quad \text{Use CN} = \boxed{69}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4)

By: MJS

Date: 02/03/08

Location: Bristol & Burlington, CT

Checked: \_\_\_\_\_

Date: \_\_\_\_\_

Circle one: Present    Developed

Watershed: Watershed CMB-30

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Acres</span> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/3 AC RESIDENTIAL	49			12.05	590.45
A	3/4 AC RESIDENTIAL	45			5.21	234.45
A	WOODS - GOOD	30			0.60	18.00
B	1/8 AC RESIDENTIAL	68			6.02	409.36
B	1/4 AC RESIDENTIAL	68			40.47	2,751.96
B	1/3 AC RESIDENTIAL	67			27.13	1,817.71
B	1/2 AC RESIDENTIAL	66			25.39	1,675.74
B	1 AC RESIDENTIAL	64			8.81	563.84
B	COMMERCIAL	92			25.03	2,302.76
B	OPEN SPACE- GOOD	55			11.48	631.40
B	WOODS - GOOD	50			23.52	1,176.00
D	1/4 AC RESIDENTIAL	84			0.09	7.56
D	1/3 AC RESIDENTIAL	84			0.18	15.12
D	1/2 AC RESIDENTIAL	83			0.04	3.32
D	3/4 AC RESIDENTIAL	82			1.78	145.96
D	WOODS - GOOD	67			3.80	254.60
I	IMPERVIOUS	98			13.69	1,341.62
						0.00
						0.00
						0.00
						0.00
						0.00
Totals =					205.29	13,939.85
					( 0.32077	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{13,939.85}{205.29} \quad \text{Use CN} = \boxed{68}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 03/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-20

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	52			0.71	36.92
A	1/4 AC RESIDENTIAL	50			16.75	837.50
A	1/3 AC RESIDENTIAL	49			17.05	835.45
A	COMMERCIAL	89			5.13	456.57
A	OPEN SPACE- GOOD	36			0.20	7.20
A	WOODS - GOOD	30			0.90	27.00
B	1/8 AC RESIDENTIAL	68			5.02	341.36
B	1/4 AC RESIDENTIAL	68			159.48	10,844.64
B	1/3 AC RESIDENTIAL	67			114.21	7,652.07
B	1/2 AC RESIDENTIAL	66			21.08	1,391.28
B	1 AC RESIDENTIAL	64			0.33	21.12
B	COMMERCIAL	92			7.22	664.24
B	OPEN SPACE- GOOD	55			45.70	2,513.50
B	WOODS - GOOD	50			102.63	5,131.50
D	1/4 AC RESIDENTIAL	84			13.89	1,166.76
D	1/3 AC RESIDENTIAL	84			17.11	1,437.24
D	1/2 AC RESIDENTIAL	83			7.80	647.40
D	1 AC RESIDENTIAL	81			2.21	179.01
D	COMMERCIAL	95			13.31	1,264.45
D	OPEN SPACE- GOOD	80			2.19	175.20
D	WOODS - GOOD	67			47.35	3,172.45
I	IMPERVIOUS	98			56.28	5,515.44
W	WATER	98			2.34	229.32
Totals =					658.89	44,547.62
					( 1.02952	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{44,547.62}{658.89} \quad \text{Use CN} = \boxed{68}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: MJS Date: 02/03/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-10

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/4 AC RESIDENTIAL	50			0.02	1.00
A	WOODS - GOOD	30			0.09	2.70
B	1/4 AC RESIDENTIAL	68			1.84	125.12
B	1/3 AC RESIDENTIAL	67			4.59	307.53
B	COMMERCIAL	92			0.16	14.72
B	WOODS - GOOD	50			1.38	69.00
I	IMPERVIOUS	98			1.14	111.72
W	WATER	98			0.16	15.68
Totals =					9.38	647.47
					( 0.01466	sq mi)

<sup>1</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{647.47}{9.38} \quad \text{Use CN} = \boxed{69}$$

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**APPENDIX D**  
**EXISTING CONDITIONS TIME OF CONCENTRATION CALCULATIONS**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $I_c$   $T_t$

By: RV Date: 02/26/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: WHB-60

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>	
	FRST	
	0.600	
ft.	300.0	
in.	3.20	
ft./ft.	0.017	
hr.	1.281	= 1.281

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=.4$  unpaved,  $d=.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>								
	FRST								
	0.100								
	UNPVD								
ft.	0.40								
ft.	515.0								
ft./ft.	0.010								
fps.	0.80								
hr.	0.180	+	0.000	+	0.000	+	0.000	=	0.180

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length,  $L$

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>	<b>E-F</b>						
ft.	5.00	10.00	15.00						
	3.00	3.00	3.00						
ft.	0.50	1.00	1.00						
ft. <sup>2</sup>	3.25	13.00	18.00						
ft.	8.16	16.32	21.32						
ft.	0.40	0.80	0.84						
ft./ft.	0.0836	0.0833	0.0167						
	0.040	0.040	0.040						
fps.	5.83	9.24	4.30						
ft.	670.0	2340.0	1800.0						
hr.	0.032	+	0.070	+	0.116	+	0.000	=	0.219
hr.									1.679



## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 02/26/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one: I<sub>c</sub> T<sub>t</sub> Subwatershed: WHB-40

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$
6.  $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$

Segment ID	A-B				
	FRST				
	0.600				
	ft. 300.0				
	in. 3.20				
	ft./ft. 0.013				
	hr. 1.403	=			1.403

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=.4$  unpaved,  $d=.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$
13. Average velocity,  $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14.  $T_t = \frac{L}{3600 * V}$

Segment ID	B-C				
	FRST				
	0.100				
	UNPVD				
	ft. 0.40				
	ft. 740.0				
	ft./ft. 0.007				
	fps. 0.67				
	hr. 0.308	+	0.000	+	0.000
				+	0.000
					= 0.308

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$
20. Hydraulic Radius,  $R = \frac{A}{P_w}$
21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$
23.  $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$
24. Flow length,  $L$
25.  $T_t = \frac{L}{3600 * V}$
26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	C-D	D-E	E-F		
	ft. 5.00	10.00	30.00		
	3.00	3.00	3.00		
	ft. 0.50	1.00	1.50		
	ft. <sup>2</sup> 3.25	13.00	51.75		
	ft. 8.16	16.32	39.49		
	ft. 0.40	0.80	1.31		
	ft./ft. 0.1030	0.0194	0.0030		
	0.040	0.040	0.040		
	fps. 6.47	4.46	2.44		
	ft. 2330.0	2570.0	2540.0		
	hr. 0.100	+	0.160	+	0.289
				+	0.000
					= 0.549
				hr.	2.261

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)      By: RV      Date: 02/26/08  
 Location: Bristol & Burlington, CT      Checked: \_\_\_\_\_      Date: \_\_\_\_\_  
 Circle one: **Present**    Developed      Watershed: Coppermine Brook  
 Circle one:  $T_c$        $T_t$       Subwatershed: WHB-30

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)	Segment ID	<b>A-B</b>	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		FRST	
3. Flow Length, L (< 300ft)	ft.	0.600	
4. Two-year 24-hr rainfall, $P_2$	in.	300.0	
5. Land slope, s	ft./ft.	3.20	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.033	
		0.976	= 0.976

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description	Segment ID	<b>B-C</b>			
8. Manning's roughness coeff., n		FRST			
9. Paved or unpaved		0.100			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft.	UNPVD			
11. Flow Length, L	ft.	0.40			
12. Watercourse slope, s	ft./ft.	430.0			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	0.093			
14. $T_t = \frac{L}{3600 * V}$	hr.	2.47			
		0.048	+ 0.000	+ 0.000	+ 0.000 = 0.048

### Channel flow

15. Channel Bottom width, b	Segment ID	<b>C-D</b>	<b>D-E</b>		
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	5.00	5.00		
17. Depth of flow, d	ft.	3.00	3.00		
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup>	0.50	0.50		
19. Wetted perimeter, $P_w$	ft.	3.25	3.25		
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	8.16	8.16		
21. Channel slope, s	ft./ft.	0.40	0.40		
22. Manning's roughness coeff., n		0.0670	0.0670		
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	0.040	0.040		
24. Flow length, L	ft.	5.22	5.22		
25. $T_t = \frac{L}{3600 * V}$	hr.	3260.0	2980.0		
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)		0.174	+ 0.159	+ 0.000	+ 0.000 = 0.332
	hr.				1.356

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 02/26/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one:  $T_c$   $T_t$  Subwatershed: WHB-20

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)	Segment ID	<b>A-B</b>	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		FRST	
3. Flow Length, L (< 300ft)	ft.	0.600	
4. Two-year 24-hr rainfall, $P_2$	in.	300.0	
5. Land slope, s	ft./ft.	3.20	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.060	
		0.768	= 0.768

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description	Segment ID	<b>B-C</b>			
8. Manning's roughness coeff., n		FRST			
9. Paved or unpaved		0.100			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft.	UNPVD			
11. Flow Length, L	ft.	0.40			
12. Watercourse slope, s	ft./ft.	2415.0			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	0.045			
14. $T_t = \frac{L}{3600 * V}$	hr.	1.72			
		0.391	+ 0.000	+ 0.000	+ 0.000 = 0.391

### Channel flow

15. Channel Bottom width, b	Segment ID	<b>C-D</b>	<b>D-E</b>		
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	15.00	400.00		
17. Depth of flow, d		3.00	3.00		
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup>	1.00	3.00		
19. Wetted perimeter, $P_w$	ft.	18.00	1227.00		
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	21.32	418.97		
21. Channel slope, s	ft./ft.	0.84	2.93		
22. Manning's roughness coeff., n		0.0191	0.0089		
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	0.040	0.040		
24. Flow length, L	ft.	4.60	7.19		
25. $T_t = \frac{L}{3600 * V}$	hr.	4715.0	560.0		
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)		0.285	+ 0.022	+ 0.000	+ 0.000 = 0.306
	hr.				1.466

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: **Present** Developed  
 Circle one:  $T_c$   $T_t$

By: RV Date: 02/26/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: WHB-10

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$
6.  $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$

Segment ID	A-B				
	FRST				
	0.600				
	ft. 300.0				
	in. 3.20				
	ft./ft. 0.073				
	hr. 0.710	=		0.710	

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=.4$  unpaved,  $d=.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$
13. Average velocity,  $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14.  $T_t = \frac{L}{3600 * V}$

Segment ID	B-C				
	FRST				
	0.100				
	UNPVD				
	ft. 0.40				
	ft. 240.0				
	ft./ft. 0.175				
	fps. 3.38				
	hr. 0.020	+	0.000	+	0.000
				+	0.000
					= 0.020

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $Z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$
20. Hydraulic Radius,  $R = \frac{A}{P_w}$
21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$
23.  $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$
24. Flow length,  $L$
25.  $T_t = \frac{L}{3600 * V}$
26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	C-D	D-E	D-E		
	ft. 3.00	3.00	15.00		
	1.00	1.00	3.00		
	ft. 0.33	0.40	1.00		
	ft. <sup>2</sup> 1.10	1.36	18.00		
	ft. 3.93	4.13	21.32		
	ft. 0.28	0.33	0.84		
	ft./ft. 0.0985	0.0310	0.0213		
	0.040	0.040	0.040		
	fps. 5.00	3.13	4.86		
	ft. 3350.0	1600.0	3050.0		
	hr. 0.186	+	0.142	+	0.174
				+	0.000
					= 0.503
				hr.	1.233

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 02/26/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one:  $T_c$   $T_t$  Subwatershed: WIB-30

### Sheet flow (applicable to $T_c$ only)

Segment ID	A-B
1. Surface description (Table 3-1)	FRST
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)	0.600
3. Flow Length, L (< 300ft)	ft. 300.0
4. Two-year 24-hr rainfall, $P_2$	in. 3.20
5. Land slope, s	ft./ft. 0.027
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr. 1.062 = 1.062

### Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID	B-C	C-D	C-D	D-E
7. Surface description	FRST	FRST	FRST	FRST
8. Manning's roughness coeff., n	0.100	0.100	0.100	0.100
9. Paved or unpaved	UNPVD	UNPVD	UNPVD	UNPVD
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft. 0.40	0.40	0.40	0.40
11. Flow Length, L	ft. 480.0	590.0	900.0	630.0
12. Watercourse slope, s	ft./ft. 0.046	0.237	0.033	0.095
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps. 1.73	3.94	1.47	2.49
14. $T_t = \frac{L}{3600 * V}$	hr. 0.077 +	0.042 +	0.170 +	0.070 = 0.359

### Channel flow

Segment ID	E-F	F-G		
15. Channel Bottom width, b	ft. 5.00	10.00		
16. Horizontal side slope component, z (z horiz:1 vert)	1.00	3.00		
17. Depth of flow, d	ft. 0.50	1.00		
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup> 2.75	13.00		
19. Wetted perimeter, $P_w$	ft. 6.41	16.32		
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft. 0.43	0.80		
21. Channel slope, s	ft./ft. 0.0086	0.0270		
22. Manning's roughness coeff., n	0.040	0.040		
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps. 1.96	5.26		
24. Flow length, L	ft. 3500.0	6550.0		
25. $T_t = \frac{L}{3600 * V}$	hr. 0.495 +	0.346 +	0.000 +	0.000 = 0.841
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)				hr. 2.262

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 02/26/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one:  $T_c$   $T_t$  Subwatershed: WIB-20

### Sheet flow (applicable to $T_c$ only)

	Segment ID	A-B
1. Surface description (Table 3-1)		FRST
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.600
3. Flow Length, L (< 300ft)	ft.	300.0
4. Two-year 24-hr rainfall, $P_2$	in.	3.20
5. Land slope, s	ft./ft.	0.033
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.976 = 0.976

### Shallow concentrated flow (assume hyd. radius = depth of flow)

	Segment ID	B-C			
7. Surface description		FRST			
8. Manning's roughness coeff., n		0.100			
9. Paved or unpaved		UNPVD			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft.	0.40			
11. Flow Length, L	ft.	2080.0			
12. Watercourse slope, s	ft./ft.	0.154			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	3.17			
14. $T_t = \frac{L}{3600 * V}$	hr.	0.182 + 0.000 + 0.000 + 0.000 = 0.182			

### Channel flow

	Segment ID	C-D	D-E	E-F	F-G
15. Channel Bottom width, b	ft.	5.00	5.00	5.00	10.00
16. Horizontal side slope component, z (z horiz:1 vert)		1.00	1.00	1.00	3.00
17. Depth of flow, d	ft.	0.50	0.50	0.50	1.00
18. Cross sectional flow area, A (assume trapazoidal)	ft. <sup>2</sup>	2.75	2.75	2.75	13.00
19. Wetted perimeter, $P_w$	ft.	6.41	6.41	6.41	16.32
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.43	0.43	0.43	0.80
21. Channel slope, s	ft./ft.	0.0960	0.0214	0.1180	0.0310
22. Manning's roughness coeff., n		0.040	0.040	0.040	0.040
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	6.56	3.10	7.28	5.63
24. Flow length, L	ft.	1360.0	1870.0	550.0	1600.0
25. $T_t = \frac{L}{3600 * V}$	hr.	0.058 + 0.168 + 0.021 + 0.079 = 0.325			
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)	hr.				1.483

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 02/26/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one: I<sub>c</sub> T<sub>t</sub> Subwatershed: WIB-10

### Sheet flow (applicable to $T_c$ only)

Segment ID	A-B
1. Surface description (Table 3-1)	FRST
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)	0.600
3. Flow Length, L (< 300ft)	ft. 300.0
4. Two-year 24-hr rainfall, P <sub>2</sub>	in. 3.20
5. Land slope, s	ft./ft. 0.050
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr. 0.826 = 0.826

### Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID	B-C			
7. Surface description	FRST			
8. Manning's roughness coeff., n	0.100			
9. Paved or unpaved	UNPVD			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft. 0.40			
11. Flow Length, L	ft. 2215.0			
12. Watercourse slope, s	ft./ft. 0.054			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps. 1.88			
14. $T_t = \frac{L}{3600 * V}$	hr. 0.327 + 0.000 + 0.000 + 0.000 = 0.327			

### Channel flow

Segment ID	C-D	D-E		
15. Channel Bottom width, b	ft. 3.00	5.00		
16. Horizontal side slope component, z (z horiz:1 vert)	1.00	2.00		
17. Depth of flow, d	ft. 0.40	0.50		
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup> 1.36	3.00		
19. Wetted perimeter, P <sub>w</sub>	ft. 4.13	7.24		
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft. 0.33	0.41		
21. Channel slope, s	ft./ft. 0.0530	0.0126		
22. Manning's roughness coeff., n	0.040	0.040		
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps. 4.09	2.32		
24. Flow length, L	ft. 1225.0	1030.0		
25. $T_t = \frac{L}{3600 * V}$	hr. 0.083 + 0.123 + 0.000 + 0.000 = 0.206			
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)				hr. 1.360

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub>  $T_t$

By: RV Date: 02/26/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: NHB-40

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>	
	FRST	
	0.600	
ft.	300.0	
in.	3.20	
ft./ft.	0.050	
hr.	0.826	= 0.826

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>								
	FRST								
	0.100								
	UNPVD								
ft.	0.40								
ft.	940.0								
ft./ft.	0.157								
fps.	3.21								
hr.	0.081	+	0.000	+	0.000	+	0.000	=	0.081

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>	<b>E-F</b>	<b>F-G</b>					
ft.	3.00	5.00	10.00	1000.0					
ft.	1.00	3.00	3.00	0.50					
ft.	0.50	0.50	1.00	5.00					
ft. <sup>2</sup>	1.75	3.25	13.00	5012.5					
ft.	4.41	8.16	16.32	1011.18					
ft.	0.40	0.40	0.80	4.96					
ft./ft.	0.0310	0.0420	0.0044	0.0044					
ft./ft.	0.040	0.040	0.040	0.040					
fps.	3.54	4.13	2.12	7.18					
ft.	3410.0	900.0	4470.0	2240.0					
hr.	0.268	+	0.061	+	0.585	+	0.087	=	1.000
hr.									1.907



## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $T_c$   $T_t$

By: RV Checked: \_\_\_\_\_ Date: 02/26/08  
 Watershed: Coppermine Brook Date: \_\_\_\_\_  
 Subwatershed: NHB-20

### Sheet flow (applicable to $T_c$ only)

Segment ID	A-B
1. Surface description (Table 3-1)	FRST
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)	0.600
3. Flow Length, L (< 300ft)	ft. 300.0
4. Two-year 24-hr rainfall, $P_2$	in. 3.20
5. Land slope, s	ft./ft. 0.033
6. $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$	hr. 0.976 = 0.976

### Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID	B-C			
7. Surface description	FRST			
8. Manning's roughness coeff., n	0.100			
9. Paved or unpaved	UNPVD			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft. 0.40			
11. Flow Length, L	ft. 1865.0			
12. Watercourse slope, s	ft./ft. 0.064			
13. Average velocity, $V = \frac{1.49}{n} (d^{2/3})(s^{1/2})$	fps. 2.05			
14. $T_t = \frac{L}{3600 * V}$	hr. 0.253 + 0.000 + 0.000 + 0.000 = 0.253			

### Channel flow

Segment ID	C-D	D-E		
15. Channel Bottom width, b	ft. 3.00	5.00		
16. Horizontal side slope component, z (z horiz:1 vert)	1.00	3.00		
17. Depth of flow, d	ft. 0.50	0.50		
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup> 1.75	3.25		
19. Wetted perimeter, $P_w$	ft. 4.41	8.16		
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft. 0.40	0.40		
21. Channel slope, s	ft./ft. 0.0540	0.0440		
22. Manning's roughness coeff., n	0.040	0.040		
23. $V = \frac{1.49}{n} (R^{2/3})(s^{1/2})$	fps. 4.67	4.23		
24. Flow length, L	ft. 4800.0	1765.0		
25. $T_t = \frac{L}{3600 * V}$	hr. 0.285 + 0.116 + 0.000 + 0.000 = 0.401			
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)				hr. 1.630

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub>  $T_t$

By: RV Checked: \_\_\_\_\_ Date: 02/26/08  
 Watershed: Coppermine Brook Date: \_\_\_\_\_  
 Subwatershed: NHB-10

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>				
	FRST				
	0.600				
ft.	300.0				
in.	3.20				
ft./ft.	0.067				
hr.	0.735	=			0.735

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>				
	FRST				
	0.100				
	UNPVD				
ft.	0.40				
ft.	470.0				
ft./ft.	0.085				
fps.	2.36				
hr.	0.055	+	0.000	+	0.000
				+	0.000
					= 0.055

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>			
ft.	10.00	15.00			
	3.00	3.00			
ft.	1.00	1.00			
ft. <sup>2</sup>	13.00	18.00			
ft.	16.32	21.32			
ft.	0.80	0.84			
ft./ft.	0.0137	0.0049			
	0.040	0.040			
fps.	3.75	2.34			
ft.	5100.0	4050.0			
hr.	0.378	+	0.482	+	0.000
				+	0.000
					= 0.860
					hr. 1.650

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: **Present**    Developed  
 Circle one:  **$I_c$**      $T_t$

By: RV    Date: 02/26/08  
 Checked: \_\_\_\_\_    Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: POB-40

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$
6.  $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$

Segment ID	A-B	
	FRST	
	0.600	
ft.	300.0	
in.	3.20	
ft./ft.	0.060	
hr.	0.768	= 0.768

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=.4$  unpaved,  $d=.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$
13. Average velocity,  $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14.  $T_t = \frac{L}{3600 * V}$

Segment ID	B-C	C-D		
	FRST	FRST		
	0.100	0.100		
	UNPVD	UNPVD		
ft.	0.40	0.40		
ft.	885.0	1985.0		
ft./ft.	0.169	0.010		
fps.	3.33	0.81		
hr.	0.074	0.682	+	0.000
			+	0.000
				= 0.756

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$
20. Hydraulic Radius,  $R = \frac{A}{P_w}$
21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$
23.  $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$
24. Flow length,  $L$
25.  $T_t = \frac{L}{3600 * V}$
26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	D-E	E-F		
ft.	5.00	10.00		
	3.00	3.00		
ft.	0.50	1.00		
ft. <sup>2</sup>	3.25	13.00		
ft.	8.16	16.32		
ft.	0.40	0.80		
ft./ft.	0.0760	0.0127		
	0.040	0.040		
fps.	5.56	3.60		
ft.	3570.0	1500.0		
hr.	0.178	0.116	+	0.000
			+	0.000
				= 0.294
				1.818

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 02/27/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one:  $I_c$   $T_t$  Subwatershed: POB-30

### Sheet flow (applicable to $T_c$ only)

Segment ID	A-B
1. Surface description (Table 3-1)	FRST
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)	0.600
3. Flow Length, L (< 300ft)	ft. 300.0
4. Two-year 24-hr rainfall, $P_2$	in. 3.20
5. Land slope, s	ft./ft. 0.150
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr. 0.532 = 0.532

### Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID	B-C			
7. Surface description	FRST			
8. Manning's roughness coeff., n	0.100			
9. Paved or unpaved	UNPVD			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft. 0.40			
11. Flow Length, L	ft. 1080.0			
12. Watercourse slope, s	ft./ft. 0.083			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps. 2.33			
14. $T_t = \frac{L}{3600 * V}$	hr. 0.129 + 0.000 + 0.000 + 0.000 = 0.129			

### Channel flow

Segment ID	C-D	D-E	E-F	F-G
15. Channel Bottom width, b	ft. 24" RCP	36" RCP	5.00	10.00
16. Horizontal side slope component, z (z horiz:1 vert)	---	---	3.00	3.00
17. Depth of flow, d	ft. FULL	FULL	0.50	1.00
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup> 3.14	7.07	3.25	13.00
19. Wetted perimeter, $P_w$	ft. 6.28	9.42	8.16	16.32
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft. 0.50	0.75	0.40	0.80
21. Channel slope, s	ft./ft. 0.0580	0.0680	0.0323	0.0140
22. Manning's roughness coeff., n	0.013	0.013	0.040	0.040
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps. 17.39	24.67	3.62	3.79
24. Flow length, L	ft. 3450.0	1470.0	3250.0	2500.0
25. $T_t = \frac{L}{3600 * V}$	hr. 0.055 + 0.017 + 0.249 + 0.183 = 0.504			
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)	hr. 1.165			

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 02/27/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one:  $I_c$   $T_t$  Subwatershed: POB-20

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	A-B	
	FRST	
	0.600	
ft.	300.0	
in.	3.20	
ft./ft.	0.067	
hr.	0.735	= 0.735

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=.4$  unpaved,  $d=.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	B-C					
	FRST					
	0.100					
	UNPVD					
ft.	0.40					
ft.	1245.0					
ft./ft.	0.201					
fps.	3.63					
hr.	0.095	+	0.000	+	0.000	+ 0.000 = 0.095

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length,  $L$

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	C-D	D-E	E-F			
ft.	18" RCP	5.00	15.00			
	---	3.00	3.00			
ft.	FULL	0.50	1.00			
ft. <sup>2</sup>	1.77	3.25	18.00			
ft.	4.71	8.16	21.32			
ft.	0.37	0.40	0.84			
ft./ft.	0.0340	0.0028	0.0023			
	0.013	0.040	0.040			
fps.	10.99	1.07	1.60			
ft.	1325.0	1410.0	2185.0			
hr.	0.033	+	0.367	+	0.380	+ 0.000 = 0.781
hr.						1.611



## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub>  $T_t$

By: RV Date: 02/27/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-110

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>	
	FRST	
	0.600	
ft.	300.0	
in.	3.20	
ft./ft.	0.033	
hr.	0.976	= 0.976

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>								
	FRST								
	0.100								
	UNPVD								
ft.	0.40								
ft.	1175.0								
ft./ft.	0.068								
fps.	2.11								
hr.	0.155	+	0.000	+	0.000	+	0.000	=	0.155

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>							
ft.	10.00	15.00							
	3.00	1.00							
ft.	0.50	1.50							
ft. <sup>2</sup>	5.75	24.75							
ft.	13.16	19.24							
ft.	0.44	1.29							
ft./ft.	0.0760	0.0132							
	0.040	0.040							
fps.	5.91	5.06							
ft.	1435.0	4540.0							
hr.	0.067	0.249	+	0.000	+	0.000	=	0.317	
								hr.	1.447



## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub>  $T_t$

By: RV Date: 03/04/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-100

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID						
ft.	<b>A-B</b>	FRST				
	0.600					
	300.0					
	3.20					
	0.133					
	0.559	=	0.559			

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID						
ft.	<b>B-C</b>	FRST	<b>C-D</b>	FRST		
	0.100	0.100				
	UNPVD	UNPVD				
	0.40	0.40				
	600.0	1030.0				
	0.292	0.068				
4.37	2.11					
0.038	0.136	+	0.000	+	0.000	=
0.174						

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID						
ft.	<b>D-E</b>	5.00				
	1.00					
	1.00					
	6.00					
	7.83					
	0.77					
0.0038						
0.030						
2.56						
2610.0						
0.283	+	0.000	+	0.000	+	0.000
0.283						=
1.015						

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $T_c$   $T_t$

By: RV Date: 02/27/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-90

### Sheet flow (applicable to $T_c$ only)

Segment ID	A-B
1. Surface description (Table 3-1)	FRST
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)	0.400
3. Flow Length, L (< 300ft)	ft. 300.0
4. Two-year 24-hr rainfall, $P_2$	in. 3.20
5. Land slope, s	ft./ft. 0.033
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr. 0.705 = 0.705

### Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID	B-C			
7. Surface description	FRST			
8. Manning's roughness coeff., n	0.100			
9. Paved or unpaved	UNPVD			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft. 0.40			
11. Flow Length, L	ft. 300.0			
12. Watercourse slope, s	ft./ft. 0.100			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps. 2.56			
14. $T_t = \frac{L}{3600 * V}$	hr. 0.033 + 0.000 + 0.000 + 0.000 = 0.033			

### Channel flow

Segment ID	C-D	D-E		
15. Channel Bottom width, b	ft. 5.00	20.00		
16. Horizontal side slope component, z (z horiz:1 vert)	2.00	1.00		
17. Depth of flow, d	ft. 0.50	1.50		
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup> 3.00	32.25		
19. Wetted perimeter, $P_w$	ft. 7.24	24.24		
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft. 0.41	1.33		
21. Channel slope, s	ft./ft. 0.0250	0.0026		
22. Manning's roughness coeff., n	0.040	0.040		
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps. 3.27	2.30		
24. Flow length, L	ft. 4100.0	1050.0		
25. $T_t = \frac{L}{3600 * V}$	hr. 0.348 + 0.127 + 0.000 + 0.000 = 0.475			
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)				hr. 1.213



## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 02/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one:  $T_c$   $T_t$  Subwatershed: CMB-70

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)	Segment ID	<b>A-B</b>	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		GRSS	
3. Flow Length, L (< 300ft)	ft.	0.240	
4. Two-year 24-hr rainfall, $P_2$	in.	300.0	
5. Land slope, s	ft./ft.	3.20	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.033	
		0.469	= 0.469

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description	Segment ID				
8. Manning's roughness coeff., n					
9. Paved or unpaved					
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft.				
11. Flow Length, L	ft.				
12. Watercourse slope, s	ft./ft.				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.000	+ 0.000	+ 0.000	+ 0.000 = 0.000

### Channel flow

15. Channel Bottom width, b	Segment ID	<b>B-C</b>	<b>C-D</b>	<b>D-E</b>	<b>E-F</b>	
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	18" RCP	30" RCP	5.00	20.00	
17. Depth of flow, d	ft.	---	---	3.00	1.00	
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup>	FULL	FULL	0.50	1.50	
19. Wetted perimeter, $P_w$	ft.	1.77	4.91	3.25	32.25	
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	4.71	7.85	8.16	24.24	
21. Channel slope, s	ft./ft.	0.37	0.62	0.40	1.33	
22. Manning's roughness coeff., n	ft./ft.	0.0186	0.0060	0.0280	0.0029	
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	0.013	0.013	0.040	0.040	
24. Flow length, L	ft.	8.13	6.49	3.37	2.43	
25. $T_t = \frac{L}{3600 * V}$	ft.	2685.0	2965.0	2660.0	1050.0	
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)	hr.	0.092	+ 0.127	+ 0.219	+ 0.120 = 0.558	
	hr.					1.027

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $I_c$   $T_t$

By: RV  
 Checked: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-60  
 Date: 02/27/08  
 Date: \_\_\_\_\_

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>				
	FRST				
	0.600				
ft.	300.0				
in.	3.20				
ft./ft.	0.017				
hr.	1.281	=		1.281	

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=.4$  unpaved,  $d=.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>								
	FRST								
	0.100								
	UNPVD								
ft.	0.40								
ft.	1400.0								
ft./ft.	0.003								
fps.	0.44								
hr.	0.893	+	0.000	+	0.000	+	0.000	=	0.893

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length,  $L$

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>	<b>E-F</b>						
ft.	5.00	54" CMP	10.00						
	3.00	—	1.00						
ft.	0.50	FULL	1.00						
ft. <sup>2</sup>	3.25	15.90	11.00						
ft.	8.16	14.13	12.83						
ft.	0.40	1.13	0.86						
ft./ft.	0.0102	0.0125	0.0032						
	0.040	0.018	0.040						
fps.	2.04	10.01	1.90						
ft.	1460.0	960.0	945.0						
hr.	0.199	0.027	0.138	+	0.000	=	0.364		
									2.538







## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $T_c$   $T_t$

By: RV Date: 02/27/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-20

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>			
	GRSS			
	0.240			
ft.	300.0			
in.	3.20			
ft./ft.	0.100			
hr.	0.301	=	0.301	

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=0.4$  unpaved,  $d=0.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3})(s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>										
	FRST										
	0.100										
	UNPVD										
ft.	0.40										
ft.	1130.0										
ft./ft.	0.204										
fps.	3.65										
hr.	0.086	+	0.000	+	0.000	+	0.000	+	0.000	=	0.086

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$

$$23. V = \frac{1.49}{n} (R^{2/3})(s^{1/2})$$

24. Flow length,  $L$

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>B-C</b>	<b>C-D</b>	<b>D-E</b>	<b>E-F</b>						
ft.	12" RCP	30" RCP	5.00	10.00						
	---	---	2.00	2.00						
ft.	FULL	FULL	0.50	1.00						
ft. <sup>2</sup>	0.79	4.91	3.00	12.00						
ft.	3.14	7.85	7.24	14.47						
ft.	0.25	0.62	0.41	0.83						
ft./ft.	0.0167	0.0190	0.0026	0.0073						
	0.013	0.013	0.040	0.040						
fps.	5.88	11.55	1.06	2.81						
ft.	620.0	1920.0	3775.0	4400.0						
hr.	0.029	+	0.046	+	0.993	+	0.435	=	1.504	
hr.										1.890

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub> T<sub>t</sub>

By: RV  
 Checked: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-10  
 Date: 02/27/08  
 Date: \_\_\_\_\_

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	A-B	
	GRSS	
	0.240	
	ft. 110.0	
	in. 3.20	
	ft./ft. 0.018	
	hr. 0.268	= 0.268

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s
13. Average velocity,  $V = \frac{1.49}{n} (d^{2/3})(s^{1/2})$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	B-C	C-D			
	GRSS	IMP			
	0.080	0.011			
	UNPVD	PVD			
	ft. 0.40	0.20			
	ft. 400.0	180.0			
	ft./ft. 0.025	0.022			
	fps. 1.60	6.87			
	hr. 0.069	+ 0.007	+ 0.000	+ 0.000	= 0.077

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$
20. Hydraulic Radius,  $R = \frac{A}{P_w}$
21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3})(s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	D-E				
	ft. 30.00				
	1.00				
	ft. 2.00				
	ft. <sup>2</sup> 64.00				
	ft. 35.66				
	ft. 1.79				
	ft./ft. 0.0071				
	0.040				
	fps. 4.64				
	ft. 425.0				
	hr. 0.025	+ 0.000	+ 0.000	+ 0.000	= 0.025
					hr. 0.370

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**APPENDIX E**  
**HEC-HMS INPUT AND OUTPUT**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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Project: Coppermine - Current Simulation Run: 10YR EXISTING

Start of Run: 01Jan2008, 00:00 Basin Model: Coppermine - ex  
 End of Run: 03Jan2008, 00:00 Meteorologic Model: 10YR  
 Compute Time: 07Jul2008, 13:45:07 Control Specifications: 48 hour storm

Volume Units: IN

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CMB-10	0.01466	10.7	01Jan2008, 12:20	3.41
CMB-100	0.25842	88.7	01Jan2008, 12:50	2.06
CMB-105	0.08475	27.6	01Jan2008, 12:40	1.89
CMB-110	0.71455	129.7	01Jan2008, 13:10	1.36
CMB-20	1.02952	326.0	01Jan2008, 13:20	2.33
CMB-30	0.32077	171.5	01Jan2008, 12:30	2.84
CMB-40	0.68575	268.1	01Jan2008, 13:00	2.57
CMB-50	0.42959	192.8	01Jan2008, 12:50	2.70
CMB-60	0.38805	127.6	01Jan2008, 13:40	2.74
CMB-70	0.60638	301.7	01Jan2008, 12:40	2.89
CMB-80	0.29313	108.7	01Jan2008, 12:40	11.40
CMB-90	0.52780	143.2	01Jan2008, 13:00	1.77
JCT-1	2.70768	732.8	01Jan2008, 13:20	2.07
JCT-12	17.58504	1631.6	01Jan2008, 16:10	1.90
JCT-13	18.93533	1736.3	01Jan2008, 16:10	1.94
JCT-14	18.94999	1737.0	01Jan2008, 16:10	1.94
JCT-2	4.00657	862.5	01Jan2008, 13:30	1.71
JCT-3	1.81684	339.6	01Jan2008, 13:30	1.61
JCT-4	6.88149	1262.5	01Jan2008, 13:50	1.68
JCT-5	7.93921	1382.1	01Jan2008, 13:50	1.66
JCT-6	2.76061	497.6	01Jan2008, 13:30	1.48
JCT-8	12.15263	1706.6	01Jan2008, 14:40	1.80
JCT-9	2.56197	725.0	01Jan2008, 13:00	2.02
Junction-10	3.25694	817.3	01Jan2008, 13:10	1.84
Junction-5A	8.46701	1458.5	01Jan2008, 13:50	1.67

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (IN)
NHB-10	0.63188	52.1	01Jan2008, 13:30	0.79
NHB-20	0.37514	68.6	01Jan2008, 13:20	1.43
NHB-30	1.41217	117.0	01Jan2008, 13:40	0.83
NHB-40	0.97330	322.2	01Jan2008, 13:20	2.43
POB-10	0.06570	25.1	01Jan2008, 12:30	2.08
POB-20	0.69497	99.3	01Jan2008, 13:20	1.18
POB-30	1.84170	550.8	01Jan2008, 12:50	1.89
POB-40	0.72027	233.3	01Jan2008, 13:20	2.35
Rch-CMB10	18.93533	1736.0	01Jan2008, 16:10	1.93
Rch-CMB110	6.88149	1257.4	01Jan2008, 14:00	1.67
Rch-CMB30	17.58504	1629.5	01Jan2008, 16:20	1.90
Rch-CMB40	0.38805	127.4	01Jan2008, 14:00	2.73
Rch-CMB50	16.08165	1497.7	01Jan2008, 16:20	1.83
Rch-NHB10	2.76061	494.0	01Jan2008, 13:50	1.47
Rch-NHB30	0.97330	318.9	01Jan2008, 13:40	2.43
Rch-POB20	2.56197	719.6	01Jan2008, 13:10	2.01
Rch-POB30	0.72027	232.4	01Jan2008, 13:30	2.34
Rch-WHB10	4.00657	799.6	01Jan2008, 14:00	1.71
Rch-WHB20	2.70768	726.1	01Jan2008, 13:40	2.06
Rch-WHB50	0.62397	222.0	01Jan2008, 13:20	2.49
Rch-WIB10	1.81684	338.6	01Jan2008, 13:30	1.61
Reservoir-Copper Lake	18.93533	1605.9	01Jan2008, 14:40	1.56
Reservoir-Copper Lake	16.08165	1499.1	01Jan2008, 16:10	1.83
Reservoir-Whiggle	4.00657	801.2	01Jan2008, 13:50	1.71
WHB-10	0.62447	124.7	01Jan2008, 13:00	1.39
WHB-20	0.71469	35.0	01Jan2008, 13:30	0.53
WHB-30	0.58420	129.4	01Jan2008, 13:00	1.55
WHB-40	0.96588	217.3	01Jan2008, 13:40	1.89
WHB-50	1.11783	314.4	01Jan2008, 13:10	1.98
WHB60	0.62397	224.0	01Jan2008, 13:10	2.49
WIB-10	0.43361	135.1	01Jan2008, 13:00	2.04

Project: Coppermine - Current Simulation Run: 25 YR EXISTING

Start of Run: 01Jan2008, 00:00 Basin Model: Coppermine - ex  
 End of Run: 03Jan2008, 00:00 Meteorologic Model: 25YR  
 Compute Time: 30Jun2008, 14:38:58 Control Specifications: 48 hour storm

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CMB-10	0.01466	14.4	01Jan2008, 12:20	4.60
CMB-100	0.25842	126.9	01Jan2008, 12:50	2.89
CMB-105	0.08475	40.9	01Jan2008, 12:40	2.72
CMB-110	0.71455	202.0	01Jan2008, 13:10	1.98
CMB-20	1.02952	447.9	01Jan2008, 13:20	3.15
CMB-30	0.32077	236.1	01Jan2008, 12:30	3.87
CMB-40	0.68575	365.7	01Jan2008, 13:00	3.46
CMB-50	0.42959	262.4	01Jan2008, 12:50	3.64
CMB-60	0.38805	169.3	01Jan2008, 13:40	3.58
CMB-70	0.60638	409.1	01Jan2008, 12:40	3.88
CMB-80	0.29313	155.9	01Jan2008, 12:40	16.38
CMB-90	0.52780	212.3	01Jan2008, 12:50	2.53
JCT-1	2.70768	1031.9	01Jan2008, 13:20	2.83
JCT-12	17.58504	2522.6	01Jan2008, 15:50	2.66
JCT-13	18.93533	2677.6	01Jan2008, 15:50	2.71
JCT-14	18.94999	2678.8	01Jan2008, 15:50	2.71
JCT-2	4.00657	1246.4	01Jan2008, 13:30	2.40
JCT-3	1.81684	504.5	01Jan2008, 13:20	2.27
JCT-4	6.88149	1840.8	01Jan2008, 13:40	2.36
JCT-5	7.93921	2033.4	01Jan2008, 13:50	2.34
JCT-6	2.76061	736.3	01Jan2008, 13:30	2.10
JCT-8	12.15263	2556.6	01Jan2008, 14:30	2.56
JCT-9	2.56197	1044.0	01Jan2008, 13:00	2.82
Junction-10	3.25694	1191.5	01Jan2008, 13:10	2.59
Junction-5A	8.46701	2140.8	01Jan2008, 13:40	2.35

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (IN)
NHB-10	0.63188	94.0	01Jan2008, 13:20	1.27
NHB-20	0.37514	105.9	01Jan2008, 13:10	2.06
NHB-30	1.41217	203.7	01Jan2008, 13:40	1.32
NHB-40	0.97330	439.2	01Jan2008, 13:20	3.26
POB-10	0.06570	36.8	01Jan2008, 12:30	2.98
POB-20	0.69497	160.0	01Jan2008, 13:10	1.75
POB-30	1.84170	807.0	01Jan2008, 12:50	2.69
POB-40	0.72027	319.8	01Jan2008, 13:20	3.17
Rch-CMB10	18.93533	2677.4	01Jan2008, 15:50	2.71
Rch-CMB110	6.88149	1836.9	01Jan2008, 13:50	2.35
Rch-CMB30	17.58504	2520.8	01Jan2008, 15:50	2.66
Rch-CMB40	0.38805	168.3	01Jan2008, 14:00	3.57
Rch-CMB50	16.08165	2326.6	01Jan2008, 16:00	2.58
Rch-NHB10	2.76061	731.8	01Jan2008, 13:50	2.10
Rch-NHB30	0.97330	436.2	01Jan2008, 13:30	3.26
Rch-POB20	2.56197	1031.5	01Jan2008, 13:10	2.81
Rch-POB30	0.72027	317.8	01Jan2008, 13:20	3.16
Rch-WHB10	4.00657	1152.5	01Jan2008, 13:50	2.39
Rch-WHB20	2.70768	1024.8	01Jan2008, 13:30	2.83
Rch-WHB50	0.62397	303.2	01Jan2008, 13:20	3.34
Rch-WIB10	1.81684	502.7	01Jan2008, 13:30	2.27
Reservoir-Coppermine	16.08165	2411.2	01Jan2008, 14:30	2.22
Reservoir-Coppermine	16.08165	2329.2	01Jan2008, 15:50	2.59
Reservoir-Whiggle	4.00657	1159.7	01Jan2008, 13:50	2.40
WHB-10	0.62447	194.5	01Jan2008, 13:00	2.04
WHB-20	0.71469	72.7	01Jan2008, 13:20	0.93
WHB-30	0.58420	197.2	01Jan2008, 13:00	2.24
WHB-40	0.96588	309.2	01Jan2008, 13:40	2.59
WHB-50	1.11783	448.5	01Jan2008, 13:10	2.75
WHB60	0.62397	305.4	01Jan2008, 13:10	3.35
WIB-10	0.43361	192.6	01Jan2008, 13:00	2.85

Project: Coppermine - Current Simulation Run: 50YR EXISTING

Start of Run: 01Jan2008, 00:00 Basin Model: Coppermine - ex  
 End of Run: 03Jan2008, 00:00 Meteorologic Model: 50YR  
 Compute Time: 30Jun2008, 14:39:51 Control Specifications: 48 hour storm

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CMB-10	0.01466	17.9	01Jan2008, 12:20	5.69
CMB-100	0.25842	164.3	01Jan2008, 12:40	3.68
CMB-105	0.08475	53.4	01Jan2008, 12:40	3.50
CMB-110	0.71455	274.1	01Jan2008, 13:00	2.60
CMB-20	1.02952	560.3	01Jan2008, 13:20	3.90
CMB-30	0.32077	295.6	01Jan2008, 12:30	4.83
CMB-40	0.68575	455.4	01Jan2008, 13:00	4.28
CMB-50	0.42959	326.2	01Jan2008, 12:50	4.51
CMB-60	0.38805	207.1	01Jan2008, 13:40	4.35
CMB-70	0.60638	507.4	01Jan2008, 12:40	4.79
CMB-80	0.29313	200.1	01Jan2008, 12:40	21.05
CMB-90	0.52780	278.7	01Jan2008, 12:50	3.26
JCT-1	2.70768	1310.2	01Jan2008, 13:20	3.55
JCT-12	17.58504	3134.8	01Jan2008, 15:30	3.39
JCT-13	18.93533	3360.4	01Jan2008, 15:10	3.44
JCT-14	18.94999	3361.6	01Jan2008, 15:10	3.44
JCT-2	4.00657	1610.0	01Jan2008, 13:20	3.06
JCT-3	1.81684	664.2	01Jan2008, 13:20	2.91
JCT-4	6.88149	2429.8	01Jan2008, 13:40	3.01
JCT-5	7.93921	2686.8	01Jan2008, 13:40	3.00
JCT-6	2.76061	967.7	01Jan2008, 13:30	2.71
JCT-8	12.15263	3583.7	01Jan2008, 14:20	3.29
JCT-9	2.56197	1343.3	01Jan2008, 13:00	3.58
Junction-10	3.25694	1556.4	01Jan2008, 13:10	3.30
Junction-5A	8.46701	2840.8	01Jan2008, 13:40	3.02

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (IN)
NHB-10	0.63188	138.4	01Jan2008, 13:20	1.75
NHB-20	0.37514	142.5	01Jan2008, 13:10	2.68
NHB-30	1.41217	293.6	01Jan2008, 13:30	1.80
NHB-40	0.97330	546.7	01Jan2008, 13:20	4.03
POB-10	0.06570	47.9	01Jan2008, 12:30	3.83
POB-20	0.69497	222.1	01Jan2008, 13:10	2.31
POB-30	1.84170	1048.8	01Jan2008, 12:50	3.44
POB-40	0.72027	400.0	01Jan2008, 13:10	3.93
Rch-CMB10	18.93533	3359.8	01Jan2008, 15:10	3.44
Rch-CMB110	6.88149	2420.2	01Jan2008, 13:50	3.01
Rch-CMB30	17.58504	3134.1	01Jan2008, 15:30	3.39
Rch-CMB40	0.38805	205.8	01Jan2008, 13:50	4.34
Rch-CMB50	16.08165	2883.8	01Jan2008, 15:50	3.30
Rch-NHB10	2.76061	958.4	01Jan2008, 13:50	2.70
Rch-NHB30	0.97330	544.0	01Jan2008, 13:30	4.02
Rch-POB20	2.56197	1334.2	01Jan2008, 13:10	3.57
Rch-POB30	0.72027	398.9	01Jan2008, 13:20	3.92
Rch-WHB10	4.00657	1505.9	01Jan2008, 13:50	3.05
Rch-WHB20	2.70768	1305.0	01Jan2008, 13:30	3.54
Rch-WHB50	0.62397	377.1	01Jan2008, 13:20	4.14
Rch-WIB10	1.81684	659.1	01Jan2008, 13:30	2.90
Reservoir-Coppermine	16.08165	3395.9	01Jan2008, 14:20	2.85
Reservoir-Coppermine	16.08165	2884.7	01Jan2008, 15:40	3.31
Reservoir-Whiggle	4.00657	1510.8	01Jan2008, 13:40	3.05
WHB-10	0.62447	262.2	01Jan2008, 13:00	2.68
WHB-20	0.71469	115.2	01Jan2008, 13:10	1.34
WHB-30	0.58420	262.3	01Jan2008, 13:00	2.91
WHB-40	0.96588	396.0	01Jan2008, 13:30	3.26
WHB-50	1.11783	574.1	01Jan2008, 13:10	3.48
WHB60	0.62397	380.2	01Jan2008, 13:10	4.14
WIB-10	0.43361	246.4	01Jan2008, 13:00	3.61

Project: Coppermine - Current Simulation Run: 100YR EXISTING

Start of Run: 01Jan2008, 00:00 Basin Model: Coppermine - ex  
 End of Run: 03Jan2008, 00:00 Meteorologic Model: 100YR  
 Compute Time: 07Jul2008, 13:47:55 Control Specifications: 48 hour storm

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CMB-10	0.01466	21.4	01Jan2008, 12:20	6.81
CMB-100	0.25842	203.7	01Jan2008, 12:40	4.53
CMB-105	0.08475	66.6	01Jan2008, 12:40	4.33
CMB-110	0.71455	352.7	01Jan2008, 13:00	3.27
CMB-20	1.02952	676.8	01Jan2008, 13:20	4.69
CMB-30	0.32077	357.2	01Jan2008, 12:30	5.82
CMB-40	0.68575	548.1	01Jan2008, 13:00	5.13
CMB-50	0.42959	392.1	01Jan2008, 12:50	5.41
CMB-60	0.38805	245.9	01Jan2008, 13:40	5.14
CMB-70	0.60638	608.8	01Jan2008, 12:40	5.73
CMB-80	0.29313	246.4	01Jan2008, 12:40	25.96
CMB-90	0.52780	349.0	01Jan2008, 12:50	4.03
JCT-1	2.70768	1600.2	01Jan2008, 13:20	4.31
JCT-12	17.58504	4383.6	01Jan2008, 15:20	4.16
JCT-13	18.93533	4618.8	01Jan2008, 15:20	4.22
JCT-14	18.94999	4605.9	01Jan2008, 15:20	4.22
JCT-2	4.00657	2011.9	01Jan2008, 13:20	3.76
JCT-3	1.81684	833.8	01Jan2008, 13:20	3.59
JCT-4	6.88149	3037.7	01Jan2008, 13:40	3.71
JCT-5	7.93921	3387.7	01Jan2008, 13:40	3.70
JCT-6	2.76061	1215.7	01Jan2008, 13:30	3.35
JCT-8	12.15263	4613.2	01Jan2008, 14:10	4.06
JCT-9	2.56197	1656.3	01Jan2008, 13:00	4.37
Junction-10	3.25694	1928.9	01Jan2008, 13:00	4.06
Junction-5A	8.46701	3575.5	01Jan2008, 13:40	3.72

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (IN)
NHB-10	0.63188	188.2	01Jan2008, 13:20	2.26
NHB-20	0.37514	181.6	01Jan2008, 13:10	3.34
NHB-30	1.41217	397.0	01Jan2008, 13:30	2.33
NHB-40	0.97330	657.7	01Jan2008, 13:20	4.83
POB-10	0.06570	59.6	01Jan2008, 12:30	4.73
POB-20	0.69497	289.7	01Jan2008, 13:10	2.93
POB-30	1.84170	1303.3	01Jan2008, 12:50	4.24
POB-40	0.72027	484.4	01Jan2008, 13:10	4.73
Rch-CMB10	18.93533	4603.8	01Jan2008, 15:20	4.22
Rch-CMB110	6.88149	3031.6	01Jan2008, 13:40	3.71
Rch-CMB30	17.58504	4350.0	01Jan2008, 15:20	4.16
Rch-CMB40	0.38805	244.6	01Jan2008, 13:50	5.13
Rch-CMB50	16.08165	4052.6	01Jan2008, 15:20	4.07
Rch-NHB10	2.76061	1208.4	01Jan2008, 13:40	3.34
Rch-NHB30	0.97330	655.1	01Jan2008, 13:30	4.82
Rch-POB20	2.56197	1649.4	01Jan2008, 13:00	4.37
Rch-POB30	0.72027	483.4	01Jan2008, 13:20	4.72
Rch-WHB10	4.00657	1874.4	01Jan2008, 13:50	3.75
Rch-WHB20	2.70768	1595.9	01Jan2008, 13:30	4.30
Rch-WHB50	0.62397	453.0	01Jan2008, 13:20	4.96
Rch-WIB10	1.81684	826.6	01Jan2008, 13:20	3.59
Reservoir-Copper Lake	18.5950	4380.5	01Jan2008, 14:10	3.52
Reservoir-Copper Lake	16.08165	4071.1	01Jan2008, 15:10	4.07
Reservoir-Whiggle	4.00657	1887.1	01Jan2008, 13:40	3.75
WHB-10	0.62447	337.8	01Jan2008, 12:50	3.38
WHB-20	0.71469	166.7	01Jan2008, 13:10	1.81
WHB-30	0.58420	331.6	01Jan2008, 13:00	3.63
WHB-40	0.96588	488.2	01Jan2008, 13:30	3.97
WHB-50	1.11783	705.4	01Jan2008, 13:10	4.24
WHB60	0.62397	457.4	01Jan2008, 13:10	4.97
WIB-10	0.43361	302.7	01Jan2008, 13:00	4.40

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**APPENDIX F**  
**FUTURE CONDITIONS RUNOFF CURVE NUMBERS AND**  
**TIME OF CONCENTRATION CALCULATIONS**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-60

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1</sup> :			Area  <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Acres</span> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	WOODS - GOOD	30			10.17	305.10
B	1 AC RESIDENTIAL	61			0.14	8.54
B	4 AC RES-REVISED TO 1 AC RES	61			0.60	36.60
B	COMMERCIAL	92			1.45	133.40
B	OPEN SPACE - GOOD	55			2.28	125.40
B	WOODS - GOOD	50			11.67	583.50
C	1 AC RESIDENTIAL	74			22.95	1,698.30
C	4 AC RES-REVISED TO 1 AC RES	74			5.13	379.62
C	BRUSH - GOOD	65			3.91	254.15
C	OPEN SPACE - GOOD	74			0.34	25.16
C	WOODS - GOOD	70			65.90	4,613.00
D	1 AC RESIDENTIAL	80			18.58	1,486.40
D	4 AC RES-REVISED TO 1 AC RES	80			38.99	3,119.20
D	COMMERCIAL	95			0.10	9.50
D	BRUSH - GOOD	73			8.59	627.07
D	OPEN SPACE - GOOD	80			0.14	11.20
D	WOODS - GOOD	67			200.55	13,436.85
I	IMPERVIOUS	98			7.54	738.92
W	WATER	98			0.31	30.38
Totals =					399.34	27,622.29
					( 0.62397	sq mi)

<sup>1</sup>. Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{27,622.29}{399.34} \quad \text{Use CN} = \boxed{69}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-50

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	MARSH/MEADOW - GOOD	62			0.05	3.10
A	WOODS - GOOD	30			97.61	2,928.30
B	1 AC RESIDENTIAL	61			5.53	337.33
B	COMMERCIAL	92			1.13	103.96
B	BRUSH - GOOD	30			0.04	1.20
B	MEADOW - GOOD	58			0.02	1.16
B	WOODS - GOOD	50			9.58	479.00
C	1/4 AC RESIDENTIAL	78			0.58	45.24
C	1 AC RESIDENTIAL	74			15.85	1,172.90
C	2 AC RES-REVISED TO 1 AC RES	74			1.95	144.30
C	BRUSH - GOOD	65			11.35	737.75
C	MEADOW - GOOD	71			2.83	200.93
C	WOODS - FAIR	73			6.52	475.96
C	WOODS - GOOD	70			100.23	7,016.10
D	1 AC RESIDENTIAL	80			30.80	2,464.00
D	2 AC RES-REVISED TO 1 AC RES	80			0.27	21.60
D	4 AC RES-REVISED TO 1 AC RES	80			14.30	1,144.00
D	MEADOW - GOOD	78			0.29	22.62
D	BRUSH - GOOD	73			0.47	34.31
D	MARSH/MEADOW - GOOD	85			14.89	1,265.65
D	WOODS - FAIR	79			0.45	35.55
D	WOODS - GOOD	67			392.66	26,308.22
I	IMPERVIOUS	98			7.20	705.60
W	WATER	98			0.81	79.38
Totals =					715.41	45,728.16

<sup>1.</sup> Use only one CN value source per line.

( 1.11783 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{45,728.16}{715.41} \quad \text{Use CN} = \boxed{64}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-40

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			0.10	4.00
A	MARSH/MEADOW - GOOD	62			0.09	5.58
A	BRUSH - GOOD	30			4.32	129.60
A	WOODS - GOOD	30			42.69	1,280.70
B	1 AC RESIDENTIAL	61			8.67	528.87
B	4 AC RES-REVISED TO 1 AC RES	61			4.68	285.48
B	BRUSH - GOOD	30			4.83	144.90
B	WOODS - GOOD	50			70.43	3,521.50
C	1 AC RESIDENTIAL	74			0.22	16.28
C	4 AC RES-REVISED TO 1 AC RES	74			19.02	1,407.48
C	BRUSH - GOOD	65			7.25	471.25
C	WOODS - GOOD	70			211.60	14,812.00
D	1 AC RESIDENTIAL	80			11.96	956.80
D	4 AC RES-REVISED TO 1 AC RES	80			28.03	2,242.40
D	MEADOW - GOOD	78			2.34	182.52
D	BRUSH - GOOD	73			7.83	571.59
D	MARSH/MEADOW - GOOD	85			3.26	277.10
D	WOODS - GOOD	67			185.25	12,411.75
I	IMPERVIOUS	98			5.59	547.82
W	WATER	98			0.00	0.00
Totals =					618.16	39,797.62

<sup>1.</sup> Use only one CN value source per line.

( 0.96588 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{39,797.62}{618.16} \text{ Use CN} = \boxed{64}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-30

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	WOODS - GOOD	30			58.12	1,743.60
B	1 AC RESIDENTIAL	61			10.70	652.70
B	WOODS - GOOD	50			68.02	3,401.00
D	1 AC RESIDENTIAL	80			31.18	2,494.40
D	WOODS - GOOD	67			205.87	13,793.29
I	IMPERVIOUS	98			0.00	0.00
Totals =					373.89	22,084.99

<sup>1.</sup> Use only one CN value source per line.

( 0.58420 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{22,084.99}{373.89} \quad \text{Use CN} = \boxed{59}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-20

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	COMMERCIAL	89			1.17	104.13
A	OPEN SPACE- GOOD	36			1.53	55.08
A	WOODS - GOOD	30			248.71	7,461.30
B	COMMERCIAL	92			1.46	134.32
B	WOODS - GOOD	50			69.61	3,480.50
C	WOODS - GOOD	70			7.91	553.70
D	1 AC RESIDENTIAL	80			5.79	463.20
D	WOODS - GOOD	67			101.20	6,780.40
I	IMPERVIOUS	98			8.78	860.44
W	WATER	98			11.24	1,101.52
Totals =					457.40	20,994.59

<sup>1.</sup> Use only one CN value source per line.

( 0.71469 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{20,994.59}{457.40} \quad \text{Use CN} = \boxed{46}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WHB-10

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			24.94	997.60
A	BARREN	72			0.52	37.44
A	MEADOW - GOOD	30			4.23	126.90
A	WOODS - GOOD	30			55.21	1,656.30
B	1 AC RESIDENTIAL	61			42.06	2,565.66
B	MEADOW - GOOD	58			29.49	1,710.42
B	BARREN	82			0.11	9.02
B	OPEN SPACE- GOOD	55			0.59	32.45
B	WOODS - GOOD	50			15.77	788.50
C	1 AC RESIDENTIAL	74			5.65	418.10
C	MEADOW - GOOD	71			2.71	192.41
C	OPEN SPACE- GOOD	74			0.95	70.30
C	WOODS - GOOD	70			16.31	1,141.70
D	1 AC RESIDENTIAL	80			25.42	2,033.60
D	MEADOW - GOOD	78			4.08	318.24
D	BARREN	89			0.09	8.01
D	OPEN SPACE- GOOD	80			2.09	167.20
D	WOODS - GOOD	67			106.06	7,106.02
I	IMPERVIOUS	98			7.04	689.92
A	IMPERVIOUS	81			14.21	1,151.01
B	IMPERVIOUS	88			32.47	2,857.36
D	INDUSTRIAL	93			9.37	871.41
W	WATER	98			0.29	28.42
Totals =					399.66	24,977.99
					( 0.62447	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{24,977.99}{399.66} \text{ Use CN} = \boxed{62}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WIB-30

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  (Acres) Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			35.52	1,420.80
A	WOODS - GOOD	30			1.63	48.90
B	1 AC RESIDENTIAL	61			194.01	11,834.61
B	WOODS - GOOD	50			148.05	7,402.50
D	1 AC RESIDENTIAL	80			150.56	12,044.80
D	WOODS - GOOD	67			202.50	13,567.50
I	IMPERVIOUS	98			8.00	784.00
W	WATER	98			0.00	0.00
Totals =					740.27	47,103.11

<sup>1.</sup> Use only one CN value source per line.

( 1.15667 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{47,103.11}{740.27} \text{ Use CN} = \boxed{64}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WIB-20

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			0.05	2.00
A	WOODS - GOOD	30			20.75	622.50
B	1 AC RESIDENTIAL	61			123.90	7,557.90
B	3 AC RESIDENTIAL	62			8.89	551.18
B	WOODS - GOOD	50			68.84	3,442.00
D	1 AC RESIDENTIAL	80			172.56	13,804.80
D	WOODS - GOOD	67			23.09	1,547.03
I	IMPERVIOUS	98			4.43	434.14
W	WATER	98			0.00	0.00
Totals =					422.51	27,961.55

<sup>1.</sup> Use only one CN value source per line.

( 0.66017 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{27,961.55}{422.51} \text{ Use CN} = \boxed{66}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed WIB-10

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			2.10	84.00
A	MEADOW - GOOD	30			3.41	102.30
A	WOODS - GOOD	30			2.03	60.90
B	1 AC RESIDENTIAL	61			97.84	5,968.24
B	BRUSH - GOOD	30			1.58	47.40
B	MEADOW - GOOD	58			15.94	924.52
B	WOODS - GOOD	50			16.78	839.00
D	1 AC RESIDENTIAL	80			83.30	6,664.00
D	BRUSH - GOOD	73			0.23	16.79
D	MEADOW - GOOD	78			6.46	503.88
D	WOODS - GOOD	67			13.74	920.58
A	INDUSTRIAL	81			5.86	474.66
B	INDUSTRIAL	88			12.25	1,078.00
D	INDUSTRIAL	93			10.60	985.80
I	IMPERVIOUS	98			5.17	506.66
W	WATER	98			0.22	21.56
Totals =					277.51	19,198.29

<sup>1.</sup> Use only one CN value source per line.

( 0.43361 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{19,198.29}{277.51} \quad \text{Use CN} = \boxed{69}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed POB-40

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/2 AC RESIDENTIAL	47			10.50	493.50
A	3/4 AC RESIDENTIAL	42			13.84	581.28
A	1 AC RESIDENTIAL	40			1.82	72.80
A	OPEN SPACE- GOOD	36			0.79	28.44
A	WOODS - GOOD	30			11.87	356.10
B	1/2 AC RESIDENTIAL	66			26.75	1,765.50
B	3/4 AC RESIDENTIAL	65			14.34	932.10
B	1 AC RESIDENTIAL	61			0.32	19.52
B	MEADOW - GOOD	58			0.29	16.82
B	WOODS - GOOD	50			2.68	134.00
C	1/2 AC RESIDENTIAL	76			211.78	16,095.28
C	3/4 AC RESIDENTIAL	75			14.50	1,087.50
C	1 AC RESIDENTIAL	74			33.96	2,513.04
C	MEADOW - GOOD	71			8.81	625.51
C	OPEN SPACE- GOOD	74			0.07	5.18
C	WOODS - GOOD	70			3.66	256.20
D	1/2 AC RESIDENTIAL	83			34.74	2,883.42
D	3/4 AC RESIDENTIAL	82			9.03	740.46
D	1 AC RESIDENTIAL	80			3.37	269.60
D	MEADOW - GOOD	78			1.11	86.58
D	WOODS - GOOD	67			53.40	3,577.80
I	IMPERVIOUS	98			2.97	291.06
W	WATER	98			0.37	36.26
Totals =					460.97	32,867.95

<sup>1.</sup> Use only one CN value source per line.

( 0.72027 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{32,867.95}{460.97} \quad \text{Use CN} = \boxed{71}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed POB-30

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1</sup>			Area Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/4 AC RESIDENTIAL	49			2.66	130.34
A	1/3 AC RESIDENTIAL	49			62.84	3,079.16
A	1/2 AC RESIDENTIAL	47			116.38	5,469.86
A	3/4 AC RESIDENTIAL	42			8.06	338.52
A	1 AC RESIDENTIAL	40			23.93	957.20
A	COMMERCIAL	89			2.36	210.04
A	BRUSH - GOOD	30			0.20	6.00
A	MEADOW - GOOD	30			13.71	411.30
A	OPEN SPACE- GOOD	36			2.45	88.20
A	WOODS - GOOD	30			21.93	657.90
B	1/3 AC RESIDENTIAL	67			48.02	3,217.34
B	1/2 AC RESIDENTIAL	66			98.23	6,483.18
B	3/4 AC RESIDENTIAL	65			0.01	0.65
B	1 AC RESIDENTIAL	61			11.67	711.87
B	BRUSH - GOOD	48			3.78	181.44
B	MEADOW - GOOD	58			2.89	167.62
B	OPEN SPACE- GOOD	55			0.20	11.00
B	WOODS - GOOD	50			34.99	1,749.50
C	1/2 AC RESIDENTIAL	76			165.74	12,596.24
C	3/4 AC RESIDENTIAL	75			16.07	1,205.25
C	1 AC RESIDENTIAL	74			10.39	768.86
C	COMMERCIAL	94			4.31	405.14
C	BRUSH - GOOD	65			0.00	0.00
C	MEADOW - GOOD	71			2.27	161.17
C	OPEN SPACE- GOOD	74			3.09	228.66
C	PASTURE - GOOD	74			1.78	131.72
C	WOODS - GOOD	70			0.00	0.00
D	1/3 AC RESIDENTIAL	84			4.03	338.52
D	1/2 AC RESIDENTIAL	83			30.29	2,514.07
D	3/4 AC RESIDENTIAL	82			8.02	657.64
D	1 AC RESIDENTIAL	80			6.06	484.80
D	BRUSH - GOOD	73			1.25	91.25
D	MEADOW - GOOD	78			3.38	263.64
D	OPEN SPACE- FAIR	84			0.05	4.20
D	OPEN SPACE- GOOD	80			1.89	151.20
D	WOODS - GOOD	67			27.13	1,817.71
I	IMPERVIOUS	98			14.53	1,423.94
W	WATER	98			3.19	312.62
Totals =					757.78	47,427.75
					( 1.18403	sq mi)

<sup>1</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{47,427.75}{757.78} \quad \text{Use CN} = \boxed{63}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed POB-20

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	54			19.29	1,041.66
A	1/4 AC RESIDENTIAL	50			7.00	350.00
A	1/3 AC RESIDENTIAL	49			32.19	1,577.31
A	1/2 AC RESIDENTIAL	47			58.12	2,731.64
A	1 AC RESIDENTIAL	40			23.69	947.60
A	COMMERCIAL	89			1.26	112.14
A	BRUSH - GOOD	30			2.09	62.70
A	MEADOW - GOOD	30			0.74	22.20
A	MARSH/MEADOW - GOOD	50			0.24	12.00
A	OPEN SPACE- GOOD	36			10.28	370.08
A	WOODS - GOOD	30			31.25	937.50
B	1/8 AC RESIDENTIAL	68			15.69	1,066.92
B	1/4 AC RESIDENTIAL	67			5.03	337.01
B	1/3 AC RESIDENTIAL	67			4.83	323.61
B	1/2 AC RESIDENTIAL	66			47.33	3,123.78
B	1 AC RESIDENTIAL	61			12.38	755.18
B	COMMERCIAL	92			2.41	221.72
B	BRUSH - GOOD	48			7.42	356.16
B	OPEN SPACE- GOOD	55			20.04	1,102.20
B	WOODS - GOOD	50			74.59	3,729.50
D	1/8 AC RESIDENTIAL	85			0.32	27.20
D	1/4 AC RESIDENTIAL	84			1.13	94.92
D	1/3 AC RESIDENTIAL	84			0.11	9.24
D	1/2 AC RESIDENTIAL	83			8.39	696.37
D	1 AC RESIDENTIAL	80			0.05	4.00
D	BRUSH - GOOD	73			1.06	77.38
D	MARSH/MEADOW - GOOD	85			5.39	458.15
D	OPEN SPACE- GOOD	80			3.13	250.40
D	WOODS - GOOD	67			30.86	2,067.62
I	IMPERVIOUS	98			17.39	1,704.22
W	WATER	98			1.08	105.84
Totals =					444.78	24,676.25
					(	0.69497 sq mi)

<sup>1</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{24,676.25}{444.78} \quad \text{Use CN} = \boxed{55}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4)      By: RV      Date: 05/28/08  
 Location: Bristol & Burlington, CT      Checked: \_\_\_\_\_      Date: \_\_\_\_\_  
 Circle one:    Present    Developed      Watershed: Watershed POB-10

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/2 AC RESIDENTIAL	47			0.85	39.95
A	OPEN SPACE- GOOD	36			0.35	12.60
A	WOODS - GOOD	30			7.08	212.40
B	1/4 AC RESIDENTIAL	68			5.41	367.88
B	1/3 AC RESIDENTIAL	67			12.76	854.92
B	1/2 AC RESIDENTIAL	66			0.69	45.54
B	OPEN SPACE- GOOD	55			0.09	4.95
B	WOODS - GOOD	50			2.27	113.50
D	1/4 AC RESIDENTIAL	84			0.05	4.20
D	1/3 AC RESIDENTIAL	84			0.68	57.12
D	1/2 AC RESIDENTIAL	83			0.72	59.76
D	OPEN SPACE- GOOD	80			0.41	32.80
D	WOODS - GOOD	67			7.58	507.86
I	IMPERVIOUS	98			2.48	243.04
W	WATER	98			0.63	61.74
Totals =					42.05	2,618.26
					( 0.06570	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{2,618.26}{42.05} \quad \text{Use CN} = \boxed{62}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed NHB-40

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  (Acres) Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	WOODS - GOOD	30			0.00	0.00
A	1 AC RESIDENTIAL	43			2.68	115.24
B	1 AC RESIDENTIAL	64			23.21	1,485.44
B	MEADOW - GOOD	58			2.68	155.44
B	WOODS - GOOD	50			7.22	361.00
C	1 AC RESIDENTIAL	74			71.19	5,268.06
C	MARSH/MEADOW - GOOD	74			0.71	52.54
C	WOODS - GOOD	50			8.83	441.50
D	1 AC RESIDENTIAL	80			179.29	14,343.20
D	COMMERCIAL	95			1.33	126.35
D	MEADOW - GOOD	78			1.13	88.14
D	MARSH/MEADOW - GOOD	85			9.42	800.70
D	WOODS - GOOD	67			242.23	16,229.41
D	INDUSTRIAL	93			22.23	2,067.39
I	IMPERVIOUS	98			11.09	1,086.82
W	WATER	98			39.67	3,887.66
Totals =					622.91	46,508.89
					( 0.97330	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{46,508.89}{622.91} \quad \text{Use CN} = \boxed{75}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed NHB-30

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1 AC RESIDENTIAL	40			63.22	2,528.80
A	1/3 AC RESIDENTIAL	57			5.49	312.93
A	COMMERCIAL	89			1.54	137.06
A	MEADOW - GOOD	30			14.53	435.90
A	WOODS - GOOD	30			286.62	8,598.60
B	1/2 AC RESIDENTIAL	66			3.44	227.04
B	1 AC RESIDENTIAL	64			48.64	3,112.96
B	COMMERCIAL	92			0.41	37.72
B	MEADOW - GOOD	58			11.93	691.94
B	WOODS - GOOD	50			68.51	3,425.50
C	1 AC RESIDENTIAL	74			57.91	4,285.34
C	1/3 AC RESIDENTIAL	81			3.67	297.27
C	MEADOW - GOOD	71			3.63	257.73
C	WOODS - GOOD	50			5.94	297.00
D	1/2 AC RESIDENTIAL	83			0.10	8.30
D	1/3 AC RESIDENTIAL	86			4.35	374.10
D	1 AC RESIDENTIAL	80			33.68	2,694.40
D	COMMERCIAL	95			0.81	76.95
D	MEADOW - GOOD	78			9.18	716.04
D	WOODS - GOOD	67			254.96	17,082.32
B	INDUSTRIAL	88			4.54	399.52
D	INDUSTRIAL	93			1.80	167.40
I	IMPERVIOUS	98			13.15	1,288.70
W	WATER	98			5.74	562.52
Totals =					903.79	48,016.04

<sup>1.</sup> Use only one CN value source per line.

( 1.41217 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{48,016.04}{903.79} \quad \text{Use CN} = \boxed{53}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed NHB-20

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/2 AC RESIDENTIAL	47			1.66	78.02
A	3/4 AC RESIDENTIAL	42			0.03	1.26
A	1 AC RESIDENTIAL	40			84.43	3,377.20
A	MEADOW - GOOD	30			0.04	1.20
A	WOODS - GOOD	30			3.49	104.70
B	1 AC RESIDENTIAL	64			13.56	867.84
B	WOODS - GOOD	50			1.53	76.50
C	1/2 AC RESIDENTIAL	76			14.34	1,089.84
C	1 AC RESIDENTIAL	74			14.36	1,062.64
C	BRUSH - GOOD	65			1.34	87.10
C	MEADOW - GOOD	71			1.67	118.57
C	WOODS - GOOD	50			1.58	79.00
D	1/2 AC RESIDENTIAL	83			2.58	214.14
D	1 AC RESIDENTIAL	80			42.22	3,377.60
D	MEADOW - GOOD	78			2.02	157.56
D	WOODS - GOOD	67			53.90	3,611.30
I	IMPERVIOUS	98			0.75	73.50
W	WATER	98			0.59	57.82
Totals =					240.09	14,435.79

( 0.37514 sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{14,435.79}{240.09} \text{ Use CN} = \boxed{60}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed NHB-10

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	54			0.71	38.34
A	1/4 AC RESIDENTIAL	49			46.51	2,278.99
A	1/3 AC RESIDENTIAL	49			55.35	2,712.15
A	1/2 AC RESIDENTIAL	47			83.10	3,905.70
A	3/4 AC RESIDENTIAL	42			0.76	31.92
A	1 AC RESIDENTIAL	40			63.30	2,532.00
A	MEADOW - GOOD	30			6.11	183.30
A	PASTURE - POOR	68			0.07	4.76
A	OPEN SPACE - GOOD	36			4.84	174.24
A	WOODS - GOOD	30			0.00	0.00
B	1/8 AC RESIDENTIAL	68			7.27	494.36
B	1/4 AC RESIDENTIAL	68			6.23	423.64
B	1/3 AC RESIDENTIAL	67			4.44	297.48
B	1/2 AC RESIDENTIAL	66			33.15	2,187.90
B	1 AC RESIDENTIAL	64			13.05	835.20
B	MEADOW - GOOD	58			0.18	10.44
B	PASTURE - POOR	79			2.52	199.08
B	OPEN SPACE - GOOD	61			2.79	170.19
B	WOODS - GOOD	50			7.45	372.50
D	1/8 AC RESIDENTIAL	84			0.05	4.20
D	1/4 AC RESIDENTIAL	84			3.46	290.64
D	1/3 AC RESIDENTIAL	84			7.54	633.36
D	1/2 AC RESIDENTIAL	83			11.37	943.71
D	1 AC RESIDENTIAL	80			2.62	209.60
D	PASTURE - POOR	89			0.07	6.23
D	OPEN SPACE - GOOD	89			0.03	2.67
D	WOODS - GOOD	67			35.22	2,359.74
I	IMPERVIOUS	98			6.11	598.78
W	WATER	98			0.10	9.80
Totals =					404.40	21,910.92
					( 0.63188	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$CN \text{ (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{21,910.92}{404.40} \text{ Use CN} = \boxed{54}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-110

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	54			0.12	6.48
A	1/3 AC RESIDENTIAL	49			23.62	1,157.38
A	1/2 AC RESIDENTIAL	47			57.15	2,686.05
A	3/4 AC RESIDENTIAL	42			12.36	519.12
A	1 AC RESIDENTIAL	40			49.17	1,966.80
A	BRUSH - POOR	48			1.73	83.04
A	MEADOW - GOOD	30			1.34	40.20
A	PASTURE - POOR	68			9.91	673.88
A	OPEN SPACE - GOOD	36			2.51	90.36
A	WOODS - GOOD	30			39.99	1,199.70
B	1/8 AC RESIDENTIAL	68			5.17	351.56
B	1/3 AC RESIDENTIAL	67			11.85	793.95
B	1/2 AC RESIDENTIAL	66			14.87	981.42
B	3/4 AC RESIDENTIAL	65			4.78	310.70
B	1 AC RESIDENTIAL	64			38.04	2,434.56
B	BRUSH - POOR	67			4.45	298.15
B	MEADOW - GOOD	58			2.18	126.44
B	PASTURE - POOR	79			2.26	178.54
B	OPEN SPACE- GOOD	61			1.57	95.77
B	WOODS - GOOD	50			11.37	568.50
D	1/3 AC RESIDENTIAL	84			3.43	288.12
D	1/2 AC RESIDENTIAL	83			18.09	1,501.47
D	3/4 AC RESIDENTIAL	82			1.60	131.20
D	1 AC RESIDENTIAL	80			64.20	5,136.00
D	PASTURE - POOR	89			0.27	24.03
D	MEADOW - GOOD	78			0.09	7.02
D	OPEN SPACE- POOR	89			0.74	65.86
D	WOODS - GOOD	67			46.47	3,113.49
A	INDUSTRIAL	81			8.78	711.18
B	INDUSTRIAL	88			12.01	1,056.88
I	IMPERVIOUS	98			7.19	704.62
Totals =					457.31	27,302.47
					( 0.71455	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{27,302.47}{457.31} \text{ Use CN} = \boxed{60}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-105

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/3 AC RESIDENTIAL	49			13.47	660.03
A	1/2 AC RESIDENTIAL	47			7.24	340.28
A	1 AC RESIDENTIAL	40			3.69	147.60
A	WOODS - GOOD	30			0.15	4.50
A	COMMERCIAL	89			1.44	128.16
B	1/3 AC RESIDENTIAL	67			4.06	272.02
B	1/2 AC RESIDENTIAL	66			2.65	174.90
B	1 AC RESIDENTIAL	64			2.39	152.96
B	COMMERCIAL	92			6.69	615.48
B	BARREN - FAIR	82			0.00	0.00
B	WOODS - GOOD	50			0.56	28.00
D	WOODS - GOOD	67			1.19	79.73
A	INDUSTRIAL	81			0.66	53.46
B	INDUSTRIAL	88			2.10	184.80
D	INDUSTRIAL	93			6.50	604.50
I	IMPERVIOUS	98			1.45	142.10
Totals =					54.24	3,588.52

<sup>1.</sup> Use only one CN value source per line.

( 0.08475 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{3,588.52}{54.24} \text{ Use CN} = \boxed{66}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4)

By: RV

Date: 05/28/08

Location: Bristol & Burlington, CT

Checked: \_\_\_\_\_

Date: \_\_\_\_\_

Circle one: Present Developed

Watershed: Watershed CMB-100

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	54			6.68	360.72
A	1/4 AC RESIDENTIAL	49			1.46	71.54
A	1/3 AC RESIDENTIAL	49			23.66	1,159.34
A	1/2 AC RESIDENTIAL	47			9.56	449.32
A	WOODS - GOOD	30			4.61	138.30
A	COMMERCIAL	89			0.22	19.58
B	1/8 AC RESIDENTIAL	68			10.81	735.08
B	1/4 AC RESIDENTIAL	68			10.64	723.52
B	1/3 AC RESIDENTIAL	67			39.30	2,633.10
B	1/2 AC RESIDENTIAL	66			12.81	845.46
B	1 AC RESIDENTIAL	64			2.01	128.64
B	COMMERCIAL	92			5.62	517.04
B	BARREN - FAIR	82			0.00	0.00
B	BRUSH - GOOD	48			2.90	139.20
B	MEADOW - GOOD	58			3.74	216.92
B	OPEN SPACE- POOR	79			1.84	145.36
B	WOODS - GOOD	50			4.68	234.00
D	1/8 AC RESIDENTIAL	85			1.80	153.00
D	1/3 AC RESIDENTIAL	84			3.81	320.04
D	1/2 AC RESIDENTIAL	83			4.29	356.07
D	BRUSH - GOOD	73			2.43	177.39
D	MEADOW - GOOD	78			0.50	39.00
D	OPEN SPACE- POOR	89			0.34	30.26
D	WOODS - GOOD	67			1.92	128.64
A	INDUSTRIAL	81			0.85	68.85
B	INDUSTRIAL	88			1.56	137.28
D	INDUSTRIAL	93			3.12	290.16
I	IMPERVIOUS	98			4.23	414.54
Totals =					165.39	10,632.35
					(	0.25842 sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{10,632.35}{165.39} \quad \text{Use CN} = \boxed{64}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-90

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1</sup> :			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	54			0.78	42.12
A	1/3 AC RESIDENTIAL	49			30.57	1,497.93
A	1/2 AC RESIDENTIAL	47			37.37	1,756.39
A	MEADOW - GOOD	30			0.89	26.70
A	WOODS - GOOD	30			8.00	240.00
B	1/8 AC RESIDENTIAL	68			0.71	48.28
B	1/3 AC RESIDENTIAL	67			86.38	5,787.46
B	1/2 AC RESIDENTIAL	66			24.06	1,587.96
B	3/4 AC RESIDENTIAL	65			8.32	540.80
B	1 AC RESIDENTIAL	64			2.57	164.48
B	COMMERCIAL	92			2.52	231.84
B	OPEN SPACE- GOOD	55			1.01	55.55
B	WOODS - GOOD	50			23.51	1,175.50
C	1/2 AC RESIDENTIAL	76			0.87	66.12
C	1/3 AC RESIDENTIAL	77			29.22	2,249.94
C	1 AC RESIDENTIAL	74			3.24	239.76
C	COMMERCIAL	94			0.03	2.82
C	OPEN SPACE- GOOD	74			0.06	4.44
C	WOODS - GOOD	70			3.10	217.00
D	1/3 AC RESIDENTIAL	84			6.99	587.16
D	1/2 AC RESIDENTIAL	83			4.19	347.77
D	3/4 AC RESIDENTIAL	82			1.34	109.88
D	1 AC RESIDENTIAL	80			0.27	21.60
D	COMMERCIAL	95			0.29	27.55
D	OPEN SPACE- GOOD	80			0.82	65.60
D	WOODS - GOOD	67			51.26	3,434.42
I	IMPERVIOUS	98			10.20	999.60
Totals =					337.79	21,486.55
					( 0.52780	sq mi)

<sup>1</sup>. Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{21,486.55}{337.79} \quad \text{Use CN} = \boxed{64}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-80

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/3 AC RESIDENTIAL	49			4.82	236.18
A	1/2 AC RESIDENTIAL	47			8.27	388.69
A	1 AC RESIDENTIAL	40			0.99	39.60
A	WOODS - GOOD	30			2.12	63.60
A	OPEN SPACE- GOOD	36			0.34	12.24
B	1/3 AC RESIDENTIAL	67			16.71	1,119.57
B	1/2 AC RESIDENTIAL	66			18.79	1,240.14
B	3/4 AC RESIDENTIAL	65			3.11	202.15
B	1 AC RESIDENTIAL	64			0.82	52.48
B	COMMERCIAL	92			2.48	228.16
B	OPEN SPACE- GOOD	55			29.24	1,608.20
B	WOODS - GOOD	50			12.48	624.00
C	1/2 AC RESIDENTIAL	76			4.84	367.84
C	3/4 AC RESIDENTIAL	75			3.62	271.50
C	COMMERCIAL	94			2.94	276.36
C	OPEN SPACE- GOOD	74			2.30	170.20
C	WOODS - GOOD	70			0.00	0.00
D	1/3 AC RESIDENTIAL	84			0.28	23.52
D	1/2 AC RESIDENTIAL	83			0.03	2.49
D	3/4 AC RESIDENTIAL	82			0.00	0.00
D	COMMERCIAL	95			0.33	31.35
D	OPEN SPACE- GOOD	80			3.06	244.80
D	WOODS - GOOD	67			51.54	3,453.18
I	IMPERVIOUS	98			17.66	1,730.68
W	WATER	98			0.87	85.26
						0.00
Totals =					187.64	12,472.19

<sup>1.</sup> Use only one CN value source per line.

( 0.29319 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{12,472.19}{187.64} \quad \text{Use CN} = \boxed{66}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-70

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	WOODS - GOOD	30			1.72	51.60
B	1/8 AC RESIDENTIAL	68			12.82	871.76
B	1/4 AC RESIDENTIAL	68			2.06	140.08
B	1/3 AC RESIDENTIAL	67			233.02	15,612.34
B	1/2 AC RESIDENTIAL	66			17.38	1,147.08
B	COMMERCIAL	92			7.89	725.88
B	OPEN SPACE- GOOD	55			10.87	597.85
B	WOODS - GOOD	50			15.39	769.50
C	1/3 AC RESIDENTIAL	77			16.63	1,280.51
C	1/2 AC RESIDENTIAL	76			0.89	67.64
C	WOODS - GOOD	70			2.52	176.40
D	1/8 AC RESIDENTIAL	84			8.42	707.28
D	1/4 AC RESIDENTIAL	84			1.07	89.88
D	1/3 AC RESIDENTIAL	84			2.84	238.56
D	1/2 AC RESIDENTIAL	83			0.17	14.11
D	COMMERCIAL	95			4.98	473.10
D	OPEN SPACE- GOOD	80			1.31	104.80
D	WOODS - GOOD	67			20.58	1,378.86
I	IMPERVIOUS	98			24.78	2,428.44
W	WATER	98			2.74	268.52
						0.00
Totals =					388.08	27,144.19
					( 0.60638	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{27,144.19}{388.08} \quad \text{Use CN} = \boxed{70}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-60

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Acres</span> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
B	1/8 AC RESIDENTIAL	68			32.80	2,230.40
B	1/4 AC RESIDENTIAL	68			9.74	662.32
B	1/3 AC RESIDENTIAL	67			40.60	2,720.20
B	1/2 AC RESIDENTIAL	66			18.30	1,207.80
B	3/4 AC RESIDENTIAL	65			2.76	179.40
B	1 AC RESIDENTIAL	64			3.05	195.20
B	COMMERCIAL	92			22.78	2,095.76
B	BRUSH - GOOD	48			3.32	159.36
B	MEADOW - GOOD	58			6.64	385.12
B	OPEN SPACE- FAIR	69			0.31	21.39
B	OPEN SPACE- GOOD	55			9.55	525.25
B	WOODS - FAIR	60			2.91	174.60
B	WOODS - GOOD	50			20.95	1,047.50
D	1/8 AC RESIDENTIAL	84			0.81	68.04
D	1/3 AC RESIDENTIAL	84			0.63	52.92
D	1/2 AC RESIDENTIAL	83			5.60	464.80
D	BRUSH - GOOD	73			0.03	2.19
D	COMMERCIAL	95			0.03	2.85
D	MEADOW- GOOD	78			0.40	31.20
D	WOODS - GOOD	67			21.67	1,451.89
I	IMPERVIOUS	98			45.47	4,456.06
						0.00
						0.00
Totals =					248.35	18,134.25
					( 0.38805	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{18,134.25}{248.35} \text{ Use CN} = \boxed{73}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-50

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  (Acres) Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/3 AC RESIDENTIAL	49			2.02	98.98
A	3/4 AC RESIDENTIAL	45			0.92	41.40
A	WOODS - GOOD	30			1.67	50.10
B	1/8 AC RESIDENTIAL	68			4.90	333.20
B	1/4 AC RESIDENTIAL	68			69.34	4,715.12
B	1/3 AC RESIDENTIAL	67			111.34	7,459.78
B	3/4 AC RESIDENTIAL	65			3.64	236.60
B	COMMERCIAL	92			22.42	2,062.64
B	OPEN SPACE- GOOD	55			8.40	462.00
B	WOODS - GOOD	50			20.18	1,009.00
D	1/8 AC RESIDENTIAL	84			0.44	36.96
D	1/3 AC RESIDENTIAL	84			0.01	0.84
D	3/4 AC RESIDENTIAL	82			0.69	56.58
D	COMMERCIAL	95			0.08	7.60
D	WOODS - GOOD	67			11.18	749.06
I	IMPERVIOUS	98			17.71	1,735.58
						0.00
						0.00
Totals =					274.94	19,055.44

<sup>1.</sup> Use only one CN value source per line.

( 0.42959 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{19,055.44}{274.94} \quad \text{Use CN} = \boxed{69}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-40

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area <u>Acres</u> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
B	1/8 AC RESIDENTIAL	68			25.53	1,736.04
B	1/4 AC RESIDENTIAL	68			135.38	9,205.84
B	1/3 AC RESIDENTIAL	67			128.05	8,579.35
B	1/2 AC RESIDENTIAL	66			48.51	3,201.66
B	3/4 AC RESIDENTIAL	65			4.08	265.20
B	1 AC RESIDENTIAL	64			6.70	428.80
B	COMMERCIAL	92			3.77	346.84
B	BRUSH - GOOD	48			1.29	61.92
B	MEADOW - GOOD	58			6.69	388.02
B	OPEN SPACE- GOOD	55			4.45	244.75
B	WOODS - GOOD	50			13.59	679.50
C	1/4 AC RESIDENTIAL	77			12.03	926.31
C	1/3 AC RESIDENTIAL	77			1.25	96.25
D	1/8 AC RESIDENTIAL	84			3.15	264.60
D	1/4 AC RESIDENTIAL	84			2.93	246.12
D	1/3 AC RESIDENTIAL	84			3.13	262.92
D	1/2 AC RESIDENTIAL	83			3.27	271.41
D	3/4 AC RESIDENTIAL	82			0.11	9.02
D	MEADOW - GOOD	78			1.08	84.24
D	OPEN SPACE- GOOD	80			1.69	135.20
D	WOODS - GOOD	67			7.35	492.45
I	IMPERVIOUS	98			23.59	2,311.82
W	WATER	98			1.26	123.48
						0.00
Totals =					438.88	30,361.74

<sup>1.</sup> Use only one CN value source per line.

( 0.68575 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{30,361.74}{438.88} \quad \text{Use CN} = \boxed{69}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-30

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Acres</span> Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/3 AC RESIDENTIAL	49			12.05	590.45
A	3/4 AC RESIDENTIAL	45			5.21	234.45
A	WOODS - GOOD	30			0.60	18.00
B	1/8 AC RESIDENTIAL	68			12.33	838.44
B	1/4 AC RESIDENTIAL	68			40.47	2,751.96
B	1/3 AC RESIDENTIAL	67			39.14	2,622.38
B	1/2 AC RESIDENTIAL	66			25.39	1,675.74
B	1 AC RESIDENTIAL	64			8.81	563.84
B	COMMERCIAL	92			18.72	1,722.24
B	OPEN SPACE- GOOD	55			11.48	631.40
B	WOODS - GOOD	50			11.51	575.50
D	1/4 AC RESIDENTIAL	84			0.09	7.56
D	1/3 AC RESIDENTIAL	84			0.18	15.12
D	1/2 AC RESIDENTIAL	83			0.04	3.32
D	3/4 AC RESIDENTIAL	82			1.78	145.96
D	WOODS - GOOD	67			3.80	254.60
I	IMPERVIOUS	98			13.69	1,341.62
Totals =					205.29	13,992.58
					( 0.32077	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{13,992.58}{205.29} \quad \text{Use CN} = \boxed{68}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-20

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/8 AC RESIDENTIAL	52			0.71	36.92
A	1/4 AC RESIDENTIAL	50			16.75	837.50
A	1/3 AC RESIDENTIAL	49			17.05	835.45
A	COMMERCIAL	89			5.13	456.57
A	OPEN SPACE- GOOD	36			0.20	7.20
A	WOODS - GOOD	30			0.90	27.00
B	1/8 AC RESIDENTIAL	68			5.02	341.36
B	1/4 AC RESIDENTIAL	68			159.48	10,844.64
B	1/3 AC RESIDENTIAL	67			151.79	10,169.93
B	1/2 AC RESIDENTIAL	66			21.08	1,391.28
B	1 AC RESIDENTIAL	64			34.90	2,233.60
B	COMMERCIAL	92			7.22	664.24
B	OPEN SPACE- GOOD	55			45.70	2,513.50
B	WOODS - GOOD	50			30.48	1,524.00
D	1/4 AC RESIDENTIAL	84			13.89	1,166.76
D	1/3 AC RESIDENTIAL	84			24.86	2,088.24
D	1/2 AC RESIDENTIAL	83			7.80	647.40
D	1 AC RESIDENTIAL	81			16.58	1,342.98
D	COMMERCIAL	95			13.31	1,264.45
D	OPEN SPACE- GOOD	80			2.19	175.20
D	WOODS - GOOD	67			25.23	1,690.41
I	IMPERVIOUS	98			56.28	5,515.44
W	WATER	98			2.34	229.32
Totals =					658.89	46,003.39
					( 1.02952	sq mi)

<sup>1.</sup> Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{46,003.39}{658.89} \quad \text{Use CN} = \boxed{70}$$

## Worksheet 2: Runoff curve number and runoff

Project: Copper Mine Brook (2235-19-4) By: RV Date: 05/28/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Watershed CMB-10

### 1.) Runoff curve number (CN)

Soil Name and Hydrologic Group  (appendix A)	Cover Description  (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value <sup>1.</sup>			Area  Acres Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
A	1/4 AC RESIDENTIAL	50			0.02	1.00
A	WOODS - GOOD	30			0.09	2.70
B	1/4 AC RESIDENTIAL	68			1.84	125.12
B	1/3 AC RESIDENTIAL	67			4.59	307.53
B	COMMERCIAL	92			0.16	14.72
B	WOODS - GOOD	50			1.38	69.00
I	IMPERVIOUS	98			1.14	111.72
W	WATER	98			0.16	15.68
Totals =					9.38	647.47

<sup>1.</sup> Use only one CN value source per line.

( 0.01466 sq mi)

CN (weighted) =  $\frac{\text{total product}}{\text{total area}}$  =  $\frac{647.47}{9.38}$  Use CN = 69

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $T_c$   $T_t$

By: RV  
 Checked: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: WHB-60  
 Date: 05/29/08  
 Date: \_\_\_\_\_

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>	
	FRST	
	0.600	
ft.	300.0	
in.	3.20	
ft./ft.	0.017	
hr.	1.281	= 1.281

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=.4$  unpaved,  $d=.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>								
	FRST								
	0.100								
	UNPVD								
ft.	0.40								
ft.	515.0								
ft./ft.	0.010								
fps.	0.80								
hr.	0.180	+	0.000	+	0.000	+	0.000	=	0.180

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $Z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length,  $L$

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>	<b>E-F</b>						
ft.	5.00	10.00	15.00						
	3.00	3.00	3.00						
ft.	0.50	1.00	1.00						
ft. <sup>2</sup>	3.25	13.00	18.00						
ft.	8.16	16.32	21.32						
ft.	0.40	0.80	0.84						
ft./ft.	0.0836	0.0833	0.0167						
	0.040	0.040	0.040						
fps.	5.83	9.24	4.30						
ft.	670.0	2340.0	1800.0						
hr.	0.032	+	0.070	+	0.116	+	0.000	=	0.219
								hr.	1.679

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $I_c$   $T_t$

By: RV Date: 05/29/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: WHB-50

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$
6.  $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$

Segment ID	A-B
FRST	
0.600	
ft. 300.0	
in. 3.20	
ft./ft. 0.150	
hr. 0.532	= 0.532

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=.4$  unpaved,  $d=.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$
13. Average velocity,  $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$
14.  $T_t = \frac{L}{3600 * V}$

Segment ID	B-C			
FRST				
0.100				
UNPVD				
ft. 0.40				
ft. 450.0				
ft./ft. 0.111				
fps. 2.69				
hr. 0.046	+	0.000	+	0.000
				+
				0.000
				= 0.046

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$
20. Hydraulic Radius,  $R = \frac{A}{P_w}$
21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$
23.  $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$
24. Flow length,  $L$
25.  $T_t = \frac{L}{3600 * V}$
26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	C-D	D-E	E-F	
ft. 5.00	10.00	10.00		
3.00	3.00	3.00		
ft. 0.50	1.00	1.00		
ft. <sup>2</sup> 3.25	13.00	13.00		
ft. 8.16	16.32	16.32		
ft. 0.40	0.80	0.80		
ft./ft. 0.0408	0.0038	0.0067		
0.040	0.040	0.040		
fps. 4.07	1.97	2.62		
ft. 3430.0	3935.0	2240.0		
hr. 0.234	+	0.554	+	0.238
				+
				0.000
				= 1.026
				hr. 1.604

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 05/29/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one:  $T_c$   $T_t$  Subwatershed: WHB-40

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>	
	FRST	
	0.600	
ft.	300.0	
in.	3.20	
ft./ft.	0.013	
hr.	1.403	= 1.403

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=.4$  unpaved,  $d=.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>								
	FRST								
	0.100								
	UNPVD								
ft.	0.40								
ft.	740.0								
ft./ft.	0.007								
fps.	0.67								
hr.	0.308	+	0.000	+	0.000	+	0.000	=	0.308

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length,  $L$

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>	<b>E-F</b>						
ft.	5.00	10.00	30.00						
	3.00	3.00	3.00						
ft.	0.50	1.00	1.50						
ft. <sup>2</sup>	3.25	13.00	51.75						
ft.	8.16	16.32	39.49						
ft.	0.40	0.80	1.31						
ft./ft.	0.1030	0.0194	0.0030						
	0.040	0.040	0.040						
fps.	6.47	4.46	2.44						
ft.	2330.0	2570.0	2540.0						
hr.	0.100	+	0.160	+	0.289	+	0.000	=	0.549
hr.									2.261

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub> T<sub>t</sub>

By: RV  
 Checked: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: WHB-30  
 Date: 05/29/08  
 Date: \_\_\_\_\_

**Sheet flow** (applicable to  $T_c$  only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

6.  $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$

Segment ID	<b>A-B</b>	
	FRST	
	0.600	
ft.	300.0	
in.	3.20	
ft./ft.	0.033	
hr.	0.976	= 0.976

**Shallow concentrated flow** (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

13. Average velocity,  $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$

14.  $T_t = \frac{L}{3600 * V}$

Segment ID	<b>B-C</b>								
	FRST								
	0.100								
	UNPVD								
ft.	0.40								
ft.	430.0								
ft./ft.	0.093								
fps.	2.47								
hr.	0.048	+	0.000	+	0.000	+	0.000	=	0.048

**Channel flow**

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

20. Hydraulic Radius,  $R = \frac{A}{P_w}$

21. Channel slope, s
22. Manning's roughness coeff., n

23.  $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$

24. Flow length, L

25.  $T_t = \frac{L}{3600 * V}$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>							
ft.	5.00	5.00							
	3.00	3.00							
ft.	0.50	0.50							
ft. <sup>2</sup>	3.25	3.25							
ft.	8.16	8.16							
ft.	0.40	0.40							
ft./ft.	0.0670	0.0670							
	0.040	0.040							
fps.	5.22	5.22							
ft.	3260.0	2980.0							
hr.	0.174	0.159	+	0.000	+	0.000	=	0.332	
								hr.	1.356

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)      By: RV      Date: 05/29/08  
 Location: Bristol & Burlington, CT      Checked: \_\_\_\_\_      Date: \_\_\_\_\_  
 Circle one: Present    Developed      Watershed: Coppermine Brook  
 Circle one:  $I_c$        $T_t$       Subwatershed: WHB-20

### Sheet flow (applicable to $T_c$ only)

Segment ID	A-B
1. Surface description (Table 3-1)	FRST
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)	0.600
3. Flow Length, L (< 300ft)	ft. 300.0
4. Two-year 24-hr rainfall, $P_2$	in. 3.20
5. Land slope, s	ft./ft. 0.060
6. $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$	hr. 0.768 = 0.768

### Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID	B-C			
7. Surface description	FRST			
8. Manning's roughness coeff., n	0.100			
9. Paved or unpaved	UNPVD			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft. 0.40			
11. Flow Length, L	ft. 2415.0			
12. Watercourse slope, s	ft./ft. 0.045			
13. Average velocity, $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$	fps. 1.72			
14. $T_t = \frac{L}{3600 * V}$	hr. 0.391 + 0.000 + 0.000 + 0.000 = 0.391			

### Channel flow

Segment ID	C-D	D-E		
15. Channel Bottom width, b	ft. 15.00	400.00		
16. Horizontal side slope component, z (z horiz:1 vert)	3.00	3.00		
17. Depth of flow, d	ft. 1.00	3.00		
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup> 18.00	1227.00		
19. Wetted perimeter, $P_w$	ft. 21.32	418.97		
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft. 0.84	2.93		
21. Channel slope, s	ft./ft. 0.0191	0.0089		
22. Manning's roughness coeff., n	0.040	0.040		
23. $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$	fps. 4.60	7.19		
24. Flow length, L	ft. 4715.0	560.0		
25. $T_t = \frac{L}{3600 * V}$	hr. 0.285 + 0.022 + 0.000 + 0.000 = 0.306			
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)			hr.	1.466

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub> T<sub>t</sub>

By: RV  
 Checked: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: WHB-10

Date: 05/29/08  
 Date: \_\_\_\_\_

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow,  $n$  (Table 3-1)
3. Flow Length,  $L$  (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope,  $s$
6.  $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$

Segment ID	<b>A-B</b>	
	FRST	
	0.600	
ft.	300.0	
in.	3.20	
ft./ft.	0.073	
hr.	0.710	= 0.710

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff.,  $n$
9. Paved or unpaved
10. Depth of flow,  $d$  (default:  $d=.4$  unpaved,  $d=.2$  paved)
11. Flow Length,  $L$
12. Watercourse slope,  $s$
13. Average velocity,  $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14.  $T_t = \frac{L}{3600 * V}$

Segment ID	<b>B-C</b>										
	FRST										
	0.100										
	UNPVD										
ft.	0.40										
ft.	240.0										
ft./ft.	0.175										
fps.	3.38										
hr.	0.020	+	0.000	+	0.000	+	0.000	+	0.000	=	0.020

### Channel flow

15. Channel Bottom width,  $b$
16. Horizontal side slope component,  $z$  ( $z$  horiz:1 vert)
17. Depth of flow,  $d$
18. Cross sectional flow area,  $A$  (assume trapezoidal)
19. Wetted perimeter,  $P_w$
20. Hydraulic Radius,  $R = \frac{A}{P_w}$
21. Channel slope,  $s$
22. Manning's roughness coeff.,  $n$
23.  $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$
24. Flow length,  $L$
25.  $T_t = \frac{L}{3600 * V}$
26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>	<b>D-E</b>							
ft.	3.00	3.00	15.00							
	1.00	1.00	3.00							
ft.	0.33	0.40	1.00							
ft. <sup>2</sup>	1.10	1.36	18.00							
ft.	3.93	4.13	21.32							
ft.	0.28	0.33	0.84							
ft./ft.	0.0985	0.0310	0.0213							
	0.040	0.040	0.040							
fps.	5.00	3.13	4.86							
ft.	3350.0	1600.0	3050.0							
hr.	0.186	+	0.142	+	0.174	+	0.000	=	0.503	
								hr.		1.233

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 05/29/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one:  $I_c$   $T_t$  Subwatershed: WIB-30

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)	Segment ID	<b>A-B</b>	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		FRST	
3. Flow Length, L (< 300ft)	ft.	0.600	
4. Two-year 24-hr rainfall, $P_2$	in.	300.0	
5. Land slope, s	ft./ft.	3.20	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.027	
		1.062	= 1.062

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description	Segment ID	<b>B-C</b>	<b>C-D</b>	<b>C-D</b>	<b>D-E</b>	
8. Manning's roughness coeff., n		FRST	FRST	FRST	FRST	
9. Paved or unpaved		0.100	0.100	0.100	0.100	
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft.	UNPVD	UNPVD	UNPVD	UNPVD	
11. Flow Length, L	ft.	0.40	0.40	0.40	0.40	
12. Watercourse slope, s	ft./ft.	480.0	590.0	900.0	630.0	
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	0.046	0.237	0.033	0.095	
14. $T_t = \frac{L}{3600 * V}$	hr.	1.73	3.94	1.47	2.49	
		0.077	+ 0.042	+ 0.170	+ 0.070	= 0.359

### Channel flow

15. Channel Bottom width, b	Segment ID	<b>E-F</b>	<b>F-G</b>			
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	5.00	10.00			
17. Depth of flow, d	ft.	1.00	3.00			
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup>	0.50	1.00			
19. Wetted perimeter, $P_w$	ft.	2.75	13.00			
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	6.41	16.32			
21. Channel slope, s	ft./ft.	0.43	0.80			
22. Manning's roughness coeff., n		0.0086	0.0270			
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	0.040	0.040			
24. Flow length, L	ft.	1.96	5.26			
25. $T_t = \frac{L}{3600 * V}$	hr.	3500.0	6550.0			
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)	hr.	0.495	+ 0.346	+ 0.000	+ 0.000	= 0.841
						2.262

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19) By: RV Date: 05/29/08  
 Location: Bristol & Burlington, CT Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Circle one: Present Developed Watershed: Coppermine Brook  
 Circle one:  $I_a$   $T_t$  Subwatershed: WIB-20

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)	Segment ID	<b>A-B</b>	
2. Manning's roughness coeff. for sheet flow, $n$ (Table 3-1)		GRSS	
3. Flow Length, $L$ (< 300ft)	ft.	0.300	
4. Two-year 24-hr rainfall, $P_2$	in.	300.0	
5. Land slope, $s$	ft./ft.	3.20	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.033	
		0.560	= 0.560

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description	Segment ID	<b>B-C</b>	<b>B-C</b>		
8. Manning's roughness coeff., $n$		GRSS	FRST		
9. Paved or unpaved		0.080	0.100		
10. Depth of flow, $d$ (default: $d=.4$ unpaved, $d=.2$ paved)	ft.	UNPVD	UNPVD		
11. Flow Length, $L$	ft.	0.40	0.40		
12. Watercourse slope, $s$	ft./ft.	650.0	1430.0		
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	0.154	0.154		
14. $T_t = \frac{L}{3600 * V}$	hr.	3.97	3.17		
		0.046	0.125	+ 0.000	+ 0.000 = 0.171

### Channel flow

15. Channel Bottom width, $b$	Segment ID	<b>C-D</b>	<b>D-E</b>	<b>E-F</b>	<b>F-G</b>
16. Horizontal side slope component, $z$ ( $z$ horiz:1 vert)	ft.	5.00	5.00	5.00	10.00
17. Depth of flow, $d$	ft.	1.00	1.00	1.00	3.00
18. Cross sectional flow area, $A$ (assume trapezoidal)	ft. <sup>2</sup>	0.50	0.50	0.50	1.00
19. Wetted perimeter, $P_w$	ft.	2.75	2.75	2.75	13.00
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	6.41	6.41	6.41	16.32
21. Channel slope, $s$	ft./ft.	0.43	0.43	0.43	0.80
22. Manning's roughness coeff., $n$	ft./ft.	0.0960	0.0214	0.1180	0.0310
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	0.040	0.040	0.040	0.040
24. Flow length, $L$	ft.	6.56	3.10	7.28	5.63
25. $T_t = \frac{L}{3600 * V}$	ft.	1360.0	1870.0	550.0	1600.0
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)	hr.	0.058	0.168	0.021	0.079 = 0.325
					hr. 1.056

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub> T<sub>t</sub>

By: RV  
 Checked: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: WIB-10  
 Date: 05/29/08  
 Date: \_\_\_\_\_

**Sheet flow** (applicable to  $T_c$  only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s
6.  $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$

Segment ID	<b>A-B</b>	
	GRSS	
	0.300	
ft.	300.0	
in.	3.20	
ft./ft.	0.050	
hr.	0.475	= 0.475

**Shallow concentrated flow** (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s
13. Average velocity,  $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14.  $T_t = \frac{L}{3600 * V}$

Segment ID	<b>B-C</b>								
	GRSS								
	0.080								
	UNPVD								
ft.	0.40								
ft.	2215.0								
ft./ft.	0.054								
fps.	2.35								
hr.	0.262	+	0.000	+	0.000	+	0.000	=	0.262

**Channel flow**

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$
20. Hydraulic Radius,  $R = \frac{A}{P_w}$
21. Channel slope, s
22. Manning's roughness coeff., n
23.  $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$
24. Flow length, L
25.  $T_t = \frac{L}{3600 * V}$
26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>							
ft.	3.00	5.00							
ft.	1.00	2.00							
ft. <sup>2</sup>	0.40	0.50							
ft.	1.36	3.00							
ft.	4.13	7.24							
ft.	0.33	0.41							
ft./ft.	0.0530	0.0126							
ft./ft.	0.040	0.040							
fps.	4.09	2.32							
ft.	1225.0	1030.0							
hr.	0.083	+	0.123	+	0.000	+	0.000	=	0.206
								hr.	0.943

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $I_c$   $T_t$

By: RV Date: 05/29/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: NHB-40

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>				
	GRSS				
	0.300				
	ft.	300.0			
	in.	3.20			
	ft./ft.	0.050			
	hr.	0.475	=		0.475

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>				
	GRSS				
	0.080				
	UNPVD				
	ft.	0.40			
	ft.	940.0			
	ft./ft.	0.157			
	fps.	4.01			
	hr.	0.065	+	0.000	+
				0.000	+
				0.000	=
					0.065

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>	<b>E-F</b>	<b>F-G</b>	
	ft.	3.00	5.00	10.00	1000.0
		1.00	3.00	3.00	0.50
	ft.	0.50	0.50	1.00	5.00
	ft. <sup>2</sup>	1.75	3.25	13.00	5012.5
	ft.	4.41	8.16	16.32	1011.18
	ft.	0.40	0.40	0.80	4.96
	ft./ft.	0.0310	0.0420	0.0044	0.0044
		0.040	0.040	0.040	0.040
	fps.	3.54	4.13	2.12	7.18
	ft.	3410.0	900.0	4470.0	2240.0
	hr.	0.268	+	0.061	+
				0.585	+
				0.087	=
					1.000
					hr.
					1.539

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub> T<sub>t</sub>

By: RV Date: 05/29/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: NHB-30

### Sheet flow (applicable to $T_c$ only)

	Segment ID	A-B
1. Surface description (Table 3-1)		GRSS
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.300
3. Flow Length, L (< 300ft)	ft.	300.0
4. Two-year 24-hr rainfall, P <sub>2</sub>	in.	3.20
5. Land slope, s	ft./ft.	0.060
6. $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$	hr.	0.441 = 0.441

### Shallow concentrated flow (assume hyd. radius = depth of flow)

	Segment ID	B-C	B-C		
7. Surface description		GRSS	FRST		
8. Manning's roughness coeff., n		0.080	0.100		
9. Paved or unpaved		UNPVD	UNPVD		
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft.	0.40	0.40		
11. Flow Length, L	ft.	1900.0	345.0		
12. Watercourse slope, s	ft./ft.	0.076	0.076		
13. Average velocity, $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$	fps.	2.79	2.23		
14. $T_t = \frac{L}{3600 * V}$	hr.	0.189 + 0.043 + 0.000 + 0.000 = 0.232			

### Channel flow

	Segment ID	C-D	D-E	E-F	F-G
15. Channel Bottom width, b	ft.	40.00	10.00	10.00	10.00
16. Horizontal side slope component, z (z horiz:1 vert)		3.00	3.00	3.00	3.00
17. Depth of flow, d	ft.	1.00	0.75	0.75	0.75
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup>	43.00	9.19	9.19	9.19
19. Wetted perimeter, P <sub>w</sub>	ft.	46.32	14.74	14.74	14.74
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.93	0.62	0.62	0.62
21. Channel slope, s	ft./ft.	0.0050	0.1028	0.0239	0.0110
22. Manning's roughness coeff., n		0.040	0.040	0.040	0.040
23. $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$	fps.	2.51	8.71	4.20	2.85
24. Flow length, L	ft.	3930.0	2140.0	4190.0	2085.0
25. $T_t = \frac{L}{3600 * V}$	hr.	0.436 + 0.068 + 0.277 + 0.203 = 0.984			
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)	hr.				1.658

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $I_c$   $T_t$

By: RV Date: 05/29/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: NHB-20

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)	Segment ID	<b>A-B</b>	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		FRST	
3. Flow Length, L (< 300ft)	ft.	0.600	
4. Two-year 24-hr rainfall, $P_2$	in.	300.0	
5. Land slope, s	ft./ft.	3.20	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.033	
		0.976	= 0.976

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description	Segment ID	<b>B-C</b>	<b>B-C</b>		
8. Manning's roughness coeff., n		FRST	GRSS		
9. Paved or unpaved		0.100	0.080		
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft.	UNPVD	UNPVD		
11. Flow Length, L	ft.	0.40	0.40		
12. Watercourse slope, s	ft./ft.	1260.0	605.0		
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	0.064	0.064		
14. $T_t = \frac{L}{3600 * V}$	hr.	2.05	2.56		
		0.171	0.066	+ 0.000	+ 0.000 = 0.237

### Channel flow

15. Channel Bottom width, b	Segment ID	<b>C-D</b>	<b>D-E</b>		
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	3.00	5.00		
17. Depth of flow, d		1.00	3.00		
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup>	0.50	0.50		
19. Wetted perimeter, $P_w$	ft.	1.75	3.25		
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	4.41	8.16		
21. Channel slope, s	ft./ft.	0.40	0.40		
22. Manning's roughness coeff., n		0.0540	0.0440		
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	0.040	0.040		
24. Flow length, L	ft.	4.67	4.23		
25. $T_t = \frac{L}{3600 * V}$	hr.	4800.0	1765.0		
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)		0.285	0.116	+ 0.000	+ 0.000 = 0.401
	hr.				1.614

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $T_c$   $T_t$

By: RV Date: 05/28/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: NHB-10

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	A-B
GRSS	
0.300	
ft. 300.0	
in. 3.20	
ft./ft. 0.067	
hr. 0.422	= 0.422

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	B-C			
GRSS				
0.080				
UNPVD				
ft. 0.40				
ft. 470.0				
ft./ft. 0.085				
fps. 2.95				
hr. 0.044	+	0.000	+	0.000
			+	0.000
				= 0.044

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	C-D	D-E		
ft. 10.00	15.00			
3.00	3.00			
ft. 1.00	1.00			
ft. <sup>2</sup> 13.00	18.00			
ft. 16.32	21.32			
ft. 0.80	0.84			
ft./ft. 0.0137	0.0049			
0.040	0.040			
fps. 3.75	2.34			
ft. 5100.0	4050.0			
hr. 0.378	+	0.482	+	0.000
			+	0.000
				= 0.860
				hr. 1.326

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $T_c$   $T_t$

By: RV Checked: \_\_\_\_\_ Date: 02/29/08  
 Watershed: Coppermine Brook Date: \_\_\_\_\_  
 Subwatershed: POB-40

### Sheet flow (applicable to $T_c$ only)

Segment ID	A-B
1. Surface description (Table 3-1)	GRSS
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)	0.300
3. Flow Length, L (< 300ft)	ft. 300.0
4. Two-year 24-hr rainfall, $P_2$	in. 3.20
5. Land slope, s	ft./ft. 0.060
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr. 0.441 = 0.441

### Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID	B-C	C-D		
7. Surface description	GRSS	GRSS		
8. Manning's roughness coeff., n	0.080	0.080		
9. Paved or unpaved	UNPVD	UNPVD		
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft. 0.40	0.40		
11. Flow Length, L	ft. 885.0	1985.0		
12. Watercourse slope, s	ft./ft. 0.169	0.010		
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps. 4.16	1.01		
14. $T_t = \frac{L}{3600 * V}$	hr. 0.059 +	0.545 +	0.000 +	0.000 = 0.604

### Channel flow

Segment ID	D-E	E-F		
15. Channel Bottom width, b	ft. 5.00	10.00		
16. Horizontal side slope component, z (z horiz:1 vert)	3.00	3.00		
17. Depth of flow, d	ft. 0.50	1.00		
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup> 3.25	13.00		
19. Wetted perimeter, $P_w$	ft. 8.16	16.32		
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft. 0.40	0.80		
21. Channel slope, s	ft./ft. 0.0760	0.0127		
22. Manning's roughness coeff., n	0.040	0.040		
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps. 5.56	3.60		
24. Flow length, L	ft. 3570.0	1500.0		
25. $T_t = \frac{L}{3600 * V}$	hr. 0.178 +	0.116 +	0.000 +	0.000 = 0.294
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)				hr. 1.340

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $I_c$   $T_t$

By: RV Date: 02/29/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: POB-30

**Sheet flow** (applicable to  $T_c$  only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	A-B	
GRSS		
0.300		
ft. 300.0		
in. 3.20		
ft./ft. 0.150		
hr. 0.306	=	0.306

**Shallow concentrated flow** (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	B-C									
GRSS										
0.080										
UNPVD										
ft. 0.40										
ft. 1080.0										
ft./ft. 0.083										
fps. 2.92										
hr. 0.103	+	0.000	+	0.000	+	0.000	+	0.000	=	0.103

**Channel flow**

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	C-D		D-E		E-F		F-G	
ft. 24" RCP		36" RCP		5.00		10.00		
---		---		3.00		3.00		
ft. FULL		ft. FULL		0.50		1.00		
ft. <sup>2</sup> 3.14		7.07		3.25		13.00		
ft. 6.28		9.42		8.16		16.32		
ft. 0.50		0.75		0.40		0.80		
ft./ft. 0.0580		0.0680		0.0323		0.0140		
0.013		0.013		0.040		0.040		
fps. 17.39		24.67		3.62		3.79		
ft. 3450.0		1470.0		3250.0		2500.0		
hr. 0.055	+	0.017	+	0.249	+	0.183	+	0.504
hr. <span style="border: 1px solid black; padding: 2px;">0.913</span>								

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $I_c$   $T_t$

By: RV Checked: \_\_\_\_\_ Date: 05/28/08  
 Watershed: Coppermine Brook  
 Subwatershed: POB-20

**Sheet flow** (applicable to  $T_c$  only)

Segment ID	A-B
1. Surface description (Table 3-1)	GRSS
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)	0.300
3. Flow Length, L (< 300ft)	ft. 300.0
4. Two-year 24-hr rainfall, $P_2$	in. 3.20
5. Land slope, s	ft./ft. 0.067
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr. 0.422 = 0.422

**Shallow concentrated flow** (assume hyd. radius = depth of flow)

Segment ID	B-C			
7. Surface description	FRST			
8. Manning's roughness coeff., n	0.100			
9. Paved or unpaved	UNPVD			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft. 0.40			
11. Flow Length, L	ft. 1245.0			
12. Watercourse slope, s	ft./ft. 0.201			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps. 3.63			
14. $T_t = \frac{L}{3600 * V}$	hr. 0.095 + 0.000 + 0.000 + 0.000 = 0.095			

**Channel flow**

Segment ID	C-D	D-E	E-F	
15. Channel Bottom width, b	ft. 18" RCP	5.00	15.00	
16. Horizontal side slope component, z (z horiz:1 vert)	---	3.00	3.00	
17. Depth of flow, d	ft. FULL	0.50	1.00	
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup> 1.77	3.25	18.00	
19. Wetted perimeter, $P_w$	ft. 4.71	8.16	21.32	
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft. 0.37	0.40	0.84	
21. Channel slope, s	ft./ft. 0.0340	0.0028	0.0023	
22. Manning's roughness coeff., n	0.013	0.040	0.040	
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps. 10.99	1.07	1.60	
24. Flow length, L	ft. 1325.0	1410.0	2185.0	
25. $T_t = \frac{L}{3600 * V}$	hr. 0.033 + 0.367 + 0.380 + 0.000 = 0.781			
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)				hr. 1.299

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub>  $T_t$

By: RV Checked: \_\_\_\_\_ Date: 02/26/08  
 Watershed: Coppermine Brook Date: \_\_\_\_\_  
 Subwatershed: POB-10

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>	
	FRST	
	0.600	
ft.	130.0	
in.	3.20	
ft./ft.	0.031	
hr.	0.512	= 0.512

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>								
	FRST								
	0.100								
	UNPVD								
ft.	0.40								
ft.	465.0								
ft./ft.	0.013								
fps.	0.92								
hr.	0.141	+	0.000	+	0.000	+	0.000	=	0.141

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>								
ft.	15.00								
ft.	3.00								
ft. <sup>2</sup>	18.00								
ft.	21.32								
ft.	0.84								
ft./ft.	0.0100								
ft./ft.	0.040								
fps.	3.33								
ft.	695.0								
hr.	0.058	+	0.000	+	0.000	+	0.000	=	0.058
hr.									0.711

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $T_c$   $T_t$

By: RV Date: 05/29/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-110

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>				
	GRSS				
	0.300				
	ft. 300.0				
	in. 3.20				
	ft./ft. 0.033				
	hr. 0.560	=			0.560

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>				
	FRST				
	0.100				
	UNPVD				
	ft. 0.40				
	ft. 1175.0				
	ft./ft. 0.068				
	fps. 2.11				
	hr. 0.155	+	0.000	+	0.000
				+	0.000
					= 0.155

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>			
	ft. 10.00	15.00			
	3.00	1.00			
	ft. 0.50	1.50			
	ft. <sup>2</sup> 5.75	24.75			
	ft. 13.16	19.24			
	ft. 0.44	1.29			
	ft./ft. 0.0760	0.0132			
	0.040	0.040			
	fps. 5.91	5.06			
	ft. 1435.0	4540.0			
	hr. 0.067	0.249	+	0.000	+
				0.000	=
					0.317
					hr. 1.032

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub> T<sub>t</sub>

By: RV Date: 05/28/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-105

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>	
	GRSS	
	0.300	
ft.	300.0	
in.	3.20	
ft./ft.	0.040	
hr.	0.519	= 0.519

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>			
	GRSS			
	0.080			
	UNPVD			
ft.	0.40			
ft.	2020.0			
ft./ft.	0.031			
fps.	1.78			
hr.	0.315	+ 0.000	+ 0.000	+ 0.000 = 0.315

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>			
ft.	15" RCP			
	---			
ft.	FULL			
ft. <sup>2</sup>	1.23			
ft.	3.93			
ft.	0.31			
ft./ft.	0.0253			
	0.013			
fps.	8.41			
ft.	1580.0			
hr.	0.052	+ 0.000	+ 0.000	+ 0.000 = 0.052
				hr. 0.886

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $T_c$   $T_t$

By: RV Date: 05/28/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-100

**Sheet flow** (applicable to  $T_c$  only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s
6.  $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$

Segment ID	A-B	
	GRSS	
	0.300	
ft.	300.0	
in.	3.20	
ft./ft.	0.133	
hr.	0.321	= 0.321

**Shallow concentrated flow** (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s
13. Average velocity,  $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14.  $T_t = \frac{L}{3600 * V}$

Segment ID	B-C	C-D			
	GRSS	GRSS			
	0.080	0.080			
	UNPVD	UNPVD			
ft.	0.40	0.40			
ft.	600.0	1030.0			
ft./ft.	0.292	0.068			
fps.	5.46	2.64			
hr.	0.031	0.109	+	0.000	+
				0.000	+
					= 0.139

**Channel flow**

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapazoidal)
19. Wetted perimeter,  $P_w$
20. Hydraulic Radius,  $R = \frac{A}{P_w}$
21. Channel slope, s
22. Manning's roughness coeff., n
23.  $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$
24. Flow length, L
25.  $T_t = \frac{L}{3600 * V}$
26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	D-E				
ft.	5.00				
	1.00				
ft.	1.00				
ft. <sup>2</sup>	6.00				
ft.	7.83				
ft.	0.77				
ft./ft.	0.0038				
	0.030				
fps.	2.56				
ft.	2610.0				
hr.	0.283	+	0.000	+	0.000
				+	0.000
					= 0.283
					0.743

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $T_c$   $T_t$

By: RV Date: 05/28/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-90

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	A-B	
	GRSS	
	0.300	
	ft.	300.0
	in.	3.20
	ft./ft.	0.033
	hr.	0.560
	=	0.560

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	B-C				
	GRSS				
	0.080				
	UNPVD				
	ft.	0.40			
	ft.	300.0			
	ft./ft.	0.100			
	fps.	3.20			
	hr.	0.026	+	0.000	+
				0.000	+
					0.000
					=
					0.026

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	C-D		D-E			
	ft.	5.00	20.00			
		2.00	1.00			
	ft.	0.50	1.50			
	ft. <sup>2</sup>	3.00	32.25			
	ft.	7.24	24.24			
	ft.	0.41	1.33			
	ft./ft.	0.0250	0.0026			
		0.040	0.040			
	fps.	3.27	2.30			
	ft.	4100.0	1050.0			
	hr.	0.348	0.127	+	0.000	+
						0.000
						=
						0.475
						1.061

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub> T<sub>t</sub>

By: RV Checked: \_\_\_\_\_ Date: 05/28/08  
 Watershed: Coppermine Brook Date: \_\_\_\_\_  
 Subwatershed: CMB-80

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>				
	GRSS				
	0.240				
	ft. 300.0				
	in. 3.20				
	ft./ft. 0.040				
	hr. 0.434	=		0.434	

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3})(s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>				
	GRSS				
	0.080				
	UNPVD				
	ft. 0.40				
	ft. 600.0				
	ft./ft. 0.050				
	fps. 2.26				
	hr. 0.074	+	0.000	+	0.000
				+	0.000
					= 0.074

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3})(s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>C-D</b>	<b>D-E</b>	<b>F-G</b>		
	ft. 24" RCP	5.00	20.00		
	---	3.00	1.00		
	ft. FULL	0.50	1.50		
	ft. <sup>2</sup> 3.14	3.25	32.25		
	ft. 6.28	8.16	24.24		
	ft. 0.50	0.40	1.33		
	ft./ft. 0.0230	0.0320	0.0014		
	0.013	0.040	0.040		
	fps. 10.95	3.61	1.69		
	ft. 420.0	1250.0	2200.0		
	hr. 0.011	0.096	0.362	+	0.000
					= 0.469
					0.977



## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $T_c$   $T_t$

By: RV Date: 05/28/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-60

### Sheet flow (applicable to $T_c$ only)

	Segment ID	A-B
1. Surface description (Table 3-1)		FRST
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.600
3. Flow Length, L (< 300ft)	ft.	300.0
4. Two-year 24-hr rainfall, $P_2$	in.	3.20
5. Land slope, s	ft./ft.	0.017
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	1.281
		= 1.281

### Shallow concentrated flow (assume hyd. radius = depth of flow)

	Segment ID	B-C			
7. Surface description		FRST			
8. Manning's roughness coeff., n		0.100			
9. Paved or unpaved		UNPVD			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft.	0.40			
11. Flow Length, L	ft.	1400.0			
12. Watercourse slope, s	ft./ft.	0.003			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	0.44			
14. $T_t = \frac{L}{3600 * V}$	hr.	0.893	+	0.000	+
				0.000	+
				0.000	=
					0.893

### Channel flow

	Segment ID	C-D	D-E	E-F	
15. Channel Bottom width, b	ft.	5.00	54" CMP	10.00	
16. Horizontal side slope component, z (z horiz:1 vert)		3.00	---	1.00	
17. Depth of flow, d	ft.	0.50	FULL	1.00	
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup>	3.25	15.90	11.00	
19. Wetted perimeter, $P_w$	ft.	8.16	14.13	12.83	
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.40	1.13	0.86	
21. Channel slope, s	ft./ft.	0.0102	0.0125	0.0032	
22. Manning's roughness coeff., n		0.040	0.018	0.040	
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	2.04	10.01	1.90	
24. Flow length, L	ft.	1460.0	960.0	945.0	
25. $T_t = \frac{L}{3600 * V}$	hr.	0.199	0.027	0.138	+
				0.000	=
					0.364
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)	hr.				
					2.538

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one:  $I_c$   $T_t$

By: RV Date: 05/28/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-50

**Sheet flow** (applicable to  $T_c$  only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

6.  $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$

Segment ID	<b>A-B</b>				
	GRSS				
	0.300				
	ft.	300.0			
	in.	3.20			
	ft./ft.	0.020			
	hr.	0.685	=	0.685	

**Shallow concentrated flow** (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

13. Average velocity,  $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$

14.  $T_t = \frac{L}{3600 * V}$

Segment ID					
	ft.				
	ft.				
	ft./ft.				
	fps.				
	hr.	0.000	+	0.000	+
					+
					+
					=
					0.000

**Channel flow**

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$
20. Hydraulic Radius,  $R = \frac{A}{P_w}$
21. Channel slope, s
22. Manning's roughness coeff., n

23.  $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$

24. Flow length, L

25.  $T_t = \frac{L}{3600 * V}$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>B-C</b>				
	ft.	20.00			
		1.00			
	ft.	2.00			
	ft. <sup>2</sup>	44.00			
	ft.	25.66			
	ft.	1.71			
	ft./ft.	0.0035			
		0.040			
	fps.	3.16			
	ft.	5400.0			
	hr.	0.475	+	0.000	+
					+
					+
					=
					0.475
					hr.
					1.160

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub> T<sub>t</sub>

By: RV Checked: \_\_\_\_\_ Date: 05/28/08  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-40

### Sheet flow (applicable to $T_c$ only)

Segment ID	A-B
1. Surface description (Table 3-1)	GRSS
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)	0.240
3. Flow Length, L (< 300ft)	ft. 300.0
4. Two-year 24-hr rainfall, P <sub>2</sub>	in. 3.20
5. Land slope, s	ft./ft. 0.033
6. $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$	hr. 0.469 = 0.469

### Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID	B-C			
7. Surface description	GRSS			
8. Manning's roughness coeff., n	0.080			
9. Paved or unpaved	UNPVD			
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)	ft. 0.40			
11. Flow Length, L	ft. 1540.0			
12. Watercourse slope, s	ft./ft. 0.036			
13. Average velocity, $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$	fps. 1.92			
14. $T_t = \frac{L}{3600 * V}$	hr. 0.223 + 0.000 + 0.000 + 0.000 = 0.223			

### Channel flow

Segment ID	C-D	D-E		
15. Channel Bottom width, b	ft. 5.00	10.00		
16. Horizontal side slope component, z (z horiz:1 vert)	3.00	1.00		
17. Depth of flow, d	ft. 0.50	1.00		
18. Cross sectional flow area, A (assume trapezoidal)	ft. <sup>2</sup> 3.25	11.00		
19. Wetted perimeter, P <sub>w</sub>	ft. 8.16	12.83		
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft. 0.40	0.86		
21. Channel slope, s	ft./ft. 0.0203	0.0060		
22. Manning's roughness coeff., n	0.040	0.040		
23. $V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$	fps. 2.87	2.60		
24. Flow length, L	ft. 2460.0	4970.0		
25. $T_t = \frac{L}{3600 * V}$	hr. 0.238 + 0.530 + 0.000 + 0.000 = 0.768			
26. Watershed or subarea $T_c$ or $T_t$ (add $T_t$ in steps 6, 14 & 25)				hr. 1.460

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)

By: RV

Date: 05/28/08

Location: Bristol & Burlington, CT

Checked: \_\_\_\_\_

Date: \_\_\_\_\_

Circle one: Present Developed

Watershed: Coppermine Brook

Circle one:  $T_c$   $T_t$

Subwatershed: CMB-30

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID

<b>A-B</b>
GRSS
0.240
ft. 300.0
in. 3.20
ft./ft. 0.050
hr. 0.397 = 0.397

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID

<b>B-C</b>			
GRSS			
0.080			
UNPVD			
ft. 0.40			
ft. 200.0			
ft./ft. 0.040			
fps. 2.02			
hr. 0.027 + 0.000 + 0.000 + 0.000 = 0.027			

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3}) (s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID

<b>C-D</b>			
ft. 20.00			
1.00			
ft. 2.00			
ft. <sup>2</sup> 44.00			
ft. 25.66			
ft. 1.71			
ft./ft. 0.0050			
0.040			
fps. 3.77			
ft. 4200.0			
hr. 0.309 + 0.000 + 0.000 + 0.000 = 0.309			

hr. 0.734

## Time of Concentration ( $T_c$ ) or Travel Time ( $T_t$ ) Worksheet

Project: Coppermine Brook Watershed (2235-19)  
 Location: Bristol & Burlington, CT  
 Circle one: Present Developed  
 Circle one: I<sub>c</sub> T<sub>t</sub>

By: RV Date: 05/28/08  
 Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
 Watershed: Coppermine Brook  
 Subwatershed: CMB-20

### Sheet flow (applicable to $T_c$ only)

1. Surface description (Table 3-1)
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)
3. Flow Length, L (< 300ft)
4. Two-year 24-hr rainfall,  $P_2$
5. Land slope, s

$$6. T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} (s^{0.4})}$$

Segment ID	<b>A-B</b>			
	GRSS			
	0.240			
ft.	300.0			
in.	3.20			
ft./ft.	0.100			
hr.	0.301	=	0.301	

### Shallow concentrated flow (assume hyd. radius = depth of flow)

7. Surface description
8. Manning's roughness coeff., n
9. Paved or unpaved
10. Depth of flow, d (default: d=.4 unpaved, d=.2 paved)
11. Flow Length, L
12. Watercourse slope, s

$$13. \text{Average velocity, } V = \frac{1.49}{n} (d^{2/3})(s^{1/2})$$

$$14. T_t = \frac{L}{3600 * V}$$

Segment ID	<b>B-C</b>										
	FRST										
	0.100										
	UNPVD										
ft.	0.40										
ft.	1130.0										
ft./ft.	0.204										
fps.	3.65										
hr.	0.086	+	0.000	+	0.000	+	0.000	+	0.000	=	0.086

### Channel flow

15. Channel Bottom width, b
16. Horizontal side slope component, Z (z horiz:1 vert)
17. Depth of flow, d
18. Cross sectional flow area, A (assume trapezoidal)
19. Wetted perimeter,  $P_w$

$$20. \text{Hydraulic Radius, } R = \frac{A}{P_w}$$

21. Channel slope, s
22. Manning's roughness coeff., n

$$23. V = \frac{1.49}{n} (R^{2/3})(s^{1/2})$$

24. Flow length, L

$$25. T_t = \frac{L}{3600 * V}$$

26. Watershed or subarea  $T_c$  or  $T_t$  (add  $T_t$  in steps 6, 14 & 25)

Segment ID	<b>B-C</b>	<b>C-D</b>	<b>D-E</b>	<b>E-F</b>								
ft.	12" RCP	30" RCP	5.00	10.00								
	---	---	2.00	2.00								
ft.	FULL	FULL	0.50	1.00								
ft. <sup>2</sup>	0.79	4.91	3.00	12.00								
ft.	3.14	7.85	7.24	14.47								
ft.	0.25	0.62	0.41	0.83								
ft./ft.	0.0167	0.0190	0.0026	0.0073								
	0.013	0.013	0.040	0.040								
fps.	5.88	11.55	1.06	2.81								
ft.	620.0	1920.0	3775.0	4400.0								
hr.	0.029	0.046	0.993	0.435								
		+		+		+		+		=	1.504	
												1.890



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**APPENDIX G**  
**FEMA EFFECTIVE HEC-2 MODEL AND MMI**  
**EFFECTIVE DUPLICATE MODEL**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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HEC2 RELEASE DATED NOV 76 UPDATED FEB 1977  
 ERROR CORR - 01  
 MODIFICATION - 50.51.52

T1 FLOOD INSURANCE STUDY BRISTOL CT. 2789-66 RIBB  
 T2 STARTING WSEL BY SLOPE AREA  
 T3 CUPPER MINE BROOK 10 YEAR

J1	LMCHK	INV	NINV	IDIR	START	METRIC	HVINS	U	WSEL	Fq
0.	2.	0.	0.	0.	0.005500	0.0	0.0	0.	211.980	0.0
J2	NPROF	IPLOY	PRFVS	XSECV	XSECH	FN	ALLDC	18W	CHNIN	ITRACE
1.000	0.0	-1.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

J3 VARIABLE CURVES FOR SUMMARY PRINTOUT

38.000	59.000	40.000	41.000	42.000	43.000	1.000	2.000	3.000	34.000
21.000	22.000	25.000	0.0	38.000	1.000	50.000	61.000	51.000	53.000
27.000	4.000	25.000	54.000	13.000	14.000	15.000	0.0	0.0	0.0

NC	0.080	0.030	0.030	0.100	0.300	0.0	0.0	0.0	0.0	0.0
OT	4.000	3630.000	2000.000	340.000	7000.000	0.0	0.0	0.0	0.0	0.0
ET	0.0	100.000	2000.000	0.0	0.0	5400	10.400	15.000	2.100	0.0
X1	0.0	11.000	980.000	1020.000	0.0	0.0	0.0	0.0	0.0	0.0
G4	240.000	685.000	215.000	928.000	210.000	962.000	208.000	980.000	207.000	985.000
GK	205.000	1000.000	207.000	1915.000	208.000	1020.000	210.000	1035.000	215.000	1195.000
G4	220.000	1875.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MC	0.100	0.100	0.030	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ET	0.0	100.000	2000.000	0.0	0.0	0.0	0.0	0.0	2.100	0.0

X1	0.074	15.000	989.000	1011.000	0.0	0.0	0.0	0.0	0.0	0.0
GR	235.000	310.000	230.000	730.000	225.000	770.000	220.000	850.000	215.000	968.000
GK	210.000	977.000	209.500	987.000	209.500	989.000	208.800	993.000	208.700	1000.000
GR	208.500	1007.000	209.300	1011.000	209.800	1015.000	210.000	1023.000	215.000	1020.000
GR	220.000	1575.000	225.000	1590.000	215.000	1620.000	0.0	0.0	0.0	0.0
MC	0.0	0.0	0.0	0.250	0.0	0.0	0.0	0.0	0.0	0.0
ET	0.0	100.000	2000.000	0.0	0.0	0.0	0.0	0.0	2.100	0.0

X1	0.080	15.000	979.900	1020.100	30.000	30.000	30.000	30.000	30.000	30.000
GR	235.000	300.000	230.000	719.000	225.000	738.000	220.000	838.000	216.000	977.000
GK	209.400	980.000	209.000	993.000	206.700	990.000	205.700	1010.000	209.000	1000.000
GR	209.400	1020.000	215.000	1020.100	215.100	1056.000	230.000	1012.000	231.000	1000.000





GR	255.000	70.000	250.000	199.000	245.000	616.000	240.000	952.000	235.000	975.000
GR	239.100	990.000	234.300	992.000	234.100	1000.000	234.300	1007.000	235.100	1919.000
GR	0.0	1018.000	240.000	1105.000	245.000	1305.000	250.000	1365.000	255.000	1530.000
NC	0.0	0.0	0.0	0.250	0.500	0.0	0.0	0.0	0.0	0.0

X1	0.960	19.000	983.500	1016.500	50.000	50.000	50.000	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GR	255.000	110.000	250.000	190.000	255.000	580.000	244.700	243.000	243.000	950.000
GR	241.200	975.000	235.100	963.400	235.100	983.500	234.300	991.000	243.300	1000.000
GR	234.700	1012.000	235.100	1016.500	235.100	1016.500	230.000	1025.000	243.000	1050.000
GR	244.400	1100.000	245.000	1360.000	250.000	1570.000	255.000	1665.000	0.0	0.0
SB	0.0	1.500	240.000	0.0	33.000	0.0	200.000	0.0	235.200	234.300

X1	0.900	0.0	0.0	0.0	42.400	42.400	42.400	0.0	0.0	0.0
A2	0.0	0.0	1.000	240.000	243.700	0.0	0.0	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BT	12.000	190.000	250.000	190.000	580.000	0.0	244.000	900.000	243.900	0.0
BT	950.000	244.300	0.0	983.400	244.100	0.0	0.0	900.000	244.000	0.0
BT	243.900	240.200	1016.500	243.900	244.100	1030.000	983.500	244.100	1100.000	1016.500
BT	0.0	1360.000	245.000	0.0	1570.000	250.000	0.0	0.0	0.0	0.0
NC	0.0	0.040	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1	0.0	100.000	2000.000	0.0	0.0	0.0	0.0	0.0	2.100	0.0

X1	0.900	27.000	970.000	1030.000	50.000	50.000	50.000	0.0	0.0	0.0
GR	259.000	10.000	255.000	85.000	250.000	125.000	247.500	196.000	247.500	580.000
GR	247.000	630.000	247.000	860.000	245.000	888.000	240.000	940.000	240.000	970.000
GR	236.250	989.000	235.100	990.000	234.000	992.000	234.100	1000.000	234.300	1007.000
GR	235.100	1010.000	235.200	1011.000	236.000	1030.000	248.000	1061.000	244.000	1100.000
GR	246.000	1160.000	246.000	1465.000	247.000	1510.000	247.000	1525.000	250.000	1600.000
GR	255.000	1684.000	265.000	1745.000	0.0	0.0	0.0	0.0	0.0	0.0
NC	0.100	0.100	0.020	0.100	0.300	0.0	0.0	0.0	0.0	0.0
QT	4.000	1890.000	3210.000	3085.000	6200.000	0.0	0.0	0.0	0.0	0.0
E1	0.0	100.000	2000.000	0.0	0.0	0.0	0.0	0.0	2.100	0.0

X1	1.250	26.000	965.000	1017.000	1531.000	1457.000	1489.000	0.0	0.0	0.0
GR	200.000	220.000	255.000	255.000	259.000	280.000	251.000	330.000	250.000	355.000
GR	245.000	430.000	243.500	605.000	242.500	665.000	242.500	795.000	242.500	820.000
GR	241.500	860.000	240.000	885.000	240.300	928.000	239.000	978.000	235.700	985.000
GR	234.900	991.000	235.300	1000.000	235.500	1011.000	235.700	1016.000	237.100	1017.000
GR	241.400	1045.000	244.400	1095.000	244.400	1140.000	244.400	1230.000	250.000	1295.000
GR	260.000	1365.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NC	0.075	0.075	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1	0.0	100.000	2000.000	0.0	0.0	0.0	0.0	0.0	2.100	0.0

X1	1.580	15.000	966.000	1014.000	1563.000	1563.000	1384.000	0.0	0.0	0.0
GR	200.000	180.000	265.000	426.000	250.000	685.000	245.000	892.000	240.000	970.000
GR	239.800	966.000	238.900	994.000	236.800	1000.000	238.600	1010.000	239.800	1017.000
GR	240.000	1036.000	245.000	1050.000	250.000	1408.000	250.000	1700.000	260.000	1800.000
NC	0.100	0.100	0.033	0.250	0.500	0.0	0.0	0.0	0.0	0.0

X1	1.500	14.000	978.700	1021.300	50.000	50.000	50.000	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GR	260.000	329.000	245.000	450.000	250.000	672.000	247.600	950.000	260.000	1100.000
GR	240.000	975.000	238.700	978.700	238.700	1021.300	240.000	1025.000	240.000	1030.000
GR	247.100	1050.000	250.000	1578.000	255.000	1735.000	240.000	1890.000	240.000	2000.000



X1	1.932	17.000	967.000	1013.000	285.000	265.000	285.000	0.0	0.0	0.0	0.0	0.0
GN	265.000	340.000	260.000	680.000	900.000	900.000	265.000	265.000	265.000	265.000	265.000	962.000
GR	250.000	975.000	246.700	987.000	992.000	992.000	244.000	1900.000	245.000	245.000	245.000	1098.000
GR	246.400	1013.000	250.000	1020.000	1065.000	1065.000	253.700	1115.000	255.000	255.000	255.000	1500.000
GR	260.000	1680.000	265.000	1820.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NL	0.0	0.0	0.0	0.250	0.500	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	1.932	15.000	964.500	1015.000	50.000	50.000	50.000	0.0	0.0	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GR	265.000	590.000	260.000	640.000	255.000	255.000	262.400	962.000	253.300	253.300	253.300	975.000
GR	246.400	984.400	246.400	984.500	244.300	244.300	244.800	1000.000	244.400	244.400	244.400	1015.000
GR	255.000	1015.000	246.400	1015.100	1025.000	1025.000	253.100	1065.000	253.700	253.700	253.700	1115.000
GR	255.000	1580.000	260.000	1715.000	265.000	265.000	1840.000	0.0	0.0	0.0	0.0	0.0
SB	0.0	1.560	2.550	0.0	30.500	30.500	259.000	0.0	0.0	0.0	0.0	244.600
X1	1.950	0.0	0.0	0.0	30.200	30.200	30.200	0.0	0.0	0.0	0.0	0.0
A2	0.0	1.000	1.000	253.300	253.000	253.000	0.0	0.0	0.0	0.0	0.0	0.0
B1	12.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B1	462.000	590.000	265.600	0.0	680.000	680.000	260.600	984.500	253.000	253.000	253.000	1015.000
B1	255.000	253.000	1015.100	255.300	255.300	255.300	0.0	255.800	255.800	255.800	255.800	254.300
B1	0.0	1580.000	235.600	1715.000	1715.000	1715.000	260.600	0.0	0.0	0.0	0.0	0.0
Z1	0.0	100.000	200.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	1.960	14.000	985.000	1015.000	50.000	50.000	50.000	0.0	0.0	0.0	0.0	0.0
GN	265.000	600.000	260.000	650.000	255.000	255.000	262.000	985.000	246.500	246.500	246.500	992.000
GR	245.500	994.000	245.500	1000.000	245.500	245.500	246.500	1008.000	250.000	250.000	250.000	1015.000
GR	251.500	1400.000	255.000	1650.000	260.000	260.000	1710.000	1800.000	0.0	0.0	0.0	0.0
GR	0.100	0.100	0.033	0.100	0.300	0.300	0.0	0.0	0.0	0.0	0.0	0.0
GR	4.000	1460.000	2610.000	3215.000	5190.000	5190.000	0.0	0.0	0.0	0.0	0.0	0.0
ET	0.0	100.000	200.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	2.240	15.000	990.000	1010.000	1426.000	1426.000	1457.000	0.0	0.0	0.0	0.0	0.0
GN	260.000	640.000	255.000	750.000	250.100	250.100	246.300	979.000	245.900	245.900	245.900	990.000
GR	245.500	942.000	245.400	1000.000	245.300	245.300	245.900	1010.000	248.500	248.500	248.500	1020.000
GR	248.500	1070.000	251.200	1117.000	251.200	251.200	1980.000	2030.000	258.100	258.100	258.100	2110.000
NL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	2.244	0.0	0.0	0.0	65.000	65.000	65.000	0.0	0.0	0.0	0.0	0.0
NL	0.0	0.0	0.0	0.250	0.500	0.500	0.0	0.0	0.0	0.0	0.0	0.0
X1	2.245	0.0	0.0	0.0	1.000	1.000	1.000	0.0	0.0	0.0	0.0	0.0
A3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	2.246	15.000	984.000	1010.000	9.000	9.000	9.000	0.0	0.0	0.0	0.0	0.0
GN	260.000	605.000	255.000	705.000	250.000	250.000	250.000	970.000	248.000	248.000	248.000	970.000
GR	246.000	984.000	244.900	996.000	244.900	244.900	246.000	1010.000	246.500	246.500	246.500	1020.000
GR	248.500	1074.000	251.200	1117.000	251.200	251.200	1980.000	2030.000	258.100	258.100	258.100	2110.000
SB	1.250	1.560	2.540	0.0	1.000	1.000	0.010	0.0	245.200	245.200	245.200	244.900
X1	2.247	0.0	0.0	0.0	2.000	2.000	2.000	0.0	0.0	0.0	0.0	0.0
X2	0.0	0.0	1.000	245.500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BI	20.000	705.000	255.300	0.0	670.000	670.000	250.300	970.000	250.300	250.300	250.300	970.000

BI	976,000	249,200	0.0	988,700	248,900	0.0	988,800	250,900	0.0	991,700
BT	250,900	1000,500	250,900	250,900	1000,500	250,900	250,900	1000,500	250,900	250,900
BT	1008,300	250,900	0.0	1011,200	250,900	0.0	1011,200	250,900	0.0	1024,000
BT	248,800	0.0	1074,000	248,800	0.0	1117,000	251,500	1980,000	0.0	251,500
BT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BT	0.0	100,000	2060,000	0.0	0.0	0.0	0.0	0.0	2,100	0.0

X1	2,262	15,000	991,000	1009,000	75,000	75,000	75,000	0.0	0.0	0.0
GR	260,000	570,000	255,000	670,000	250,000	840,000	250,000	910,000	243,100	980,000
GR	248,100	991,000	245,600	996,000	245,500	1000,000	245,000	1004,000	246,100	1009,000
GR	249,100	1014,000	250,200	1025,000	250,000	2100,000	255,000	2180,000	256,100	2200,000
NC	0.060	0.060	0.0	0.100	0.300	0.0	0.0	0.0	0.0	0.0
ET	0.0	100,000	2000,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0

X1	2,432	17,000	986,000	1014,000	887,000	898,000	898,000	0.0	0.0	0.0
GR	265,000	450,000	260,000	986,000	258,000	600,000	255,000	730,000	250,600	932,000
GR	254,100	945,500	247,600	961,000	250,200	992,000	247,800	1000,000	247,600	1012,000
GR	255,000	1230,000	260,300	2320,000	261,500	1065,000	255,000	1165,000	7,000	1725,000
NC	0.050	0.050	0.030	0.250	0.500	0.0	0.0	0.0	0.0	0.0

X1	2,442	13,000	945,500	1054,500	50,000	50,000	50,000	0.0	0.0	0.0
X3	10,000	0.0	0.0	0.0	0.0	0.0	0.0	254,100	254,100	0.0
GR	265,300	465,500	260,300	560,000	255,000	720,000	255,000	900,000	257,100	945,000
GR	254,100	945,500	247,600	961,000	247,600	1032,000	258,100	1054,500	258,100	1054,000
GR	255,000	1230,000	260,300	2320,000	261,500	2400,000	0.0	0.0	0.0	0.0
NC	0.0	1,500	2,950	0.0	109,000	0.0	608,000	0.0	247,600	247,600

X1	2,446	0.0	0.0	0.0	24,800	24,800	24,800	0.0	0.0	0.0
X3	10,000	0.0	1,000	254,100	255,000	0.0	0.0	0.0	0.0	0.0
BT	11,000	465,000	263,300	0.0	560,000	260,300	0.0	255,000	255,000	0.0
BT	900,000	255,000	0.0	945,400	256,900	0.0	945,500	256,900	254,100	1094,500
BT	258,700	254,100	0.0	250,900	0.0	1250,000	255,000	0.0	2320,000	260,300
BT	0.0	2400,000	251,500	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BT	0.0	100,000	0.0	0.0	0.0	0.0	0.0	0.0	2,100	0.0

X1	2,456	19,000	986,000	1014,000	150,000	50,000	50,000	0.0	0.0	0.0
GR	265,000	465,000	260,000	560,000	255,000	720,000	255,000	900,000	250,600	932,000
GR	250,600	945,600	245,700	960,000	248,000	992,000	247,300	1000,000	246,900	1012,000
GR	248,700	1014,000	250,200	1014,000	250,200	1069,000	251,700	1157,000	252,400	1213,000
GR	252,600	1219,000	255,000	1250,000	260,000	2320,000	261,500	2400,000	0.0	0.0
NC	0.060	0.060	0.0	0.100	0.300	0.0	0.0	0.0	0.0	0.0
ET	0.0	100,000	2000,000	0.0	0.0	0.0	0.0	0.0	2,100	0.0

X1	2,420	18,000	990,000	1010,000	1321,000	2165,000	2458,000	0.0	0.0	0.0
GR	270,000	50,000	265,000	350,000	260,000	430,000	265,000	535,000	253,900	928,000
GR	253,900	988,000	253,100	990,000	250,300	994,000	249,900	1000,000	250,600	1006,000
GR	260,000	1010,000	253,600	1015,000	253,500	1042,000	255,600	1060,000	257,600	1700,000
GR	260,000	2070,000	265,000	2090,000	268,700	2150,000	0.0	0.0	0.0	0.0
NC	0.034	6,035	0.029	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ET	4,000	1100,000	2000,000	2490,000	4150,000	0.0	0.0	0.0	0.0	0.0
ET	0.0	100,000	2000,000	0.0	0.0	0.0	0.0	0.0	2,100	0.0

XI	3.140	15.000	990.000	1010.000	1195.000	1761.000	0.00	0.00	0.00	0.00
GR	270.000	320.000	265.000	550.000	260.000	530.000	615.000	254.500	690.000	0.00
GR	254.500	990.000	252.500	995.000	252.000	1000.000	1005.000	254.500	1010.000	0.00
ET	0.00	1200.000	255.000	1255.000	260.000	1820.000	1690.000	270.000	1950.000	0.00
		100.000	2000.000	0.00	0.00	0.00	0.00	2.100	0.00	0.00

XI	3.072	14.000	969.000	1012.000	3675.000	4002.000	0.00	0.00	0.00	0.00
GR	275.000	420.000	270.000	540.000	265.000	580.000	725.000	260.900	980.000	0.00
GR	254.500	993.000	257.100	995.000	257.200	1000.000	1005.000	258.300	1007.000	0.00
ET	0.038	1012.000	260.800	1072.000	265.000	1094.000	1121.000	0.00	0.00	0.00
		100.000	2000.000	0.00	0.00	0.00	0.00	2.100	0.00	0.00

XI	3.360	18.000	990.000	1010.000	930.000	990.000	0.00	0.00	0.00	0.00
GR	290.000	400.000	285.000	420.000	280.000	530.000	740.000	270.000	960.000	0.00
GR	269.000	975.000	264.200	990.000	263.400	996.000	1000.000	263.400	1005.000	0.00
ET	0.035	1010.000	268.000	1030.000	270.000	1070.000	1125.000	0.00	0.00	0.00
		1160.000	285.000	1180.000	286.300	1220.000	0.00	0.00	0.00	0.00
		0.060	0.00	0.250	0.500	0.00	0.00	0.00	0.00	0.00
		100.000	2000.000	0.00	0.00	0.00	0.00	2.100	0.00	0.00

XI	3.670	18.000	982.000	1016.300	50.000	50.000	0.00	0.00	0.00	0.00
GR	10.000	420.000	280.000	530.000	275.000	900.000	270.000	270.000	950.000	0.00
GR	269.500	975.000	264.500	981.900	265.000	982.000	987.000	264.500	1000.000	0.00
ET	0.035	1013.000	269.000	1018.300	266.000	1016.400	1030.000	272.800	1050.000	0.00
		1160.000	280.000	1220.000	285.000	1310.000	0.00	0.00	0.00	0.00
		1.560	2.800	0.00	36.500	0.00	0.00	0.00	262.800	264.400

XI	3.582	18.000	982.000	1016.300	57.500	57.500	0.00	0.00	0.00	0.00
GR	10.000	420.000	280.000	530.000	271.700	900.000	272.000	272.000	950.000	0.00
GR	269.500	975.000	264.500	981.900	265.000	982.000	987.000	264.500	1000.000	0.00
ET	0.035	1013.000	269.000	1018.300	266.000	1016.400	1030.000	272.800	1050.000	0.00
		1160.000	280.000	1220.000	285.000	1310.000	0.00	0.00	0.00	0.00
		1.560	2.800	0.00	36.500	0.00	0.00	0.00	262.800	264.400

XI	3.692	13.000	990.000	1010.000	50.000	50.000	0.00	0.00	0.00	0.00
GR	285.000	500.000	280.000	550.000	275.000	615.000	968.000	265.000	990.000	0.00
GR	275.000	994.000	265.100	1000.000	265.400	1005.000	1010.000	275.000	1030.000	0.00
ET	0.100	1010.000	260.000	1050.000	265.000	1260.000	0.00	0.00	0.00	0.00
		100.000	1950.000	2455.000	0.300	0.00	0.00	0.00	0.00	0.00
		100.000	2000.000	0.00	0.00	0.00	0.00	2.100	0.00	0.00

XI	4.084	15.000	995.000	1007.000	950.000	1014.000	0.00	0.00	0.00	0.00
GR	300.000	280.000	295.000	500.000	290.000	620.000	989.000	280.000	980.000	0.00
GR	270.700	993.000	277.300	997.000	277.400	1000.000	1003.000	277.300	1007.000	0.00

GR	250.000	1010.000	285.000	1020.000	290.000	1028.000	295.000	1150.000	300.000	1180.000
NC	0.0	0.0	0.0	0.250	0.500	0.0	0.0	0.0	0.0	0.0
X1	8.094	16.000	959.500	1010.500	50.000	50.000	50.000	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	290.700	290.700	0.0
GR	300.000	350.000	295.000	480.000	290.100	550.000	286.000	912.000	265.000	950.000
GR	278.000	959.400	276.800	959.500	278.400	970.000	278.800	980.000	280.000	1040.500
GR	280.000	1040.000	290.000	1050.000	290.500	1088.000	290.800	1138.000	292.000	1160.000
GR	300.000	1200.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SB	0.0	1.500	2.800	0.0	51.000	0.0	779.000	0.0	276.300	278.400
X1	4.106	0.0	0.0	0.0	55.000	55.000	55.000	0.0	-0.100	0.0
X2	0.0	0.0	1.000	288.700	290.000	0.0	0.0	0.0	0.0	0.0
X3	13.000	0.0	0.0	0.0	0.0	0.0	0.0	290.000	290.700	0.0
BT	12.000	350.000	300.000	0.0	480.000	292.800	0.0	550.000	290.000	0.0
BT	912.000	291.600	0.0	959.400	292.800	0.0	959.500	292.800	292.800	0.0
BT	292.800	288.700	1040.000	292.800	0.0	1088.000	292.000	0.0	1136.000	1040.500
BT	0.0	1160.000	295.000	0.0	1200.000	300.000	0.0	0.0	0.0	290.700
NL	0.070	0.070	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	4.116	21.000	993.000	1007.000	50.000	50.000	50.000	0.0	0.0	0.0
GR	299.400	41.000	289.500	818.000	288.900	850.000	285.800	885.000	288.500	946.000
GR	287.100	973.000	276.800	993.000	277.600	997.000	277.500	1000.000	277.100	1003.000
GR	278.800	1007.000	261.200	1011.000	263.000	1029.000	262.400	1059.000	267.400	1069.000
GR	297.500	1121.000	300.100	1236.000	308.100	1263.000	308.100	1286.000	314.700	1296.000
GR	314.500	1354.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NC	0.100	0.100	0.0	0.100	0.300	0.0	0.0	0.0	0.0	0.0
BT	4.000	975.000	900.000	2410.000	4070.000	0.0	0.0	0.0	0.0	0.0
BT	0.0	100.000	2000.000	0.0	0.0	0.0	0.0	0.0	2.100	0.0
X1	4.368	19.000	991.000	1009.000	1310.000	1310.000	1331.000	0.0	0.0	0.0
GR	325.000	170.000	320.000	250.000	315.000	635.000	310.000	908.000	308.600	934.000
GR	305.000	962.000	300.500	584.000	258.400	991.000	297.800	993.000	297.300	1000.000
GR	297.900	1007.000	298.400	1009.000	299.400	1013.000	300.000	1015.000	305.000	1025.000
GR	310.000	1044.000	315.000	1072.000	320.000	1100.000	325.000	1250.000	0.0	0.0
NL	0.000	0.000	0.000	0.250	0.500	0.0	0.0	0.0	0.0	0.0
X1	4.479	18.000	986.000	1014.000	50.000	50.000	50.000	0.0	0.0	0.0
GR	325.000	170.000	320.000	250.000	315.000	635.000	310.000	908.000	308.600	934.000
GR	305.000	962.000	300.500	584.000	258.400	991.000	297.800	993.000	297.300	1000.000
GR	298.200	1016.000	300.000	1012.000	303.400	1014.000	308.000	1025.000	310.000	1048.000
GR	315.000	1072.000	320.000	1100.000	325.000	1250.000	330.000	1300.000	0.0	0.0
SN	1.250	1.500	3.320	0.0	1.000	0.900	0.100	0.0	300.700	298.000
X1	4.379	18.000	986.000	1014.000	2.000	2.000	2.000	0.0	0.0	0.0
X2	0.0	0.0	1.000	301.700	301.800	0.0	0.0	0.0	0.0	0.0
BT	14.000	635.000	315.000	0.0	308.000	310.000	0.0	318.000	308.500	0.0
BT	986.000	303.500	0.0	987.000	302.600	0.0	999.400	301.800	0.0	999.500
BT	301.800	301.700	1000.500	301.600	301.700	1000.600	301.800	0.0	1013.000	302.500
BT	0.0	1014.000	303.400	0.0	1025.000	305.000	0.0	1048.000	310.000	0.0
BT	1072.000	315.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GR	325.000	170.000	320.000	250.000	315.000	635.000	310.000	908.000	308.600	934.000
GR	205.000	962.000	303.900	986.000	302.000	988.000	301.000	990.000	309.700	1000.000
GR	301.000	1019.000	302.000	1012.000	303.400	1014.000	305.000	1025.000	310.000	1048.000
GR	315.000	1072.000	320.000	1100.000	325.000	1250.000	330.000	1300.000	0.0	0.0



\*\*\*\*\*  
HEC2 RELEASE DATED NOV 76 UPDATED FEB 1977  
ERROR CORR - 01  
MODIFICATION - 50,51,52  
\*\*\*\*\*

T1 FLOOD-INSURANCE STUDY BRISTOL,CT. 2780-44 RBB  
T2 STARTING WSEL BY SLOPE-AREA  
T3 CUPPER MINE BROOK 50 YEAR

J1	JCHECK	INQ	NINV	IDIR	SIRT	METRIC	HVINS	Q	WSEL	FO
0.	3.	0.	0.	0.	0.004700	0.0	0.0	0.	215.580	0.0
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IGW	CHNIM	4TRACE
2.000	0.0	0.0	-1.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0

THIS RUN EXECUTED 11/06/77 17:29.36

\*\*\*\*\*  
HEC2 RELEASE DATED NOV 76 UPDATED FEB 1977  
ERROR CORR -- 01  
MODIFICATION -- 50#51#52  
\*\*\*\*\*

T1 FLUID INSURANCE STUDY BRISTOL CT. 2789-44 PBB  
T2 STARTING WSEL BY SLIDE AREA  
T3 COPPER MINE BRUCK 100 YEAR

J1	I CHECK	IND	NINV	IDIR	STRT	METRIC	MVINS	Q	WSEL	F0
0.	4.	0.	0.	0.	0.004500	0.0	0.0	0.	216.190	0.0
J2	NPROF	IPL0T	PRFVS	XSECY	XSECH	FN	ALLDC	TRM	CHNIM	ITRACE
	3.000	0.0	-1.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0

THIS RUN EXECUTED 11/06/77 17:30.51

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REC2 RELEASE DATED NOV 76 UPDATED FEB 1977  
ERROR CORR -- 01  
MODIFICATION -- 50.51.52  
\*\*\*\*\*

T1 FLOOD INSURANCE STUDY BRISTOL CT. 2789-44 RBB  
T2 STARTING MSEL BY SLOPE AREA  
T3 COPPER MINE BROOK 500 YEAR

J.	ICHECK	IMJ	MINV	IDIR	STRT	METRIC	MVINS	Q	MSEL	FO
0.	5.	0.	0.	0.004700	0.0	0.0	0.0	0.	217.670	0.0
J2	NPROF	IPLOT	PPFYS	XSECV	XSECH	FN	ALLDC	IBW	CHINR	ITRACE
	15.000	0.0	-1.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.000000  
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0.000000

THIS RUN EXECUTED 11/05/77 17:32:21

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REC2 RELEASE DATED NOV 76 UNDATED FEB 1977  
ENROR CORR - 02  
MODIFICATION - 50,51,52  
\*\*\*\*\*

NOTE - A SLINK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

COPYR KINE BOOK 10 YEA  
SUMMARY PRINTOUT

SLCNO	ALCH	ELTRU	ELLC	ELMIN	O	CMSEL	CRIVE	EG	.OIK	SYCHL	STCHA	VCH
0.0	0.0	0.0	0.0	205.00	2140.00	210.97	210.94	212.38	286.43	980.00	1020.00	10.09
0.0	0.0	0.0	0.0	205.00	3630.00	212.40	212.36	213.92	1.30.31	980.00	1020.00	11.14
0.0	0.0	0.0	0.0	205.00	4340.00	212.92	212.89	214.47	648.15	980.00	1020.00	11.52
0.0	0.0	0.0	0.0	205.00	7000.00	214.21	214.15	216.06	1023.39	980.00	1020.00	13.25
0.074	1.00	0.0	0.0	208.70	2140.00	214.37	214.37	216.71	238.49	989.00	1011.00	13.80
0.074	1.00	0.0	0.0	208.70	3630.00	217.25	217.25	219.04	563.91	989.00	1011.00	13.11
0.074	1.00	0.0	0.0	208.70	4340.00	217.96	217.96	219.86	701.77	989.00	1011.00	13.30
0.074	1.00	0.0	0.0	208.70	7000.00	219.56	219.56	221.25	1141.53	989.00	1011.00	14.59
0.080	30.00	0.0	0.0	208.70	2140.00	216.45	0.0	217.21	486.34	979.90	1020.10	6.95
0.080	30.00	0.0	0.0	208.70	3630.00	218.42	215.15	219.33	815.61	979.90	1020.10	8.25
0.080	30.00	0.0	0.0	208.70	4340.00	218.90	217.15	219.92	934.24	979.90	1020.10	8.68
0.080	30.00	0.0	0.0	208.70	7000.00	220.65	0.0	221.53	1587.56	979.90	1020.10	9.38
0.084	20.00	0.0	0.0	207.70	2140.00	216.41	213.52	217.32	537.11	983.50	1016.50	7.43
0.084	20.00	0.0	0.0	207.70	3630.00	218.40	0.0	219.44	914.70	983.50	1016.50	9.05
0.084	20.00	0.0	0.0	207.70	4340.00	218.86	0.0	220.03	1036.57	983.50	1016.50	9.83
0.084	20.00	0.0	0.0	207.70	7000.00	220.53	0.0	221.72	1647.39	983.50	1016.50	11.83
0.094	42.00	216.20	215.20	206.50	2140.00	217.29	0.0	217.61	906.34	983.50	1016.50	8.16
0.094	42.00	216.20	215.20	206.50	3630.00	219.25	0.0	219.41	1919.36	983.50	1016.50	9.68
0.094	42.00	216.20	215.20	206.50	4340.00	219.87	0.0	220.03	2393.37	983.50	1016.50	10.84
0.094	42.00	216.20	215.20	206.50	7000.00	221.59	0.0	221.72	3400.65	983.50	1016.50	12.45
0.114	100.00	0.0	0.0	208.50	2140.00	217.30	0.0	217.77	545.21	992.00	1008.00	7.75
0.114	100.00	0.0	0.0	208.50	3630.00	219.29	0.0	219.51	1305.78	992.00	1008.00	6.34
0.114	100.00	0.0	0.0	208.50	4340.00	219.90	0.0	220.09	1673.81	992.00	1008.00	6.15
0.114	100.00	0.0	0.0	208.50	7000.00	221.62	0.0	221.77	3251.58	992.00	1008.00	5.78
0.308	1013.00	0.0	0.0	215.40	2035.00	222.46	222.46	224.61	277.67	989.00	1011.00	13.82
0.308	1013.00	0.0	0.0	215.40	3975.00	225.27	225.27	226.76	638.83	989.00	1011.00	13.80
0.308	1013.00	0.0	0.0	215.40	4175.00	225.74	225.74	227.34	745.76	989.00	1011.00	12.58
0.308	1013.00	0.0	0.0	215.40	6740.00	227.24	227.24	228.89	1177.69	989.00	1011.00	14.12
0.308	10.00	0.0	0.0	215.40	2035.00	222.56	222.56	224.31	277.35	989.00	1011.00	12.66
0.308	10.00	0.0	0.0	215.40	3975.00	226.04	0.0	226.96	816.03	989.00	1011.00	7.77
0.308	10.00	0.0	0.0	215.40	4175.00	226.63	0.0	227.54	983.68	989.00	1011.00	10.00
0.308	10.00	0.0	0.0	215.40	6740.00	227.87	0.0	229.03	1596.86	989.00	1011.00	12.34

A -

B -

SEC-40	ALCH	ELTRD	ELLC	ELWIN	U	CVSEI	GRWS	EG	OR	SICRU	SICBR	VCH
0.316	40.00	0.0	0.0	210.50	2035.00	228.13	0.0	225.23	420.50	983.50	1010.50	8.40
0.316	40.00	0.0	0.0	216.50	3475.00	225.46	0.0	227.75	365.82	983.50	1010.50	12.14
0.316	40.00	0.0	0.0	216.50	4175.00	226.52	0.0	227.80	915.54	983.50	1010.50	10.20
0.316	40.00	0.0	0.0	216.50	6740.00	227.61	227.51	229.51	1229.80	983.50	1010.50	13.16
0.320	48.70	2.25.00	224.70	217.40	2035.00	224.12	0.0	225.51	348.85	983.50	1010.50	8.40
0.320	48.70	2.25.00	224.70	217.40	3475.00	224.60	224.60	228.11	390.54	983.50	1010.50	15.04
0.320	48.70	2.25.00	224.70	217.40	4175.00	226.06	0.0	228.93	1120.88	983.50	1010.50	8.75
0.320	48.70	2.25.00	224.70	217.40	6740.00	228.33	228.20	230.30	1205.37	983.50	1010.50	13.36
0.330	50.00	0.0	0.0	217.10	2035.00	225.77	0.0	225.87	1111.68	983.00	1020.00	3.42
0.330	50.00	0.0	0.0	217.10	3475.00	228.93	0.0	229.00	2613.14	983.00	1020.00	3.17
0.330	50.00	0.0	0.0	217.10	4175.00	229.04	0.0	229.14	2688.37	983.00	1020.00	3.74
0.330	50.00	0.0	0.0	217.10	6740.00	230.84	0.0	230.80	3701.74	983.00	1020.00	4.74
0.560	131.00	0.0	0.0	220.60	2035.00	227.63	227.63	229.93	260.78	990.00	1010.00	13.11
0.560	131.00	0.0	0.0	220.60	3475.00	230.45	230.45	232.22	581.53	990.00	1010.00	12.70
0.560	131.00	0.0	0.0	220.60	4175.00	231.04	231.04	232.86	691.55	990.00	1010.00	13.36
0.560	131.00	0.0	0.0	220.60	6740.00	232.75	232.75	234.65	1102.86	990.00	1010.00	15.01
0.740	445.00	0.0	0.0	228.70	2035.00	235.91	235.91	238.04	290.30	990.00	1012.00	12.34
0.740	445.00	0.0	0.0	228.70	3475.00	237.96	237.96	240.45	497.36	990.00	1012.00	13.19
0.740	445.00	0.0	0.0	228.70	4175.00	236.72	236.72	241.37	537.51	990.00	1012.00	14.99
0.740	445.00	0.0	0.0	228.70	6740.00	241.10	241.10	244.03	937.05	990.00	1012.00	16.82
0.750	50.00	0.0	0.0	230.30	2035.00	237.16	0.0	238.48	311.00	981.00	1022.00	9.24
0.750	50.00	0.0	0.0	230.30	3475.00	238.11	0.0	240.89	409.15	981.00	1022.00	13.39
0.750	50.00	0.0	0.0	230.30	4175.00	241.06	240.18	241.94	982.65	981.00	1022.00	8.71
0.750	50.00	0.0	0.0	230.30	6740.00	243.23	0.0	244.57	1492.82	981.00	1022.00	10.59
0.760	5.10	442.10	241.50	230.50	2035.00	237.13	0.0	238.50	290.28	981.00	1022.00	9.04
0.760	5.10	442.10	241.50	230.50	3475.00	238.05	238.02	241.08	579.13	981.00	1022.00	13.95
0.760	5.10	442.10	241.50	230.50	4175.00	241.80	0.0	243.47	812.93	981.00	1022.00	10.37
0.760	5.10	442.10	241.50	230.50	6740.00	244.40	0.0	245.51	1791.30	981.00	1022.00	9.46
0.770	50.00	0.0	0.0	232.00	2035.00	237.36	0.0	238.92	243.77	981.00	1019.00	10.21
0.770	50.00	0.0	0.0	232.00	3475.00	239.87	238.59	241.59	504.63	981.00	1019.00	11.25
0.770	50.00	0.0	0.0	232.00	4175.00	242.92	0.0	243.78	1020.94	981.00	1019.00	8.25
0.770	50.00	0.0	0.0	232.00	6740.00	244.45	0.0	245.73	1423.00	981.00	1019.00	10.60
0.970	1050.00	0.0	0.0	234.00	2035.00	241.79	0.0	242.47	458.71	990.00	1010.00	8.28
0.970	1050.00	0.0	0.0	234.00	3475.00	241.80	0.0	244.32	917.30	990.00	1010.00	8.28
0.970	1050.00	0.0	0.0	234.00	4175.00	244.82	0.0	245.23	1245.09	990.00	1010.00	7.84
0.970	1050.00	0.0	0.0	234.00	6700.00	246.90	0.0	247.22	2268.37	990.00	1010.00	7.84
0.980	50.00	0.0	0.0	241.50	2035.00	241.67	0.0	242.81	406.44	983.50	1015.50	8.59
0.980	50.00	0.0	0.0	241.50	3475.00	243.24	0.0	244.36	679.56	983.50	1015.50	10.71
0.980	50.00	0.0	0.0	241.50	4175.00	244.22	243.02	246.00	917.94	983.50	1015.50	11.30
0.980	50.00	0.0	0.0	241.50	6700.00	246.62	0.0	247.62	1710.38	983.50	1015.50	10.20
0.980	42.40	2.3.70	247.40	234.20	2035.00	243.31	0.0	244.05	571.92	983.50	1015.50	6.90
0.980	42.40	2.3.70	247.40	234.20	3475.00	244.20	0.0	245.39	832.59	983.50	1015.50	9.30
0.980	42.40	2.3.70	247.40	234.20	4175.00	244.36	0.0	245.00	801.62	983.50	1015.50	10.98
0.980	42.40	2.3.70	247.40	234.20	6700.00	246.80	0.0	247.62	1926.64	983.50	1015.50	9.22

C

D

SECD	ALCH	ELTRD	ELLC	ELAIN	O	CVSCL	CHIPS	EG	FOIK	SIGN	STEM	VGR
0.998	50.00	0.0	0.0	234.00	2020.00	244.17	0.0	244.24	1754.46	970.00	1030.00	3.38
0.998	50.00	0.0	0.0	234.00	3850.00	245.57	0.0	245.69	2425.67	970.00	1030.00	3.25
0.998	50.00	0.0	0.0	234.00	4145.00	246.27	0.0	246.40	2831.72	970.00	1030.00	3.50
0.998	50.00	0.0	0.0	234.00	6700.00	247.63	0.0	247.79	4045.02	970.00	1030.00	4.29
1.280	1489.00	0.0	0.0	234.90	1890.00	248.45	0.0	248.56	947.23	985.00	1017.00	3.51
1.280	1489.00	0.0	0.0	234.90	3210.00	249.99	0.0	249.99	1806.20	985.00	1017.00	3.93
1.280	1489.00	0.0	0.0	234.90	3865.00	249.72	0.0	249.81	2007.25	985.00	1017.00	3.97
1.280	1489.00	0.0	0.0	234.90	6200.00	248.19	0.0	248.30	2974.49	985.00	1017.00	4.64
1.580	1584.00	0.0	0.0	238.60	1890.00	245.42	0.0	245.63	499.70	986.00	1014.00	5.37
1.580	1584.00	0.0	0.0	238.60	3210.00	246.94	0.0	247.25	823.68	986.00	1014.00	6.38
1.580	1584.00	0.0	0.0	238.60	3685.00	247.60	0.0	247.92	1013.29	986.00	1014.00	6.62
1.580	1584.00	0.0	0.0	238.60	6200.00	245.18	0.0	249.51	1614.98	985.00	1015.00	7.51
1.590	50.00	0.0	0.0	238.70	1690.00	245.28	0.0	245.99	439.67	978.70	1021.30	6.74
1.590	50.00	0.0	0.0	238.70	3210.00	246.69	0.0	247.69	682.04	978.70	1021.30	6.67
1.590	50.00	0.0	0.0	238.70	3885.00	247.23	0.0	248.49	767.46	978.70	1021.30	9.52
1.590	50.00	0.0	0.0	238.70	6200.00	248.34	246.86	250.58	976.13	978.70	1021.30	12.95
1.590	52.00	246.90	246.70	238.40	1890.00	246.33	0.0	246.82	598.46	978.70	1021.30	1.59
1.590	52.00	246.90	246.70	238.40	3210.00	247.73	0.0	248.45	924.33	978.70	1021.30	6.84
1.590	52.00	246.90	246.70	238.40	3885.00	249.92	0.0	248.84	950.90	978.70	1021.30	6.77
1.590	52.00	246.90	246.70	238.40	6200.00	249.31	0.0	250.58	1336.84	978.70	1021.30	10.28
1.600	50.00	0.0	0.0	236.40	1890.00	246.30	0.0	246.97	457.82	986.00	1018.00	8.99
1.600	50.00	0.0	0.0	236.40	3210.00	247.69	0.0	248.72	670.37	986.00	1018.00	9.10
1.600	50.00	0.0	0.0	236.40	3685.00	247.77	0.0	249.22	684.98	986.00	1018.00	10.84
1.600	50.00	0.0	0.0	236.40	6200.00	249.37	249.37	251.00	1064.23	986.00	1018.00	12.44
1.850	1278.00	0.0	0.0	242.10	1750.00	249.99	249.70	251.24	209.97	990.00	1010.00	12.50
1.850	1278.00	0.0	0.0	242.10	3210.00	252.36	252.38	253.84	557.04	990.00	1010.00	11.59
1.850	1278.00	0.0	0.0	242.10	3848.00	252.90	252.90	254.36	663.07	990.00	1010.00	12.08
1.850	1278.00	0.0	0.0	242.10	6170.00	255.31	255.31	256.55	1100.86	990.00	1010.00	12.72
1.860	50.00	0.0	0.0	241.60	1750.00	251.67	0.0	251.80	1093.87	980.90	1019.10	3.35
1.860	50.00	0.0	0.0	241.60	3210.00	254.07	0.0	254.22	1980.95	980.90	1019.10	3.90
1.860	50.00	0.0	0.0	241.60	3685.00	254.55	0.0	254.72	2231.28	980.90	1019.10	4.27
1.860	50.00	0.0	0.0	241.60	6170.00	255.55	0.0	255.84	2856.32	980.90	1019.10	5.64
1.860	51.90	251.20	248.90	241.40	1750.00	252.42	0.0	252.61	1368.51	980.90	1019.10	2.81
1.860	51.90	251.20	248.90	241.40	3210.00	254.31	0.0	254.44	2219.77	980.90	1019.10	3.58
1.860	51.90	251.20	248.90	241.40	3848.00	254.79	0.0	254.93	2484.98	980.90	1019.10	3.93
1.860	51.90	251.20	248.90	241.40	6170.00	255.81	0.0	256.03	3190.04	980.90	1019.10	5.16
1.870	50.00	0.0	0.0	242.70	1750.00	252.37	0.0	252.58	732.02	985.00	1015.00	4.37
1.870	50.00	0.0	0.0	242.70	3210.00	254.31	0.0	254.47	1657.48	985.00	1015.00	4.30
1.870	50.00	0.0	0.0	242.70	3848.00	254.79	0.0	254.95	1949.54	985.00	1015.00	4.50
1.870	50.00	0.0	0.0	242.70	6170.00	255.86	0.0	256.06	2624.25	985.00	1015.00	5.98
1.932	285.00	0.0	0.0	244.60	1750.00	252.32	0.0	252.93	458.89	987.00	1013.00	6.95
1.932	285.00	0.0	0.0	244.60	3210.00	254.07	0.0	254.85	798.57	987.00	1013.00	8.48
1.932	285.00	0.0	0.0	244.60	3848.00	254.61	0.0	255.32	994.16	987.00	1013.00	8.50
1.932	285.00	0.0	0.0	244.60	6170.00	255.86	0.0	256.34	1524.51	987.00	1013.00	10.05

E-

F-

G-

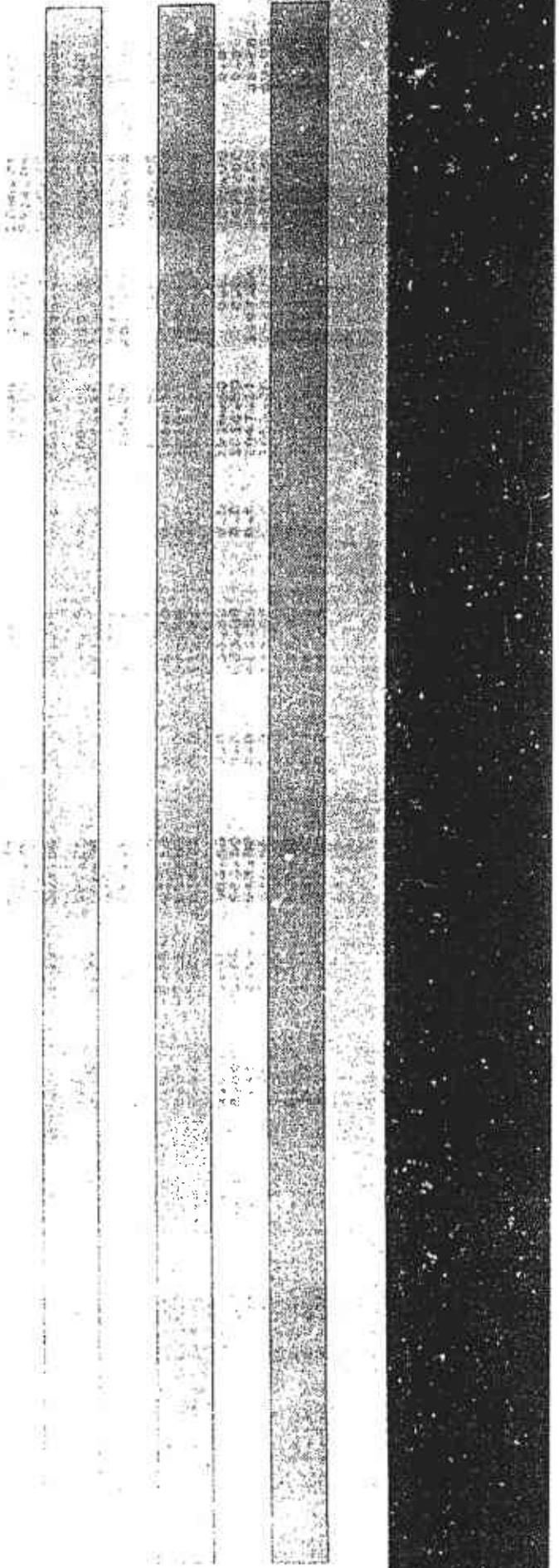
H-

SECNO	KLCH	ELTRD	ELLC	ELVIN	G	CMSL	CRIMS	EC	VOIK	STCHL	STCRH	VGH
1.942	50.00	0.0	0.0	244.30	1750.00	252.25	0.0	253.17	380.59	984.50	1015.00	7.70
1.942	50.00	0.0	0.0	244.30	3210.00	256.85	253.86	253.04	773.97	984.50	1015.00	8.86
1.942	50.00	0.0	0.0	244.30	3848.00	254.58	254.24	255.50	949.87	984.50	1015.00	8.98
1.942	50.00	0.0	0.0	244.30	6170.00	255.58	0.0	256.42	1634.57	984.50	1015.00	8.04
1.950	30.20	253.00	253.30	244.90	1750.00	252.23	0.0	253.33	340.40	984.50	1015.00	8.40
1.950	30.20	253.00	253.30	244.90	3210.00	255.60	255.60	256.12	500.21	984.50	1015.00	7.46
1.950	30.20	253.00	253.30	244.90	3848.00	255.75	255.75	256.29	569.55	984.50	1015.00	7.85
1.950	30.20	253.00	253.30	244.90	6170.00	256.07	256.05	256.94	1468.02	984.50	1015.00	9.87
1.900	50.00	0.0	0.0	244.50	1750.00	253.58	0.0	253.61	1537.82	985.00	1015.00	1.95
1.900	50.00	0.0	0.0	244.50	3210.00	256.24	0.0	256.25	4756.77	985.00	1015.00	1.44
1.900	50.00	0.0	0.0	244.50	3848.00	256.41	0.0	256.43	5041.44	985.00	1015.00	1.64
1.900	50.00	0.0	0.0	244.50	6170.00	257.12	0.0	257.16	6293.39	985.00	1015.00	2.21
2.230	1457.00	0.0	0.0	245.30	1460.00	253.77	0.0	253.79	1339.66	990.00	1010.00	2.00
2.230	1457.00	0.0	0.0	245.30	2610.00	256.32	0.0	256.33	3420.81	990.00	1010.00	1.67
2.230	1457.00	0.0	0.0	245.30	3215.00	256.32	0.0	256.33	3626.82	990.00	1010.00	1.97
2.230	1457.00	0.0	0.0	245.30	5190.00	257.30	0.0	257.32	4485.40	990.00	1010.00	2.70
2.247	05.00	0.0	0.0	245.30	1460.00	253.78	0.0	253.80	1375.21	990.00	1010.00	2.15
2.247	05.00	0.0	0.0	245.30	2610.00	256.32	0.0	256.33	3482.36	990.00	1010.00	1.81
2.247	05.00	0.0	0.0	245.30	3215.00	256.52	0.0	256.53	3687.51	990.00	1010.00	2.14
2.247	05.00	0.0	0.0	245.30	5190.00	257.31	0.0	257.33	4549.37	990.00	1010.00	2.92
2.245	1.00	0.0	0.0	245.30	1460.00	253.78	0.0	253.80	1375.20	990.00	1010.00	2.15
2.245	1.00	0.0	0.0	245.30	2610.00	256.32	0.0	256.33	3482.87	990.00	1010.00	1.81
2.245	1.00	0.0	0.0	245.30	3215.00	256.52	0.0	256.53	3688.49	990.00	1010.00	2.14
2.245	1.00	0.0	0.0	245.30	5190.00	257.31	0.0	257.33	4547.89	990.00	1010.00	2.93
2.244	9.00	0.0	0.0	244.90	1460.00	253.78	0.0	253.80	1619.33	984.00	1015.00	1.85
2.240	9.00	0.0	0.0	244.90	2610.00	256.32	0.0	256.33	3905.50	984.00	1015.00	1.84
2.240	9.00	0.0	0.0	244.90	3215.00	256.52	0.0	256.53	4125.87	984.00	1015.00	1.93
2.240	9.00	0.0	0.0	244.90	5190.00	257.31	0.0	257.33	5050.10	984.00	1015.00	2.60
2.247	2.00	245.70	245.30	245.20	1460.00	253.79	0.0	253.82	1425.02	984.00	1016.00	2.06
2.247	2.00	245.70	245.30	245.20	2610.00	256.36	0.0	256.37	3624.11	984.00	1016.00	1.73
2.247	2.00	245.70	245.30	245.20	3215.00	256.56	0.0	256.58	3845.48	984.00	1016.00	2.04
2.247	2.00	245.70	245.30	245.20	5190.00	257.36	0.0	257.39	4733.23	984.00	1016.00	2.79
2.202	75.00	0.0	0.0	245.00	1460.00	253.82	0.0	253.83	2189.92	991.00	1009.00	1.36
2.202	75.00	0.0	0.0	245.00	2610.00	256.37	0.0	256.37	2885.16	991.00	1009.00	1.28
2.202	75.00	0.0	0.0	245.00	3215.00	256.54	0.0	256.58	3187.55	991.00	1009.00	1.52
2.202	75.00	0.0	0.0	245.00	5190.00	257.39	0.0	257.40	6273.89	991.00	1009.00	2.11
2.432	898.00	0.0	0.0	247.60	1460.00	252.85	0.0	252.96	614.19	986.00	1014.00	3.84
2.432	898.00	0.0	0.0	247.60	2610.00	256.49	0.0	256.49	1774.93	986.00	1014.00	1.80
2.432	898.00	0.0	0.0	247.60	3215.00	256.67	0.0	256.67	1932.91	986.00	1014.00	1.98
2.432	898.00	0.0	0.0	247.60	5190.00	257.46	0.0	257.54	2495.67	986.00	1014.00	2.25
2.442	50.00	0.0	0.0	247.60	1460.00	253.88	0.0	253.96	378.78	945.50	1054.50	2.50
2.442	50.00	0.0	0.0	247.60	2610.00	256.39	0.0	256.47	1989.81	945.50	1054.50	2.52
2.442	50.00	0.0	0.0	247.60	3215.00	256.60	0.0	256.71	2148.17	945.50	1054.50	2.91
2.442	50.00	0.0	0.0	247.60	5190.00	257.44	0.0	257.50	2938.58	945.50	1054.50	3.71

I



SECNO	ALCH	ELTRD	EMCC	ELMIN	Q	CASEL	CRINS	FS	POIK	STCHL	STCHR	VCM
4-106	55-00	290-00	288-70	270-30	1810-00	284-49	0-0	284-57	525-57	959-50	1040-50	2-31
4-106	55-00	290-00	288-70	278-30	1950-00	285-76	0-0	265-92	116-68	959-50	1040-50	3-14
4-106	55-00	290-00	288-70	278-30	2455-00	287-55	0-0	287-75	1388-48	959-50	1040-50	3-59
4-106	55-00	290-00	288-70	278-30	4150-00	289-67	0-0	290-03	1984-70	959-50	1040-50	4-84
4-116	50-00	0-0	0-0	277-10	1010-00	283-97	0-0	245-13	171-50	993-00	1007-00	9-57
4-116	50-00	0-0	0-0	277-10	1950-00	285-06	0-0	287-99	320-66	993-00	1007-00	12-01
4-116	50-00	0-0	0-0	277-10	2455-00	286-70	0-0	288-68	377-95	993-00	1007-00	13-47
4-116	50-00	0-0	0-0	277-10	4350-00	289-15	0-0	291-34	646-96	993-00	1007-00	14-74
4-378	131-00	0-0	0-0	297-30	075-00	301-94	301-94	303-74	112-19	991-00	1009-00	11-32
4-378	131-00	0-0	0-0	297-30	1900-00	304-06	304-06	306-50	233-01	991-00	1009-00	13-85
4-378	131-00	0-0	0-0	297-30	2410-00	305-16	305-16	307-86	313-39	991-00	1009-00	14-50
4-378	131-00	0-0	0-0	297-30	4070-00	307-65	307-65	310-98	551-03	991-00	1009-00	16-04
4-378	50-00	0-0	0-0	298-00	975-00	303-48	0-0	304-35	122-57	986-00	1014-00	7-40
4-378	50-00	0-0	0-0	298-00	1900-00	305-18	0-0	307-24	277-32	986-00	1014-00	8-55
4-378	50-00	0-0	0-0	298-00	2410-00	307-53	305-95	308-57	364-27	986-00	1014-00	8-52
4-378	50-00	0-0	0-0	298-00	4070-00	311-02	0-0	311-79	854-28	986-00	1014-00	8-27
4-379	2-00	301-60	301-70	300-70	975-00	305-32	0-0	306-27	110-86	986-00	1014-00	8-04
4-379	2-00	301-60	301-70	300-70	1900-00	305-52	306-47	308-18	185-08	986-00	1014-00	11-08
4-379	2-00	301-60	301-70	300-70	2410-00	307-18	307-13	309-02	237-43	986-00	1014-00	11-91
4-379	2-00	301-60	301-70	300-70	4070-00	310-77	0-0	311-73	669-10	986-00	1014-00	9-84
4-389	50-00	0-0	0-0	300-90	975-00	302-56	0-0	306-57	158-80	987-00	1013-00	8-21
4-389	50-00	0-0	0-0	300-90	1900-00	306-68	306-68	308-85	234-65	987-00	1013-00	12-25
4-389	50-00	0-0	0-0	300-90	2410-00	307-52	307-52	309-92	306-76	987-00	1013-00	13-07
4-389	50-00	0-0	0-0	300-90	4070-00	310-24	309-77	312-72	614-56	987-00	1013-00	13-96
4-644	1346-00	0-0	0-0	317-60	975-00	322-33	322-33	324-15	95-19	990-00	1010-00	11-08
4-644	1346-00	0-0	0-0	317-60	1900-00	325-46	325-46	326-48	317-76	990-00	1010-00	9-39
4-644	1346-00	0-0	0-0	317-60	2410-00	325-89	325-89	326-94	391-87	990-00	1010-00	10-03
4-644	1346-00	0-0	0-0	317-60	4070-00	326-77	326-77	328-06	581-64	990-00	1020-00	12-20



CUPPER WIRE BINDER 10 YEA

SUMMARY PRINTOUT

SLCNU	CASEL	DTFASP	DIFEG	OIFWXR	SSTA	STENCL	TOPMID	STENCR	ENDST	ULOB	UCLH	UKUB
0-0	210-97	0-0	0-0	0-0	955-37	0-0	110-80	0-0	1066-18	79-50	1855-88	206-82
0-0	212-60	1-93	1-54	0-0	645-68	0-0	186-13	0-0	1111-81	203-18	2685-22	741-60
0-0	212-92	0-52	2-00	0-0	942-16	0-0	186-23	0-0	1128-39	263-48	3013-88	1062-96
0-0	214-21	1-20	3-88	0-0	837-37	0-0	236-34	0-0	1169-71	481-01	3152-73	2366-26
0-074	214-37	0-0	0-0	3-30	669-14	0-0	62-60	0-0	1031-74	232-43	1666-70	240-87
0-074	217-25	2-84	2-34	4-85	914-97	0-0	361-59	0-0	1276-56	488-70	2413-75	727-55
0-074	217-98	0-71	2-95	5-04	898-23	0-0	455-26	0-0	1353-49	610-79	2655-84	1073-37
0-074	219-58	1-60	4-54	5-35	860-42	0-0	666-72	0-0	1527-14	1063-55	3482-54	2403-91
0-080	216-45	0-07	0-0	2-01	964-15	0-0	140-88	0-0	1105-03	0-64	2132-59	6-87
0-080	218-62	1-97	2-14	1-17	894-17	0-0	492-09	0-0	1386-26	77-79	3172-91	379-29
0-080	218-90	0-48	2-71	0-95	877-24	0-0	572-08	0-0	1454-32	131-18	3287-33	621-51
0-080	220-85	1-75	4-32	1-09	827-72	0-0	765-95	0-0	1613-67	470-46	4448-70	2080-83
0-089	216-41	0-0	0-0	-0-04	954-63	0-0	216-44	0-0	1171-07	23-26	2050-94	65-79
0-084	218-40	1-99	2-12	-0-02	918-82	0-0	655-53	0-0	1384-34	115-69	2965-47	549-04
0-084	218-86	0-47	2-71	0-04	910-43	0-0	523-83	0-0	1434-36	163-82	3371-03	805-94
0-084	220-53	1-66	4-40	-0-12	872-49	0-0	684-92	0-0	1357-41	411-05	4391-00	2197-94
0-092	217-29	0-0	0-0	0-88	857-89	0-0	389-92	0-0	1247-60	85-71	1830-89	419-80
0-092	218-5	1-96	1-63	0-65	781-78	0-0	459-80	0-0	1441-56	279-80	1785-26	1564-94
0-094	219-87	0-91	2-42	1-00	758-22	0-0	743-45	0-0	1501-67	365-60	1864-51	2109-88
0-094	221-59	1-73	4-11	1-06	736-48	0-0	780-37	0-0	1519-35	678-68	2046-72	4280-62
0-114	217-38	0-0	0-0	0-01	785-10	0-0	370-43	0-0	1156-03	754-10	1013-35	376-35
0-114	219-29	1-99	1-73	0-04	655-28	0-0	625-64	0-0	1320-92	1160-97	1028-84	1420-19
0-114	219-90	0-61	2-32	0-04	667-50	0-0	704-28	0-0	1371-77	1385-67	1086-84	1925-49
0-114	221-62	1-72	3-99	0-03	652-42	0-0	733-83	0-0	1386-15	1940-76	1125-24	3934-00
0-300	222-40	0-0	0-0	5-10	928-76	0-0	93-62	0-0	1022-36	186-53	1766-71	61-79
0-300	225-27	2-61	2-14	5-98	716-75	0-0	420-66	0-0	1137-35	672-74	2414-04	186-22
0-300	225-74	0-47	2-74	5-84	704-07	0-0	338-92	0-0	1392-72	1191-92	2698-74	284-34
0-300	227-24	1-50	4-28	5-63	683-84	0-0	483-58	0-0	1447-22	2493-43	3501-07	745-30
0-300	222-56	0-0	0-0	0-10	927-23	0-0	93-77	0-0	1011-00	201-12	1828-88	0-0
0-300	228-04	0-88	2-15	0-77	696-38	0-0	444-82	0-0	1411-16	1056-23	2146-53	201-24
0-300	228-63	0-39	2-73	0-89	680-37	0-0	463-77	0-0	1444-14	1417-08	2363-92	394-00
0-300	227-87	1-24	4-23	0-63	647-12	0-0	503-22	0-0	1150-34	2669-28	3229-06	841-63
0-310	225-15	0-0	0-0	1-57	981-50	0-0	31-30	0-0	1610-80	0-0	2035-00	0-0
0-310	225-46	1-32	2-52	-0-58	983-50	0-0	33-30	0-0	1016-80	0-0	2035-00	0-0
0-310	225-52	1-09	2-97	-0-11	661-85	0-0	376-46	0-0	1038-72	164-24	2175-90	310
0-310	227-01	1-09	4-27	-0-26	634-73	0-0	419-35	0-0	1054-08	1956-07	3110-97	72-86
0-320	224-12	0-0	0-0	-0-01	983-50	0-0	33-30	0-0	1016-80	0-0	2035-00	0-0
0-320	224-60	0-46	2-60	-0-86	643-50	0-0	33-30	0-0	1016-80	0-0	2035-00	0-0
0-320	224-80	3-44	3-41	1-54	643-52	0-0	403-59	0-0	1047-11	1107-69	3026-02	38-78
0-320	224-13	0-27	4-79	0-72	636-85	0-0	415-60	0-0	1051-25	1920-07	3749-33	10-67
0-330	225-71	0-0	0-0	1-95	686-33	0-0	491-97	0-0	1038-10	683-35	1145-00	0-0
0-330	225-91	0-16	3-12	4-33	630-22	0-0	267-55	0-0	1072-76	1803-47	1550-31	187-7
0-330	225-04	0-12	3-23	0-99	621-90	0-0	470-25	0-0	1028-15	1319-47	1770-17	182-3

0.330 250.000 1.00 4.92 2.31 899.32 0.0 508.36 0.0 1103.20 337.81 2551.75 830.53

SECR0	CSSEL	DIFRSP	DIFEL	DIFRSK	SSVA	STENCL	TOPPID	STENCH	ENDST	UL06	QCR	ORDB
0.580	237.63	0.0	0.0	1.86	976.52	0.0	73.36	0.0	1049.88	106.79	1740.02	182.20
0.585	230.45	2.88	2.28	1.53	888.04	0.0	258.68	0.0	1102.72	395.44	2408.16	170.42
0.588	231.04	0.58	2.92	1.49	840.83	0.0	265.38	0.0	1106.21	605.33	2668.12	880.48
0.588	232.75	1.71	4.72	2.10	827.53	0.0	286.94	0.0	1116.47	1537.04	3533.75	1667.21
0.745	245.91	0.0	0.0	6.28	970.56	0.0	105.25	0.0	1075.81	80.80	1830.76	124.24
0.748	237.96	2.06	2.41	7.51	949.19	0.0	139.26	0.0	1085.44	224.72	2745.27	505.02
0.748	230.72	3.33	3.33	7.68	941.34	0.0	145.28	0.0	1087.61	518.13	2149.00	710.00
0.748	241.10	2.38	5.99	8.35	904.23	0.0	196.91	0.0	1101.14	785.95	4416.16	1337.69
0.756	237.10	0.0	0.0	1.25	981.00	0.0	41.00	0.0	1022.00	0.0	2035.00	0.0
0.758	236.11	0.95	2.41	0.18	981.00	0.0	41.00	0.0	1022.00	0.0	2035.00	0.0
0.758	241.00	2.04	3.46	2.28	956.19	0.0	136.50	0.0	1092.69	65.18	3291.31	798.51
0.758	243.23	2.23	6.04	2.13	881.01	0.0	217.69	0.0	1094.70	264.82	5015.68	1459.50
0.760	237.13	0.0	0.0	-0.02	981.00	0.0	41.00	0.0	1022.00	0.0	2035.00	0.0
0.760	236.05	0.92	2.50	-0.06	981.00	0.0	41.00	0.0	1022.00	0.0	2035.00	0.0
0.760	241.80	3.75	4.90	0.81	981.00	0.0	41.00	0.0	1022.00	0.0	2035.00	0.0
0.760	245.44	2.68	6.93	1.26	825.12	0.0	295.74	0.0	1120.86	379.84	4651.12	1509.34
0.770	237.36	0.0	0.0	0.23	970.70	0.0	56.55	0.0	1026.75	44.17	1960.36	30.46
0.770	239.07	2.51	2.77	1.81	963.87	0.0	120.31	0.0	1034.19	127.20	3223.10	124.70
0.770	240.92	3.05	4.56	1.31	863.76	0.0	255.37	0.0	1130.07	343.64	3340.56	490.61
0.770	244.45	1.53	6.81	3.04	802.10	0.0	332.38	0.0	1134.48	837.94	4881.02	1013.04
0.970	243.79	0.0	0.0	4.43	901.13	0.0	275.51	0.0	1176.68	440.15	1248.95	330.91
0.970	243.80	2.01	1.85	3.93	843.86	0.0	413.44	0.0	1257.31	562.65	1583.36	903.99
0.970	246.82	1.02	2.76	1.91	814.97	0.0	493.03	0.0	1298.00	1260.48	1654.69	1225.63
0.970	246.90	4.08	4.75	2.46	575.51	0.0	752.32	0.0	1327.84	2445.72	1984.86	2269.44
0.980	241.67	0.0	0.0	-0.12	963.50	0.0	33.00	0.0	1016.50	0.0	2020.00	0.0
0.980	243.34	1.68	2.15	-0.45	956.78	0.0	106.79	0.0	1062.58	174.65	3112.10	163.16
0.980	244.22	0.86	3.16	-0.60	934.62	0.0	158.78	0.0	1093.40	259.79	3633.34	251.87
0.980	246.62	2.40	4.80	-0.28	453.47	0.0	974.67	0.0	1428.13	1583.64	4068.78	1050.57
0.988	243.31	0.0	0.0	1.04	983.50	0.0	33.00	0.0	1016.50	0.0	2020.00	0.0
0.988	244.20	0.69	1.34	0.85	928.45	0.0	166.04	0.0	1096.49	221.68	3013.37	214.04
0.988	246.30	0.16	1.35	0.14	917.01	0.0	289.82	0.0	1120.83	279.32	3521.57	271.61
0.988	246.86	2.50	1.56	0.24	427.19	0.0	1015.10	0.0	1432.28	1786.95	3778.35	1134.70
0.998	244.17	0.0	0.0	0.86	896.60	0.0	208.61	0.0	1105.20	310.80	3242.41	466.79
0.998	245.57	1.40	1.45	1.37	879.87	0.0	267.54	0.0	1157.41	613.72	1970.78	683.50
0.998	246.27	0.70	3.16	1.91	870.15	0.0	397.21	0.0	1477.36	784.96	2265.98	1094.04
0.998	247.64	1.36	3.56	0.78	186.34	0.0	1354.69	0.0	1541.02	1378.83	3127.93	2194.13
1.260	245.45	0.0	0.0	0.28	493.38	0.0	737.28	0.0	1230.66	701.72	1028.13	160.15
1.260	245.94	1.54	1.53	0.42	415.08	0.0	333.43	0.0	1248.61	1486.61	1438.01	367.18
1.280	246.72	0.73	2.25	0.44	404.16	0.0	852.74	0.0	1256.93	1910.52	1444.50	320.09
1.280	248.19	1.47	3.74	0.55	382.17	0.0	891.80	0.0	1273.97	3201.22	1601.72	1804.06
1.580	245.42	0.0	0.0	0.97	874.32	0.0	206.24	0.0	1080.57	557.78	960.56	363.56
1.580	246.94	1.52	1.57	0.95	811.49	0.0	377.74	0.0	1189.23	1101.61	1420.30	687.89
1.580	247.60	0.66	2.24	0.89	784.09	0.0	452.65	0.0	1234.61	1389.02	1580.43	839.53
1.580	249.18	1.57	3.53	0.99	718.93	0.0	630.39	0.0	1340.82	2553.37	2118.45	1511.70

SECNO	CWSEL	DIFWSP	DIFIG	DIFWSA	SSYA	STEMCL	TOPWID	STEMOR	ENDST	GLOR	GGH	URUS
1.590	245.28	0.0	0.0	-0.14	978.70	0.0	42.60	0.0	1023.30	0.0	1890.00	0.0
1.590	246.69	1.21	1.71	-0.28	253.61	0.0	93.54	0.0	1073.05	182.50	2861.50	143.80
1.590	247.23	0.54	2.50	-0.38	951.43	0.0	121.61	0.0	1073.04	236.21	3457.32	191.47
1.590	248.34	1.11	4.80	-0.84	864.52	0.0	407.46	0.0	1271.96	434.64	5316.71	446.46
1.598	246.33	0.0	0.0	1.05	976.70	0.0	42.60	0.0	1021.30	0.0	1890.00	0.0
1.598	247.79	1.46	1.11	0.60	892.64	0.0	315.61	0.0	1259.45	216.26	2766.95	206.79
1.598	247.92	0.13	2.03	0.60	877.93	0.0	373.30	0.0	1259.45	267.04	3352.01	264.95
1.598	249.31	1.73	3.77	0.48	716.66	0.0	784.20	0.0	1504.86	594.04	4775.18	827.78
1.608	249.10	0.0	0.0	-0.03	873.43	0.0	175.15	0.0	1049.28	121.76	1647.63	120.02
1.608	247.99	1.38	1.78	-0.19	858.37	0.0	219.13	0.0	1077.51	406.85	2546.94	256.16
1.608	247.77	0.08	2.35	-0.15	857.48	0.0	221.81	0.0	1079.29	506.54	3064.30	314.16
1.608	249.37	1.60	4.04	0.06	716.31	0.0	765.45	0.0	1502.76	1255.89	4152.30	791.80
1.650	248.99	0.0	0.0	2.69	973.33	0.0	46.67	0.0	1020.00	92.36	1591.47	66.18
1.650	252.38	3.39	2.62	4.70	865.06	0.0	413.41	0.0	1278.49	395.70	2249.02	565.28
1.650	254.90	9.51	3.12	5.13	842.54	0.0	491.07	0.0	1333.61	526.36	2667.66	833.96
1.650	254.31	1.42	4.31	4.94	780.21	0.0	743.60	0.0	1523.81	1014.92	2958.82	2196.26
1.660	251.67	0.0	0.0	2.67	909.98	0.0	197.44	0.0	1107.42	224.33	1289.43	236.24
1.660	254.07	2.40	2.41	1.66	838.04	0.0	336.00	0.0	1173.04	639.82	1888.78	711.40
1.660	254.55	0.88	2.92	1.95	823.61	0.0	363.79	0.0	1167.40	822.14	2112.03	513.83
1.660	255.85	1.01	4.03	1.24	789.01	0.0	471.80	0.0	1260.79	1399.54	3005.93	1603.43
1.666	252.42	0.0	0.0	0.75	881.87	0.0	252.36	0.0	1133.82	270.48	1182.60	286.72
1.666	254.71	1.90	1.93	0.25	824.54	0.0	361.90	0.0	1186.49	682.76	1768.29	798.95
1.666	254.74	0.47	2.42	0.25	810.39	0.0	389.25	0.0	1199.64	870.87	2010.60	966.53
1.666	255.81	1.02	3.52	0.25	771.77	0.0	538.91	0.0	1310.67	1574.48	2837.97	1757.55
1.678	252.37	0.0	0.0	-0.05	924.10	0.0	271.66	0.0	1191.25	103.56	1215.04	431.40
1.678	254.31	1.94	1.89	-0.04	888.51	0.0	337.54	0.0	1226.84	365.62	1445.66	1398.72
1.678	254.79	0.48	2.38	-0.04	865.11	0.0	368.46	0.0	1233.57	493.02	1576.28	1733.69
1.678	255.85	1.95	3.47	0.94	813.29	0.0	849.50	0.0	1652.70	965.65	2019.13	1193.22
1.932	252.32	0.0	0.0	-0.05	964.96	0.0	83.21	0.0	1048.17	256.71	1296.16	197.13
1.932	254.07	1.75	1.92	-0.24	918.50	0.0	307.50	0.0	1226.00	622.44	1969.09	618.47
1.932	254.81	0.54	2.34	-0.17	907.64	0.0	479.82	0.0	1288.60	788.83	2092.17	970.30
1.932	255.66	1.25	3.41	0.01	861.90	0.0	669.13	0.0	1531.11	1234.52	2246.09	2689.33
1.942	252.25	0.0	0.0	-0.07	984.50	0.0	30.50	0.0	1015.00	0.0	1750.00	0.0
1.942	254.85	1.80	1.87	-0.02	949.23	0.0	295.96	0.0	1240.20	325.17	2500.78	924.57
1.942	254.86	0.53	2.33	-0.03	938.49	0.0	492.22	0.0	1430.71	426.88	2680.96	740.15
1.942	255.90	1.51	3.25	0.03	888.12	0.0	716.26	0.0	1604.38	699.88	2741.03	2729.08
1.950	252.32	0.0	0.0	-0.02	984.50	0.0	30.50	0.0	1015.00	0.0	1750.00	0.0
1.950	255.00	3.37	2.80	1.55	933.92	0.0	646.12	0.0	1580.84	380.64	1993.71	1358.70
1.950	255.75	0.15	2.97	1.17	926.36	0.0	651.70	0.0	1589.06	340.76	2788.10	1731.02
1.950	256.07	0.31	3.61	0.17	910.37	0.0	683.19	0.0	1592.56	700.40	2713.03	2337.84
1.960	253.58	0.0	0.0	1.35	968.52	0.0	580.21	0.0	1548.73	64.16	103.81	1220.02
1.960	256.24	2.66	2.65	0.64	895.94	0.0	778.93	0.0	1664.67	179.60	113.06	2117.93
1.960	256.41	0.17	2.82	0.66	875.34	0.0	749.60	0.0	1666.94	101.48	181.52	2268.60
1.960	257.12	0.71	3.55	1.05	831.84	0.0	843.60	0.0	1675.44	210.60	605.12	2254.18

SECNO	CWSEL	QIPWSP	DIFEC	DIFSWX	SSTA	STENCL	TOPWID	STENCR	ENDST	QLOB	QCH	QRUB
2.236	253.77	0.0	0.0	0.19	794.76	0.0	1219.09	0.0	2013.87	203.42	332.24	924.35
2.236	256.32	2.54	2.54	0.08	721.05	0.0	1342.90	0.0	2063.95	384.59	362.63	1662.55
2.236	256.52	0.20	2.74	0.11	716.75	0.0	1352.25	0.0	2069.00	977.73	434.84	2302.43
2.236	257.30	0.78	3.53	0.10	699.42	0.0	1389.91	0.0	2083.33	793.92	636.81	3759.27
2.244	253.78	0.0	0.0	0.01	794.99	0.0	1219.09	0.0	2013.98	198.84	356.58	904.55
2.244	256.32	2.54	2.53	0.00	720.88	0.0	1343.25	0.0	2064.14	379.67	393.00	1837.32
2.244	256.52	0.20	2.74	0.00	716.53	0.0	1352.74	0.0	2069.26	471.57	471.25	2272.18
2.244	257.31	0.78	3.53	0.01	699.24	0.0	1390.22	0.0	2085.50	784.44	691.38	3714.10
2.245	253.78	0.0	0.0	0.00	794.86	0.0	1219.36	0.0	2013.94	196.67	356.84	904.54
2.245	256.32	2.54	2.53	0.0	720.89	0.0	1343.25	0.0	2064.14	379.66	353.03	1837.31
2.245	256.52	0.20	2.74	0.0	716.53	0.0	1352.74	0.0	2069.26	471.56	471.31	2272.14
2.245	257.31	0.78	3.53	0.0	699.28	0.0	1390.22	0.0	2085.50	784.44	691.50	3714.02
2.246	253.78	0.0	0.0	0.00	745.24	0.0	1268.71	0.0	2013.95	202.65	501.75	785.60
2.246	256.32	2.54	2.53	0.0	678.53	0.0	1345.62	0.0	2064.16	412.87	576.12	1641.01
2.246	256.52	0.20	2.74	0.00	674.56	0.0	1398.72	0.0	2069.28	513.20	682.13	2009.67
2.246	257.31	0.78	3.53	0.00	658.87	0.0	1430.66	0.0	2085.52	655.26	1021.70	3313.04
2.247	253.79	0.0	0.0	0.01	754.73	0.0	1255.44	0.0	2010.17	199.99	528.26	722.13
2.247	256.36	2.56	2.55	0.03	683.73	0.0	1328.72	0.0	2057.45	407.66	596.30	1646.02
2.247	256.56	0.20	2.76	0.04	679.61	0.0	1363.15	0.0	2065.76	507.27	714.60	1993.07
2.247	257.56	0.80	3.57	0.06	663.76	0.0	1419.45	0.0	2083.21	697.33	1049.05	3293.62
2.262	253.82	0.0	0.0	0.03	710.00	0.0	1420.58	0.0	2130.59	217.55	281.98	1640.48
2.262	256.37	2.56	2.56	0.01	642.78	0.0	1523.56	0.0	2160.34	430.73	249.54	1959.74
2.262	256.56	0.21	2.76	0.02	638.05	0.0	1531.89	0.0	2170.44	535.11	300.72	2379.18
2.262	257.59	0.81	3.57	0.03	622.16	0.0	1564.13	0.0	2186.20	690.09	449.80	3650.12
2.432	253.85	0.0	0.0	0.03	782.93	0.0	1366.19	0.0	1141.02	433.84	633.73	392.34
2.432	256.40	2.59	2.74	0.02	678.98	0.0	1478.57	0.0	1557.35	1085.96	750.44	838.19
2.432	256.60	0.22	2.71	0.04	675.68	0.0	1493.22	0.0	1618.91	1353.59	857.58	1084.07
2.432	257.66	0.85	3.58	0.07	662.96	0.0	1533.49	0.0	1816.45	2207.52	1132.64	1850.04
2.441	253.88	0.0	0.0	0.04	946.01	0.0	107.97	0.0	1053.99	0.0	1460.00	0.0
2.441	256.39	2.59	2.74	0.01	677.69	0.0	853.69	0.0	1531.99	179.54	2160.39	270.37
2.441	256.59	0.22	2.72	0.01	671.31	0.0	949.31	0.0	1575.62	258.84	2568.60	368.36
2.442	257.64	0.84	3.61	0.02	646.28	0.0	1096.72	0.0	1743.00	617.31	3609.37	966.41
2.446	253.89	0.0	0.0	0.01	946.01	0.0	107.97	0.0	1053.99	0.0	1460.00	0.0
2.446	256.42	2.53	2.51	0.03	677.14	0.0	850.52	0.0	1536.66	183.04	2151.43	275.52
2.446	256.63	0.21	2.75	0.03	670.72	0.0	908.87	0.0	1579.59	251.28	2500.35	393.37
2.446	257.64	0.81	3.61	0.0	646.25	0.0	1096.98	0.0	1743.23	614.54	3608.87	966.59
2.450	253.90	0.0	0.0	0.06	907.66	0.0	327.50	0.0	1235.16	254.74	539.50	685.76
2.450	256.40	2.54	2.51	0.07	672.84	0.0	895.59	0.0	1568.04	614.44	631.32	1268.24
2.450	256.72	0.23	2.75	0.09	664.99	0.0	942.90	0.0	1617.59	779.67	743.57	1809.67
2.450	257.67	0.83	3.62	0.13	637.25	0.0	1162.26	0.0	1800.02	1863.41	1930.81	2798.97
2.420	255.44	0.0	0.0	1.49	525.66	0.0	659.18	0.0	1164.85	660.49	637.76	161.75
2.420	257.08	1.03	1.70	0.59	491.40	0.0	1151.51	0.0	1642.51	1600.24	502.91	606.85
2.420	257.44	0.34	1.70	0.70	444.19	0.0	1305.14	0.0	1739.33	1631.16	836.95	836.95
2.420	258.41	0.99	2.69	0.84	463.47	0.0	1420.58	0.0	1884.03	2732.46	517.05	1613.88

SECNO	CMSL	P1WSP	DIFEG	DIFSK	SSTA	STENCIL	TOPWID	STENCH	FMOST	GL0B	OCH	OROB
3.140	256.39	0.0	0.0	0.95	591.20	0.0	822.03	0.0	1413.22	577.40	104.47	418.82
3.140	257.53	1.04	1.04	0.35	573.70	0.0	955.70	0.0	1529.50	1033.73	135.48	430.76
3.140	257.77	0.34	1.39	0.36	567.83	0.0	1000.68	0.0	1568.51	1275.21	155.01	1039.16
3.140	258.74	0.96	2.35	0.33	551.45	0.0	1125.95	0.0	1677.40	2064.25	216.99	1003.76
3.678	261.58	0.0	0.0	3.19	700.87	0.0	370.23	0.0	1076.10	359.01	525.69	415.30
3.678	261.95	0.36	0.50	4.52	687.98	0.0	390.03	0.0	1076.01	873.72	733.61	362.67
3.678	262.13	0.18	0.72	4.35	681.51	0.0	397.45	0.0	1076.96	1185.23	818.34	486.43
3.678	262.58	0.45	1.36	3.84	665.49	0.0	415.85	0.0	1081.54	2261.15	1091.79	797.05
3.880	267.06	0.0	0.0	0.08	979.19	0.0	49.00	0.0	1028.20	85.21	508.28	140.51
3.880	269.34	1.69	1.78	7.40	949.85	0.0	87.02	0.0	1056.87	222.60	1336.70	418.01
3.880	270.27	0.94	3.42	6.14	948.00	0.0	177.54	0.0	1125.55	334.60	1472.06	402.74
3.880	271.52	1.14	3.68	6.53	997.53	0.0	230.20	0.0	1127.83	598.52	1969.08	1887.44
3.870	268.25	0.0	0.0	0.67	982.00	0.0	36.30	0.0	1014.30	0.0	1100.00	0.0
3.870	270.95	2.28	2.03	1.28	931.61	0.0	108.27	0.0	1039.88	160.89	1714.77	124.34
3.870	270.92	0.09	2.54	0.44	928.94	0.0	111.37	0.0	1040.31	211.83	2120.39	157.78
3.870	272.63	1.31	4.28	0.61	864.23	0.0	162.16	0.0	1046.40	698.40	3133.44	318.16
3.882	269.07	0.0	0.0	0.73	982.00	0.0	36.30	0.0	1018.30	0.0	1100.00	0.0
3.882	271.54	2.47	3.73	0.92	982.00	0.0	36.30	0.0	1018.30	0.0	2000.00	0.0
3.882	272.65	1.11	3.25	1.93	853.68	0.0	195.64	0.0	1049.53	538.90	1759.05	192.06
3.882	273.81	1.16	4.59	1.78	797.69	0.0	311.99	0.0	1109.68	1260.29	2526.24	363.67
3.892	269.50	0.0	0.0	0.42	978.03	0.0	42.27	0.0	1020.30	120.46	874.89	102.65
3.892	271.37	1.87	2.10	0.73	971.96	0.0	53.57	0.0	1025.53	310.35	1425.17	284.40
3.892	271.91	0.55	3.00	-0.73	973.21	0.0	56.85	0.0	1027.64	414.98	1721.38	353.65
3.892	274.52	2.01	4.60	0.71	681.49	0.0	361.87	0.0	1043.36	1412.45	2074.37	663.18
4.084	282.61	0.0	0.0	13.11	938.31	0.0	76.90	0.0	1015.21	169.87	776.24	41.89
4.084	284.85	1.84	2.25	13.08	908.84	0.0	110.05	0.0	1018.89	547.95	1292.93	109.11
4.084	285.40	0.98	3.12	13.49	877.52	0.0	143.12	0.0	1020.64	803.77	1898.14	153.08
4.084	287.26	1.86	5.11	12.74	773.49	0.0	250.12	0.0	1023.61	1756.28	2101.89	232.13
4.094	284.27	0.0	0.0	1.86	959.50	0.0	81.00	0.0	1040.50	0.0	1010.00	0.0
4.094	285.74	2.27	2.34	2.29	959.50	0.0	81.00	0.0	1040.50	0.0	1950.00	0.0
4.094	287.53	0.79	3.18	2.12	959.50	0.0	81.00	0.0	1040.50	0.0	2455.00	0.0
4.094	289.33	1.80	5.17	2.07	959.50	0.0	81.00	0.0	1040.50	0.0	4150.00	0.0
4.100	284.49	0.0	0.0	0.02	959.50	0.0	81.00	0.0	1040.50	0.0	1010.00	0.0
4.100	286.76	2.28	2.35	0.02	959.50	0.0	81.00	0.0	1040.50	0.0	1950.00	0.0
4.100	287.55	0.79	3.18	0.03	959.50	0.0	81.00	0.0	1040.50	0.0	2455.00	0.0
4.100	289.37	2.12	5.46	0.34	959.50	0.0	81.00	0.0	1040.50	0.0	4150.00	0.0
4.110	283.97	0.0	0.0	-0.52	960.54	0.0	58.07	0.0	1035.01	71.93	827.01	111.00
4.110	285.06	2.09	2.34	-0.71	975.51	0.0	74.34	0.0	1049.83	183.63	1388.66	377.71
4.110	286.70	0.64	3.54	-0.86	973.96	0.0	80.27	0.0	1054.23	245.79	1679.13	532.75
4.110	289.15	2.45	5.99	-0.53	833.66	0.0	244.32	0.0	1077.98	608.58	2851.85	1195.57
4.368	301.94	0.0	0.0	17.97	976.98	0.0	41.69	0.0	1016.07	45.20	883.60	48.20
4.368	304.06	2.12	2.85	18.00	966.60	0.0	56.51	0.0	1023.12	150.49	1619.29	130.22
4.368	305.18	1.10	4.11	18.46	960.76	0.0	64.97	0.0	1025.73	230.11	1973.94	166.95
4.368	307.65	2.49	7.24	18.50	941.43	0.0	95.74	0.0	1037.17	620.04	3044.95	405.60

SECD	LNSEL	DIPRSP	DIFEC	DRWSX	SSVA	STENC	JURPID	STENCH	ENDST	QLOG	UCR	CRDE
4.376	303.48	0.0	0.0	1.60	986.22	0.0	28.32	0.0	1014.54	0.0	975.60	0.00
4.378	306.18	2.71	2.92	2.13	952.80	0.0	71.83	0.0	1030.44	81.12	1772.55	46.33
4.373	307.53	1.25	4.10	2.37	942.34	0.0	94.29	0.0	1030.63	210.15	2084.64	111.72
4.375	311.02	3.49	7.08	3.38	851.99	0.0	200.94	0.0	1052.92	633.60	2837.70	400.70
4.379	305.32	0.0	0.0	1.84	959.52	0.0	66.95	0.0	1029.47	31.22	922.13	21.65
4.379	306.52	1.20	1.91	0.33	950.21	0.0	81.76	0.0	1031.97	166.43	1641.35	92.20
4.379	307.18	0.66	2.75	-0.25	945.08	0.0	89.93	0.0	1032.01	277.07	1984.73	149.20
4.379	310.77	3.59	5.52	0.25	866.08	0.0	185.60	0.0	1051.69	969.04	2628.85	472.11
4.389	305.58	0.0	0.0	0.24	974.67	0.0	47.22	0.0	1021.89	17.16	936.04	14.19
4.389	306.58	1.12	2.28	0.16	967.92	0.0	57.50	0.0	1023.71	69.47	1759.41	71.13
4.389	307.52	0.84	3.35	0.25	962.85	0.0	65.74	0.0	1026.58	176.54	2163.35	122.12
4.389	310.24	2.71	6.15	-0.53	731.99	0.0	107.14	0.0	1039.13	467.18	3295.95	366.86
4.644	322.53	0.0	0.0	16.77	983.03	0.0	30.55	0.0	1013.58	37.90	926.25	10.85
4.644	325.46	3.14	2.33	18.78	924.72	0.0	326.66	0.0	1251.38	347.52	1373.55	179.93
4.644	325.89	0.43	2.79	18.37	922.77	0.0	329.91	0.0	1252.67	488.86	1553.91	367.23
4.644	326.77	0.88	3.91	16.54	910.59	0.0	344.73	0.0	1253.32	932.26	2103.57	1032.14

SUMMARY OF ERRORS

CAUTION	SECD=	0.074	PROFILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SECD=	0.074	PROFILE 1	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECD=	0.074	PROFILE 1	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECD=	0.074	PROFILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SECD=	0.074	PROFILE 2	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECD=	0.074	PROFILE 2	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECD=	0.074	PROFILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SECD=	0.074	PROFILE 3	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECD=	0.074	PROFILE 3	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECD=	0.074	PROFILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SECD=	0.074	PROFILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECD=	0.074	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECD=	0.306	PROFILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SECD=	0.306	PROFILE 1	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECD=	0.306	PROFILE 1	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECD=	0.306	PROFILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SECD=	0.306	PROFILE 2	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECD=	0.306	PROFILE 2	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECD=	0.306	PROFILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SECD=	0.306	PROFILE 3	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECD=	0.306	PROFILE 3	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECD=	0.306	PROFILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SECD=	0.306	PROFILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECD=	0.306	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECD=	0.306	PROFILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SECD=	0.326	PROFILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SECD=	0.326	PROFILE 2	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECD=	0.326	PROFILE 3	WSEL ASSUMED BASED ON MIN DIFF
CAUTION	SECD=	0.326	PROFILE 3	20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION	SE COND	0.326	PROF ILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	0.326	PROF ILE 4	WSEL ASSUMED BASED ON MIN DIFF
			PROF ILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	0.588	PROF ILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	0.588	PROF ILE 1	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	0.588	PROF ILE 1	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	0.588	PROF ILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	0.588	PROF ILE 2	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	0.588	PROF ILE 2	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	0.588	PROF ILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	0.588	PROF ILE 3	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	0.588	PROF ILE 3	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	0.588	PROF ILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	0.588	PROF ILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	0.588	PROF ILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	0.746	PROF ILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	0.746	PROF ILE 1	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	0.746	PROF ILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	0.746	PROF ILE 2	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	0.746	PROF ILE 2	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	0.746	PROF ILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	0.746	PROF ILE 3	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	0.746	PROF ILE 3	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	0.746	PROF ILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	0.746	PROF ILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	0.746	PROF ILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	1.598	PROF ILE 3	HYDRAULIC JUMP D.S.
CAUTION	SE COND	1.598	PROF ILE 4	HYDRAULIC JUMP D.S.
CAUTION	SE COND	1.808	PROF ILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	1.808	PROF ILE 4	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	1.850	PROF ILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	1.850	PROF ILE 2	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	1.850	PROF ILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	1.850	PROF ILE 3	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	1.850	PROF ILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	1.850	PROF ILE 4	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	1.850	PROF ILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	1.850	PROF ILE 4	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	1.866	PROF ILE 4	HYDRAULIC JUMP D.S.
CAUTION	SE COND	1.950	PROF ILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	1.950	PROF ILE 2	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	1.950	PROF ILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	1.950	PROF ILE 3	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	1.950	PROF ILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	1.950	PROF ILE 4	WSEL ASSUMED BASED ON MIN DIFF
CAUTION	SE COND	1.950	PROF ILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	2.247	PROF ILE 1	HYDRAULIC JUMP D.S.
CAUTION	SE COND	2.247	PROF ILE 2	HYDRAULIC JUMP D.S.
CAUTION	SE COND	2.247	PROF ILE 3	HYDRAULIC JUMP D.S.
CAUTION	SE COND	2.247	PROF ILE 4	HYDRAULIC JUMP D.S.
CAUTION	SE COND	3.678	PROF ILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3.678	PROF ILE 1	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3.678	PROF ILE 2	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	3.678	PROF ILE 2	CRITICAL DEPTH ASSUMED

CAUTION	SE COND	3-676	PROFILE 2	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-676	PROFILE 3	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	3-678	PROFILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3-678	PROFILE 3	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-678	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	3-678	PROFILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3-678	PROFILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-678	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	3-860	PROFILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3-860	PROFILE 2	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-860	PROFILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3-860	PROFILE 3	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-860	PROFILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3-860	PROFILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-860	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	3-870	PROFILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3-870	PROFILE 3	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-870	PROFILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3-870	PROFILE 4	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-870	PROFILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3-876	PROFILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-876	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	3-892	PROFILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3-892	PROFILE 2	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-892	PROFILE 3	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	3-892	PROFILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	3-892	PROFILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	3-892	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	4-064	PROFILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	4-064	PROFILE 2	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	4-064	PROFILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	4-064	PROFILE 3	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	4-064	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	4-064	PROFILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	4-064	PROFILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	4-064	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	4-116	PROFILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	4-116	PROFILE 4	MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	4-368	PROFILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	4-368	PROFILE 1	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	4-368	PROFILE 2	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	4-368	PROFILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	4-368	PROFILE 2	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	4-368	PROFILE 3	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SE COND	4-368	PROFILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SE COND	4-368	PROFILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SE COND	4-368	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION	SECNO#	A.368	PROFILE A	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECNO#	4.379	PROFILE 1	HYDRAULIC JUMP 0.5*
CAUTION	SECNO#	4.379	PROFILE 2	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECNO#	4.379	PROFILE 2	WSEL ASSUMED BASED ON MIN DIFF
CAUTION	SECNO#	4.379	PROFILE 2	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECNO#	4.379	PROFILE 3	HYDRAULIC JUMP 0.5*
CAUTION	SECNO#	4.379	PROFILE 3	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECNO#	4.379	PROFILE 3	WSEL ASSUMED BASED ON MIN DIFF
CAUTION	SECNO#	4.379	PROFILE 3	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECNO#	4.379	PROFILE 4	HYDRAULIC JUMP 0.5*
CAUTION	SECNO#	4.369	PROFILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO#	4.369	PROFILE 2	MINIMUM SPECIFIC ENERGY
CAUTION	SECNO#	4.369	PROFILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SECNO#	4.369	PROFILE 3	MINIMUM SPECIFIC ENERGY
CAUTION	SECNO#	4.644	PROFILE 1	CRITICAL DEPTH ASSUMED
CAUTION	SECNO#	4.644	PROFILE 1	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECNO#	4.644	PROFILE 1	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECNO#	4.644	PROFILE 2	CRITICAL DEPTH ASSUMED
CAUTION	SECNO#	4.644	PROFILE 2	MINIMUM SPECIFIC ENERGY
CAUTION	SECNO#	4.644	PROFILE 3	CRITICAL DEPTH ASSUMED
CAUTION	SECNO#	4.644	PROFILE 3	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECNO#	4.644	PROFILE 3	20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION	SECNO#	4.644	PROFILE 4	CRITICAL DEPTH ASSUMED
CAUTION	SECNO#	4.644	PROFILE 4	PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION	SECNO#	4.644	PROFILE 4	20 TRIALS ATTEMPTED TO BALANCE WSEL

THIS RUN EXECUTED 11/08/77 17:32 52

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HEL2 RELEASE DATED NOV 76 UPDATED FEB 1977  
LNNR CORR - 01  
MODIFICATION - 50,51,52  
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CR

1104001 FACULTION TERMINATING DUE TO ERROR COUNT FOR ERROR NUMBER 217  
1104211 PLOCS - END OF DATA SET ON UNIT 5

ROUTINE	CALLER FROM	ISN	REG.	14	REG.	15	REG.	0	REG.	1
IBCOM			00313C58	00335879	00000001	003218A8				
HSMAIN			42310154	003101A0	00000000	00000000				
MAIN			00000002	01310050	00FE3CBC	0036EFF8				

ENTRY POINT= 01310050

SUMMARY OF ERRORS FOR THIS JOB

ERROR NUMBER

NUMBER OF ERRORS

217

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PLOT DECK PRINTOUT FOLLOWS

0.0	205.000	210.976	217.900	211.318	214.210	0.0	11/08/77
0.074	206.700	217.247	217.957	217.957	219.559	0.0	11/08/77
0.060	208.700	218.422	218.503	218.503	220.850	0.0	11/08/77
0.084	207.700	216.304	218.865	218.865	220.528	0.0	11/08/77
0.114	206.500	217.289	219.253	219.465	221.693	215.200	11/08/77
0.300	208.500	217.304	219.289	219.901	221.618	0.0	11/08/77
0.300	215.400	225.463	225.271	225.744	227.671	0.0	11/08/77
0.300	215.400	222.707	225.040	225.529	227.671	0.0	11/08/77
0.316	216.600	224.135	225.559	226.523	227.610	0.0	11/08/77
0.336	217.600	224.126	224.601	228.059	228.333	224.700	11/08/77
0.588	220.600	225.769	226.920	229.045	230.643	0.0	11/08/77
0.748	226.700	229.907	230.654	231.036	232.786	0.0	11/08/77
0.756	230.300	237.155	238.718	238.718	241.100	0.0	11/08/77
0.776	232.500	237.134	238.054	240.999	243.226	0.0	11/08/77
0.970	234.000	237.454	239.866	241.605	244.489	241.500	11/08/77
0.980	234.000	241.791	243.800	243.823	244.953	0.0	11/08/77
0.980	234.200	241.311	244.198	244.222	246.022	0.0	11/08/77
0.980	234.000	245.172	245.572	246.275	247.635	240.400	11/08/77
1.280	234.900	244.454	245.990	246.717	248.166	0.0	11/08/77
1.580	238.600	245.424	246.941	247.603	249.177	0.0	11/08/77
1.574	236.500	240.530	247.793	247.760	248.334	0.0	11/08/77
1.608	238.500	240.304	247.659	247.922	249.314	249.700	11/08/77
1.650	242.100	248.994	252.384	253.497	249.369	0.0	11/08/77
1.650	241.600	251.667	254.066	254.547	253.313	0.0	11/08/77
1.656	241.500	252.416	254.314	254.787	253.805	248.900	11/08/77
1.875	242.700	252.360	254.306	254.786	255.650	0.0	11/08/77
1.942	244.600	253.316	254.099	254.611	255.663	0.0	11/08/77
1.950	244.300	253.248	254.090	254.582	255.896	0.0	11/08/77
1.950	244.500	253.530	253.692	253.759	255.065	253.300	11/08/77
2.234	245.300	253.563	256.239	256.411	257.137	0.0	11/08/77
2.244	243.300	253.774	256.320	256.518	257.300	0.0	11/08/77
2.244	245.300	253.779	256.323	256.521	257.306	0.0	11/08/77
2.260	244.900	253.780	256.323	256.521	257.306	0.0	11/08/77
2.262	245.200	253.793	256.356	256.561	257.362	0.0	11/08/77
2.431	247.000	253.745	259.396	259.615	257.392	245.300	11/08/77
2.442	247.600	253.465	256.387	256.603	257.462	0.0	11/08/77
2.446	247.000	253.92	256.420	256.632	257.483	0.0	11/08/77
2.455	246.900	253.947	256.486	256.719	257.483	254.100	11/08/77
2.470	252.000	256.463	257.075	257.419	258.486	0.0	11/08/77
2.478	257.100	261.502	257.430	257.775	258.738	0.0	11/08/77
2.490	264.100	267.502	261.947	262.150	262.503	0.0	11/08/77
2.492	262.600	266.516	267.344	270.273	271.417	0.0	11/08/77
2.492	262.600	266.516	270.525	270.716	272.025	0.0	11/08/77
3.032	263.100	269.698	271.582	272.648	273.809	270.400	11/08/77
4.004	278.000	282.605	284.447	285.401	274.521	0.0	11/08/77
4.004	278.500	284.469	286.750	287.526	287.259	0.0	11/08/77
4.100	277.300	284.467	286.762	287.552	289.329	0.0	11/08/77
4.110	277.100	283.970	286.057	286.699	289.670	288.700	11/08/77
4.368	290.300	301.935	304.058	305.159	289.145	0.0	11/08/77
4.375	290.000	303.574	305.183	307.526	307.645	0.0	11/08/77
4.375	300.700	305.317	308.516	307.176	310.820	0.0	11/08/77
4.369	300.900	305.659	306.681	307.524	310.820	304.700	11/08/77
4.044	311.600	322.326	325.461	325.891	326.779	0.0	11/08/77

MMI DUPLICATE MODEL OUTPUT

HEC-RAS Plan: FEMA Dup River Coppermine Brook Reach: Main Channel

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Grd W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cht
Main Channel	0.00	10Yr	2140.00	205.00	211.20	210.93	212.78	0.005508	10.41	293.02	119.39	0.84
Main Channel	0.00	50Yr	3630.00	205.00	212.72	212.89	214.84	0.005509	12.50	519.34	178.37	0.87
Main Channel	0.00	100Yr	4340.00	205.00	213.38	213.38	215.62	0.005267	13.06	646.11	204.09	0.87
Main Channel	0.00	500Yr	7000.00	205.00	215.10	215.00	217.97	0.005510	15.46	1054.24	280.85	0.92
Main Channel	0.074	10Yr	2140.00	208.70	214.41	214.41	216.82	0.008091	13.90	286.93	62.77	1.04
Main Channel	0.074	50Yr	3630.00	208.70	217.94	217.94	219.51	0.003239	12.22	1070.19	453.72	0.72
Main Channel	0.074	100Yr	4340.00	208.70	218.51	218.51	220.07	0.003204	12.66	1350.24	528.96	0.72
Main Channel	0.074	500Yr	7000.00	208.70	220.14	220.14	221.54	0.002963	13.58	2382.78	727.65	0.71
Main Channel	0.08	10Yr	2140.00	208.70	216.83	217.34	217.34	0.001774	6.79	360.76	173.99	0.43
Main Channel	0.08	50Yr	3630.00	208.70	219.21	219.81	219.81	0.001269	6.95	1403.71	633.75	0.38
Main Channel	0.08	100Yr	4340.00	208.70	219.72	220.35	220.35	0.001353	7.41	1745.20	723.36	0.40
Main Channel	0.08	500Yr	7000.00	208.70	221.13	221.79	221.79	0.001470	8.38	2845.52	795.04	0.42
Main Channel	0.084	10Yr	2140.00	207.70	216.84	213.55	217.41	0.001031	6.53	521.85	270.46	0.40
Main Channel	0.084	50Yr	3630.00	207.70	219.79	217.17	219.94	0.000294	4.27	1866.78	640.25	0.22
Main Channel	0.084	100Yr	4340.00	207.70	220.36	217.68	220.49	0.000266	4.20	2246.42	679.01	0.21
Main Channel	0.084	500Yr	7000.00	207.70	221.80	218.81	221.93	0.000250	4.39	3257.24	730.18	0.21
Main Channel	0.09	Bridge										
Main Channel	0.094	10Yr	2140.00	206.50	217.65	212.77	217.91	0.000454	4.77	920.38	438.64	0.27
Main Channel	0.094	50Yr	3630.00	206.50	219.88	216.74	220.01	0.000248	4.04	2238.71	745.05	0.20
Main Channel	0.094	100Yr	4340.00	206.50	220.43	217.45	220.55	0.000230	4.00	2681.24	766.97	0.20
Main Channel	0.094	500Yr	7000.00	206.50	221.84	218.68	221.96	0.000228	4.27	3755.69	783.26	0.20
Main Channel	0.114	10Yr	2140.00	208.50	217.33	218.18	218.18	0.002355	9.59	840.66	373.66	0.59
Main Channel	0.114	50Yr	3630.00	208.50	219.69	220.15	220.15	0.001328	8.53	2083.55	677.48	0.46
Main Channel	0.114	100Yr	4340.00	208.50	220.25	220.69	220.69	0.001291	8.71	2480.54	719.64	0.46
Main Channel	0.114	500Yr	7000.00	208.50	221.68	222.10	222.10	0.001347	9.64	3513.58	734.42	0.48
Main Channel	0.306	10Yr	2035.00	215.40	222.48	222.48	224.68	0.005439	12.61	280.30	93.93	0.87
Main Channel	0.306	50Yr	3475.00	215.40	223.89	223.89	227.38	0.007122	16.46	430.55	118.72	1.03
Main Channel	0.306	100Yr	4175.00	215.40	223.90	223.90	228.91	0.010239	19.74	431.49	118.85	1.24
Main Channel	0.306	500Yr	6740.00	215.40	227.38	227.38	229.15	0.003368	14.43	1844.25	487.68	0.75
Main Channel	0.308	10Yr	2035.00	215.40	222.60	222.60	224.89	0.005398	12.72	258.81	95.99	0.87
Main Channel	0.308	50Yr	3475.00	215.40	223.89	223.89	227.80	0.007693	17.10	381.14	118.73	1.07
Main Channel	0.308	100Yr	4175.00	215.40	229.94	223.89	230.13	0.000370	5.47	3194.47	566.95	0.26

HEC-RAS Plan: FEMA Dup River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	0.308	500Yr	6740.00	215.40	228.21	223.89	229.34	0.002157	12.10	2280.52	514.10	0.61
Main Channel	0.316	10Yr	2035.00	216.60	224.26	221.74	225.32	0.001947	8.26	246.38	196.43	0.54
Main Channel	0.316	50Yr	3475.00	216.60	228.37	223.83	228.74	0.000567	5.98	1837.92	466.42	0.31
Main Channel	0.316	100Yr	4175.00	216.60	229.91	224.74	230.19	0.000409	5.53	2627.65	561.39	0.27
Main Channel	0.316	500Yr	6740.00	216.60	228.06	227.50	229.67	0.002474	12.28	1696.91	447.35	0.65
Main Channel	0.320	Bridge										
Main Channel	0.326	10Yr	2035.00	217.40	226.21	222.54	227.00	0.001203	7.15	284.65	335.16	0.43
Main Channel	0.326	50Yr	3475.00	217.40	228.36	224.92	228.78	0.000741	6.51	1473.19	415.29	0.35
Main Channel	0.326	100Yr	4175.00	217.40	230.12	225.54	230.39	0.000438	5.54	2309.12	525.15	0.28
Main Channel	0.326	500Yr	6740.00	217.40	230.58	228.16	231.16	0.000922	8.24	2558.31	553.70	0.40
Main Channel	0.336	10Yr	2035.00	217.10	227.04	227.77	227.10	0.000167	2.61	2030.21	428.44	0.16
Main Channel	0.336	50Yr	3475.00	217.10	228.77	228.94	228.84	0.000209	3.30	2800.09	464.31	0.18
Main Channel	0.336	100Yr	4175.00	217.10	230.36	230.43	230.43	0.000159	3.17	3666.42	500.23	0.16
Main Channel	0.336	500Yr	6740.00	217.10	231.08	231.23	231.23	0.000323	4.68	3936.00	520.93	0.23
Main Channel	0.588	10Yr	2035.00	220.60	227.77	227.77	230.25	0.006145	13.35	251.39	76.01	0.90
Main Channel	0.588	50Yr	3475.00	220.60	231.03	231.03	232.84	0.003257	12.62	794.51	265.26	0.70
Main Channel	0.588	100Yr	4175.00	220.60	231.59	231.59	233.52	0.003431	13.43	945.97	273.01	0.73
Main Channel	0.588	500Yr	6740.00	220.60	233.20	233.20	235.51	0.003905	15.92	1403.26	285.19	0.80
Main Channel	0.748	10Yr	2035.00	228.70	234.92	234.92	238.27	0.009749	15.11	175.20	41.70	1.11
Main Channel	0.748	50Yr	3475.00	228.70	238.10	238.10	240.59	0.004747	14.13	533.36	137.22	0.83
Main Channel	0.748	100Yr	4175.00	228.70	238.86	238.86	241.53	0.004755	14.94	642.47	148.38	0.85
Main Channel	0.748	500Yr	6740.00	228.70	241.06	241.06	244.40	0.005038	17.52	1012.12	195.75	0.90
Main Channel	0.758	10Yr	2035.00	230.30	238.11	238.06	239.08	0.002445	7.88	258.20	112.26	0.55
Main Channel	0.758	50Yr	3475.00	230.30	240.30	237.88	241.14	0.001741	8.11	733.74	129.84	0.49
Main Channel	0.758	100Yr	4175.00	230.30	241.15	238.66	242.09	0.001757	8.69	847.50	137.95	0.50
Main Channel	0.758	500Yr	6740.00	230.30	243.75	240.22	245.05	0.001823	10.43	1317.82	248.85	0.53
Main Channel	0.759	Bridge										
Main Channel	0.760	10Yr	2035.00	230.50	238.10	236.26	239.13	0.003489	8.15	240.58	110.62	0.58
Main Channel	0.760	50Yr	3475.00	230.50	242.60	238.08	243.59	0.001612	8.01	433.80	172.34	0.43
Main Channel	0.760	100Yr	4175.00	230.50	243.30	238.87	243.84	0.001042	6.72	1168.64	211.30	0.35
Main Channel	0.760	500Yr	6740.00	230.50	244.55	241.44	245.65	0.001885	9.70	1482.01	301.17	0.48

HEC-RAS Plan: FEMA Dup River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crt W.S. (ft)	E.G. Elev. (ft)	E.G. Slope (ft/ft)	Vel Cntrl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cnl
Main Channel	0.770	10Yr	2035.00	232.00	238.22		239.30	0.002808	8.57	281.85	80.29	0.62
Main Channel	0.770	50Yr	3475.00	232.00	243.10		243.69	0.000804	6.84	1042.19	264.85	0.37
Main Channel	0.770	100Yr	4175.00	232.00	243.15		243.99	0.001135	6.16	1056.10	267.46	0.44
Main Channel	0.770	500Yr	6740.00	232.00	244.48		245.81	0.001684	10.73	1456.25	333.99	0.54
Main Channel	0.970	10Yr	2020.00	234.00	241.33		242.48	0.003162	10.14	521.00	244.02	0.67
Main Channel	0.970	50Yr	3450.00	234.00	244.28		244.75	0.001226	7.96	1536.47	445.49	0.44
Main Channel	0.970	100Yr	4145.00	234.00	244.64		245.33	0.001265	8.39	1799.07	484.13	0.45
Main Channel	0.970	500Yr	6700.00	234.00	247.02		247.44	0.001079	8.77	3149.94	767.84	0.43
Main Channel	0.980	10Yr	2020.00	234.30	241.43		242.66	0.002456	8.89	227.21	63.98	0.60
Main Channel	0.980	50Yr	3450.00	234.30	243.84		245.34	0.002206	10.27	511.52	128.73	0.59
Main Channel	0.980	100Yr	4145.00	234.30	244.17		246.18	0.002821	11.89	557.56	154.44	0.68
Main Channel	0.980	500Yr	6700.00	234.30	246.62		247.76	0.001426	9.94	2542.71	1030.69	0.50
Main Channel	0.984	Bridge										
Main Channel	0.988	10Yr	2020.00	234.20	243.37		244.10	0.001038	6.86	294.61	112.19	0.40
Main Channel	0.988	50Yr	3450.00	234.20	244.44		245.49	0.001497	8.88	626.03	251.29	0.50
Main Channel	0.988	100Yr	4145.00	234.20	245.67		246.19	0.000839	7.18	1517.64	914.77	0.38
Main Channel	0.988	500Yr	6700.00	234.20	247.92		248.06	0.000296	4.82	3855.72	1162.40	0.23
Main Channel	0.998	10Yr	2020.00	234.00	244.07		244.19	0.000329	3.10	1115.24	204.46	0.19
Main Channel	0.998	50Yr	3450.00	234.00	245.36		245.62	0.000584	4.54	1413.63	258.01	0.25
Main Channel	0.998	100Yr	4145.00	234.00	245.94		246.25	0.000681	5.09	1569.48	283.35	0.28
Main Channel	0.998	500Yr	6700.00	234.00	247.63		248.22	0.001059	7.01	2849.09	1354.25	0.35
Main Channel	1.280	10Yr	1890.00	234.90	244.61		244.70	0.000356	3.38	1745.91	756.71	0.20
Main Channel	1.280	50Yr	3210.00	234.90	246.17		246.24	0.000294	3.40	3016.93	838.17	0.18
Main Channel	1.280	100Yr	3885.00	234.90	246.84		246.90	0.000274	3.42	3578.93	855.82	0.18
Main Channel	1.280	500Yr	6200.00	234.90	248.67		248.93	0.000228	3.48	5374.47	909.94	0.17
Main Channel	1.580	10Yr	1890.00	236.60	245.51		245.99	0.001909	6.83	692.08	215.37	0.47
Main Channel	1.580	50Yr	3210.00	236.60	246.85		247.63	0.002566	8.97	1083.01	367.06	0.58
Main Channel	1.580	100Yr	3885.00	236.60	247.44		248.28	0.002649	9.56	1317.86	433.37	0.58
Main Channel	1.580	500Yr	6200.00	236.60	249.34		250.11	0.002257	10.10	2346.32	648.26	0.55
Main Channel	1.560	10Yr	1890.00	236.70	245.51		246.17	0.001623	6.52	290.06	80.59	0.44
Main Channel	1.560	50Yr	3210.00	236.70	246.85		247.86	0.002139	8.44	530.41	95.35	0.52

HEC-RAS Plan: FEMA Dup River Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	In Ch El (ft)	W.S. Elev (ft)	Crt W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frroude # Ch
Main Channel	1.590	100Yr	3885.00	238.70	247.31	245.07	248.67	0.002654	9.74	579.06	136.54	0.59
Main Channel	1.590	500Yr	6200.00	238.70	248.66	247.03	251.08	0.003991	13.17	992.07	501.84	0.74
Main Channel	1.594	Bridge										
Main Channel	1.598	10Yr	1890.00	238.40	246.70	242.34	247.15	0.000837	5.34	363.76	87.03	0.33
Main Channel	1.598	50Yr	3210.00	238.40	247.72	244.01	248.53	0.001423	7.52	730.85	312.49	0.43
Main Channel	1.598	100Yr	3885.00	238.40	247.69	244.77	248.89	0.002108	9.13	722.31	304.32	0.53
Main Channel	1.598	500Yr	6200.00	238.40	251.53	248.57	251.92	0.000665	6.46	3728.53	1061.94	0.31
Main Channel	1.608	10Yr	1890.00	238.40	246.64		247.25	0.001478	6.71	504.44	186.36	0.43
Main Channel	1.608	50Yr	3210.00	238.40	247.57		248.73	0.002556	9.52	691.63	215.54	0.57
Main Channel	1.608	100Yr	3885.00	238.40	247.39		249.23	0.004118	11.92	653.97	210.00	0.72
Main Channel	1.608	500Yr	6200.00	238.40	251.64		251.96	0.000764	6.73	3743.83	1059.00	0.33
Main Channel	1.850	10Yr	1750.00	242.10	249.25		250.75	0.004773	10.71	204.88	48.00	0.74
Main Channel	1.850	50Yr	3210.00	242.10	252.14	252.14	263.17	0.002704	10.28	699.33	375.79	0.59
Main Channel	1.850	100Yr	3848.00	242.10	252.61	252.51	263.53	0.002524	10.26	895.41	447.94	0.57
Main Channel	1.850	500Yr	6170.00	242.10	252.95		254.61	0.004753	14.40	1087.46	499.78	0.79
Main Channel	1.860	10Yr	1750.00	241.60	250.89	245.62	251.12	0.000439	4.17	574.29	144.49	0.24
Main Channel	1.860	50Yr	3210.00	241.60	253.10	247.63	253.40	0.000508	5.17	1049.85	279.94	0.27
Main Channel	1.860	100Yr	3848.00	241.60	253.33	248.41	253.72	0.000651	5.93	1116.13	293.30	0.31
Main Channel	1.860	500Yr	6170.00	241.60	254.35	250.00	254.97	0.001010	7.81	1446.30	352.39	0.39
Main Channel	1.864	Bridge										
Main Channel	1.868	10Yr	1750.00	241.40	252.04	245.43	252.15	0.000200	3.08	831.91	230.61	0.17
Main Channel	1.868	50Yr	3210.00	241.40	253.63	247.44	253.80	0.000283	4.02	1271.28	322.42	0.20
Main Channel	1.868	100Yr	3848.00	241.40	253.93	248.20	254.14	0.000346	4.52	1371.73	339.94	0.23
Main Channel	1.868	500Yr	6170.00	241.40	254.88	250.72	255.21	0.000549	5.98	1721.22	402.43	0.29
Main Channel	1.878	10Yr	1750.00	242.70	251.90		252.24	0.000761	5.20	490.69	212.72	0.31
Main Channel	1.878	50Yr	3210.00	242.70	253.55		253.86	0.000705	5.62	944.28	304.45	0.31
Main Channel	1.878	100Yr	3848.00	242.70	253.85		254.21	0.000808	6.13	1037.48	312.94	0.33
Main Channel	1.878	500Yr	6170.00	242.70	254.80		255.30	0.001107	7.59	1358.76	369.07	0.39
Main Channel	1.932	10Yr	1750.00	244.60	252.05		252.77	0.002163	7.51	287.00	78.75	0.50
Main Channel	1.932	50Yr	3210.00	244.60	253.39		254.78	0.003510	10.78	415.38	132.87	0.66
Main Channel	1.932	100Yr	3848.00	244.60	253.61	252.98	255.35	0.004350	12.21	445.16	136.39	0.74



HEC-RAS Plan: FEMA Dup River, Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crt W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	2.247	10Yr	1460.00	245.20	253.81	249.80	253.83	0.000118	1.99	3377.89	1256.29	0.12
Main Channel	2.247	50Yr	2610.00	245.20	257.33	252.16	257.34	0.000034	1.35	8090.04	1418.21	0.07
Main Channel	2.247	100Yr	3215.00	245.20	256.78	252.43	256.79	0.000059	1.87	7310.60	1392.81	0.10
Main Channel	2.247	500Yr	5190.00	245.20	257.55	252.37	257.58	0.000121	2.58	8403.12	1428.29	0.13
Main Channel	2.262	10Yr	1460.00	245.00	253.84		253.84	0.000019	0.80	5323.51	1421.18	0.05
Main Channel	2.262	50Yr	2610.00	245.00	257.34		257.34	0.000007	0.63	10808.59	1575.63	0.03
Main Channel	2.262	100Yr	3215.00	245.00	256.79		256.80	0.000015	0.86	9748.20	1565.88	0.05
Main Channel	2.262	500Yr	5190.00	245.00	257.58		257.58	0.000026	1.20	10983.64	1581.58	0.06
Main Channel	2.432	10Yr	1460.00	247.80	253.84		253.93	0.000506	3.60	911.66	357.52	0.26
Main Channel	2.432	50Yr	2610.00	247.80	257.35		257.37	0.000105	2.24	3505.40	1227.92	0.13
Main Channel	2.432	100Yr	3215.00	247.80	256.80		256.86	0.000256	3.36	2867.94	1096.38	0.20
Main Channel	2.432	500Yr	5190.00	247.80	257.60		257.67	0.000335	4.08	3824.69	1281.37	0.23
Main Channel	2.442	10Yr	1460.00	247.80	253.86	249.77	253.95	0.000281	2.51	581.29	107.84	0.19
Main Channel	2.442	50Yr	2610.00	247.80	257.34	250.76	257.39	0.000089	1.96	2691.67	1073.43	0.12
Main Channel	2.442	100Yr	3215.00	247.80	256.79	251.22	256.89	0.000200	2.82	2136.37	945.78	0.17
Main Channel	2.442	500Yr	5190.00	247.80	257.58	252.50	257.73	0.000298	3.66	2954.93	1128.91	0.21
Main Channel	2.444		Bridge									
Main Channel	2.446	10Yr	1460.00	247.60	253.86	249.76	253.96	0.000279	2.51	582.07	107.87	0.19
Main Channel	2.446	50Yr	2610.00	247.60	257.36	250.76	257.41	0.000088	1.95	2714.88	1076.43	0.12
Main Channel	2.446	100Yr	3215.00	247.60	256.86	251.20	256.96	0.000190	2.76	2204.35	962.32	0.17
Main Channel	2.446	500Yr	5190.00	247.60	257.66	252.50	257.80	0.000282	3.58	3048.84	1148.05	0.21
Main Channel	2.456	10Yr	1460.00	246.90	253.88		253.98	0.000464	3.58	979.95	326.14	0.25
Main Channel	2.456	50Yr	2610.00	246.90	257.37		257.41	0.000154	2.76	3309.11	1114.03	0.16
Main Channel	2.456	100Yr	3215.00	246.90	256.88		256.97	0.000336	3.95	2792.69	993.47	0.23
Main Channel	2.456	500Yr	5190.00	246.90	257.70		257.82	0.000479	4.98	3689.32	1195.04	0.28
Main Channel	2.920	10Yr	1460.00	249.90	255.48		255.61	0.001151	4.61	710.64	670.47	0.38
Main Channel	2.920	50Yr	2610.00	249.90	257.67		257.69	0.000096	1.72	2902.89	1319.59	0.12
Main Channel	2.920	100Yr	3215.00	249.90	257.60		257.53	0.000181	2.32	2674.59	1278.61	0.16
Main Channel	2.920	500Yr	5190.00	249.90	258.40		258.43	0.000166	2.42	3894.18	1419.25	0.15
Main Channel	3.140	10Yr	1100.00	262.00	256.16		256.18	0.000215	1.62	1149.38	790.72	0.16
Main Channel	3.140	50Yr	2000.00	262.00	257.77		257.78	0.000055	1.16	2595.74	1000.85	0.09

HEC-RAS Plan: FEMA Dup River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cnl
Main Channel	3.140	100Yr	2490.00	252.00	257.68		257.70	0.000112	1.50	2503.62	988.61	0.12
Main Channel	3.140	500Yr	4150.00	252.00	258.58		268.60	0.000125	1.78	3441.72	1105.10	0.13
Main Channel	3.678	10Yr	1100.00	257.10	261.57	261.57	261.97	0.004100	6.83	330.57	374.79	0.66
Main Channel	3.678	50Yr	2000.00	257.10	261.96	261.96	262.48	0.005454	8.48	488.50	390.59	0.77
Main Channel	3.678	100Yr	2490.00	257.10	262.13	262.13	262.71	0.005985	9.15	565.74	397.52	0.82
Main Channel	3.678	500Yr	4150.00	257.10	262.60	262.60	263.36	0.007294	10.90	747.89	416.68	0.92
Main Channel	3.850	10Yr	1100.00	263.10	267.69	267.69	269.10	0.006783	10.47	133.84	49.28	0.91
Main Channel	3.850	50Yr	2000.00	263.10	269.39	269.39	271.13	0.005844	12.22	244.65	88.57	0.89
Main Channel	3.850	100Yr	2490.00	263.10	270.82	270.82	271.91	0.003184	10.43	455.30	202.51	0.68
Main Channel	3.850	500Yr	4150.00	263.10	271.85	271.85	273.07	0.003529	12.00	688.59	249.95	0.73
Main Channel	3.870	10Yr	1100.00	264.40	268.33	268.33	269.48	0.005685	8.62	127.65	52.56	0.81
Main Channel	3.870	50Yr	2000.00	264.40	269.52	269.52	271.64	0.007105	11.70	170.91	60.56	0.95
Main Channel	3.870	100Yr	2490.00	264.40	270.93	270.93	272.12	0.003250	9.43	348.54	118.54	0.67
Main Channel	3.870	500Yr	4150.00	264.40	271.92	271.92	273.84	0.004623	12.42	483.11	156.42	0.82
Main Channel	3.876		Bridge									
Main Channel	3.882	10Yr	1100.00	262.80	269.10	269.10	269.85	0.003848	6.93	166.70	57.20	0.58
Main Channel	3.882	50Yr	2000.00	262.80	271.96	269.27	272.86	0.002377	7.62	262.49	158.63	0.50
Main Channel	3.882	100Yr	2490.00	262.80	272.79	270.00	273.19	0.001234	5.90	639.31	202.76	0.37
Main Channel	3.882	500Yr	4150.00	262.80	273.67	272.44	274.41	0.002102	8.26	860.54	297.44	0.49
Main Channel	3.892	10Yr	1100.00	265.10	269.79	269.79	271.63	0.007566	11.45	134.69	44.00	0.97
Main Channel	3.892	50Yr	2000.00	265.10	271.71	271.71	274.23	0.006656	13.71	230.33	55.56	0.97
Main Channel	3.892	100Yr	2490.00	265.10	272.50	272.50	275.40	0.006668	14.85	276.06	60.31	0.99
Main Channel	3.892	500Yr	4150.00	265.10	276.00	276.00	277.42	0.002589	12.11	1340.32	488.08	0.66
Main Channel	4.084	10Yr	1010.00	277.00	282.71	282.71	284.26	0.003356	11.27	189.90	78.75	0.89
Main Channel	4.084	50Yr	1950.00	277.00	284.64	284.64	286.55	0.005868	13.46	375.29	113.47	0.90
Main Channel	4.084	100Yr	2455.00	277.00	285.00	285.00	287.52	0.007425	15.66	417.64	120.00	1.02
Main Channel	4.084	500Yr	4150.00	277.00	287.90	287.90	289.91	0.004628	15.45	1007.59	286.99	0.85
Main Channel	4.084	10Yr	1010.00	278.40	284.58	280.90	284.66	0.000232	2.32	436.11	94.29	0.18
Main Channel	4.084	50Yr	1950.00	278.40	286.87	281.82	287.03	0.000265	3.14	621.72	212.15	0.20
Main Channel	4.084	100Yr	2455.00	278.40	287.96	282.24	288.15	0.000270	3.46	709.74	309.12	0.21
Main Channel	4.084	500Yr	4150.00	278.40	290.02	283.54	290.37	0.000381	4.73	876.93	495.09	0.25

HEC-RAS Plan: FEMA Dup River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Crnt (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Crl
Main Channel	4.100		Bridge									
Main Channel	4.106	10Yr	1010.00	278.30	284.60	280.78	284.68	0.000216	2.27	445.54	94.57	0.17
Main Channel	4.106	50Yr	1950.00	278.30	286.89	281.72	287.04	0.000252	3.09	631.43	222.84	0.19
Main Channel	4.106	100Yr	2455.00	278.30	287.98	282.15	288.16	0.000258	3.41	719.50	319.87	0.20
Main Channel	4.106	500Yr	4150.00	278.30	290.54	283.42	290.70	0.000211	3.65	2143.87	568.23	0.19
Main Channel	4.116	10Yr	1010.00	277.10	283.70		285.11	0.004289	10.33	156.78	52.57	0.75
Main Channel	4.116	50Yr	1950.00	277.10	285.46		287.71	0.006346	13.72	263.81	68.84	0.87
Main Channel	4.116	100Yr	2455.00	277.10	286.60		288.80	0.004663	14.05	347.77	79.30	0.83
Main Channel	4.116	500Yr	4150.00	277.10	289.94	289.94	291.68	0.002940	13.83	894.01	290.03	0.70
Main Channel	4.368	10Yr	975.00	297.30	301.86	301.86	303.54	0.013171	11.08	117.83	41.38	0.95
Main Channel	4.368	50Yr	1900.00	297.30	303.89	303.89	306.14	0.011388	13.35	215.82	55.34	0.94
Main Channel	4.368	100Yr	2410.00	297.30	304.77	304.77	307.26	0.010955	14.29	267.27	61.41	0.94
Main Channel	4.368	500Yr	4070.00	297.30	307.24	307.24	310.23	0.009690	16.37	453.53	90.69	0.93
Main Channel	4.378	10Yr	975.00	298.00	303.28		304.21	0.007192	7.72	126.22	27.61	0.64
Main Channel	4.378	50Yr	1900.00	298.00	305.02	304.06	306.77	0.009201	10.68	197.84	63.30	0.75
Main Channel	4.378	100Yr	2410.00	298.00	306.12	305.39	307.90	0.007900	11.02	274.64	76.87	0.72
Main Channel	4.378	500Yr	4070.00	298.00	309.41		310.93	0.004758	10.95	598.60	126.43	0.59
Main Channel	4.3785		Bridge									
Main Channel	4.379	10Yr	975.00	300.70	304.71	304.70	306.19	0.008071	9.83	110.48	54.60	0.93
Main Channel	4.379	50Yr	1900.00	300.70	308.52	306.49	309.22	0.001727	7.45	426.24	106.58	0.49
Main Channel	4.379	100Yr	2410.00	300.70	309.23	307.22	310.09	0.001929	8.37	506.90	122.12	0.52
Main Channel	4.379	500Yr	4070.00	300.70	310.91	308.97	312.32	0.002587	11.01	769.86	194.01	0.62
Main Channel	4.389	10Yr	975.00	300.90	305.57	304.75	306.56	0.005279	8.12	138.17	47.40	0.68
Main Channel	4.389	50Yr	1900.00	300.90	308.47	309.40	309.40	0.002673	8.38	314.72	74.50	0.55
Main Channel	4.389	100Yr	2410.00	300.90	309.16		310.30	0.003204	9.40	368.32	81.08	0.59
Main Channel	4.389	500Yr	4070.00	300.90	310.51		312.74	0.005218	13.31	495.97	128.43	0.77
Main Channel	4.644	10Yr	975.00	317.60	322.31	322.31	324.15	0.010604	11.11	96.70	30.51	0.96
Main Channel	4.644	50Yr	1900.00	317.60	325.59	325.59	328.56	0.003353	9.20	480.55	327.64	0.59
Main Channel	4.644	100Yr	2410.00	317.60	326.00	326.00	327.00	0.003591	9.86	615.14	330.73	0.62
Main Channel	4.644	500Yr	4070.00	317.60	326.91	326.91	328.16	0.004687	12.12	920.72	349.68	0.72

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**APPENDIX H**  
**EXISTING CONDITIONS HEC-RAS MODEL OUTPUT**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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EXISTING CONDITIONS  
HEC-RAS MODEL OUTPUT

HEC-RAS Plan: Existing River: Coppermine Brook - Reach: Main Channel

Reach	River Sta	Profile	Q Total	Min Chl El	W.S. Elev	Cut W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	0.00	100Yr	4618.00	208.78	216.40	213.95	217.29	0.001889	8.56	1454.60	870.24	0.48
Main Channel	0.00	100Yr	1739.00	208.78	212.20	210.14	212.89	0.002467	6.80	312.65	100.21	0.50
Main Channel	0.00	50Yr	3360.00	208.78	216.00	212.38	216.48	0.001104	6.36	1133.80	609.08	0.36
Main Channel	0.00	25Yr	2677.00	208.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42
Main Channel	0.051	100Yr	4618.00	207.98	217.01		217.95	0.003112	9.83	1488.87	766.70	0.59
Main Channel	0.051	100Yr	1739.00	207.98	212.94		214.26	0.007523	9.88	226.45	58.38	0.83
Main Channel	0.051	50Yr	3360.00	207.98	216.19		217.23	0.003301	9.46	922.33	623.87	0.60
Main Channel	0.051	25Yr	2677.00	207.98	214.77	213.57	216.24	0.005397	10.54	349.61	148.31	0.74
Main Channel	0.061	100Yr	4618.00	208.13	217.77		218.23	0.001951	7.02	1921.79	852.32	0.41
Main Channel	0.061	100Yr	1739.00	208.13	213.68		214.72	0.006043	8.23	224.97	54.11	0.66
Main Channel	0.061	50Yr	3360.00	208.13	217.09		217.54	0.001846	6.48	1383.32	730.80	0.40
Main Channel	0.061	25Yr	2677.00	208.13	215.33	213.77	216.59	0.005156	9.23	402.20	289.05	0.64
Main Channel	0.074	100Yr	4618.00	207.71	217.89		218.40	0.002218	8.84	2094.30	884.55	0.51
Main Channel	0.074	100Yr	1739.00	207.71	213.93		215.38	0.007039	10.94	247.89	60.94	0.83
Main Channel	0.074	50Yr	3360.00	207.71	217.18		217.74	0.002284	8.51	1507.00	760.61	0.51
Main Channel	0.074	25Yr	2677.00	207.71	215.17	214.78	217.70	0.009142	14.30	381.90	231.91	0.97
Main Channel	0.08	100Yr	4618.00	207.70	217.96		218.45	0.001454	7.14	2020.64	883.77	0.40
Main Channel	0.08	100Yr	1739.00	207.70	214.93		215.56	0.001803	6.38	294.36	140.75	0.43
Main Channel	0.08	50Yr	3360.00	207.70	217.38		217.80	0.001212	6.26	1539.47	776.25	0.36
Main Channel	0.08	25Yr	2677.00	207.70	217.79	213.33	217.98	0.000559	4.38	1869.24	851.40	0.25
Main Channel	0.084	100Yr	4618.00	207.19	218.40		218.56	0.000497	5.09	2404.49	920.63	0.28
Main Channel	0.084	100Yr	1739.00	207.19	214.75		215.82	0.002419	8.30	209.45	100.94	0.58
Main Channel	0.084	50Yr	3360.00	207.19	217.71		217.89	0.000505	4.90	1804.70	825.53	0.28
Main Channel	0.084	25Yr	2677.00	207.19	217.92	216.15	218.01	0.000262	3.58	1992.10	860.88	0.20
Main Channel	0.09		Bridge									
Main Channel	0.094	100Yr	4618.00	206.50	218.38		218.62	0.000577	5.64	1963.04	656.68	0.30
Main Channel	0.094	100Yr	1739.00	206.50	215.28		216.02	0.001383	6.95	250.22	167.94	0.44
Main Channel	0.094	50Yr	3360.00	206.50	217.70		217.94	0.000545	5.25	1532.85	612.62	0.29
Main Channel	0.094	25Yr	2677.00	206.50	217.97	213.58	218.08	0.000273	3.78	1697.82	629.88	0.21
Main Channel	0.114	100Yr	4618.00	207.65	218.42		218.68	0.000462	4.39	1977.46	607.48	0.26
Main Channel	0.114	100Yr	1739.00	207.65	216.04		216.15	0.000254	2.69	742.37	416.02	0.19
Main Channel	0.114	50Yr	3360.00	207.65	217.81		217.99	0.000345	3.61	1616.97	564.80	0.23

HEC-RAS Plan: Existing River: Coppermire Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	Q Total (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Ch W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel/Chnt (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ch
Main Channel	0.144	25Yr	2677.00	207.85	218.00		218.11	0.000196	2.77	1729.71	578.49	0.17
Main Channel	0.148	100Yr	4383.00	208.35	218.23	217.21	219.03	0.004666	9.69	1058.16	345.74	0.57
Main Channel	0.148	10Yr	1634.00	208.35	215.81		216.40	0.003826	7.13	498.52	198.01	0.49
Main Channel	0.148	50Yr	3135.00	208.35	217.66	216.46	218.25	0.003505	8.04	874.91	296.49	0.49
Main Channel	0.148	25Yr	2522.00	208.35	217.93	215.91	218.25	0.001887	6.02	958.48	319.89	0.36
Main Channel	0.224	100Yr	4383.00	210.13	218.56	219.72	222.54	0.009149	17.90	399.06	250.77	1.15
Main Channel	0.224	10Yr	1634.00	210.13	216.75		218.45	0.004724	10.70	179.23	40.38	0.79
Main Channel	0.224	50Yr	3135.00	210.13	217.98	219.23	221.66	0.008254	16.11	268.83	185.08	1.08
Main Channel	0.224	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Main Channel	0.306	100Yr	4383.00	211.80	224.44	224.44	225.93	0.002835	11.87	1089.54	394.17	0.62
Main Channel	0.306	10Yr	1634.00	211.80	219.02	218.84	221.48	0.007713	12.63	138.32	32.11	0.92
Main Channel	0.306	50Yr	3135.00	211.80	221.91	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Main Channel	0.308	100Yr	4383.00	212.00	224.87		225.99	0.002197	10.70	1253.39	405.50	0.56
Main Channel	0.308	10Yr	1634.00	212.00	219.01	219.00	221.60	0.008344	12.99	134.70	32.06	0.96
Main Channel	0.308	50Yr	3135.00	212.00	224.96	223.36	225.50	0.001065	7.49	1299.99	409.99	0.39
Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Main Channel	0.316	100Yr	4383.00	212.85	224.27	222.23	226.87	0.006155	12.94	338.67	38.91	0.72
Main Channel	0.316	10Yr	1634.00	212.85	221.70	218.31	222.34	0.002258	6.46	253.11	36.72	0.41
Main Channel	0.316	50Yr	3135.00	212.85	224.68	220.60	225.91	0.002756	8.89	352.50	39.26	0.48
Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Main Channel	0.320		Bridge									
Main Channel	0.326	100Yr	4383.00	214.38	228.82	223.28	228.98	0.001119	7.51	1390.63	413.71	0.37
Main Channel	0.326	10Yr	1634.00	214.38	221.71	219.37	222.58	0.002825	7.50	217.99	36.75	0.52
Main Channel	0.326	50Yr	3135.00	214.38	225.30	221.67	226.64	0.002416	9.28	337.77	68.38	0.51
Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.92	0.001603	7.79	323.60	60.07	0.44
Main Channel	0.336	100Yr	4383.00	216.00	228.97	223.82	229.07	0.000328	3.75	2905.67	468.56	0.20
Main Channel	0.336	10Yr	1634.00	216.00	221.88		222.80	0.006496	8.32	320.04	184.50	0.75
Main Channel	0.336	50Yr	3135.00	216.00	226.68	223.00	226.81	0.000523	4.05	1887.21	420.92	0.24
Main Channel	0.336	25Yr	2522.00	216.00	225.81	222.56	225.95	0.000578	3.96	1530.68	402.92	0.25
Main Channel	0.588	100Yr	4383.00	220.60	231.45	231.45	233.08	0.004106	12.90	907.96	271.09	0.70

HFC-RAS Plan: Existing River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	O Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Chl W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Friction Coef
Main Channel	0.588	10Yr	1634.00	220.60	228.13		229.33	0.003768	9.58	279.61	82.69	0.63
Main Channel	0.588	50Yr	3135.00	220.60	228.69	228.69	232.17	0.010112	16.51	329.22	93.03	1.05
Main Channel	0.588	25Yr	2522.00	220.60	228.46	228.46	230.95	0.007448	13.88	307.92	88.70	0.89
Main Channel	0.729	100Yr	4383.00	226.80	235.20		236.93	0.006558	11.81	462.09	117.79	0.79
Main Channel	0.729	10Yr	1634.00	226.80	232.02	232.01	233.59	0.009010	10.31	174.49	62.28	0.87
Main Channel	0.729	50Yr	3135.00	226.80	235.37		236.18	0.002984	8.10	482.41	120.19	0.53
Main Channel	0.729	25Yr	2522.00	226.80	234.19		235.19	0.004219	8.74	352.01	100.76	0.62
Main Channel	0.748	100Yr	4383.00	227.50	235.95		237.67	0.008576	11.44	440.05	95.30	0.89
Main Channel	0.748	10Yr	1634.00	227.50	233.68	233.04	234.46	0.007174	7.63	238.40	81.32	0.75
Main Channel	0.748	50Yr	3135.00	227.50	235.62		236.63	0.005459	8.74	409.27	93.26	0.70
Main Channel	0.748	25Yr	2522.00	227.50	234.73		235.72	0.006912	8.64	327.93	88.19	0.76
Main Channel	0.758	100Yr	4383.00	229.00	236.32	235.75	238.14	0.008208	11.94	442.47	99.17	0.89
Main Channel	0.758	10Yr	1634.00	229.00	234.02	233.39	234.82	0.006821	7.72	238.77	80.53	0.74
Main Channel	0.758	50Yr	3135.00	229.00	235.84	234.79	236.98	0.005704	9.38	397.54	97.19	0.73
Main Channel	0.758	25Yr	2522.00	229.00	235.03	234.26	236.10	0.006646	9.03	323.64	89.85	0.76
Main Channel	0.759		Bridge									
Main Channel	0.760	100Yr	4383.00	229.10	237.28	235.77	238.40	0.004995	9.18	531.92	103.62	0.65
Main Channel	0.760	10Yr	1634.00	229.10	234.20	233.41	234.90	0.005850	7.16	252.33	82.22	0.68
Main Channel	0.760	50Yr	3135.00	229.10	236.25	234.83	237.11	0.004795	7.97	435.35	98.91	0.62
Main Channel	0.760	25Yr	2522.00	229.10	235.39	234.31	236.22	0.005565	7.82	355.26	93.26	0.66
Main Channel	0.770	100Yr	4383.00	229.00	237.50		238.67	0.004906	10.16	562.98	121.70	0.70
Main Channel	0.770	10Yr	1634.00	229.00	234.47		235.23	0.006543	7.80	247.21	86.73	0.73
Main Channel	0.770	50Yr	3135.00	229.00	236.42		237.38	0.004893	9.02	436.73	110.30	0.68
Main Channel	0.770	25Yr	2522.00	229.00	235.61		236.53	0.005638	8.71	353.02	97.90	0.71
Main Channel	0.798	100Yr	4383.00	230.50	238.25	236.71	239.30	0.003510	9.28	631.86	134.84	0.61
Main Channel	0.798	10Yr	1634.00	230.50	235.36		235.97	0.003711	6.73	291.89	98.12	0.58
Main Channel	0.798	50Yr	3135.00	230.50	237.13		238.01	0.003563	8.34	484.37	128.37	0.60
Main Channel	0.798	25Yr	2522.00	230.50	236.43		237.22	0.003688	7.80	403.22	109.50	0.60
Main Channel	0.808	100Yr	4383.00	230.50	237.62	237.62	240.18	0.008735	14.33	369.55	74.91	0.96
Main Channel	0.808	10Yr	1634.00	230.50	235.24	234.80	236.36	0.006327	9.19	206.26	62.68	0.76
Main Channel	0.808	50Yr	3135.00	230.50	236.69	236.46	238.62	0.008354	12.58	295.57	69.64	0.92
Main Channel	0.808	25Yr	2522.00	230.50	236.06	235.85	237.75	0.007903	11.47	258.49	66.84	0.88



HEC-RAS Plan: Existing River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	O Total (cfs)	Min Chl El (ft)	W/S Elev (ft)	Chl W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	1598	100Yr	4071.00	238.40	248.06	244.97	249.11	0.001846	8.77	855.01	413.45	0.50
Main Channel	1598	10Yr	1501.00	238.40	245.30	241.78	245.70	0.000979	5.11	293.91	81.59	0.34
Main Channel	1599	50Yr	2885.00	238.40	247.73	243.62	248.33	0.001078	6.55	734.93	316.33	0.38
Main Channel	1599	25Yr	2329.00	238.40	247.31	242.91	247.72	0.000796	5.46	628.13	192.40	0.32
Main Channel	1608	100Yr	4071.00	238.40	248.02	245.38	249.39	0.003017	10.70	792.74	270.94	0.63
Main Channel	1608	10Yr	1501.00	238.40	245.23	245.63	245.63	0.001845	6.55	305.23	69.57	0.46
Main Channel	1608	50Yr	2885.00	238.40	247.69	248.44	248.44	0.001722	7.89	718.35	219.39	0.47
Main Channel	1608	25Yr	2329.00	238.40	247.22	244.23	247.64	0.001482	7.05	617.00	204.41	0.43
Main Channel	1850	100Yr	4071.00	242.10	253.18	253.18	254.38	0.002886	11.38	1175.51	534.38	0.62
Main Channel	1850	10Yr	1501.00	242.10	248.39	248.39	250.37	0.007045	11.85	165.60	43.41	0.87
Main Channel	1850	50Yr	2885.00	242.10	249.94	249.81	253.87	0.010600	17.06	239.44	51.70	1.12
Main Channel	1850	25Yr	2329.00	242.10	249.79	249.79	252.50	0.007490	14.14	231.54	50.87	0.93
Main Channel	1850	100Yr	4071.00	241.60	254.45	248.55	254.71	0.000418	5.05	1483.93	358.51	0.25
Main Channel	1850	10Yr	1501.00	241.60	250.78	245.23	250.95	0.000337	3.62	559.38	136.76	0.21
Main Channel	1850	50Yr	2885.00	241.60	254.94	247.22	255.04	0.000166	3.27	1663.74	386.40	0.16
Main Channel	1850	25Yr	2329.00	241.60	253.14	246.46	253.30	0.000261	3.72	1063.08	282.66	0.19
Main Channel	1854		Bridge									
Main Channel	1858	100Yr	4071.00	241.40	254.55	248.47	254.77	0.000363	4.78	1590.91	375.35	0.23
Main Channel	1858	10Yr	1501.00	241.40	251.23	245.03	251.48	0.000374	4.00	375.51	183.75	0.22
Main Channel	1858	50Yr	2885.00	241.40	255.02	247.02	255.11	0.000150	3.14	1776.57	422.30	0.15
Main Channel	1858	25Yr	2329.00	241.40	253.25	246.27	253.38	0.000225	3.51	1151.64	300.21	0.18
Main Channel	1878	100Yr	4071.00	242.70	254.55		254.80	0.000568	5.36	1267.03	352.59	0.28
Main Channel	1878	10Yr	1501.00	242.70	251.11		251.57	0.001012	5.64	332.65	176.70	0.35
Main Channel	1878	50Yr	2885.00	242.70	255.03		255.12	0.000210	3.35	1442.66	383.52	0.17
Main Channel	1878	25Yr	2329.00	242.70	253.21		253.42	0.000485	4.56	841.71	294.81	0.25
Main Channel	1932	100Yr	4071.00	243.87	254.81		255.00	0.000813	5.12	1899.68	694.49	0.31
Main Channel	1932	10Yr	1501.00	243.87	251.29	249.50	252.20	0.003635	7.65	197.97	53.85	0.59
Main Channel	1932	50Yr	2885.00	243.87	255.12		255.20	0.000311	3.24	2120.69	714.59	0.19
Main Channel	1932	25Yr	2329.00	243.87	253.35		253.66	0.001196	5.49	958.03	576.98	0.36
Main Channel	1942	100Yr	4071.00	244.25	254.78	253.70	255.12	0.000977	6.50	1572.71	557.59	0.36
Main Channel	1942	10Yr	1501.00	244.25	251.56	249.03	252.36	0.002029	7.22	214.34	42.00	0.49
Main Channel	1942	50Yr	2885.00	244.25	255.11	251.32	255.24	0.000377	4.13	1760.17	574.40	0.23



HEC-RAS Plan: Existing River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Old W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Floude # Chl
Main Channel	2.247	100Yr	4380.00	245.20	255.60	252.62	255.63	0.000184	2.82	5698.99	1338.76	0.16
Main Channel	2.247	10Yr	1605.00	245.20	252.75	250.04	252.82	0.000359	3.16	2071.99	1207.36	0.21
Main Channel	2.247	50Yr	3395.00	245.20	255.47	251.47	255.49	0.000120	2.27	5528.18	1332.90	0.13
Main Channel	2.247	25Yr	2409.00	245.20	254.14	252.06	254.17	0.000175	2.48	3788.74	1271.30	0.15
Main Channel	2.262	100Yr	4380.00	245.00	255.63		255.64	0.000086	1.94	7950.48	1517.24	0.11
Main Channel	2.262	10Yr	1605.00	245.00	252.83		252.84	0.000099	1.67	3918.79	1379.04	0.11
Main Channel	2.262	50Yr	3395.00	245.00	255.49		255.50	0.000056	1.55	7739.81	1506.85	0.09
Main Channel	2.262	25Yr	2409.00	245.00	254.17		254.18	0.000068	1.54	5799.06	1435.16	0.09
Main Channel	2.432	100Yr	4380.00	247.60	255.45		256.03	0.002333	9.09	1654.30	697.13	0.59
Main Channel	2.432	10Yr	1605.00	247.60	252.75		253.23	0.002564	7.08	562.99	285.10	0.57
Main Channel	2.432	50Yr	3395.00	247.60	255.38		255.75	0.001471	7.18	1608.99	677.68	0.46
Main Channel	2.432	25Yr	2409.00	247.60	254.11		254.44	0.001582	6.57	1010.07	375.45	0.47
Main Channel	2.442	100Yr	4380.00	246.89	255.89		256.15	0.001003	5.44	938.22	529.59	0.37
Main Channel	2.442	10Yr	1605.00	246.89	253.22		253.38	0.000526	3.15	510.17	111.46	0.26
Main Channel	2.442	50Yr	3395.00	246.89	255.53		255.82	0.000656	4.34	860.11	432.82	0.30
Main Channel	2.442	25Yr	2409.00	246.89	254.30		254.52	0.000628	3.81	632.66	115.26	0.29
Main Channel	2.444		Bridge									
Main Channel	2.448	100Yr	4380.00	247.05	255.99		256.36	0.000772	4.94	1157.97	712.44	0.33
Main Channel	2.448	10Yr	1605.00	247.05	253.26		253.40	0.000460	3.03	530.07	115.14	0.24
Main Channel	2.448	50Yr	3395.00	247.05	255.81		256.06	0.000514	3.97	1035.41	601.44	0.27
Main Channel	2.448	25Yr	2409.00	247.05	254.52		254.73	0.000480	3.61	667.50	119.21	0.26
Main Channel	2.456	100Yr	4380.00	246.90	256.05		256.42	0.001367	7.48	2228.41	787.85	0.45
Main Channel	2.456	10Yr	1605.00	246.90	253.24		253.46	0.001106	5.14	885.37	341.66	0.38
Main Channel	2.456	50Yr	3395.00	246.90	255.84		256.09	0.000938	6.09	2067.33	735.84	0.37
Main Channel	2.456	25Yr	2409.00	246.90	254.57		254.75	0.000839	5.15	1368.48	385.71	0.34
Main Channel	2.920	100Yr	4380.00	249.90	258.46		258.52	0.000641	4.62	3980.75	1427.62	0.29
Main Channel	2.920	10Yr	1605.00	249.90	256.18		256.35	0.001392	5.38	1254.99	882.08	0.41
Main Channel	2.920	50Yr	3395.00	249.90	257.88		257.96	0.000696	4.57	3182.33	1348.43	0.30
Main Channel	2.920	25Yr	2409.00	249.90	256.89		257.02	0.001145	5.30	1952.67	1095.05	0.38
Main Channel	3.140	100Yr	3038.00	252.00	259.02		259.04	0.000280	2.71	3946.87	1163.01	0.19
Main Channel	3.140	10Yr	1263.00	252.00	257.12		257.14	0.000335	2.31	1972.06	916.04	0.20

HEC-RAS Plan: Existing River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Cmt (ft/s)	Flow Area (sq ft)	Top Width (ft)	Friction f Coef
Main Channel	3.149	50Yr	2430.00	252.00	258.48	255.85	258.50	0.000286	2.57	3394.02	1092.36	0.19
Main Channel	3.140	25Yr	1841.00	252.00	257.74	255.67	257.76	0.000343	2.56	2560.19	996.02	0.20
Main Channel	3.678	100Yr	3038.00	257.10	262.01	262.73	264.47	0.030016	17.20	507.26	392.53	1.56
Main Channel	3.678	10Yr	1263.00	257.10	261.87	261.87	262.42	0.006717	7.93	452.64	386.84	0.73
Main Channel	3.678	50Yr	2430.00	257.10	262.22	262.51	263.31	0.013445	11.93	589.54	400.96	1.05
Main Channel	3.678	25Yr	1841.00	257.10	262.21	262.21	262.84	0.007758	9.06	588.26	400.83	0.80
Main Channel	3.650	100Yr	3038.00	263.10	271.33	271.54	272.92	0.004098	12.39	480.87	228.94	0.78
Main Channel	3.650	10Yr	1263.00	263.10	267.07	268.08	270.33	0.018422	15.48	104.91	44.08	1.45
Main Channel	3.650	50Yr	2430.00	263.10	270.03	270.48	272.26	0.006434	13.74	277.91	83.37	0.95
Main Channel	3.650	25Yr	1841.00	263.10	268.31	269.00	271.36	0.012305	15.47	165.85	54.37	1.25
Main Channel	3.670	100Yr	3038.00	266.18	272.40	272.40	273.33	0.004603	9.38	623.16	368.78	0.68
Main Channel	3.670	10Yr	1263.00	266.18	269.87	269.87	271.54	0.011921	10.38	121.67	62.42	1.00
Main Channel	3.670	50Yr	2430.00	266.18	271.95	271.95	272.92	0.004825	9.11	478.48	326.92	0.69
Main Channel	3.670	25Yr	1841.00	266.18	271.30	271.30	272.36	0.005503	8.94	311.78	240.96	0.72
Main Channel	3.676		Bridge									
Main Channel	3.882	100Yr	3038.00	264.30	272.78	272.00	273.36	0.004210	7.85	728.63	390.64	0.57
Main Channel	3.882	10Yr	1263.00	264.30	272.14	270.58	272.31	0.001318	4.07	530.52	287.81	0.31
Main Channel	3.882	50Yr	2430.00	264.30	272.45	271.67	272.94	0.003695	7.07	617.29	336.99	0.53
Main Channel	3.882	25Yr	1841.00	264.30	272.17	271.22	272.53	0.002716	5.87	539.63	293.39	0.45
Main Channel	3.892	100Yr	3038.00	265.10	273.13	271.66	273.55	0.003020	7.94	1177.35	482.14	0.50
Main Channel	3.892	10Yr	1263.00	265.10	272.24	272.24	272.37	0.000992	4.19	825.62	329.52	0.28
Main Channel	3.892	50Yr	2430.00	265.10	272.76	271.16	273.11	0.002537	7.04	1012.39	402.60	0.46
Main Channel	3.892	25Yr	1841.00	265.10	272.40	270.52	272.65	0.001855	5.82	880.57	347.28	0.39
Main Channel	3.903	100Yr	3038.00	265.70	273.65	273.65	276.39	0.011168	15.11	326.31	85.45	0.97
Main Channel	3.903	10Yr	1263.00	265.70	271.71	271.71	272.77	0.005966	9.07	203.36	54.73	0.67
Main Channel	3.903	50Yr	2430.00	265.70	272.71	272.71	275.23	0.011866	14.26	261.28	61.60	0.98
Main Channel	3.903	25Yr	1841.00	265.70	271.81	271.81	273.96	0.011883	12.95	206.70	55.37	0.95
Main Channel	3.948	100Yr	3038.00	267.60	277.27	277.84	277.84	0.002537	8.32	1149.89	478.40	0.48
Main Channel	3.948	10Yr	1263.00	267.60	273.30	274.60	274.60	0.007390	9.86	178.16	49.06	0.75
Main Channel	3.948	50Yr	2430.00	267.60	276.09	275.71	277.21	0.004549	10.19	632.01	381.51	0.63
Main Channel	3.948	25Yr	1841.00	267.60	274.85	276.18	276.18	0.005872	10.39	324.10	145.90	0.69

HEC-RAS Plan: Existing River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cor. W.S. (ft)	E.G. Elev. (ft)	E.G. Slope (ft/ft)	Vel Chnt (ft/s)	Flow Area (sq. ft)	Top Width (ft)	Frouds # Chnt
Main Channel	3.985	100Yr	3038.00	269.32	277.90	275.74	278.25	0.002192	5.88	1085.67	464.21	0.38
Main Channel	3.985	10Yr	1263.00	269.32	275.11	273.92	275.49	0.003395	5.36	346.92	173.06	0.44
Main Channel	3.985	50Yr	2430.00	269.32	277.47	275.25	277.75	0.001840	5.18	908.79	354.43	0.34
Main Channel	3.985	25Yr	1841.00	269.32	276.55	274.61	276.81	0.001991	4.90	650.18	247.81	0.35
Main Channel	4.084	100Yr	3038.00	277.00	284.74	284.74	286.72	0.010779	12.72	387.18	115.34	0.90
Main Channel	4.084	10Yr	1263.00	277.00	282.37	282.37	283.80	0.012846	10.05	184.61	72.74	0.91
Main Channel	4.084	50Yr	2430.00	277.00	284.06	284.06	285.89	0.011120	11.95	313.27	103.16	0.90
Main Channel	4.084	25Yr	1841.00	277.00	283.32	283.32	284.94	0.011474	11.02	241.44	89.76	0.89
Main Channel	4.094	100Yr	3038.00	278.40	286.98	282.71	287.34	0.001094	4.82	630.06	221.33	0.30
Main Channel	4.094	10Yr	1263.00	278.40	284.14	281.16	284.29	0.000858	3.16	400.25	93.23	0.25
Main Channel	4.094	50Yr	2430.00	278.40	286.18	282.23	286.47	0.001002	4.30	585.75	150.49	0.29
Main Channel	4.094	25Yr	1841.00	278.40	285.26	281.72	285.47	0.000924	3.75	490.69	105.25	0.27
Main Channel	4.100	Bridge										
Main Channel	4.106	100Yr	3038.00	278.30	287.04	282.63	287.38	0.000575	4.72	643.12	235.73	0.30
Main Channel	4.106	10Yr	1263.00	278.30	284.18	281.06	284.33	0.000438	3.07	411.93	93.57	0.24
Main Channel	4.106	50Yr	2430.00	278.30	286.24	282.13	286.51	0.000524	4.20	578.29	164.31	0.28
Main Channel	4.106	25Yr	1841.00	278.30	285.30	281.62	285.51	0.000479	3.66	502.78	111.06	0.26
Main Channel	4.116	100Yr	3038.00	277.10	285.71	287.00	290.59	0.012888	20.37	281.51	71.17	1.28
Main Channel	4.116	10Yr	1263.00	277.10	282.95	283.91	286.27	0.011573	15.50	120.14	45.54	1.20
Main Channel	4.116	50Yr	2430.00	277.10	284.80	286.30	289.51	0.012190	19.51	220.26	62.73	1.30
Main Channel	4.116	25Yr	1841.00	277.10	283.96	285.23	288.05	0.011924	17.72	170.85	54.98	1.26
Main Channel	4.368	100Yr	3038.00	297.30	305.26	305.26	308.02	0.014878	15.48	298.67	66.27	0.98
Main Channel	4.368	10Yr	1263.00	297.30	302.48	302.48	304.25	0.015497	11.69	144.59	45.62	0.93
Main Channel	4.368	50Yr	2430.00	297.30	304.61	304.61	306.90	0.013537	13.91	257.81	60.34	0.93
Main Channel	4.368	25Yr	1841.00	297.30	303.63	303.63	305.69	0.014321	12.94	201.56	53.54	0.93
Main Channel	4.378	100Yr	3038.00	298.00	304.79	306.47	309.65	0.026848	17.80	183.93	57.09	1.28
Main Channel	4.378	10Yr	1263.00	298.00	301.08	302.67	306.40	0.075141	18.51	68.25	25.19	1.98
Main Channel	4.378	50Yr	2430.00	298.00	303.55	305.52	308.68	0.037538	18.17	133.78	28.84	1.46
Main Channel	4.378	25Yr	1841.00	298.00	302.29	303.92	307.61	0.051555	18.50	99.49	26.52	1.68
Main Channel	4.3785	Bridge										
Main Channel	4.379	100Yr	3038.00	300.70	309.93	307.93	310.86	0.001984	8.98	598.40	138.40	0.54

HEC-RAS Plan: Existing River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ctl
Main Channel	4.379	10Yr	1263.00	300.70	307.41	305.43	307.98	0.001399	6.01	315.92	92.89	0.43
Main Channel	4.379	50Yr	2430.00	300.70	309.23	307.20	310.01	0.001801	8.09	507.20	122.18	0.50
Main Channel	4.379	25Yr	1841.00	300.70	308.43	306.40	309.05	0.001578	7.06	416.96	105.50	0.46
Main Channel	4.359	100Yr	3038.00	300.90	309.80	308.36	311.12	0.004539	10.31	422.82	87.17	0.62
Main Channel	4.359	10Yr	1263.00	300.90	307.41	305.47	308.03	0.002998	6.75	240.70	64.61	0.48
Main Channel	4.359	50Yr	2430.00	300.90	309.15	307.55	310.23	0.004058	9.24	367.42	80.97	0.58
Main Channel	4.359	25Yr	1841.00	300.90	308.38	306.80	309.23	0.003546	8.08	307.91	73.74	0.53
Main Channel	4.644	100Yr	3038.00	317.60	325.62	326.31	327.76	0.010008	13.94	490.95	327.88	0.90
Main Channel	4.644	10Yr	1263.00	317.60	323.04	323.04	325.10	0.012817	11.90	121.93	33.14	0.95
Main Channel	4.644	50Yr	2430.00	317.60	325.21	325.99	327.43	0.010007	13.42	355.75	324.75	0.89
Main Channel	4.644	25Yr	1841.00	317.60	324.59	325.52	326.79	0.010013	12.63	213.42	123.29	0.88

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**APPENDIX I**  
**FLOODPLAIN MAPPING**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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PROJECT NO. 2235-19 DATE: MAY 2008 SCALE: 1"=300'

**LEGEND**

FEMA 100 YEAR FLOODPLAIN BOUNDARY - - - - -

MMI 100 YEAR FLOODPLAIN BOUNDARY - - - - -



MATCH MARK - SEE FIGURE 3

A north arrow pointing upwards and a graphic scale bar showing 0, 150, and 300 feet.

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REVISIONS


TOWN TOPO WITH FLOODPLAIN BOUNDARIES - NORTH

**COPPERMINE BROOK ANALYSIS**

BRISTOL, CONNECTICUT

RV DESIGNED	RV DRAWN	NEB CHECKED
SCALE: 1"=300'		
DATE: MAY 2008		
PROJECT NO. 2235-19		

FIGURE 4

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**APPENDIX J**  
**STEVENS STREET ALTERNATIVES HEC-RAS MODEL OUTPUT**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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**REMOVAL OF SEDIMENT FROM STEVENS STREET BRIDGE  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: Prop-1A River: Coppermine Brook Reach: Main Channel

Reach	River Sta	Profile	O. Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Out W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnt (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ch
Main Channel	0.00	100Yr	4618.00	205.78	216.40	213.95	217.29	0.001889	8.56	1454.60	870.24	0.48
Main Channel	0.00	10Yr	1739.00	205.78	212.20	210.14	212.89	0.002467	6.80	312.65	100.21	0.50
Main Channel	0.00	50Yr	3360.00	205.78	216.00	212.98	216.48	0.001104	6.36	1133.80	609.08	0.36
Main Channel	0.00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42
Main Channel	0.051	100Yr	4618.00	207.98	217.01		217.95	0.003112	9.83	1488.87	766.70	0.59
Main Channel	0.051	10Yr	1739.00	207.98	212.94		214.26	0.007523	9.88	226.45	58.38	0.83
Main Channel	0.051	50Yr	3360.00	207.98	216.19		217.23	0.003301	9.46	922.33	623.67	0.60
Main Channel	0.051	25Yr	2677.00	207.98	214.77	213.67	216.24	0.005397	10.54	349.61	148.31	0.74
Main Channel	0.061	100Yr	4618.00	208.13	217.77		218.23	0.001951	7.02	1921.79	852.32	0.41
Main Channel	0.061	10Yr	1739.00	208.13	213.68		214.72	0.006043	8.23	224.97	54.11	0.66
Main Channel	0.061	50Yr	3360.00	208.13	217.09		217.54	0.001846	6.48	1383.32	730.80	0.40
Main Channel	0.061	25Yr	2677.00	208.13	215.33	213.77	216.59	0.005156	9.23	402.20	289.05	0.64
Main Channel	0.074	100Yr	4618.00	207.71	217.89		218.40	0.002218	8.84	2094.30	884.55	0.51
Main Channel	0.074	10Yr	1739.00	207.71	213.93		215.38	0.007039	10.94	247.89	60.94	0.83
Main Channel	0.074	50Yr	3360.00	207.71	217.18		217.74	0.002284	8.51	1507.00	760.61	0.51
Main Channel	0.074	25Yr	2677.00	207.71	215.17	214.78	217.70	0.009142	14.30	381.90	231.91	0.97
Main Channel	0.08	100Yr	4618.00	207.70	217.96		218.45	0.001454	7.14	2020.64	883.77	0.40
Main Channel	0.08	10Yr	1739.00	207.70	214.93		215.56	0.001803	6.38	294.36	140.75	0.43
Main Channel	0.08	50Yr	3360.00	207.70	217.98		217.80	0.001212	6.26	1539.47	776.25	0.36
Main Channel	0.08	25Yr	2677.00	207.70	217.79	213.33	217.98	0.000559	4.38	1869.24	851.40	0.25
Main Channel	0.084	100Yr	4618.00	207.19	218.40	216.97	218.56	0.000497	5.09	2404.49	920.63	0.28
Main Channel	0.084	10Yr	1739.00	207.19	214.75	212.82	215.82	0.002419	8.30	209.45	100.94	0.58
Main Channel	0.084	50Yr	3360.00	207.19	217.71	216.50	217.89	0.000505	4.90	1804.70	825.53	0.28
Main Channel	0.084	25Yr	2677.00	207.19	217.92	216.15	218.01	0.000262	3.58	1982.10	860.88	0.20
Main Channel	0.09		Bridge									
Main Channel	0.094	100Yr	4618.00	206.50	218.38	217.08	218.62	0.000577	5.64	1963.04	656.68	0.30
Main Channel	0.094	10Yr	1739.00	206.50	215.28	212.11	216.02	0.001383	6.95	250.22	167.94	0.44
Main Channel	0.094	50Yr	3360.00	206.50	217.70	214.56	217.94	0.000545	5.25	1532.85	612.62	0.29
Main Channel	0.094	25Yr	2677.00	206.50	217.97	213.58	218.08	0.000273	3.78	1897.82	629.88	0.21
Main Channel	0.114	100Yr	4618.00	207.65	218.42		218.68	0.000462	4.39	1977.46	607.48	0.26
Main Channel	0.114	10Yr	1739.00	207.65	216.04		216.15	0.000254	2.69	742.37	416.02	0.19
Main Channel	0.114	50Yr	3360.00	207.65	217.81		217.99	0.000345	3.61	1616.97	564.80	0.23

HFC-RAS Plan: Prop-1A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Cmt (ft/s)	Flow Area (sq ft)	Top Width (ft)	Profile ± Cht
Main Channel	0.114	25Yr	2677.00	207.65	218.00		218.11	0.000196	2.77	1729.71	578.49	0.17
Main Channel	0.148	100Yr	4383.00	208.35	218.23	217.21	219.03	0.004866	9.69	1058.16	345.74	0.57
Main Channel	0.148	10Yr	1634.00	208.35	215.81		216.40	0.003826	7.13	438.52	198.01	0.49
Main Channel	0.148	50Yr	3135.00	208.35	217.66	216.46	218.25	0.003505	8.04	874.91	296.49	0.49
Main Channel	0.148	25Yr	2522.00	208.35	217.93	215.91	218.25	0.001887	6.02	958.48	319.89	0.36
Main Channel	0.224	100Yr	4383.00	210.13	218.56	219.72	222.54	0.009149	17.90	399.06	250.77	1.15
Main Channel	0.224	10Yr	1634.00	210.13	216.75		218.45	0.004724	10.70	179.23	40.38	0.79
Main Channel	0.224	50Yr	3135.00	210.13	217.98	219.23	221.66	0.008254	16.11	268.83	185.08	1.08
Main Channel	0.224	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Main Channel	0.306	100Yr	4383.00	211.80	224.44	224.44	225.93	0.002835	11.87	1089.54	394.17	0.62
Main Channel	0.306	10Yr	1634.00	211.80	219.02	218.84	221.48	0.007713	12.63	138.32	32.11	0.92
Main Channel	0.306	50Yr	3135.00	211.80	221.91	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Main Channel	0.308	100Yr	4383.00	212.00	224.87		225.99	0.002197	10.70	1253.39	405.50	0.56
Main Channel	0.308	10Yr	1634.00	212.00	219.01	219.00	221.60	0.008344	12.99	134.70	32.06	0.96
Main Channel	0.308	50Yr	3135.00	212.00	224.96	223.36	225.50	0.001065	7.49	1299.99	409.99	0.39
Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Main Channel	0.316	100Yr	4383.00	212.85	224.27	222.23	226.87	0.006155	12.94	338.67	38.91	0.72
Main Channel	0.316	10Yr	1634.00	212.85	221.70	218.31	222.34	0.002258	6.46	253.11	36.72	0.41
Main Channel	0.316	50Yr	3135.00	212.85	224.68	220.60	225.91	0.002756	8.89	352.50	39.26	0.48
Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	36.46	0.45
Main Channel	0.320		Bridge									
Main Channel	0.326	100Yr	4383.00	214.38	228.32	223.28	228.98	0.001119	7.51	1390.63	413.71	0.37
Main Channel	0.326	10Yr	1634.00	214.38	221.71	219.37	222.58	0.002825	7.50	217.99	36.75	0.52
Main Channel	0.326	50Yr	3135.00	214.38	225.30	221.67	226.64	0.002416	9.28	337.77	66.38	0.51
Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Main Channel	0.336	100Yr	4383.00	216.00	228.97	223.82	229.07	0.000328	3.75	2905.67	468.56	0.20
Main Channel	0.336	10Yr	1634.00	216.00	221.88		222.80	0.006496	8.32	320.04	184.50	0.75
Main Channel	0.336	50Yr	3135.00	216.00	226.68	223.00	226.81	0.000523	4.05	1897.21	420.92	0.24
Main Channel	0.336	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000578	3.96	1530.68	402.92	0.25
Main Channel	0.568	100Yr	4383.00	220.60	231.45	231.45	233.08	0.004106	12.90	907.96	271.09	0.70

HEC-RAS Plan: Prop-1A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cut V/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	0.588	10Yr	1634.00	220.60	228.13		229.33	0.003768	9.58	279.61	82.59	0.63
Main Channel	0.588	50Yr	3135.00	220.60	228.69	228.69	232.17	0.010112	16.51	329.22	93.03	1.05
Main Channel	0.588	25Yr	2522.00	220.60	228.46	228.46	230.95	0.007448	13.88	307.92	88.70	0.89
Main Channel	0.729	100Yr	4383.00	226.80	235.20		236.93	0.006558	11.81	482.09	117.79	0.79
Main Channel	0.729	10Yr	1634.00	226.80	232.02	232.01	233.59	0.009010	10.31	174.49	62.28	0.87
Main Channel	0.729	50Yr	3135.00	226.80	235.37	235.37	236.18	0.002984	8.10	482.41	120.19	0.53
Main Channel	0.729	25Yr	2522.00	226.80	234.19	234.19	235.19	0.004219	8.74	352.01	100.76	0.62
Main Channel	0.748	100Yr	4383.00	227.50	235.95		237.67	0.008576	11.44	440.05	95.30	0.89
Main Channel	0.748	10Yr	1634.00	227.50	233.69	233.04	234.46	0.007174	7.63	238.40	81.32	0.75
Main Channel	0.748	50Yr	3135.00	227.50	235.82	235.82	236.63	0.005459	8.74	409.27	93.26	0.70
Main Channel	0.748	25Yr	2522.00	227.50	234.73	234.73	235.72	0.006912	8.64	327.93	88.19	0.76
Main Channel	0.758	100Yr	4383.00	229.00	236.32		238.14	0.008208	11.94	442.47	99.17	0.89
Main Channel	0.758	10Yr	1634.00	229.00	234.02	233.39	234.82	0.006821	7.72	238.77	80.53	0.74
Main Channel	0.758	50Yr	3135.00	229.00	235.84	234.79	236.98	0.005704	9.38	387.54	97.19	0.73
Main Channel	0.758	25Yr	2522.00	229.00	235.03	234.26	236.10	0.006646	9.03	323.64	89.85	0.76
Main Channel	0.759		Bridge									
Main Channel	0.760	100Yr	4383.00	229.10	237.28		238.40	0.004995	9.18	531.92	103.62	0.65
Main Channel	0.760	10Yr	1634.00	229.10	234.20	233.41	234.90	0.005850	7.16	252.33	82.22	0.68
Main Channel	0.760	50Yr	3135.00	229.10	236.25	234.83	237.11	0.004795	7.97	435.35	98.91	0.62
Main Channel	0.760	25Yr	2522.00	229.10	235.39	234.31	236.22	0.005565	7.82	355.26	93.26	0.66
Main Channel	0.770	100Yr	4383.00	229.00	237.50		238.67	0.004906	10.18	562.98	121.70	0.70
Main Channel	0.770	10Yr	1634.00	229.00	234.47	233.77	235.23	0.006543	7.80	247.21	86.73	0.73
Main Channel	0.770	50Yr	3135.00	229.00	236.42	234.83	237.38	0.004893	9.02	436.73	110.30	0.68
Main Channel	0.770	25Yr	2522.00	229.00	235.61	234.31	236.53	0.005638	8.71	353.02	97.90	0.71
Main Channel	0.798	100Yr	4383.00	230.50	238.25		239.30	0.003510	9.28	631.86	134.84	0.61
Main Channel	0.798	10Yr	1634.00	230.50	235.96	235.36	235.97	0.003711	6.73	291.89	98.12	0.58
Main Channel	0.798	50Yr	3135.00	230.50	237.13	236.42	238.01	0.003563	8.34	484.37	126.37	0.60
Main Channel	0.798	25Yr	2522.00	230.50	236.43	235.61	237.22	0.003688	7.80	403.22	109.50	0.60
Main Channel	0.808	100Yr	4383.00	230.50	237.82		240.18	0.008735	14.33	389.55	74.91	0.96
Main Channel	0.808	10Yr	1634.00	230.50	235.24	234.80	236.36	0.006327	9.19	206.26	62.68	0.76
Main Channel	0.808	50Yr	3135.00	230.50	236.59	236.46	238.62	0.008354	12.58	295.57	69.64	0.92
Main Channel	0.808	25Yr	2522.00	230.50	236.05	235.85	237.75	0.007903	11.47	258.49	66.84	0.88



HEC-RAS Plan: Prop-1A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W/S Elev (ft)	Gr W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frroude # Ch
Main Channel	1.598	100Yr	4071.00	238.40	248.06	244.97	249.11	0.001846	8.77	855.01	413.45	0.50
Main Channel	1.598	10Yr	1501.00	238.40	245.30	241.78	245.70	0.000979	5.11	293.91	81.59	0.34
Main Channel	1.598	50Yr	2885.00	238.40	247.73	243.82	248.33	0.001078	6.55	734.93	316.33	0.38
Main Channel	1.598	25Yr	2329.00	238.40	247.31	242.91	247.72	0.000796	5.46	628.13	192.40	0.32
Main Channel	1.608	100Yr	4071.00	238.40	248.02	245.38	249.39	0.003017	10.70	792.74	270.94	0.63
Main Channel	1.608	10Yr	1501.00	238.40	245.23	241.78	245.83	0.001845	6.55	305.23	69.57	0.46
Main Channel	1.608	50Yr	2885.00	238.40	247.89	243.82	248.44	0.001722	7.89	718.35	219.39	0.47
Main Channel	1.608	25Yr	2329.00	238.40	247.22	244.23	247.84	0.001482	7.05	617.00	204.41	0.43
Main Channel	1.850	100Yr	4071.00	242.10	253.18	253.18	254.38	0.002886	11.38	1175.51	534.38	0.62
Main Channel	1.850	10Yr	1501.00	242.10	248.39	248.39	250.37	0.007045	11.85	165.60	43.41	0.87
Main Channel	1.850	50Yr	2885.00	242.10	249.94	249.81	253.87	0.010600	17.06	239.44	51.70	1.12
Main Channel	1.850	25Yr	2329.00	242.10	249.79	249.79	252.50	0.007490	14.14	231.54	50.87	0.93
Main Channel	1.860	100Yr	4071.00	241.60	254.45	248.65	254.71	0.000418	5.05	1483.93	358.51	0.25
Main Channel	1.860	10Yr	1501.00	241.60	250.78	245.23	250.95	0.000337	3.62	559.38	136.76	0.21
Main Channel	1.860	50Yr	2885.00	241.60	254.94	247.22	255.04	0.000166	3.27	1663.74	386.40	0.16
Main Channel	1.860	25Yr	2329.00	241.60	253.14	246.46	253.30	0.000261	3.72	1063.08	282.66	0.19
Main Channel	1.864		Bridge									
Main Channel	1.869	100Yr	4071.00	241.40	254.55	248.47	254.77	0.000363	4.78	1590.91	375.35	0.23
Main Channel	1.868	10Yr	1501.00	241.40	251.23	245.03	251.48	0.000374	4.00	375.51	183.75	0.22
Main Channel	1.868	50Yr	2885.00	241.40	255.02	247.02	255.11	0.000150	3.14	1776.57	422.30	0.15
Main Channel	1.868	25Yr	2329.00	241.40	253.25	246.27	253.38	0.000225	3.51	1151.64	300.21	0.18
Main Channel	1.878	100Yr	4071.00	242.70	254.55	248.47	254.80	0.000568	5.36	1267.03	352.59	0.28
Main Channel	1.878	10Yr	1501.00	242.70	251.11	245.03	251.67	0.001012	5.64	332.65	176.70	0.35
Main Channel	1.878	50Yr	2885.00	242.70	255.03	247.02	255.12	0.000210	3.35	1442.66	383.52	0.17
Main Channel	1.878	25Yr	2329.00	242.70	253.21	246.27	253.42	0.000485	4.56	841.71	294.81	0.25
Main Channel	1.932	100Yr	4071.00	243.87	254.81	248.65	255.00	0.000813	5.12	1899.68	694.49	0.31
Main Channel	1.932	10Yr	1501.00	243.87	251.29	249.60	252.20	0.003635	7.65	197.97	53.85	0.59
Main Channel	1.932	50Yr	2885.00	243.87	255.12	247.02	255.20	0.000311	3.24	2120.69	714.59	0.19
Main Channel	1.932	25Yr	2329.00	243.87	253.35	246.27	253.66	0.001196	5.49	958.03	576.98	0.36
Main Channel	1.942	100Yr	4071.00	244.25	254.78	253.70	255.12	0.000977	6.50	1572.71	557.59	0.36
Main Channel	1.942	10Yr	1501.00	244.25	251.56	249.03	252.36	0.002029	7.22	214.34	42.00	0.49
Main Channel	1.942	50Yr	2885.00	244.25	255.11	251.32	255.24	0.000377	4.13	1760.17	574.40	0.23



HEC-RAS Plan Prop-1A River Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	O. Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Ch W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Profile # Chl
Main Channel	2.247	100Yr	4380.00	245.20	255.60	252.62	255.63	0.000184	2.82	5698.99	1338.76	0.16
Main Channel	2.247	10Yr	1605.00	245.20	252.75	250.04	252.82	0.000359	3.16	2071.99	1207.36	0.21
Main Channel	2.247	50Yr	3395.00	245.20	255.47	251.47	255.49	0.000120	2.27	5528.18	1332.90	0.13
Main Channel	2.247	25Yr	2409.00	245.20	254.14	252.06	254.17	0.000175	2.48	3788.74	1271.30	0.15
Main Channel	2.262	100Yr	4380.00	245.00	255.63	255.63	255.64	0.000086	1.94	7950.48	1517.24	0.11
Main Channel	2.262	10Yr	1605.00	245.00	252.63	252.63	252.84	0.000099	1.67	3918.79	1379.04	0.11
Main Channel	2.262	50Yr	3395.00	245.00	255.49	255.49	255.50	0.000056	1.55	7739.81	1508.85	0.09
Main Channel	2.262	25Yr	2409.00	245.00	254.17	254.17	254.18	0.000068	1.54	5799.06	1435.16	0.09
Main Channel	2.432	100Yr	4380.00	247.60	255.45	252.20	256.03	0.002333	9.09	1654.30	697.13	0.59
Main Channel	2.432	10Yr	1605.00	247.60	252.75	250.25	253.23	0.002564	7.08	562.99	285.10	0.57
Main Channel	2.432	50Yr	3395.00	247.60	255.38	251.59	255.75	0.001471	7.18	1608.99	677.68	0.46
Main Channel	2.432	25Yr	2409.00	247.60	254.11	250.89	254.44	0.001582	6.57	1010.07	375.45	0.47
Main Channel	2.442	100Yr	4380.00	246.89	255.69	252.20	256.15	0.001003	5.44	936.22	529.59	0.37
Main Channel	2.442	10Yr	1605.00	246.89	253.22	250.25	253.38	0.000526	3.15	510.17	111.46	0.26
Main Channel	2.442	50Yr	3395.00	246.89	255.63	251.59	255.82	0.000656	4.34	860.11	432.82	0.30
Main Channel	2.442	25Yr	2409.00	246.89	254.30	250.89	254.52	0.000628	3.81	632.66	115.26	0.29
Main Channel	2.444		Bridge									
Main Channel	2.446	100Yr	4380.00	247.05	255.99	252.06	256.36	0.000772	4.94	1157.97	712.44	0.33
Main Channel	2.446	10Yr	1605.00	247.05	253.26	250.11	253.40	0.000460	3.03	530.07	115.14	0.24
Main Channel	2.446	50Yr	3395.00	247.05	255.81	251.45	256.06	0.000514	3.97	1035.41	601.44	0.27
Main Channel	2.446	25Yr	2409.00	247.05	254.52	250.78	254.73	0.000480	3.61	667.50	119.21	0.26
Main Channel	2.456	100Yr	4380.00	246.90	256.05	256.05	256.42	0.001367	7.48	2228.41	787.85	0.45
Main Channel	2.456	10Yr	1605.00	246.90	253.24	253.46	253.46	0.001106	5.14	885.37	341.66	0.38
Main Channel	2.456	50Yr	3395.00	246.90	255.84	255.09	256.09	0.000938	6.09	2067.33	735.84	0.37
Main Channel	2.456	25Yr	2409.00	246.90	254.57	254.75	254.75	0.000839	5.15	1368.48	385.71	0.34
Main Channel	2.920	100Yr	4380.00	249.90	258.46	258.46	258.52	0.000641	4.62	3980.75	1427.62	0.29
Main Channel	2.920	10Yr	1605.00	249.90	256.18	256.18	256.35	0.001392	5.38	1254.99	882.08	0.41
Main Channel	2.920	50Yr	3395.00	249.90	257.88	257.88	257.96	0.000696	4.57	3182.33	1348.43	0.30
Main Channel	2.920	25Yr	2409.00	249.90	256.89	256.89	257.02	0.001145	5.30	1952.67	1095.05	0.38
Main Channel	3.140	100Yr	3038.00	252.00	259.02	255.99	259.04	0.000280	2.71	3946.87	1163.01	0.19
Main Channel	3.140	10Yr	1263.00	252.00	257.12	255.46	257.14	0.000335	2.31	1972.06	916.04	0.20

HEC-RAS Plan: Prop-1A River, Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chit (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #	Chl
Main Channel	3.148	50Yr	2430.00	252.00	258.48	255.85	258.50	0.000286	2.57	3334.02	1092.36	0.19	
Main Channel	3.140	25Yr	1841.00	252.00	257.74	255.67	257.76	0.000343	2.56	2560.19	996.02	0.20	
Main Channel	3.678	100Yr	3038.00	257.10	262.01	262.73	264.47	0.030016	17.20	507.26	392.53	1.56	
Main Channel	3.678	10Yr	1263.00	257.10	261.87	261.87	262.42	0.006717	7.93	452.64	386.84	0.73	
Main Channel	3.678	50Yr	2430.00	257.10	262.22	262.51	263.31	0.013445	11.93	589.54	400.96	1.05	
Main Channel	3.674	25Yr	1841.00	257.10	262.21	262.21	262.84	0.007758	9.06	588.26	400.83	0.80	
Main Channel	3.860	100Yr	3038.00	263.10	271.33	271.54	272.92	0.004098	12.39	480.87	228.94	0.78	
Main Channel	3.860	10Yr	1263.00	263.10	267.07	268.08	270.33	0.018422	15.48	104.91	44.08	1.45	
Main Channel	3.860	50Yr	2430.00	263.10	270.03	270.48	272.26	0.006434	13.74	277.91	83.37	0.95	
Main Channel	3.860	25Yr	1841.00	263.10	268.23	269.00	271.43	0.013145	15.81	161.55	53.73	1.29	
Main Channel	3.870	100Yr	3038.00	266.18	272.40	272.40	273.33	0.004603	9.38	623.16	368.78	0.68	
Main Channel	3.870	10Yr	1263.00	266.18	269.87	269.87	271.54	0.011921	10.38	121.67	62.42	1.00	
Main Channel	3.870	50Yr	2430.00	266.18	271.95	271.95	272.92	0.004825	9.11	478.48	328.92	0.69	
Main Channel	3.870	25Yr	1841.00	266.18	270.79	271.30	272.44	0.009333	10.80	218.34	171.06	0.92	
Main Channel	3.876		Bridge										
Main Channel	3.882	100Yr	3038.00	264.30	272.77	271.33	273.36	0.001695	7.21	813.25	388.62	0.44	
Main Channel	3.882	10Yr	1263.00	264.30	272.00	267.75	272.16	0.000484	3.61	584.22	267.02	0.23	
Main Channel	3.882	50Yr	2430.00	264.30	272.48	269.58	272.94	0.001314	6.20	718.59	343.91	0.38	
Main Channel	3.882	25Yr	1841.00	264.30	267.77	268.69	271.29	0.024882	15.05	122.32	58.58	1.45	
Main Channel	3.892	100Yr	3038.00	265.10	273.03	271.66	273.49	0.003254	8.17	1131.38	461.36	0.52	
Main Channel	3.892	10Yr	1263.00	265.10	272.04	271.16	272.20	0.001158	4.44	763.12	308.07	0.30	
Main Channel	3.892	50Yr	2430.00	265.10	272.67	271.16	273.04	0.002669	7.16	979.48	384.77	0.47	
Main Channel	3.892	25Yr	1841.00	265.10	269.42	270.52	272.73	0.033122	16.93	208.42	130.37	1.50	
Main Channel	3.903	100Yr	3038.00	265.70	273.65	273.65	276.39	0.011168	15.11	326.31	85.45	0.97	
Main Channel	3.903	10Yr	1263.00	265.70	271.45	265.70	272.65	0.007125	9.61	189.45	53.01	0.73	
Main Channel	3.903	50Yr	2430.00	265.70	272.71	272.71	275.23	0.011866	14.26	261.28	61.60	0.98	
Main Channel	3.903	25Yr	1841.00	265.70	271.81	271.81	273.96	0.011883	12.95	208.70	55.37	0.95	
Main Channel	3.948	100Yr	3038.00	267.60	277.27	277.27	277.84	0.002537	8.32	1149.89	478.40	0.48	
Main Channel	3.948	10Yr	1263.00	267.60	273.30	273.30	274.60	0.007365	9.85	178.40	49.09	0.74	
Main Channel	3.948	50Yr	2430.00	267.60	276.09	275.71	277.21	0.004549	10.19	632.01	381.51	0.63	
Main Channel	3.948	25Yr	1841.00	267.60	274.85	274.85	276.18	0.005872	10.39	324.10	145.90	0.69	

HEC-RAS Plan: Prop-1A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Ch W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frroude # Chl
Main Channel	3.985	100Yr	3038.00	269.32	277.90	275.74	278.25	0.002192	5.88	1085.67	464.21	0.38
Main Channel	3.985	10Yr	1263.00	269.32	276.11	273.52	275.49	0.003994	5.36	346.40	173.08	0.44
Main Channel	3.985	50Yr	2430.00	269.32	277.47	275.25	277.75	0.001840	5.18	908.79	354.43	0.34
Main Channel	3.985	25Yr	1841.00	269.32	276.55	274.61	276.81	0.001991	4.90	650.18	247.81	0.35
Main Channel	4.084	100Yr	3038.00	277.00	284.74	284.74	286.72	0.010779	12.72	387.18	115.34	0.90
Main Channel	4.084	10Yr	1263.00	277.00	282.37	282.37	283.80	0.012846	10.05	164.61	72.74	0.91
Main Channel	4.084	50Yr	2430.00	277.00	284.06	284.06	285.89	0.011120	11.95	313.27	103.16	0.90
Main Channel	4.084	25Yr	1841.00	277.00	283.32	283.32	284.94	0.011474	11.02	241.44	89.76	0.89
Main Channel	4.094	100Yr	3038.00	278.40	286.98	282.71	287.34	0.001094	4.82	630.06	221.33	0.30
Main Channel	4.094	10Yr	1263.00	278.40	284.14	281.16	284.29	0.000858	3.16	400.25	93.23	0.25
Main Channel	4.094	50Yr	2430.00	278.40	286.18	282.23	286.47	0.001002	4.30	565.75	150.49	0.29
Main Channel	4.094	25Yr	1841.00	278.40	285.26	281.72	285.47	0.000924	3.75	490.69	105.25	0.27
Main Channel	4.100	Bridge										
Main Channel	4.106	100Yr	3038.00	278.30	287.04	282.63	287.38	0.000575	4.72	643.12	235.73	0.30
Main Channel	4.106	10Yr	1263.00	278.30	284.18	281.06	284.33	0.000438	3.07	411.93	93.57	0.24
Main Channel	4.106	50Yr	2430.00	278.30	286.24	282.13	286.51	0.000524	4.20	578.29	164.31	0.28
Main Channel	4.106	25Yr	1841.00	278.30	285.30	281.62	285.51	0.000479	3.66	502.78	111.06	0.26
Main Channel	4.116	100Yr	3038.00	277.10	285.71	287.00	290.59	0.012888	20.37	281.51	71.17	1.28
Main Channel	4.116	10Yr	1263.00	277.10	282.95	283.91	286.27	0.011573	15.50	120.14	45.54	1.20
Main Channel	4.116	50Yr	2430.00	277.10	284.80	286.30	289.51	0.012190	19.51	220.26	62.73	1.30
Main Channel	4.116	25Yr	1841.00	277.10	283.96	285.23	288.05	0.011924	17.72	170.85	54.98	1.26
Main Channel	4.368	100Yr	3038.00	297.30	305.26	305.26	308.02	0.014878	15.48	288.67	66.27	0.98
Main Channel	4.368	10Yr	1263.00	297.30	302.48	302.48	304.25	0.015497	11.69	144.59	45.62	0.93
Main Channel	4.368	50Yr	2430.00	297.30	304.51	304.61	306.90	0.013537	13.91	257.81	60.34	0.93
Main Channel	4.368	25Yr	1841.00	297.30	303.63	303.63	305.69	0.014321	12.94	201.56	53.54	0.93
Main Channel	4.378	100Yr	3038.00	298.00	304.79	306.47	309.65	0.028848	17.80	183.93	57.09	1.28
Main Channel	4.378	10Yr	1263.00	298.00	301.08	302.67	306.40	0.075141	18.51	68.25	25.19	1.98
Main Channel	4.378	50Yr	2430.00	298.00	303.55	305.52	308.68	0.037538	18.17	133.78	28.84	1.46
Main Channel	4.378	25Yr	1841.00	298.00	302.29	303.92	307.61	0.051555	18.50	99.49	26.52	1.68
Main Channel	4.378b	Bridge										
Main Channel	4.379	100Yr	3038.00	300.70	309.93	307.93	310.86	0.001984	8.98	598.40	138.40	0.54

HEC-RAS Plan: Prop-1A River Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	O Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Ord W.S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel/Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	4.379	10Yr	1263.00	300.70	307.41	305.43	307.88	0.001399	6.01	315.92	92.89	0.43
Main Channel	4.379	50Yr	2430.00	300.70	309.23	307.20	310.01	0.001801	8.09	507.20	122.18	0.50
Main Channel	4.379	25Yr	1841.00	300.70	308.43	306.40	309.05	0.001578	7.06	416.96	105.50	0.46
Main Channel	4.359	100Yr	3038.00	300.90	309.80	308.36	311.12	0.004539	10.31	422.82	87.17	0.62
Main Channel	4.359	10Yr	1263.00	300.90	307.41	305.47	308.03	0.002998	6.75	240.70	64.61	0.48
Main Channel	4.359	50Yr	2430.00	300.90	309.15	307.55	310.23	0.004058	9.24	367.42	80.97	0.58
Main Channel	4.359	25Yr	1841.00	300.90	308.38	306.60	309.23	0.003546	8.08	307.91	73.74	0.53
Main Channel	4.644	100Yr	3038.00	317.60	325.62	326.31	327.76	0.010008	13.94	490.95	327.88	0.90
Main Channel	4.644	10Yr	1263.00	317.60	323.04	323.04	325.10	0.012817	11.90	121.93	33.14	0.95
Main Channel	4.644	50Yr	2430.00	317.60	325.21	325.99	327.43	0.010007	13.42	355.75	324.75	0.89
Main Channel	4.644	25Yr	1841.00	317.60	324.59	325.52	326.79	0.010013	12.63	213.42	123.29	0.88

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**REPAIR OF THE BERM AT CURRENT ELEVATION  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: Prop-1B River: Coppemine Brook Reach: Main Channel

Reach	River Site	Profile	Q Total (cfs)	Min Ch Elevation (ft)	W.S. Elev (ft)	Cut W.S. (ft)	F.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ctl
Main Channel	0.00	100Yr	4618.00	205.78	216.40	213.95	217.29	0.001889	8.56	1454.60	870.24	0.48
Main Channel	0.00	10Yr	1739.00	205.78	212.20	210.14	212.89	0.002467	6.80	312.85	100.21	0.50
Main Channel	0.00	50Yr	3360.00	205.78	216.00	212.38	216.48	0.001104	6.36	1133.80	609.08	0.36
Main Channel	0.00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42
Main Channel	0.051	100Yr	4618.00	207.98	217.01		217.95	0.003112	9.83	1488.87	766.70	0.59
Main Channel	0.051	10Yr	1739.00	207.98	212.94		214.26	0.007523	9.88	226.45	58.38	0.83
Main Channel	0.051	50Yr	3360.00	207.98	216.19		217.23	0.003301	9.46	922.33	623.67	0.60
Main Channel	0.051	25Yr	2677.00	207.98	214.77	213.57	216.24	0.005397	10.54	349.61	148.31	0.74
Main Channel	0.061	100Yr	4618.00	208.13	217.77		218.23	0.001951	7.02	1921.79	852.32	0.41
Main Channel	0.061	10Yr	1739.00	208.13	213.68		214.72	0.006043	8.23	224.97	54.11	0.66
Main Channel	0.061	50Yr	3360.00	208.13	217.09		217.54	0.001846	6.48	1383.32	730.80	0.40
Main Channel	0.061	25Yr	2677.00	208.13	215.33	213.77	216.59	0.005156	9.23	402.20	289.05	0.64
Main Channel	0.074	100Yr	4618.00	207.71	217.89		218.40	0.002218	8.84	2094.30	884.55	0.51
Main Channel	0.074	10Yr	1739.00	207.71	213.93		215.38	0.007039	10.94	247.89	60.94	0.83
Main Channel	0.074	50Yr	3360.00	207.71	217.18		217.74	0.002284	8.51	1507.00	760.61	0.51
Main Channel	0.074	25Yr	2677.00	207.71	215.17	214.78	217.70	0.009142	14.30	381.90	231.91	0.97
Main Channel	0.08	100Yr	4618.00	207.70	217.96		218.45	0.001454	7.14	2020.64	883.77	0.40
Main Channel	0.08	10Yr	1739.00	207.70	214.93		215.56	0.001803	6.38	294.36	140.75	0.43
Main Channel	0.08	50Yr	3360.00	207.70	217.38		217.80	0.001212	6.26	1539.47	776.25	0.36
Main Channel	0.08	25Yr	2677.00	207.70	217.79	213.33	217.98	0.000559	4.38	1869.24	851.40	0.25
Main Channel	0.084	100Yr	4618.00	207.19	218.40	216.97	218.56	0.000497	5.09	2404.49	920.63	0.28
Main Channel	0.084	10Yr	1739.00	207.19	214.75	212.82	215.82	0.002419	8.30	209.45	100.94	0.58
Main Channel	0.084	50Yr	3360.00	207.19	217.71	216.50	217.89	0.000505	4.90	1804.70	825.53	0.28
Main Channel	0.084	25Yr	2677.00	207.19	217.92	216.15	218.01	0.000262	3.58	1982.10	860.88	0.20
Main Channel	0.09	Bridge										
Main Channel	0.094	100Yr	4618.00	206.50	218.38	217.08	218.62	0.000577	5.64	1963.04	656.68	0.30
Main Channel	0.094	10Yr	1739.00	206.50	215.28	212.11	216.02	0.001383	6.95	250.22	167.94	0.44
Main Channel	0.094	50Yr	3360.00	206.50	217.70	214.56	217.94	0.000545	5.25	1532.85	612.62	0.29
Main Channel	0.094	25Yr	2677.00	206.50	217.97	213.58	218.08	0.000273	3.78	1697.82	629.88	0.21
Main Channel	0.114	100Yr	4618.00	207.65	218.42		218.68	0.000462	4.39	1977.46	607.48	0.26
Main Channel	0.114	10Yr	1739.00	207.65	216.04		216.15	0.000254	2.69	742.37	416.02	0.19
Main Channel	0.114	50Yr	3360.00	207.65	217.81		217.99	0.000345	3.61	1616.97	564.80	0.23

HEC-RAS Plan: Prop-1B River: Coppersmiths Brook Reach: Main Channel (Continued)

Reach	River Site	Profile	Q Total (cfs)	Min Ch. El. (ft)	W.S. Elev (ft)	Gr. W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel. Cont. (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ch1
Main Channel	0.174	25Yr	2677.00	207.65	218.00		218.11	0.000196	2.77	1729.71	578.49	0.17
Main Channel	0.146	100Yr	4383.00	208.35	218.23	217.21	219.03	0.004666	9.69	1058.16	345.74	0.57
Main Channel	0.148	10Yr	1634.00	208.35	215.81		216.40	0.003826	7.13	438.52	198.01	0.49
Main Channel	0.148	50Yr	3135.00	208.35	217.66	216.46	218.25	0.003505	8.04	874.91	296.49	0.49
Main Channel	0.148	25Yr	2522.00	208.35	217.93	215.91	218.25	0.001887	6.02	958.48	319.89	0.36
Main Channel	0.224	100Yr	4383.00	210.13	218.56	219.72	222.54	0.009149	17.90	399.06	250.77	1.15
Main Channel	0.224	10Yr	1634.00	210.13	216.75		218.45	0.004724	10.70	179.23	40.38	0.79
Main Channel	0.224	50Yr	3135.00	210.13	217.98	219.23	221.66	0.008254	16.11	268.83	185.08	1.08
Main Channel	0.224	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Main Channel	0.306	100Yr	4383.00	211.80	224.44	224.44	225.93	0.002835	11.87	1089.54	394.17	0.62
Main Channel	0.306	10Yr	1634.00	211.80	219.02	218.84	221.48	0.007713	12.63	138.32	32.11	0.92
Main Channel	0.306	50Yr	3135.00	211.80	221.91	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Main Channel	0.308	100Yr	4383.00	212.00	224.87		225.99	0.002197	10.70	1253.39	405.50	0.56
Main Channel	0.308	10Yr	1634.00	212.00	219.01	219.00	221.60	0.008344	12.99	134.70	32.06	0.96
Main Channel	0.308	50Yr	3135.00	212.00	224.96	223.36	225.50	0.001065	7.49	1299.99	409.99	0.39
Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005461	13.33	267.04	98.08	0.83
Main Channel	0.316	100Yr	4383.00	212.85	224.27	222.23	226.87	0.006155	12.94	338.67	38.91	0.72
Main Channel	0.316	10Yr	1634.00	212.85	221.70	218.31	222.34	0.002258	6.46	253.11	36.72	0.41
Main Channel	0.316	50Yr	3135.00	212.85	224.68	220.60	225.91	0.002756	8.89	352.50	39.26	0.48
Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Main Channel	0.320		Bridge									
Main Channel	0.326	100Yr	4383.00	214.38	228.32	223.28	228.98	0.001119	7.51	1390.63	413.71	0.37
Main Channel	0.326	10Yr	1634.00	214.38	221.71	219.37	222.58	0.002825	7.50	217.99	36.75	0.52
Main Channel	0.326	50Yr	3135.00	214.38	225.30	221.87	226.64	0.002416	9.28	337.77	68.38	0.51
Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Main Channel	0.326	100Yr	4383.00	216.00	228.97	223.82	229.07	0.000328	3.75	2905.67	468.56	0.20
Main Channel	0.326	10Yr	1634.00	216.00	221.88		222.80	0.006496	8.32	320.04	184.50	0.75
Main Channel	0.326	50Yr	3135.00	216.00	226.68	223.00	228.81	0.000523	4.05	1887.21	420.92	0.24
Main Channel	0.326	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000576	3.96	1530.68	402.92	0.25
Main Channel	0.588	100Yr	4383.00	220.60	231.45	231.45	233.08	0.004106	12.90	907.96	271.09	0.70

HEC-RAS Plan Prop-1B River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W/S Elev (ft)	Ch W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #	Ch
Main Channel	0.588	10Yr	1634.00	220.60	228.13		229.33	0.003768	9.58	279.61	82.59	0.63	
Main Channel	0.588	50Yr	3135.00	220.60	228.69	228.69	232.17	0.010112	16.51	329.22	93.03	1.05	
Main Channel	0.588	25Yr	2522.00	220.60	228.46	228.46	230.95	0.007448	13.88	307.92	88.70	0.89	
Main Channel	0.729	100Yr	4383.00	226.80	235.20		236.93	0.006558	11.81	462.09	117.79	0.79	
Main Channel	0.729	10Yr	1634.00	226.80	232.02	232.01	233.59	0.009010	10.31	174.49	62.28	0.87	
Main Channel	0.729	50Yr	3135.00	226.80	235.37		236.18	0.002984	8.10	482.41	120.19	0.53	
Main Channel	0.729	25Yr	2522.00	226.80	234.19		235.19	0.004219	8.74	352.01	100.76	0.62	
Main Channel	0.748	100Yr	4383.00	227.50	235.95		237.67	0.008576	11.44	440.05	95.30	0.89	
Main Channel	0.748	10Yr	1634.00	227.50	233.68	233.04	234.46	0.007174	7.63	238.40	81.32	0.75	
Main Channel	0.748	50Yr	3135.00	227.50	235.62		236.63	0.005459	8.74	409.27	93.26	0.70	
Main Channel	0.748	25Yr	2522.00	227.50	234.73		235.72	0.006912	8.64	327.93	88.19	0.76	
Main Channel	0.758	100Yr	4383.00	229.00	236.32	235.75	238.14	0.008208	11.94	442.47	99.17	0.89	
Main Channel	0.758	10Yr	1634.00	229.00	234.02	233.39	234.82	0.006821	7.72	238.77	80.53	0.74	
Main Channel	0.758	50Yr	3135.00	229.00	235.84	234.79	236.98	0.005704	9.38	397.54	97.19	0.73	
Main Channel	0.758	25Yr	2522.00	229.00	235.03	234.26	236.10	0.006646	9.03	323.64	89.85	0.76	
Main Channel	0.759		Bridge										
Main Channel	0.760	100Yr	4383.00	229.10	237.28	235.77	238.40	0.004995	9.18	531.92	103.62	0.65	
Main Channel	0.760	10Yr	1634.00	229.10	234.20	233.41	234.90	0.005850	7.16	262.33	82.22	0.68	
Main Channel	0.760	50Yr	3135.00	229.10	236.25	234.83	237.11	0.004795	7.97	435.35	98.91	0.62	
Main Channel	0.760	25Yr	2522.00	229.10	235.39	234.31	236.22	0.005565	7.82	355.26	93.26	0.66	
Main Channel	0.770	100Yr	4383.00	229.00	237.50		238.67	0.004906	10.16	562.98	121.70	0.70	
Main Channel	0.770	10Yr	1634.00	229.00	234.47		235.23	0.006543	7.80	247.21	86.73	0.73	
Main Channel	0.770	50Yr	3135.00	229.00	236.42		237.38	0.004893	9.02	436.73	110.30	0.68	
Main Channel	0.770	25Yr	2522.00	229.00	235.61		236.53	0.005638	8.71	353.02	97.90	0.71	
Main Channel	0.798	100Yr	4383.00	230.50	238.25	236.71	239.30	0.003510	9.28	631.86	134.84	0.61	
Main Channel	0.798	10Yr	1634.00	230.50	235.36		235.97	0.003711	6.73	291.89	98.12	0.58	
Main Channel	0.798	50Yr	3135.00	230.50	237.13		238.01	0.003563	8.34	484.37	128.37	0.60	
Main Channel	0.798	25Yr	2522.00	230.50	236.43		237.22	0.003688	7.80	403.22	109.50	0.60	
Main Channel	0.808	100Yr	4383.00	230.50	237.62	237.62	240.18	0.008735	14.33	369.55	74.91	0.96	
Main Channel	0.808	10Yr	1634.00	230.50	235.24	234.80	236.36	0.006327	9.19	206.26	62.68	0.76	
Main Channel	0.808	50Yr	3135.00	230.50	236.59	236.46	238.62	0.008354	12.58	295.57	69.64	0.92	
Main Channel	0.808	25Yr	2522.00	230.50	236.05	235.85	237.75	0.007903	11.47	258.49	66.84	0.88	



HEC-RAS Plan: Prop-1B River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profiles	Q Total (cfs)	Min Ch El (ft)	W/S Elev (ft)	Crt W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ch
Main Channel	1.998	100Yr	4071.00	238.40	248.06	244.97	249.11	0.001846	8.77	855.01	413.45	0.50
Main Channel	1.998	10Yr	1501.00	238.40	245.30	241.78	245.70	0.000979	5.11	293.91	81.59	0.34
Main Channel	1.998	50Yr	2885.00	238.40	247.73	243.62	248.33	0.001078	6.55	734.93	316.33	0.38
Main Channel	1.998	25Yr	2329.00	238.40	247.31	242.91	247.72	0.000796	5.46	628.13	192.40	0.32
Main Channel	1.908	100Yr	4071.00	238.40	248.02	245.38	249.39	0.003017	10.70	792.74	270.94	0.63
Main Channel	1.908	10Yr	1501.00	238.40	245.23	245.83	245.83	0.001845	6.55	305.23	69.57	0.46
Main Channel	1.908	50Yr	2885.00	238.40	247.89	248.44	248.44	0.001722	7.89	718.35	219.39	0.47
Main Channel	1.908	25Yr	2329.00	238.40	247.22	244.23	247.84	0.001482	7.05	617.00	204.41	0.43
Main Channel	1.850	100Yr	4071.00	242.10	253.18	253.18	254.38	0.002886	11.38	1175.51	534.38	0.62
Main Channel	1.850	10Yr	1501.00	242.10	248.39	250.37	250.37	0.007045	11.85	165.60	43.41	0.87
Main Channel	1.850	50Yr	2885.00	242.10	249.94	249.81	253.87	0.010600	17.06	239.44	51.70	1.12
Main Channel	1.850	25Yr	2329.00	242.10	249.79	249.79	252.50	0.007490	14.14	231.54	50.87	0.93
Main Channel	1.860	100Yr	4071.00	241.60	254.45	248.65	254.71	0.000418	5.05	1483.93	358.51	0.25
Main Channel	1.860	10Yr	1501.00	241.60	250.78	245.23	250.95	0.000337	3.62	559.38	136.76	0.21
Main Channel	1.860	50Yr	2885.00	241.60	254.94	247.22	255.04	0.000166	3.27	1663.74	386.40	0.16
Main Channel	1.860	25Yr	2329.00	241.60	253.14	246.46	253.30	0.000261	3.72	1063.08	282.66	0.19
Main Channel	1.864		Bridge									
Main Channel	1.868	100Yr	4071.00	241.40	254.55	248.47	254.77	0.000363	4.78	1590.91	375.35	0.23
Main Channel	1.868	10Yr	1501.00	241.40	251.23	245.03	251.48	0.000374	4.00	375.51	183.75	0.22
Main Channel	1.868	50Yr	2885.00	241.40	255.02	247.02	255.11	0.000150	3.14	1776.57	422.30	0.15
Main Channel	1.868	25Yr	2329.00	241.40	253.25	246.27	253.38	0.000225	3.51	1151.64	300.21	0.18
Main Channel	1.878	100Yr	4071.00	242.70	254.55	254.80	254.80	0.000568	5.36	1267.03	352.59	0.28
Main Channel	1.878	10Yr	1501.00	242.70	251.11	251.57	251.57	0.001012	5.64	332.65	176.70	0.35
Main Channel	1.878	50Yr	2885.00	242.70	255.03	255.12	255.12	0.000210	3.35	1442.66	383.52	0.17
Main Channel	1.878	25Yr	2329.00	242.70	253.21	253.42	253.42	0.000485	4.56	841.71	294.81	0.25
Main Channel	1.932	100Yr	4071.00	243.87	254.81	255.00	255.00	0.000813	5.12	1899.68	694.49	0.31
Main Channel	1.932	10Yr	1501.00	243.87	251.29	249.60	252.20	0.003635	7.65	197.97	53.85	0.59
Main Channel	1.932	50Yr	2885.00	243.87	255.12	255.20	255.20	0.000311	3.24	2120.69	714.59	0.19
Main Channel	1.932	25Yr	2329.00	243.87	253.35	253.66	253.66	0.001196	5.49	958.03	576.98	0.36
Main Channel	1.942	100Yr	4071.00	244.25	254.78	253.70	255.12	0.000977	6.50	1572.71	557.59	0.36
Main Channel	1.942	10Yr	1501.00	244.25	251.56	249.03	252.36	0.002029	7.22	214.34	42.00	0.49
Main Channel	1.942	50Yr	2885.00	244.25	255.11	251.32	255.24	0.000377	4.13	1760.17	574.40	0.23



HFC-RAS Plan: Prop-1B River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Cim (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frontie # Cht
Main Channel	2.247	100Yr	4380.00	245.20	255.60	252.62	255.63	0.000184	2.82	5698.99	1338.76	0.16
Main Channel	2.247	10Yr	1605.00	245.20	252.75	250.04	252.82	0.000359	3.16	2071.99	1207.98	0.21
Main Channel	2.247	50Yr	3395.00	245.20	255.47	251.47	255.49	0.000120	2.27	5528.18	1332.90	0.13
Main Channel	2.247	25Yr	2409.00	245.20	254.14	252.06	254.17	0.000175	2.48	3788.74	1271.30	0.15
Main Channel	2.262	100Yr	4380.00	245.00	255.63	255.64	255.64	0.000086	1.94	7960.48	1517.24	0.11
Main Channel	2.262	10Yr	1605.00	245.00	252.83	252.84	252.84	0.000099	1.67	3918.79	1379.04	0.11
Main Channel	2.262	50Yr	3395.00	245.00	255.49	255.49	255.50	0.000056	1.55	7739.81	1506.85	0.09
Main Channel	2.262	25Yr	2409.00	245.00	254.17	254.18	254.18	0.000068	1.54	5799.06	1435.16	0.09
Main Channel	2.432	100Yr	4380.00	247.60	255.45	255.03	256.03	0.002333	9.09	1654.30	697.13	0.59
Main Channel	2.432	10Yr	1605.00	247.60	252.75	252.23	253.23	0.002564	7.08	582.99	285.10	0.57
Main Channel	2.432	50Yr	3395.00	247.60	255.38	255.75	255.75	0.001471	7.18	1608.99	677.68	0.46
Main Channel	2.432	25Yr	2409.00	247.60	254.11	254.44	254.44	0.001582	6.57	1010.07	375.45	0.47
Main Channel	2.442	100Yr	4380.00	246.89	256.69	252.20	256.15	0.001003	5.44	938.22	529.59	0.37
Main Channel	2.442	10Yr	1605.00	246.89	253.22	250.25	253.38	0.000526	3.15	510.17	111.46	0.26
Main Channel	2.442	50Yr	3395.00	246.89	255.53	251.59	255.82	0.000656	4.34	860.11	432.82	0.30
Main Channel	2.442	25Yr	2409.00	246.89	254.30	250.89	254.52	0.000628	3.81	632.66	115.26	0.29
Main Channel	2.444		Bridge									
Main Channel	2.446	100Yr	4380.00	247.05	255.99	252.06	256.36	0.000772	4.94	1157.97	712.44	0.33
Main Channel	2.446	10Yr	1605.00	247.05	253.26	250.11	253.40	0.000460	3.03	530.07	115.14	0.24
Main Channel	2.446	50Yr	3395.00	247.05	255.81	251.45	256.06	0.000514	3.97	1035.41	601.44	0.27
Main Channel	2.446	25Yr	2409.00	247.05	254.52	250.78	254.73	0.000480	3.61	667.50	119.21	0.26
Main Channel	2.456	100Yr	4380.00	246.90	256.05	256.42	256.42	0.001367	7.48	2228.41	787.85	0.45
Main Channel	2.456	10Yr	1605.00	246.90	253.24	253.46	253.46	0.001106	5.14	885.37	341.66	0.38
Main Channel	2.456	50Yr	3395.00	246.90	255.84	256.09	256.09	0.000938	6.09	2067.33	735.84	0.37
Main Channel	2.456	25Yr	2409.00	246.90	254.57	254.75	254.75	0.000839	5.15	1368.48	385.71	0.34
Main Channel	2.920	100Yr	4380.00	249.90	258.46	258.52	258.52	0.000641	4.62	3980.75	1427.62	0.29
Main Channel	2.920	10Yr	1605.00	249.90	256.18	256.35	256.35	0.001392	5.38	1254.99	882.08	0.41
Main Channel	2.920	50Yr	3395.00	249.90	257.88	257.96	257.96	0.000696	4.57	3182.33	1348.43	0.30
Main Channel	2.920	25Yr	2409.00	249.90	256.89	257.02	257.02	0.001145	5.30	1952.67	1095.05	0.38
Main Channel	3.140	100Yr	3038.00	252.00	259.02	255.99	259.04	0.000280	2.71	3946.87	1163.01	0.19
Main Channel	3.140	10Yr	1263.00	252.00	257.12	255.46	257.14	0.000335	2.31	1972.06	916.04	0.20

HEC-RAS Plan: Prop-1B River: Coppemine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Friction f, Chi
Main Channel	3.140	50Yr	2430.00	252.00	258.48	255.85	258.50	0.000286	2.57	3334.02	1092.36	0.19
Main Channel	3.140	25Yr	1841.00	252.00	257.74	255.67	257.76	0.000343	2.56	2560.19	996.02	0.20
Main Channel	3.678	100Yr	3038.00	257.10	262.73	262.73	263.53	0.009666	10.97	802.93	422.01	0.91
Main Channel	3.678	10Yr	1263.00	257.10	261.87	261.87	262.42	0.006717	7.93	452.64	386.84	0.73
Main Channel	3.678	50Yr	2430.00	257.10	262.51	262.51	263.21	0.008495	9.94	709.38	412.91	0.86
Main Channel	3.678	25Yr	1841.00	257.10	262.21	262.21	262.84	0.007758	9.06	588.26	400.83	0.80
Main Channel	3.860	100Yr	3038.00	263.10	269.64	271.54	273.85	0.012934	18.69	247.94	72.80	1.34
Main Channel	3.860	10Yr	1263.00	263.10	267.07	268.08	270.33	0.018422	15.48	104.91	44.08	1.45
Main Channel	3.860	50Yr	2430.00	263.10	268.87	270.48	272.74	0.013815	17.65	197.71	58.94	1.35
Main Channel	3.860	25Yr	1841.00	263.10	268.11	269.00	271.55	0.014558	16.35	155.11	52.75	1.35
Main Channel	3.870	100Yr	3038.00	266.18	272.29	272.29	274.89	0.009596	13.38	251.94	80.59	0.98
Main Channel	3.870	10Yr	1263.00	266.18	269.87	269.87	271.54	0.011921	10.38	121.67	62.42	1.00
Main Channel	3.870	50Yr	2430.00	266.18	271.52	271.52	273.80	0.010112	12.48	213.22	74.80	0.98
Main Channel	3.870	25Yr	1841.00	266.18	270.68	270.68	272.63	0.010930	11.48	173.08	68.50	0.99
Main Channel	3.876		Bridge									
Main Channel	3.892	100Yr	3038.00	264.30	275.66	272.55	275.69	0.000214	2.31	2889.05	891.23	0.14
Main Channel	3.892	10Yr	1263.00	264.30	272.92	270.20	273.35	0.001926	5.39	250.28	79.68	0.39
Main Channel	3.892	50Yr	2430.00	264.30	274.50	271.76	274.55	0.000420	2.94	1885.90	791.16	0.19
Main Channel	3.892	25Yr	1841.00	264.30	273.09	270.94	274.00	0.003889	7.80	258.05	96.96	0.55
Main Channel	3.892	100Yr	3038.00	265.10	275.66	272.59	275.72	0.000409	3.53	2882.53	788.88	0.19
Main Channel	3.892	10Yr	1263.00	265.10	272.91	270.06	273.50	0.002319	6.82	306.37	94.85	0.44
Main Channel	3.892	50Yr	2430.00	265.10	274.50	272.22	274.59	0.000652	4.11	2018.88	701.84	0.24
Main Channel	3.892	25Yr	1841.00	265.10	274.06	271.21	274.14	0.000560	3.69	1716.69	674.52	0.22
Main Channel	3.903	100Yr	3038.00	265.70	274.08	273.70	276.49	0.009172	14.21	354.65	77.50	0.88
Main Channel	3.903	10Yr	1263.00	265.70	273.05	270.68	273.65	0.002645	6.97	263.03	64.63	0.46
Main Channel	3.903	50Yr	2430.00	265.70	273.20	272.72	275.28	0.009056	13.07	292.43	65.89	0.86
Main Channel	3.903	25Yr	1841.00	265.70	273.42	271.81	274.52	0.004628	9.53	307.04	67.81	0.62
Main Channel	3.948	100Yr	3038.00	267.60	277.26	276.00	277.83	0.002562	8.36	1144.47	477.71	0.48
Main Channel	3.948	10Yr	1263.00	267.60	273.71	272.82	274.78	0.005645	9.04	198.73	52.09	0.66
Main Channel	3.948	50Yr	2430.00	267.60	275.45	274.95	277.56	0.008100	12.89	320.61	95.32	0.82
Main Channel	3.948	25Yr	1841.00	267.60	274.55	273.69	276.22	0.007425	11.35	249.28	67.82	0.77

HEC-RAS Plan: Prop-1B River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cr'd W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Twp Width (ft)	Friction # Cd
Main Channel	3.985	100Yr	3038.00	269.32	277.59	275.73	278.48	0.004568	8.25	473.11	90.93	0.54
Main Channel	3.985	10Yr	1263.00	269.32	275.14	273.50	275.61	0.003879	5.75	264.07	80.10	0.47
Main Channel	3.985	50Yr	2430.00	269.32	277.89	275.12	278.40	0.002500	6.27	500.64	92.26	0.40
Main Channel	3.985	25Yr	1841.00	269.32	276.59	274.42	277.08	0.002969	6.02	384.55	86.51	0.43
Main Channel	4.084	100Yr	3038.00	277.00	284.74	284.74	286.72	0.010779	12.72	387.18	115.34	0.90
Main Channel	4.084	10Yr	1263.00	277.00	282.40	282.40	283.80	0.012557	9.97	166.27	73.14	0.90
Main Channel	4.084	50Yr	2430.00	277.00	284.06	284.06	285.89	0.011137	11.96	313.06	103.13	0.90
Main Channel	4.084	25Yr	1841.00	277.00	283.31	283.31	284.94	0.011542	11.04	240.80	89.63	0.89
Main Channel	4.094	100Yr	3038.00	278.40	286.98	282.71	287.34	0.001094	4.82	630.06	221.33	0.30
Main Channel	4.094	10Yr	1263.00	278.40	284.13	281.16	284.29	0.000862	3.16	399.62	93.21	0.25
Main Channel	4.094	50Yr	2430.00	278.40	286.18	282.23	286.47	0.001001	4.29	565.81	150.66	0.29
Main Channel	4.094	25Yr	1841.00	278.40	285.26	281.72	285.48	0.000923	3.75	490.89	105.34	0.27
Main Channel	4.109		Bridge									
Main Channel	4.106	100Yr	3038.00	278.30	287.04	282.63	287.38	0.000575	4.72	643.12	235.73	0.30
Main Channel	4.106	10Yr	1263.00	278.30	284.18	281.06	284.32	0.000441	3.07	411.32	93.56	0.24
Main Channel	4.106	50Yr	2430.00	278.30	286.24	282.13	286.51	0.000524	4.20	578.35	164.37	0.28
Main Channel	4.106	25Yr	1841.00	278.30	285.31	281.62	285.52	0.000479	3.66	502.97	111.15	0.26
Main Channel	4.116	100Yr	3038.00	277.10	285.71	287.00	290.59	0.011288	20.37	281.51	71.17	1.28
Main Channel	4.116	10Yr	1263.00	277.10	282.95	283.91	286.27	0.011573	15.50	120.14	45.54	1.20
Main Channel	4.116	50Yr	2430.00	277.10	284.80	286.30	289.51	0.012190	19.51	220.26	62.73	1.30
Main Channel	4.116	25Yr	1841.00	277.10	283.96	285.23	288.05	0.011924	17.72	170.85	54.98	1.26
Main Channel	4.368	100Yr	3038.00	297.30	305.26	305.26	308.02	0.014878	15.48	298.67	66.27	0.98
Main Channel	4.368	10Yr	1263.00	297.30	302.48	302.48	304.25	0.015497	11.69	144.59	45.62	0.93
Main Channel	4.368	50Yr	2430.00	297.30	304.61	304.61	306.90	0.013537	13.91	257.81	60.34	0.93
Main Channel	4.368	25Yr	1841.00	297.30	303.63	303.63	305.69	0.014321	12.94	201.56	53.54	0.93
Main Channel	4.378	100Yr	3038.00	298.00	304.79	306.47	309.65	0.026848	17.80	183.93	57.09	1.28
Main Channel	4.378	10Yr	1263.00	298.00	301.08	302.67	306.40	0.075141	18.51	68.25	25.19	1.98
Main Channel	4.378	50Yr	2430.00	298.00	303.55	305.52	308.68	0.037538	18.17	193.78	28.84	1.46
Main Channel	4.378	25Yr	1841.00	298.00	302.29	303.92	307.61	0.051555	18.50	99.49	26.52	1.68
Main Channel	4.378		Bridge									
Main Channel	4.579	100Yr	3038.00	300.70	309.93	307.93	310.86	0.001984	8.98	598.40	138.40	0.54

HEC-RAS Plan: Prop-1B River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cht
Main Channel	4.379	10Yr	1263.00	300.70	307.41	305.43	307.88	0.001399	6.01	315.92	92.89	0.43
Main Channel	4.379	50Yr	2430.00	300.70	309.23	307.20	310.01	0.001801	8.09	507.20	122.18	0.50
Main Channel	4.379	25Yr	1841.00	300.70	308.43	306.40	309.05	0.001578	7.06	416.96	105.50	0.46
Main Channel	4.389	100Yr	3038.00	300.90	309.80	308.36	311.12	0.004539	10.31	422.82	87.17	0.62
Main Channel	4.389	10Yr	1263.00	300.90	307.41	305.47	308.03	0.002998	6.75	240.70	64.61	0.48
Main Channel	4.389	50Yr	2430.00	300.90	309.15	307.55	310.23	0.004058	9.24	367.42	80.97	0.58
Main Channel	4.389	25Yr	1841.00	300.90	308.38	306.60	309.23	0.003546	8.08	307.91	73.74	0.53
Main Channel	4.644	100Yr	3038.00	317.60	325.62	326.31	327.76	0.010008	13.94	490.95	327.88	0.90
Main Channel	4.644	10Yr	1263.00	317.60	323.04	323.04	325.10	0.012817	11.90	121.93	33.14	0.95
Main Channel	4.644	50Yr	2430.00	317.60	325.21	325.99	327.43	0.010007	13.42	355.75	324.75	0.89
Main Channel	4.644	25Yr	1841.00	317.60	324.59	325.52	326.79	0.010013	12.63	213.42	123.29	0.88

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**REPLACE BERM AT HIGHER ELEVATION  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: Prop-1C River: Coppermine Brook Reach: Main Channel

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	F.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	0.00	100Yr	4618.00	205.78	216.40	213.95	217.29	0.001889	8.56	1454.60	870.24	0.48
Main Channel	0.00	10Yr	1739.00	205.78	212.20	210.14	212.89	0.002467	6.80	312.65	100.21	0.50
Main Channel	0.00	50Yr	3360.00	205.78	216.00	212.38	216.48	0.001104	6.36	1133.80	609.08	0.36
Main Channel	0.00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	863.90	230.46	0.42
Main Channel	0.051	100Yr	4618.00	207.98	217.01		217.95	0.003112	9.83	1488.87	766.70	0.59
Main Channel	0.051	10Yr	1739.00	207.98	212.94		214.26	0.007523	9.88	226.45	58.38	0.83
Main Channel	0.051	50Yr	3360.00	207.98	216.19		217.23	0.003301	9.46	922.33	623.67	0.60
Main Channel	0.051	25Yr	2677.00	207.98	214.77		216.24	0.005397	10.54	349.61	148.31	0.74
Main Channel	0.061	100Yr	4618.00	208.13	217.77		218.23	0.001951	7.02	1921.79	852.32	0.41
Main Channel	0.061	10Yr	1739.00	208.13	213.68		214.72	0.006043	8.23	224.97	54.11	0.66
Main Channel	0.061	50Yr	3360.00	208.13	217.09		217.54	0.001846	6.48	1383.32	730.80	0.40
Main Channel	0.061	25Yr	2677.00	208.13	215.33		216.59	0.005156	9.23	402.20	289.05	0.64
Main Channel	0.074	100Yr	4618.00	207.71	217.89		218.40	0.002218	8.84	2094.30	884.55	0.51
Main Channel	0.074	10Yr	1739.00	207.71	213.93		215.38	0.007039	10.94	247.89	60.94	0.83
Main Channel	0.074	50Yr	3360.00	207.71	217.18		217.74	0.002284	8.51	1507.00	760.61	0.51
Main Channel	0.074	25Yr	2677.00	207.71	215.17		217.70	0.009142	14.30	381.90	231.91	0.97
Main Channel	0.08	100Yr	4618.00	207.70	217.96		218.45	0.001454	7.14	2020.64	883.77	0.40
Main Channel	0.08	10Yr	1739.00	207.70	214.93		215.56	0.001803	6.38	294.36	140.75	0.43
Main Channel	0.08	50Yr	3360.00	207.70	217.38		217.80	0.001212	6.26	1539.47	776.25	0.36
Main Channel	0.08	25Yr	2677.00	207.70	217.79		217.98	0.000559	4.38	1869.24	851.40	0.25
Main Channel	0.084	100Yr	4618.00	207.19	218.40		218.56	0.000497	5.09	2404.49	920.63	0.28
Main Channel	0.084	10Yr	1739.00	207.19	214.75		215.82	0.002419	8.30	209.45	100.94	0.58
Main Channel	0.084	50Yr	3360.00	207.19	217.71		217.89	0.000505	4.90	1804.70	825.53	0.28
Main Channel	0.084	25Yr	2677.00	207.19	217.92		218.01	0.000262	3.58	1982.10	860.88	0.20
Main Channel	0.09		Bridge									
Main Channel	0.094	100Yr	4618.00	206.50	218.38		218.62	0.000577	5.64	1963.04	656.68	0.30
Main Channel	0.094	10Yr	1739.00	206.50	215.28		216.02	0.001383	6.95	250.22	167.94	0.44
Main Channel	0.094	50Yr	3360.00	206.50	217.70		217.94	0.000545	5.25	1592.85	612.62	0.29
Main Channel	0.094	25Yr	2677.00	206.50	217.97		218.08	0.000273	3.78	1697.82	629.88	0.21
Main Channel	0.114	100Yr	4618.00	207.65	218.42		218.68	0.000462	4.39	1977.46	607.48	0.26
Main Channel	0.114	10Yr	1739.00	207.65	216.04		216.15	0.000254	2.69	742.37	416.02	0.19
Main Channel	0.114	50Yr	3360.00	207.65	217.81		217.99	0.000345	3.61	1616.97	564.80	0.23

HEC-RAS Plan: Prop-1C River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River/Sta	Profile	Q Total (cfs)	Max Ch El (ft)	W.S. Elev (ft)	Gr W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ctl
Main Channel	0.114	25Yr	2677.00	207.65	218.00		218.11	0.000196	2.77	1729.71	578.49	0.17
Main Channel	0.148	100Yr	4383.00	208.35	218.23	217.21	219.03	0.004866	9.69	1058.16	345.74	0.57
Main Channel	0.148	10Yr	1634.00	208.35	215.81		216.40	0.003826	7.13	438.52	198.01	0.49
Main Channel	0.148	50Yr	3135.00	208.35	217.66	216.46	218.25	0.003505	8.04	874.91	296.49	0.49
Main Channel	0.148	25Yr	2522.00	208.35	217.93	215.91	218.25	0.001887	6.02	958.48	319.89	0.36
Main Channel	0.224	100Yr	4383.00	210.13	218.56	219.72	222.54	0.009149	17.90	399.06	250.77	1.15
Main Channel	0.224	10Yr	1634.00	210.13	216.75		218.45	0.004724	10.70	179.23	40.38	0.79
Main Channel	0.224	50Yr	3135.00	210.13	217.98	219.23	221.66	0.008254	16.11	268.83	185.08	1.08
Main Channel	0.224	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Main Channel	0.306	100Yr	4383.00	211.80	224.44	224.44	225.93	0.002835	11.87	1089.54	394.17	0.62
Main Channel	0.306	10Yr	1634.00	211.80	219.02	218.84	221.48	0.007713	12.63	138.32	32.11	0.92
Main Channel	0.306	50Yr	3135.00	211.80	221.91	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Main Channel	0.308	100Yr	4383.00	212.00	224.87		225.99	0.002197	10.70	1253.39	405.50	0.56
Main Channel	0.308	10Yr	1634.00	212.00	219.01	219.00	221.60	0.008344	12.99	134.70	32.06	0.96
Main Channel	0.308	50Yr	3135.00	212.00	224.96	223.36	225.50	0.001065	7.49	1289.99	409.99	0.39
Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Main Channel	0.316	100Yr	4383.00	212.85	224.27	222.23	226.87	0.006155	12.94	398.67	38.91	0.72
Main Channel	0.316	10Yr	1634.00	212.85	221.70	218.31	222.34	0.002268	6.46	253.11	36.72	0.41
Main Channel	0.316	50Yr	3135.00	212.85	224.68	220.60	225.91	0.002756	8.89	352.50	39.26	0.48
Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Main Channel	0.320		Bridge									
Main Channel	0.326	100Yr	4383.00	214.38	228.32	223.28	228.98	0.001119	7.51	1390.63	413.71	0.37
Main Channel	0.326	10Yr	1634.00	214.38	221.71	219.37	222.58	0.002825	7.50	217.99	36.75	0.52
Main Channel	0.326	50Yr	3135.00	214.38	225.30	221.67	226.64	0.002416	9.28	337.77	68.38	0.51
Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Main Channel	0.336	100Yr	4383.00	216.00	228.97	223.82	229.07	0.000328	3.75	2905.67	468.56	0.20
Main Channel	0.336	10Yr	1634.00	216.00	221.88		222.80	0.006496	8.32	320.04	184.50	0.75
Main Channel	0.336	50Yr	3135.00	216.00	226.68	223.00	226.81	0.000523	4.05	1887.21	420.92	0.24
Main Channel	0.336	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000578	3.96	1530.68	402.92	0.25
Main Channel	0.588	100Yr	4383.00	220.60	231.45	231.45	233.08	0.004106	12.90	907.96	271.09	0.70

HEC-RAS Plan: Prop-1C River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Cntl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Fronda # Cfl
Main Channel	0.588	10Yr	1634.00	220.60	228.13		229.33	0.003768	9.58	279.61	82.59	0.63
Main Channel	0.588	50Yr	3135.00	220.60	228.69	228.69	232.17	0.010112	16.51	329.22	93.03	1.05
Main Channel	0.588	25Yr	2522.00	220.60	228.46	228.46	230.95	0.007448	13.88	307.92	88.70	0.89
Main Channel	0.729	100Yr	4383.00	226.80	235.20		236.93	0.006558	11.81	462.09	117.79	0.79
Main Channel	0.729	10Yr	1634.00	226.80	232.02	232.01	233.59	0.009010	10.31	174.49	62.28	0.87
Main Channel	0.729	50Yr	3135.00	226.80	235.37		236.18	0.002984	8.10	482.41	120.19	0.53
Main Channel	0.729	25Yr	2522.00	226.80	234.19		235.19	0.004219	8.74	352.01	100.76	0.62
Main Channel	0.748	100Yr	4383.00	227.50	235.95		237.67	0.008576	11.44	440.05	95.30	0.89
Main Channel	0.748	10Yr	1634.00	227.50	233.68	233.04	234.46	0.007174	7.63	238.40	81.32	0.75
Main Channel	0.748	50Yr	3135.00	227.50	235.62		236.63	0.005459	8.74	409.27	93.26	0.70
Main Channel	0.748	25Yr	2522.00	227.50	234.73		235.72	0.006912	8.64	327.93	88.19	0.76
Main Channel	0.758	100Yr	4383.00	229.00	236.32	235.75	238.14	0.008208	11.94	442.47	99.17	0.89
Main Channel	0.758	10Yr	1634.00	229.00	234.02	233.39	234.82	0.006821	7.72	238.77	80.63	0.74
Main Channel	0.758	50Yr	3135.00	229.00	235.84	234.79	236.98	0.005704	9.38	397.54	97.19	0.73
Main Channel	0.758	25Yr	2522.00	229.00	235.03	234.26	236.10	0.006646	9.03	323.64	89.85	0.76
Main Channel	0.759		Bridge									
Main Channel	0.760	100Yr	4383.00	229.10	237.28	235.77	238.40	0.004995	9.18	531.92	103.62	0.65
Main Channel	0.760	10Yr	1634.00	229.10	234.20	233.41	234.90	0.005850	7.16	252.33	82.22	0.68
Main Channel	0.760	50Yr	3135.00	229.10	236.25	234.83	237.11	0.004795	7.97	495.35	98.91	0.62
Main Channel	0.760	25Yr	2522.00	229.10	235.39	234.31	236.22	0.005565	7.82	355.26	93.26	0.66
Main Channel	0.770	100Yr	4383.00	229.00	237.50		238.67	0.004906	10.16	562.98	121.70	0.70
Main Channel	0.770	10Yr	1634.00	229.00	234.47		235.23	0.006543	7.80	247.21	86.73	0.73
Main Channel	0.770	50Yr	3135.00	229.00	236.42		237.38	0.004893	9.02	436.73	110.30	0.68
Main Channel	0.770	25Yr	2522.00	229.00	235.61		236.63	0.005638	8.71	353.02	97.90	0.71
Main Channel	0.786	100Yr	4383.00	230.50	238.25	236.71	239.30	0.003510	9.28	631.86	134.84	0.61
Main Channel	0.786	10Yr	1634.00	230.50	235.36		235.97	0.003711	6.73	291.89	98.12	0.58
Main Channel	0.786	50Yr	3135.00	230.50	237.13		238.01	0.003563	8.34	484.37	128.37	0.60
Main Channel	0.786	25Yr	2522.00	230.50	236.43		237.22	0.003688	7.80	403.22	109.50	0.60
Main Channel	0.808	100Yr	4383.00	230.50	237.62	237.62	240.18	0.008735	14.33	369.55	74.91	0.96
Main Channel	0.808	10Yr	1634.00	230.50	235.24	234.80	236.36	0.006927	9.19	206.26	62.68	0.76
Main Channel	0.808	50Yr	3135.00	230.50	236.59	236.46	238.62	0.008354	12.58	295.57	69.64	0.92
Main Channel	0.808	25Yr	2522.00	230.50	236.05	235.85	237.75	0.007903	11.47	258.49	66.84	0.88



HEC-RAS Plan: Prop-1C River: Coppersmine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel/Chd (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froutde # Cht
Main Channel	1.598	100Yr	4071.00	238.40	248.06	244.97	249.11	0.001846	8.77	885.01	413.45	0.50
Main Channel	1.598	10Yr	1501.00	238.40	245.30	241.78	245.70	0.000979	5.11	293.91	81.59	0.34
Main Channel	1.598	50Yr	2885.00	238.40	247.73	243.62	248.33	0.001078	6.55	734.93	316.33	0.38
Main Channel	1.598	25Yr	2329.00	238.40	247.31	242.91	247.72	0.000796	5.46	628.13	192.40	0.32
Main Channel	1.608	100Yr	4071.00	238.40	248.02	245.38	249.39	0.003017	10.70	792.74	270.94	0.63
Main Channel	1.608	10Yr	1501.00	238.40	245.23		245.63	0.001845	6.55	305.23	69.57	0.46
Main Channel	1.608	50Yr	2885.00	238.40	247.69		248.44	0.001722	7.89	718.35	219.39	0.47
Main Channel	1.608	25Yr	2329.00	238.40	247.22	244.23	247.84	0.001482	7.05	617.00	204.41	0.43
Main Channel	1.853	100Yr	4071.00	242.10	253.18	253.18	254.38	0.002886	11.38	1175.51	534.38	0.62
Main Channel	1.853	10Yr	1501.00	242.10	248.39		250.37	0.007045	11.85	165.60	43.41	0.87
Main Channel	1.853	50Yr	2885.00	242.10	249.94	249.81	253.87	0.010600	17.06	239.44	51.70	1.12
Main Channel	1.853	25Yr	2329.00	242.10	249.79	249.79	252.50	0.007490	14.14	231.54	50.87	0.93
Main Channel	1.860	100Yr	4071.00	241.60	254.45	248.65	254.71	0.000418	5.05	1483.93	358.51	0.25
Main Channel	1.860	10Yr	1501.00	241.60	250.78	245.23	250.95	0.000337	3.62	559.38	136.76	0.21
Main Channel	1.860	50Yr	2885.00	241.60	254.94	247.22	256.04	0.000166	3.27	1663.74	386.40	0.16
Main Channel	1.860	25Yr	2329.00	241.60	253.14	246.46	253.30	0.000261	3.72	1063.08	282.66	0.19
Main Channel	1.864		Bridge									
Main Channel	1.868	100Yr	4071.00	241.40	254.55	248.47	254.77	0.000363	4.78	1590.91	375.35	0.23
Main Channel	1.868	10Yr	1501.00	241.40	251.23	245.03	251.48	0.000374	4.00	375.51	183.75	0.22
Main Channel	1.868	50Yr	2885.00	241.40	255.02	247.02	255.11	0.000150	3.14	1776.57	422.30	0.15
Main Channel	1.868	25Yr	2329.00	241.40	253.25	246.27	253.38	0.000225	3.51	1151.64	300.21	0.18
Main Channel	1.878	100Yr	4071.00	242.70	254.55		254.80	0.000568	5.36	1267.03	352.59	0.28
Main Channel	1.878	10Yr	1501.00	242.70	251.11		251.57	0.001012	5.64	392.65	176.70	0.35
Main Channel	1.878	50Yr	2885.00	242.70	255.03		255.12	0.000210	3.35	1442.66	383.52	0.17
Main Channel	1.878	25Yr	2329.00	242.70	253.21		253.42	0.000485	4.56	841.71	294.81	0.25
Main Channel	1.932	100Yr	4071.00	243.87	254.81		255.00	0.000813	5.12	1899.68	694.49	0.31
Main Channel	1.932	10Yr	1501.00	243.87	251.29	249.60	252.20	0.003635	7.65	197.97	53.85	0.59
Main Channel	1.932	50Yr	2885.00	243.87	255.12		255.20	0.000311	3.24	2120.69	714.59	0.19
Main Channel	1.932	25Yr	2329.00	243.87	253.35		253.66	0.001196	5.49	958.03	576.98	0.36
Main Channel	1.942	100Yr	4071.00	244.25	254.78	253.70	255.12	0.000977	6.50	1572.71	557.59	0.36
Main Channel	1.942	10Yr	1501.00	244.25	251.56	249.03	252.36	0.002029	7.22	214.34	42.00	0.49
Main Channel	1.942	50Yr	2885.00	244.25	255.11	251.32	255.24	0.000377	4.13	1760.17	574.40	0.23



HEC-RAS Plan: Prop-1C River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Ch W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froutde # Chl
Main Channel	2.247	100Yr	4380.00	245.20	255.60	252.62	255.63	0.000184	2.82	5698.99	1338.76	0.16
Main Channel	2.247	10Yr	1605.00	245.20	252.75	250.04	252.82	0.000359	3.16	2071.99	1207.36	0.21
Main Channel	2.247	50Yr	3395.00	245.20	255.47	251.47	255.49	0.000120	2.27	5528.18	1332.90	0.13
Main Channel	2.247	25Yr	2409.00	245.20	254.14	252.06	254.17	0.000175	2.48	3788.74	1271.30	0.15
Main Channel	2.263	100Yr	4380.00	245.00	255.63	255.63	255.64	0.000086	1.94	7950.48	1517.24	0.11
Main Channel	2.262	10Yr	1605.00	245.00	252.83	252.83	252.84	0.000099	1.67	3918.79	1379.04	0.11
Main Channel	2.263	50Yr	3395.00	245.00	255.49	255.49	255.50	0.000056	1.55	7739.81	1506.85	0.09
Main Channel	2.262	25Yr	2409.00	245.00	254.17	254.17	254.18	0.000068	1.54	5799.06	1435.16	0.09
Main Channel	2.432	100Yr	4380.00	247.60	255.45	255.45	255.03	0.002333	9.09	1654.30	697.13	0.59
Main Channel	2.432	10Yr	1605.00	247.60	252.75	252.75	253.23	0.002564	7.08	562.99	285.10	0.57
Main Channel	2.432	50Yr	3395.00	247.60	255.38	255.38	255.75	0.001471	7.18	1608.99	677.68	0.46
Main Channel	2.432	25Yr	2409.00	247.60	254.11	254.11	254.44	0.001582	6.57	1010.07	375.46	0.47
Main Channel	2.442	100Yr	4380.00	246.89	255.69	252.20	256.15	0.001003	5.44	938.22	529.59	0.37
Main Channel	2.442	10Yr	1605.00	246.89	253.22	250.25	253.38	0.000526	3.15	510.17	111.46	0.26
Main Channel	2.442	50Yr	3395.00	246.89	255.53	251.59	255.82	0.000656	4.34	860.11	432.82	0.30
Main Channel	2.442	25Yr	2409.00	246.89	254.30	250.89	254.52	0.000628	3.81	632.66	115.26	0.29
Main Channel	2.444		Bridge									
Main Channel	2.446	100Yr	4380.00	247.05	255.99	252.06	256.36	0.000772	4.94	1157.97	712.44	0.33
Main Channel	2.446	10Yr	1605.00	247.05	253.26	250.11	253.40	0.000460	3.03	530.07	115.14	0.24
Main Channel	2.446	50Yr	3395.00	247.05	255.81	251.45	256.06	0.000514	3.97	1035.41	601.44	0.27
Main Channel	2.446	25Yr	2409.00	247.05	254.52	250.78	254.73	0.000480	3.61	667.50	119.21	0.26
Main Channel	2.456	100Yr	4380.00	246.90	256.05	256.05	256.42	0.001367	7.48	2228.41	787.85	0.45
Main Channel	2.456	10Yr	1605.00	246.90	253.24	253.24	253.46	0.001106	5.14	885.37	341.66	0.38
Main Channel	2.456	50Yr	3395.00	246.90	255.84	255.84	256.09	0.000938	6.09	2067.33	735.84	0.37
Main Channel	2.456	25Yr	2409.00	246.90	254.57	254.57	254.75	0.000839	5.15	1368.48	385.71	0.34
Main Channel	2.920	100Yr	4380.00	249.90	258.46	258.46	258.52	0.000641	4.62	3980.75	1427.62	0.29
Main Channel	2.920	10Yr	1605.00	249.90	256.18	256.18	256.35	0.001392	5.38	1254.99	882.08	0.41
Main Channel	2.920	50Yr	3395.00	249.90	257.88	257.88	257.96	0.000696	4.57	3182.33	1348.43	0.30
Main Channel	2.920	25Yr	2409.00	249.90	256.89	256.89	257.02	0.001145	5.30	1952.67	1095.05	0.38
Main Channel	3.140	100Yr	3038.00	252.00	259.02	255.99	259.04	0.000280	2.71	3946.87	1163.01	0.19
Main Channel	3.140	10Yr	1263.00	252.00	257.12	255.46	257.14	0.000335	2.31	1972.06	916.04	0.20

HEC-RAS Plan: Prop-1C River: Coppersmine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Chl Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	3.140	50Yr	2430.00	252.00	258.48	256.85	258.50	0.000286	2.57	3334.02	1092.36	0.19
Main Channel	3.140	25Yr	1841.00	252.00	257.74	255.67	257.76	0.000343	2.56	2560.19	996.02	0.20
Main Channel	3.678	100Yr	3038.00	257.10	262.06	262.73	264.32	0.027697	16.65	525.08	394.37	1.50
Main Channel	3.678	10Yr	1263.00	257.10	261.87	261.87	262.42	0.006717	7.93	452.64	386.84	0.73
Main Channel	3.678	50Yr	2430.00	257.10	262.22	262.51	263.31	0.013445	11.93	589.54	400.96	1.05
Main Channel	3.678	25Yr	1841.00	257.10	262.21	262.21	262.84	0.007758	9.06	588.26	400.83	0.80
Main Channel	3.860	100Yr	3038.00	263.10	271.25	271.54	272.93	0.004854	12.68	461.94	219.48	0.81
Main Channel	3.860	10Yr	1263.00	263.10	267.07	268.08	270.33	0.018422	15.48	104.91	44.06	1.45
Main Channel	3.860	50Yr	2430.00	263.10	270.03	270.48	272.26	0.006434	13.74	277.91	83.37	0.95
Main Channel	3.860	25Yr	1841.00	263.10	268.31	269.00	271.36	0.012305	15.47	165.86	54.37	1.25
Main Channel	3.870	100Yr	3038.00	266.18	272.22	272.40	273.35	0.005638	10.09	566.49	354.82	0.74
Main Channel	3.870	10Yr	1263.00	266.18	269.87	269.87	271.54	0.011921	10.38	121.67	62.42	1.00
Main Channel	3.870	50Yr	2430.00	266.18	271.95	271.95	272.92	0.004825	9.11	478.48	328.92	0.69
Main Channel	3.870	25Yr	1841.00	266.18	271.30	271.30	272.36	0.005503	8.94	311.78	240.96	0.72
Main Channel	3.876		Bridge									
Main Channel	3.882	100Yr	3038.00	264.30	277.80	272.57	277.81	0.000049	1.27	4851.53	1018.90	0.07
Main Channel	3.882	10Yr	1263.00	264.30	272.92	270.20	273.35	0.001926	5.39	250.28	79.88	0.39
Main Channel	3.882	50Yr	2430.00	264.30	273.75	271.76	275.00	0.004897	9.17	288.50	119.26	0.62
Main Channel	3.882	25Yr	1841.00	264.30	274.72	270.93	275.00	0.001095	4.83	569.80	165.75	0.30
Main Channel	3.892	100Yr	3038.00	265.10	277.80	273.06	277.81	0.000118	2.15	4645.67	969.02	0.11
Main Channel	3.892	10Yr	1263.00	265.10	272.96	270.06	273.47	0.002068	6.47	304.72	64.15	0.42
Main Channel	3.892	50Yr	2430.00	265.10	273.88	272.22	275.29	0.004877	10.84	367.72	74.39	0.66
Main Channel	3.892	25Yr	1841.00	265.10	274.52	271.21	275.19	0.002192	7.55	419.34	87.20	0.44
Main Channel	3.903	100Yr	3038.00	265.70	277.26	273.69	278.07	0.002267	8.83	742.71	181.65	0.47
Main Channel	3.903	10Yr	1263.00	265.70	273.04	270.66	273.64	0.002670	6.99	281.94	64.48	0.47
Main Channel	3.903	50Yr	2430.00	265.70	274.12	272.72	275.64	0.005759	11.30	357.77	78.17	0.70
Main Channel	3.903	25Yr	1841.00	265.70	274.61	271.81	275.35	0.002624	7.94	398.52	86.51	0.48
Main Channel	3.948	100Yr	3038.00	267.60	278.29	276.32	278.56	0.001267	6.30	1673.59	636.47	0.34
Main Channel	3.948	10Yr	1263.00	267.60	273.70	272.51	274.78	0.005676	9.06	198.26	51.97	0.66
Main Channel	3.948	50Yr	2430.00	267.60	275.52	274.96	277.57	0.007841	12.76	326.82	97.99	0.81
Main Channel	3.948	25Yr	1841.00	267.60	275.16	273.70	276.49	0.005364	10.22	294.66	83.26	0.67

HEC-RAS Plan: Prop-1C River: Coppermine Brook Reach: Main Channel (Continued)

Reach	Reach Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	3.985	100Yr	3038.00	269.32	278.58	275.73	278.78	0.001259	4.72	1398.80	497.73	0.29
Main Channel	3.985	10Yr	1263.00	269.32	275.14	273.50	275.61	0.003888	5.76	263.85	80.08	0.47
Main Channel	3.985	50Yr	2430.00	269.32	277.89	275.12	278.40	0.002497	6.27	500.83	92.27	0.40
Main Channel	3.985	25Yr	1841.00	269.32	276.74	274.42	277.20	0.002711	5.84	397.47	87.17	0.41
Main Channel	4.084	100Yr	3038.00	277.00	284.74	284.74	286.72	0.010779	12.72	387.18	115.34	0.90
Main Channel	4.084	10Yr	1263.00	277.00	282.40	282.40	283.80	0.012557	9.97	166.27	73.14	0.90
Main Channel	4.084	50Yr	2430.00	277.00	284.06	284.06	285.89	0.011132	11.96	313.12	103.14	0.90
Main Channel	4.084	25Yr	1841.00	277.00	283.31	283.31	284.94	0.011560	11.04	240.64	89.60	0.89
Main Channel	4.084	100Yr	3038.00	278.40	286.98	282.71	287.34	0.001094	4.82	630.06	221.33	0.30
Main Channel	4.084	10Yr	1263.00	278.40	284.13	281.16	284.29	0.000862	3.16	399.62	93.21	0.25
Main Channel	4.084	50Yr	2430.00	278.40	286.18	282.23	286.47	0.001001	4.29	565.80	150.54	0.29
Main Channel	4.084	25Yr	1841.00	278.40	285.26	281.72	285.48	0.000923	3.75	490.94	105.37	0.27
Main Channel	4.100		Bridge									
Main Channel	4.106	100Yr	3038.00	278.30	287.04	282.63	287.38	0.000575	4.72	643.12	235.73	0.30
Main Channel	4.106	10Yr	1263.00	278.30	284.18	281.06	284.32	0.000441	3.07	411.32	93.55	0.24
Main Channel	4.106	50Yr	2430.00	278.30	286.24	282.13	286.51	0.000524	4.20	578.34	164.36	0.28
Main Channel	4.106	25Yr	1841.00	278.30	285.31	281.62	285.52	0.000479	3.66	503.02	111.18	0.26
Main Channel	4.116	100Yr	3038.00	277.10	285.71	287.00	290.59	0.011288	20.37	281.51	71.17	1.28
Main Channel	4.116	10Yr	1263.00	277.10	282.95	283.91	286.27	0.011573	15.50	120.14	45.54	1.20
Main Channel	4.116	50Yr	2430.00	277.10	284.80	286.30	289.51	0.012190	19.51	220.26	62.73	1.30
Main Channel	4.116	25Yr	1841.00	277.10	283.96	285.23	288.05	0.011924	17.72	170.85	54.98	1.26
Main Channel	4.368	100Yr	3038.00	297.30	305.26	305.26	308.02	0.014878	15.48	298.67	66.27	0.98
Main Channel	4.368	10Yr	1263.00	297.30	302.48	302.48	304.25	0.015497	11.69	144.59	45.62	0.93
Main Channel	4.368	50Yr	2430.00	297.30	304.61	304.61	306.90	0.013537	13.91	257.81	60.34	0.93
Main Channel	4.368	25Yr	1841.00	297.30	303.63	303.63	305.89	0.014321	12.94	201.56	53.54	0.93
Main Channel	4.378	100Yr	3038.00	298.00	304.79	306.47	309.65	0.026848	17.80	183.93	57.09	1.28
Main Channel	4.378	10Yr	1263.00	298.00	301.08	302.67	306.40	0.075141	18.51	68.25	25.19	1.98
Main Channel	4.378	50Yr	2430.00	298.00	303.55	305.52	308.68	0.037538	18.17	133.78	28.84	1.46
Main Channel	4.378	25Yr	1841.00	298.00	302.29	303.92	307.61	0.051555	18.50	99.49	26.52	1.68
Main Channel	4.3785		Bridge									
Main Channel	4.379	100Yr	3038.00	300.70	309.93	307.93	310.86	0.001984	8.98	598.40	138.40	0.54

HEC-RAS Plan: Prop-1C River: Coppersmine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cut W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ch
Main Channel	4.379	10Yr	1263.00	300.70	307.41	305.43	307.88	0.001399	6.01	315.92	92.89	0.43
Main Channel	4.379	50Yr	2430.00	300.70	309.23	307.20	310.01	0.001801	8.09	507.20	122.18	0.50
Main Channel	4.379	25Yr	1841.00	300.70	308.43	306.40	309.05	0.001578	7.06	416.96	105.50	0.46
Main Channel	4.389	100Yr	3038.00	300.90	309.80	308.36	311.12	0.004539	10.31	422.82	87.17	0.62
Main Channel	4.389	10Yr	1263.00	300.90	307.41	305.47	308.03	0.002998	6.75	240.70	64.61	0.48
Main Channel	4.389	50Yr	2430.00	300.90	309.15	307.55	310.23	0.004058	9.24	387.42	80.97	0.58
Main Channel	4.389	25Yr	1841.00	300.90	308.38	306.60	309.23	0.003546	8.08	307.91	73.74	0.53
Main Channel	4.644	100Yr	3038.00	317.60	325.62	326.31	327.76	0.010008	13.94	490.95	327.88	0.90
Main Channel	4.644	10Yr	1263.00	317.60	323.04	323.04	325.10	0.012817	11.90	121.93	33.14	0.95
Main Channel	4.644	50Yr	2430.00	317.60	325.21	325.99	327.43	0.010007	13.42	355.75	324.75	0.89
Main Channel	4.644	25Yr	1841.00	317.60	324.59	325.52	326.79	0.010013	12.63	213.42	123.29	0.88

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**REMOVE BERM AND CONSTRUCT COMPUND CHANNEL  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: Prop-1E River: Coppersmine Brook Reach: Main Channel

Reach	R/S Site	Profile	Q Total (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chn (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frict # Chl
Main Channel	0.00	100Yr	4618.00	205.78	216.40	213.95	217.29	0.001889	8.56	1454.60	870.24	0.48
Main Channel	0.00	10Yr	1739.00	205.78	212.20	210.14	212.89	0.002467	6.80	312.85	100.21	0.50
Main Channel	0.00	50Yr	3360.00	205.78	216.00	212.38	216.48	0.001104	6.36	1133.80	609.08	0.36
Main Channel	0.00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42
Main Channel	0.051	100Yr	4618.00	207.98	217.01		217.95	0.003112	9.83	1488.87	766.70	0.59
Main Channel	0.051	10Yr	1739.00	207.98	212.94		214.28	0.007523	9.88	226.45	58.38	0.83
Main Channel	0.051	50Yr	3360.00	207.98	216.19		217.23	0.003301	9.46	922.33	623.67	0.60
Main Channel	0.051	25Yr	2677.00	207.98	214.77	213.57	216.24	0.005397	10.54	349.61	148.31	0.74
Main Channel	0.051	100Yr	4618.00	208.13	217.77		218.23	0.001951	7.02	1921.79	852.32	0.41
Main Channel	0.051	10Yr	1739.00	208.13	213.68		214.72	0.006043	8.23	224.97	54.11	0.66
Main Channel	0.051	50Yr	3360.00	208.13	217.09		217.54	0.001846	6.48	1383.32	730.80	0.40
Main Channel	0.051	25Yr	2677.00	208.13	215.33	213.77	216.59	0.005156	9.23	402.20	289.05	0.64
Main Channel	0.074	100Yr	4618.00	207.71	217.89		218.40	0.002218	8.84	2094.30	884.55	0.51
Main Channel	0.074	10Yr	1739.00	207.71	213.93		215.38	0.007039	10.94	247.89	60.94	0.83
Main Channel	0.074	50Yr	3360.00	207.71	217.18		217.74	0.002284	8.51	1507.00	760.61	0.51
Main Channel	0.074	25Yr	2677.00	207.71	215.17	214.78	217.70	0.009142	14.30	381.90	231.91	0.97
Main Channel	0.08	100Yr	4618.00	207.70	217.96		218.45	0.001454	7.14	2020.64	883.77	0.40
Main Channel	0.08	10Yr	1739.00	207.70	214.93		215.56	0.001803	6.38	294.36	140.75	0.43
Main Channel	0.08	50Yr	3360.00	207.70	217.38		217.80	0.001212	6.26	1539.47	776.25	0.36
Main Channel	0.08	25Yr	2677.00	207.70	217.79	213.33	217.98	0.000559	4.38	1869.24	851.40	0.25
Main Channel	0.084	100Yr	4618.00	207.19	218.40	216.97	218.56	0.000497	5.09	2404.49	920.63	0.28
Main Channel	0.084	10Yr	1739.00	207.19	214.75	212.82	215.82	0.002419	8.30	209.45	100.94	0.58
Main Channel	0.084	50Yr	3360.00	207.19	217.71	216.50	217.89	0.000505	4.90	1804.70	825.53	0.28
Main Channel	0.084	25Yr	2677.00	207.19	217.92	216.15	218.01	0.000262	3.58	1982.10	860.88	0.20
Main Channel	0.09	Bridge										
Main Channel	0.094	100Yr	4618.00	206.50	218.38	217.08	218.62	0.000577	5.64	1963.04	656.68	0.30
Main Channel	0.094	10Yr	1739.00	206.50	215.28	212.11	216.02	0.001383	6.95	250.22	167.94	0.44
Main Channel	0.094	50Yr	3360.00	206.50	217.70	214.56	217.94	0.000545	5.25	1532.85	612.62	0.29
Main Channel	0.094	25Yr	2677.00	206.50	217.97	213.58	218.08	0.000273	3.78	1697.82	629.88	0.21
Main Channel	0.114	100Yr	4618.00	207.65	218.42		218.68	0.000462	4.39	1977.46	607.48	0.26
Main Channel	0.114	10Yr	1739.00	207.65	216.04		216.15	0.000254	2.69	742.37	416.02	0.19
Main Channel	0.114	50Yr	3360.00	207.65	217.81		217.99	0.000345	3.61	1616.97	564.80	0.23

HEC-RAS Plan: Prop-1E River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	G Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	C# W.S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Ctl
Main Channel	0.114	25Yr	2677.00	207.65	218.00		218.11	0.000196	2.77	1729.71	578.49	0.17
Main Channel	0.148	100Yr	4383.00	208.35	218.23	217.21	219.03	0.004866	9.69	1058.16	345.74	0.57
Main Channel	0.148	10Yr	1634.00	208.35	215.81		216.40	0.003826	7.13	438.52	198.01	0.49
Main Channel	0.148	50Yr	3135.00	208.35	217.66	216.46	218.25	0.003505	8.04	874.91	296.49	0.49
Main Channel	0.148	25Yr	2522.00	208.35	217.93	215.91	218.25	0.001887	6.02	958.48	319.89	0.36
Main Channel	0.224	100Yr	4383.00	210.13	218.56	219.72	222.54	0.009149	17.90	399.06	250.77	1.15
Main Channel	0.224	10Yr	1634.00	210.13	216.75		218.45	0.004724	10.70	179.23	40.38	0.79
Main Channel	0.224	50Yr	3135.00	210.13	217.98	219.23	221.66	0.008254	16.11	268.83	185.08	1.08
Main Channel	0.224	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Main Channel	0.306	100Yr	4383.00	211.80	224.44	224.44	225.93	0.002835	11.87	1089.54	394.17	0.62
Main Channel	0.306	10Yr	1634.00	211.80	219.02	218.84	221.48	0.007713	12.63	138.32	32.11	0.92
Main Channel	0.306	50Yr	3135.00	211.80	221.91	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Main Channel	0.308	100Yr	4383.00	212.00	224.87		225.99	0.002197	10.70	1253.39	405.50	0.56
Main Channel	0.308	10Yr	1634.00	212.00	219.01	219.00	221.60	0.008344	12.99	134.70	32.06	0.96
Main Channel	0.308	50Yr	3135.00	212.00	224.96	223.36	225.50	0.001065	7.49	1289.99	409.99	0.39
Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Main Channel	0.316	100Yr	4383.00	212.85	224.27	222.23	226.87	0.006155	12.94	338.67	38.91	0.72
Main Channel	0.316	10Yr	1634.00	212.85	221.70	218.31	222.34	0.002258	6.46	253.11	36.72	0.41
Main Channel	0.316	50Yr	3135.00	212.85	224.68	220.60	225.91	0.002756	8.89	352.50	39.26	0.48
Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.86	321.09	38.46	0.45
Main Channel	0.320		Bridge									
Main Channel	0.326	100Yr	4383.00	214.38	228.32	223.28	228.98	0.001119	7.51	1390.63	413.71	0.37
Main Channel	0.326	10Yr	1634.00	214.38	221.71	219.37	222.58	0.002825	7.50	217.99	36.75	0.52
Main Channel	0.326	50Yr	3135.00	214.38	225.30	221.67	226.64	0.002416	9.28	337.77	68.38	0.51
Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Main Channel	0.336	100Yr	4383.00	216.00	228.97	223.82	229.07	0.000328	3.76	2906.67	468.56	0.20
Main Channel	0.336	10Yr	1634.00	216.00	221.88		222.80	0.006496	8.32	320.04	184.50	0.75
Main Channel	0.336	50Yr	3135.00	216.00	226.68	223.00	226.81	0.000523	4.05	1887.21	420.92	0.24
Main Channel	0.336	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000578	3.96	1530.68	402.92	0.25
Main Channel	0.588	100Yr	4383.00	220.60	231.45	231.45	233.08	0.004106	12.90	907.96	271.09	0.70

HEC-RAS Plan: Prop-1E River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q (cfs)	Min Cr E	W.S. Elev (ft)	Cr W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frobals # (Ch)
Main Channel	0.588	10Yr	1634.00	220.60	228.13	228.13	229.33	0.003768	9.58	279.61	82.59	0.63
Main Channel	0.588	50Yr	3135.00	220.60	228.69	228.69	232.17	0.010112	16.51	329.22	93.03	1.05
Main Channel	0.588	25Yr	2522.00	220.60	228.46	228.46	230.95	0.007448	13.88	307.92	88.70	0.89
Main Channel	0.729	100Yr	4383.00	226.80	235.20	235.20	236.93	0.006558	11.81	462.09	117.79	0.79
Main Channel	0.729	10Yr	1634.00	226.80	232.02	232.01	233.59	0.009010	10.31	174.49	62.28	0.87
Main Channel	0.729	50Yr	3135.00	226.80	235.37	235.37	236.18	0.002984	8.10	482.41	120.19	0.53
Main Channel	0.729	25Yr	2522.00	226.80	234.19	234.19	235.19	0.004219	8.74	352.01	100.76	0.62
Main Channel	0.748	100Yr	4383.00	227.50	235.95	235.95	237.67	0.008576	11.44	440.05	95.30	0.89
Main Channel	0.748	10Yr	1634.00	227.50	233.68	233.04	234.46	0.007174	7.63	238.40	81.32	0.75
Main Channel	0.748	50Yr	3135.00	227.50	235.62	235.62	236.63	0.005459	8.74	409.27	93.26	0.70
Main Channel	0.748	25Yr	2522.00	227.50	234.73	234.73	235.72	0.006912	8.64	327.93	88.19	0.76
Main Channel	0.758	100Yr	4383.00	229.00	236.32	235.75	238.14	0.008208	11.94	442.47	99.17	0.89
Main Channel	0.758	10Yr	1634.00	229.00	234.02	233.39	234.82	0.006821	7.72	238.77	80.53	0.74
Main Channel	0.758	50Yr	3135.00	229.00	235.84	234.79	236.98	0.005704	9.38	397.54	97.19	0.73
Main Channel	0.758	25Yr	2522.00	229.00	235.03	234.26	236.10	0.006646	9.03	323.64	89.85	0.76
Main Channel	0.759		Bridge									
Main Channel	0.760	100Yr	4383.00	229.10	237.28	235.77	238.40	0.004995	9.18	531.92	103.62	0.65
Main Channel	0.760	10Yr	1634.00	229.10	234.20	233.41	234.90	0.005850	7.16	252.33	82.22	0.68
Main Channel	0.760	50Yr	3135.00	229.10	236.25	234.83	237.11	0.004795	7.97	435.35	98.91	0.62
Main Channel	0.760	25Yr	2522.00	229.10	235.39	234.31	236.22	0.005565	7.82	355.26	93.26	0.66
Main Channel	0.770	100Yr	4383.00	229.00	237.50	236.71	238.67	0.004906	10.16	562.98	121.70	0.70
Main Channel	0.770	10Yr	1634.00	229.00	234.47	235.23	235.23	0.006543	7.80	247.21	86.73	0.73
Main Channel	0.770	50Yr	3135.00	229.00	236.42	237.38	237.38	0.004893	9.02	436.73	110.30	0.68
Main Channel	0.770	25Yr	2522.00	229.00	235.61	236.53	236.53	0.005638	8.71	353.02	97.90	0.71
Main Channel	0.798	100Yr	4383.00	230.50	238.25	236.71	239.30	0.003510	9.28	631.86	134.84	0.61
Main Channel	0.798	10Yr	1634.00	230.50	235.36	235.97	235.97	0.003711	6.73	291.89	98.12	0.58
Main Channel	0.798	50Yr	3135.00	230.50	237.13	238.01	238.01	0.003563	8.34	484.37	128.37	0.60
Main Channel	0.798	25Yr	2522.00	230.50	236.43	237.22	237.22	0.003688	7.80	403.22	109.50	0.60
Main Channel	0.808	100Yr	4383.00	230.50	237.62	237.62	240.18	0.008735	14.33	369.55	74.91	0.96
Main Channel	0.808	10Yr	1634.00	230.50	235.24	234.80	236.36	0.006327	9.19	206.26	62.68	0.76
Main Channel	0.808	50Yr	3135.00	230.50	236.59	236.46	238.62	0.008354	12.58	295.57	69.64	0.92
Main Channel	0.808	25Yr	2522.00	230.50	236.05	236.85	237.75	0.007903	11.47	258.49	66.84	0.88



HEC-RAS Plan: Prop-1E River: Coppemine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cr. W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	1598	100Yr	4071.00	238.40	248.06	244.97	249.11	0.001846	8.77	855.01	413.45	0.50
Main Channel	1598	10Yr	1501.00	238.40	245.30	241.78	245.70	0.000979	5.11	293.91	81.59	0.34
Main Channel	1598	50Yr	2885.00	238.40	247.73	243.62	248.33	0.001078	6.55	734.93	316.33	0.38
Main Channel	1598	25Yr	2329.00	238.40	247.31	242.91	247.72	0.000796	5.46	628.13	192.40	0.32
Main Channel	1608	100Yr	4071.00	238.40	248.02	245.38	249.39	0.003017	10.70	792.74	270.94	0.63
Main Channel	1608	10Yr	1501.00	238.40	245.23	245.83	245.83	0.001845	6.55	305.23	69.57	0.46
Main Channel	1608	50Yr	2885.00	238.40	247.69	248.44	248.44	0.001722	7.89	718.35	219.39	0.47
Main Channel	1608	25Yr	2329.00	238.40	247.22	244.23	247.84	0.001482	7.05	617.00	204.41	0.43
Main Channel	1850	100Yr	4071.00	242.10	253.18	253.18	254.38	0.002886	11.38	1175.51	534.38	0.62
Main Channel	1850	10Yr	1501.00	242.10	248.39	248.39	250.37	0.007045	11.85	165.60	43.41	0.87
Main Channel	1850	50Yr	2885.00	242.10	249.94	249.81	253.87	0.010600	17.06	239.44	51.70	1.12
Main Channel	1850	25Yr	2329.00	242.10	249.79	249.79	252.50	0.007490	14.14	231.54	50.87	0.93
Main Channel	1860	100Yr	4071.00	241.60	254.45	248.65	254.71	0.000418	5.05	1483.93	358.51	0.25
Main Channel	1860	10Yr	1501.00	241.60	250.78	245.23	250.95	0.000337	3.62	559.38	136.76	0.21
Main Channel	1860	50Yr	2885.00	241.60	254.94	247.22	255.04	0.000166	3.27	1663.74	386.40	0.16
Main Channel	1860	25Yr	2329.00	241.60	253.14	246.46	253.30	0.000261	3.72	1063.08	282.66	0.19
Main Channel	1864		Bridge									
Main Channel	1868	100Yr	4071.00	241.40	254.55	248.47	254.77	0.000363	4.78	1590.91	375.35	0.23
Main Channel	1868	10Yr	1501.00	241.40	251.23	245.03	251.48	0.000374	4.00	375.51	183.75	0.22
Main Channel	1868	50Yr	2885.00	241.40	255.02	247.02	255.11	0.000150	3.14	1776.57	422.30	0.15
Main Channel	1868	25Yr	2329.00	241.40	253.25	246.27	253.38	0.000225	3.51	1151.64	300.21	0.18
Main Channel	1878	100Yr	4071.00	242.70	254.55		254.80	0.000568	5.36	1267.03	352.59	0.28
Main Channel	1878	10Yr	1501.00	242.70	251.11		251.57	0.001012	5.64	332.65	176.70	0.35
Main Channel	1878	50Yr	2885.00	242.70	255.03		255.12	0.000210	3.35	1442.66	383.52	0.17
Main Channel	1878	25Yr	2329.00	242.70	253.21		253.42	0.000485	4.56	841.71	294.81	0.25
Main Channel	1932	100Yr	4071.00	243.87	254.81		255.00	0.000813	5.12	1899.68	694.49	0.31
Main Channel	1932	10Yr	1501.00	243.87	251.29	249.60	252.20	0.003635	7.65	197.97	53.85	0.59
Main Channel	1932	50Yr	2885.00	243.87	255.12		255.20	0.000311	3.24	2120.69	714.59	0.19
Main Channel	1932	25Yr	2329.00	243.87	253.35		253.66	0.001196	5.49	958.03	576.98	0.36
Main Channel	1942	100Yr	4071.00	244.25	254.78	253.70	255.12	0.000977	6.50	1572.71	557.59	0.36
Main Channel	1942	10Yr	1501.00	244.25	251.56	249.03	252.36	0.002029	7.22	214.34	42.00	0.49
Main Channel	1942	50Yr	2885.00	244.25	255.11	251.32	255.24	0.000377	4.13	1760.17	574.40	0.23



HEC-RAS Plan: Prop-1E River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crt W.S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Provide # Cftl
Main Channel	2.247	100Yr	4380.00	245.20	255.60	252.62	255.63	0.000184	2.82	5698.99	1338.76	0.16
Main Channel	2.247	10Yr	1605.00	245.20	252.75	250.04	252.82	0.000359	3.16	2071.99	1207.36	0.21
Main Channel	2.247	50Yr	3395.00	245.20	255.47	251.47	255.49	0.000120	2.27	5528.18	1332.90	0.13
Main Channel	2.247	25Yr	2409.00	245.20	254.14	252.06	254.17	0.000175	2.48	3788.74	1271.30	0.15
Main Channel	2.262	100Yr	4380.00	245.00	255.63		255.64	0.000086	1.94	7950.48	1517.24	0.11
Main Channel	2.262	10Yr	1605.00	245.00	252.83		252.84	0.000099	1.67	3918.79	1379.04	0.11
Main Channel	2.262	50Yr	3395.00	245.00	255.49		255.50	0.000056	1.55	7739.81	1506.85	0.09
Main Channel	2.262	25Yr	2409.00	245.00	254.17		254.18	0.000068	1.54	5799.06	1435.16	0.09
Main Channel	2.432	100Yr	4380.00	247.60	255.45		256.03	0.002333	9.09	1654.30	697.13	0.59
Main Channel	2.432	10Yr	1605.00	247.60	252.75		253.23	0.002564	7.08	562.99	285.10	0.57
Main Channel	2.432	50Yr	3395.00	247.60	255.38		255.75	0.001471	7.18	1608.99	677.68	0.46
Main Channel	2.432	25Yr	2409.00	247.60	254.11		254.44	0.001582	6.57	1010.07	375.46	0.47
Main Channel	2.442	100Yr	4380.00	246.89	255.69	252.20	256.15	0.001003	5.44	938.22	529.59	0.37
Main Channel	2.442	10Yr	1605.00	246.89	253.22	250.25	253.38	0.000526	3.15	510.17	111.46	0.26
Main Channel	2.442	50Yr	3395.00	246.89	255.53	251.59	255.82	0.000656	4.34	860.11	432.82	0.30
Main Channel	2.442	25Yr	2409.00	246.89	254.30	250.89	254.52	0.000628	3.81	632.66	115.26	0.29
Main Channel	2.444		Bridge									
Main Channel	2.446	100Yr	4380.00	247.05	255.99	252.06	256.36	0.000772	4.94	1157.97	712.44	0.33
Main Channel	2.446	10Yr	1605.00	247.05	253.26	250.11	253.40	0.000460	3.03	530.07	115.14	0.24
Main Channel	2.446	50Yr	3395.00	247.05	255.81	251.45	256.06	0.000514	3.97	1035.41	601.44	0.27
Main Channel	2.446	25Yr	2409.00	247.05	254.52	250.78	254.73	0.000480	3.61	667.50	119.21	0.26
Main Channel	2.456	100Yr	4380.00	246.90	256.05		256.42	0.001367	7.48	2228.41	787.85	0.45
Main Channel	2.456	10Yr	1605.00	246.90	253.24		253.46	0.001106	5.14	885.37	341.66	0.38
Main Channel	2.456	50Yr	3395.00	246.90	255.84		256.09	0.000938	6.09	2067.33	735.84	0.37
Main Channel	2.456	25Yr	2409.00	246.90	254.57		254.75	0.000839	5.15	1368.48	385.71	0.34
Main Channel	2.920	100Yr	4380.00	249.90	258.46		258.52	0.000641	4.62	3980.75	1427.62	0.29
Main Channel	2.920	10Yr	1605.00	249.90	256.18		256.35	0.001392	5.38	1254.99	882.08	0.41
Main Channel	2.920	50Yr	3395.00	249.90	257.88		257.96	0.000696	4.57	3182.33	1348.43	0.30
Main Channel	2.920	25Yr	2409.00	249.90	256.89		257.02	0.001145	5.30	1952.67	1095.05	0.38
Main Channel	3.140	100Yr	3038.00	252.00	259.02	255.99	259.04	0.000280	2.71	3946.87	1163.01	0.19
Main Channel	3.140	10Yr	1263.00	252.00	257.12	255.46	257.14	0.000335	2.31	1972.06	916.04	0.20

HEC-RAS Plan: Prop-1E River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W/S Elev (ft)	Ch W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cht
Main Channel	3.140	50Yr	2430.00	252.00	258.48	255.85	258.50	0.000286	2.57	3334.02	1092.36	0.19
Main Channel	3.140	25Yr	1841.00	252.00	257.74	255.67	257.76	0.000343	2.56	2560.19	996.02	0.20
Main Channel	3.678	100Yr	3038.00	257.10	262.01	262.73	264.47	0.030109	17.22	506.58	392.46	1.56
Main Channel	3.678	10Yr	1263.00	257.10	261.87	261.87	262.42	0.006717	7.93	452.64	386.84	0.73
Main Channel	3.678	50Yr	2430.00	257.10	262.22	262.51	263.31	0.013445	11.93	589.54	400.96	1.05
Main Channel	3.678	25Yr	1841.00	257.10	262.21	262.21	262.84	0.007758	9.06	588.26	400.83	0.80
Main Channel	3.860	100Yr	3038.00	263.10	271.33	271.54	272.92	0.004088	12.38	481.63	229.31	0.78
Main Channel	3.860	10Yr	1263.00	263.10	267.07	268.08	270.33	0.018422	15.48	104.91	44.08	1.45
Main Channel	3.860	50Yr	2430.00	263.10	270.03	270.48	272.26	0.006434	13.74	277.91	83.37	0.95
Main Channel	3.860	25Yr	1841.00	263.10	268.31	269.00	271.36	0.012305	15.47	165.95	54.37	1.25
Main Channel	3.870	100Yr	3038.00	266.18	272.40	272.40	273.33	0.004603	9.38	623.16	368.78	0.68
Main Channel	3.870	10Yr	1263.00	266.18	269.87	269.87	271.54	0.011921	10.38	121.67	62.42	1.00
Main Channel	3.870	50Yr	2430.00	266.18	271.95	271.95	272.92	0.004825	9.11	478.48	328.92	0.69
Main Channel	3.870	25Yr	1841.00	266.18	271.30	271.30	272.36	0.005503	8.94	311.78	240.96	0.72
Main Channel	3.876		Bridge									
Main Channel	3.882	100Yr	3038.00	264.30	272.78	272.00	273.36	0.004210	7.85	728.63	390.64	0.57
Main Channel	3.882	10Yr	1263.00	264.30	272.14	270.58	272.31	0.001318	4.07	530.52	287.81	0.31
Main Channel	3.882	50Yr	2430.00	264.30	272.45	271.67	272.94	0.003895	7.07	617.29	336.99	0.53
Main Channel	3.882	25Yr	1841.00	264.30	272.17	271.22	272.53	0.002716	5.87	539.63	293.39	0.45
Main Channel	3.892	100Yr	3038.00	265.10	273.13	271.66	273.55	0.003020	7.94	1177.35	482.14	0.50
Main Channel	3.892	10Yr	1263.00	265.10	272.24	271.16	272.37	0.000992	4.19	825.62	329.52	0.28
Main Channel	3.892	50Yr	2430.00	265.10	272.76	271.16	273.11	0.002537	7.04	1012.39	402.60	0.46
Main Channel	3.892	25Yr	1841.00	265.10	272.40	270.52	272.65	0.001855	5.82	880.57	347.28	0.39
Main Channel	3.903	100Yr	3038.00	265.70	273.68	273.68	276.32	0.010806	14.91	349.41	126.31	0.95
Main Channel	3.903	10Yr	1263.00	265.70	271.71	272.71	272.77	0.005966	9.07	203.36	54.73	0.67
Main Channel	3.903	50Yr	2430.00	265.70	272.71	272.71	275.23	0.011901	14.28	260.96	61.56	0.98
Main Channel	3.903	25Yr	1841.00	265.70	271.81	271.81	273.96	0.011883	12.95	208.70	55.37	0.95
Main Channel	3.948	100Yr	3038.00	267.60	277.18	277.18	277.59	0.002027	7.40	1288.05	473.23	0.43
Main Channel	3.948	10Yr	1263.00	267.60	273.31	273.31	274.55	0.007144	9.71	201.41	124.74	0.73
Main Channel	3.948	50Yr	2430.00	267.60	276.19	276.19	276.85	0.003081	8.46	849.88	413.00	0.52
Main Channel	3.948	25Yr	1841.00	267.60	274.98	274.44	275.79	0.004002	8.69	476.91	197.64	0.57

HEC-RAS Plan: Prop-1E River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Ch Chl (ft)	W.S. Elev. (ft)	Crit W.S. (ft)	E.G. Elev. (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sqft)	Top Width (ft)	Profile # Chl
Main Channel	3.985	100Yr	3038.00	269.32	277.59	275.56	277.95	0.002464	6.06	1000.83	384.88	0.40
Main Channel	3.986	10Yr	1263.00	269.32	275.07	273.66	275.39	0.003148	5.13	379.24	182.28	0.42
Main Channel	3.985	50Yr	2430.00	269.32	277.02	275.10	277.30	0.002129	5.33	819.87	268.97	0.37
Main Channel	3.986	25Yr	1841.00	269.32	276.05	274.52	276.37	0.002673	5.37	579.39	225.82	0.40
Main Channel	4.084	100Yr	3038.00	277.00	284.74	284.74	286.72	0.010779	12.72	387.18	115.34	0.90
Main Channel	4.084	10Yr	1263.00	277.00	282.37	282.37	283.80	0.012846	10.05	164.61	72.74	0.91
Main Channel	4.084	50Yr	2430.00	277.00	284.06	284.06	285.89	0.011120	11.95	313.27	103.16	0.90
Main Channel	4.084	25Yr	1841.00	277.00	283.32	283.32	284.94	0.011474	11.02	241.44	89.76	0.89
Main Channel	4.084	100Yr	3038.00	278.40	286.98	282.71	287.34	0.001094	4.82	630.06	221.33	0.30
Main Channel	4.084	10Yr	1263.00	278.40	284.14	281.16	284.29	0.000858	3.16	400.25	93.23	0.25
Main Channel	4.084	50Yr	2430.00	278.40	286.18	282.23	286.47	0.001002	4.30	565.75	150.49	0.29
Main Channel	4.084	25Yr	1841.00	278.40	285.26	281.72	285.47	0.000924	3.75	490.69	105.25	0.27
Main Channel	4.100		Bridge									
Main Channel	4.106	100Yr	3038.00	278.30	287.04	282.63	287.38	0.000575	4.72	643.12	235.73	0.30
Main Channel	4.106	10Yr	1263.00	278.30	284.18	281.06	284.33	0.000438	3.07	411.93	93.57	0.24
Main Channel	4.106	50Yr	2430.00	278.30	286.24	282.13	286.51	0.000524	4.20	578.29	164.31	0.28
Main Channel	4.106	25Yr	1841.00	278.30	285.30	281.62	285.51	0.000479	3.66	502.78	111.06	0.26
Main Channel	4.116	100Yr	3038.00	277.10	285.71	287.00	290.59	0.011288	20.37	281.51	71.17	1.28
Main Channel	4.116	10Yr	1263.00	277.10	282.95	283.91	286.27	0.011573	15.50	120.14	45.54	1.20
Main Channel	4.116	50Yr	2430.00	277.10	284.80	286.30	289.51	0.012190	19.51	220.26	62.73	1.30
Main Channel	4.116	25Yr	1841.00	277.10	283.96	285.23	288.05	0.011924	17.72	170.85	54.98	1.26
Main Channel	4.368	100Yr	3038.00	297.30	305.26	305.26	308.02	0.014878	15.48	298.67	66.27	0.98
Main Channel	4.369	10Yr	1263.00	297.30	302.48	302.48	304.25	0.015497	11.69	144.59	45.62	0.93
Main Channel	4.368	50Yr	2430.00	297.30	304.61	304.61	306.90	0.013537	13.91	257.91	60.34	0.93
Main Channel	4.368	25Yr	1841.00	297.30	303.63	303.63	305.69	0.014321	12.94	201.56	53.54	0.93
Main Channel	4.375	100Yr	3038.00	298.00	304.79	306.47	309.65	0.026848	17.80	183.93	57.09	1.28
Main Channel	4.375	10Yr	1263.00	298.00	301.08	302.67	306.40	0.075141	18.51	68.25	25.19	1.98
Main Channel	4.375	50Yr	2430.00	298.00	303.55	305.52	308.68	0.037638	18.17	133.78	28.84	1.46
Main Channel	4.375	25Yr	1841.00	298.00	302.29	303.92	307.61	0.051555	18.50	99.49	26.52	1.68
Main Channel	4.3785		Bridge									
Main Channel	4.379	100Yr	3038.00	300.70	309.93	307.93	310.86	0.001984	8.98	598.40	138.40	0.54

HEC-RAS Plan: Prop-1E River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Ord. W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cht
Main Channel	4.379	10Yr	1263.00	300.70	307.41	305.43	307.88	0.001399	6.01	315.92	92.89	0.43
Main Channel	4.379	50Yr	2430.00	300.70	309.23	307.20	310.01	0.001801	8.09	507.20	122.18	0.50
Main Channel	4.379	25Yr	1841.00	300.70	308.43	306.40	309.05	0.001578	7.06	416.96	105.50	0.46
Main Channel	4.389	100Yr	3038.00	300.90	309.80	308.36	311.12	0.004539	10.31	422.82	87.17	0.62
Main Channel	4.389	10Yr	1263.00	300.90	307.41	305.47	308.03	0.002998	6.75	240.70	64.61	0.48
Main Channel	4.389	50Yr	2430.00	300.90	309.15	307.55	310.23	0.004058	9.24	367.42	80.97	0.58
Main Channel	4.389	25Yr	1841.00	300.90	308.38	306.60	309.23	0.003546	8.08	307.91	73.74	0.53
Main Channel	4.644	100Yr	3038.00	317.60	325.62	326.31	327.76	0.010008	13.94	490.95	327.88	0.90
Main Channel	4.644	10Yr	1263.00	317.60	323.04	323.04	325.10	0.012817	11.90	121.93	33.14	0.95
Main Channel	4.644	50Yr	2430.00	317.60	325.21	325.99	327.43	0.010007	13.42	355.75	324.75	0.89
Main Channel	4.644	25Yr	1841.00	317.60	324.59	325.52	326.79	0.010013	12.63	213.42	123.29	0.88

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**RELOCATE BERM FURTHER FROM CHANNEL  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: Prop-1D River: Coppemine Brook Reach: Main Channel

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Grat W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel/Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	0+00	100Yr	4618.00	205.78	216.40	213.95	217.29	0.001889	8.56	1454.60	870.24	0.48
Main Channel	0+00	10Yr	1739.00	205.78	212.20	210.14	212.89	0.002467	6.80	312.65	100.21	0.50
Main Channel	0+00	50Yr	3360.00	205.78	216.00	212.38	216.48	0.001104	6.36	1133.80	609.08	0.36
Main Channel	0+00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42
Main Channel	0+051	100Yr	4618.00	207.98	217.01		217.95	0.003112	9.83	1488.97	766.70	0.59
Main Channel	0+051	10Yr	1739.00	207.98	212.94		214.26	0.007523	9.88	226.45	58.38	0.83
Main Channel	0+051	50Yr	3360.00	207.98	216.19		217.23	0.003301	9.46	923.33	623.67	0.60
Main Channel	0+051	25Yr	2677.00	207.98	214.77	213.57	216.24	0.005397	10.54	349.61	148.31	0.74
Main Channel	0+061	100Yr	4618.00	208.13	217.77		218.23	0.001951	7.02	1921.79	852.32	0.41
Main Channel	0+061	10Yr	1739.00	208.13	213.68		214.72	0.006043	8.23	224.97	54.11	0.66
Main Channel	0+061	50Yr	3360.00	208.13	217.09		217.54	0.001846	6.48	1383.32	730.80	0.40
Main Channel	0+061	25Yr	2677.00	208.13	215.33	213.77	216.59	0.005156	9.23	402.20	289.05	0.64
Main Channel	0+074	100Yr	4618.00	207.71	217.89		218.40	0.002218	8.84	2094.30	884.55	0.51
Main Channel	0+074	10Yr	1739.00	207.71	213.93		215.38	0.007039	10.94	247.89	60.94	0.83
Main Channel	0+074	50Yr	3360.00	207.71	217.18		217.74	0.002284	8.51	1507.00	760.61	0.51
Main Channel	0+074	25Yr	2677.00	207.71	215.17	214.78	217.70	0.009142	14.30	381.90	231.91	0.97
Main Channel	0+08	100Yr	4618.00	207.70	217.96		218.45	0.001454	7.14	2020.64	883.77	0.40
Main Channel	0+08	10Yr	1739.00	207.70	214.93		215.56	0.001803	6.38	294.36	140.75	0.43
Main Channel	0+08	50Yr	3360.00	207.70	217.38		217.80	0.001212	6.26	1539.47	776.25	0.36
Main Channel	0+08	25Yr	2677.00	207.70	217.79	213.33	217.98	0.000559	4.38	1869.24	851.40	0.25
Main Channel	0+084	100Yr	4618.00	207.19	218.40	216.97	218.56	0.000497	5.09	2404.49	920.63	0.28
Main Channel	0+084	10Yr	1739.00	207.19	214.75	212.82	215.82	0.002419	8.30	209.45	100.94	0.58
Main Channel	0+084	50Yr	3360.00	207.19	217.71	216.50	217.89	0.000505	4.90	1804.70	825.53	0.28
Main Channel	0+084	25Yr	2677.00	207.19	217.92	216.15	218.01	0.000262	3.58	1982.10	860.88	0.20
Main Channel	0+09	Bridge										
Main Channel	0+094	100Yr	4618.00	206.50	218.38	217.08	218.62	0.000577	5.64	1963.04	656.68	0.30
Main Channel	0+094	10Yr	1739.00	206.50	216.28	212.11	216.02	0.001383	6.95	250.22	167.94	0.44
Main Channel	0+094	50Yr	3360.00	206.50	217.70	214.56	217.94	0.000545	5.25	1532.85	612.62	0.29
Main Channel	0+094	25Yr	2677.00	206.50	217.97	213.58	218.08	0.000273	3.78	1697.82	629.88	0.21
Main Channel	0+114	100Yr	4618.00	207.65	218.42		218.88	0.000462	4.39	1977.46	607.48	0.26
Main Channel	0+114	10Yr	1739.00	207.65	216.04		216.15	0.000254	2.69	742.37	416.02	0.19
Main Channel	0+114	50Yr	3360.00	207.65	217.81		217.99	0.000345	3.61	1616.97	564.80	0.23

HEC-RAS Plan: Prop-1D River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch Elev (ft)	W S Elev (ft)	Crit W S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	0.144	25Yr	2677.00	207.65	218.00		218.11	0.000196	2.77	1729.71	578.49	0.17
Main Channel	0.146	100Yr	4383.00	208.35	218.23	217.21	219.03	0.004666	9.69	1058.16	345.74	0.57
Main Channel	0.148	10Yr	1634.00	208.35	215.81		216.40	0.003826	7.13	438.52	198.01	0.49
Main Channel	0.148	50Yr	3135.00	208.35	217.66	216.46	218.25	0.003505	8.04	874.91	296.49	0.49
Main Channel	0.148	25Yr	2522.00	208.35	217.93	215.91	218.25	0.001887	6.02	958.48	319.89	0.36
Main Channel	0.224	100Yr	4383.00	210.13	218.56	219.72	222.54	0.009149	17.90	399.06	250.77	1.15
Main Channel	0.224	10Yr	1634.00	210.13	216.75		218.45	0.004724	10.70	179.23	40.38	0.79
Main Channel	0.224	50Yr	3135.00	210.13	217.98	219.23	221.66	0.008254	16.11	268.83	185.08	1.08
Main Channel	0.224	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Main Channel	0.306	100Yr	4383.00	211.80	224.44	224.44	225.93	0.002835	11.87	1089.54	394.17	0.62
Main Channel	0.306	10Yr	1634.00	211.80	219.02	218.84	221.48	0.007713	12.63	138.32	32.11	0.92
Main Channel	0.306	50Yr	3135.00	211.80	221.91	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Main Channel	0.309	100Yr	4383.00	212.00	224.87		225.99	0.002197	10.70	1253.39	405.50	0.56
Main Channel	0.308	10Yr	1634.00	212.00	219.01	219.00	221.60	0.008344	12.99	134.70	32.06	0.96
Main Channel	0.308	50Yr	3135.00	212.00	224.96	223.36	225.50	0.001065	7.49	1289.99	409.99	0.39
Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Main Channel	0.316	100Yr	4383.00	212.85	224.27	222.23	226.87	0.006155	12.94	338.67	38.91	0.72
Main Channel	0.316	10Yr	1634.00	212.85	221.70	218.31	222.34	0.002258	6.46	253.11	36.72	0.41
Main Channel	0.316	50Yr	3135.00	212.85	224.68	220.60	225.91	0.002756	8.89	352.50	39.26	0.48
Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Main Channel	0.320		Bridge									
Main Channel	0.326	100Yr	4383.00	214.38	228.32	223.28	228.98	0.001119	7.51	1390.63	413.71	0.37
Main Channel	0.326	10Yr	1634.00	214.38	221.71	219.37	222.58	0.002825	7.50	217.99	36.75	0.52
Main Channel	0.326	50Yr	3135.00	214.38	225.30	221.67	226.84	0.002416	9.28	337.77	68.98	0.51
Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Main Channel	0.336	100Yr	4383.00	216.00	228.97	223.82	229.07	0.000328	3.75	2905.67	468.56	0.20
Main Channel	0.336	10Yr	1634.00	216.00	221.88		222.80	0.006496	8.32	320.04	184.50	0.75
Main Channel	0.336	50Yr	3135.00	216.00	226.68	223.00	226.81	0.000523	4.05	1887.21	420.92	0.24
Main Channel	0.336	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000578	3.96	1530.68	402.92	0.25
Main Channel	0.588	100Yr	4383.00	220.60	231.45	231.45	233.08	0.004106	12.90	907.96	271.09	0.70

HEC-RAS Plan: Prop-1D River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Chl W.S. (ft)	E.G. Elev (ft)	F.G. Slope (ft/ft)	Vel/Chl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Fronda # Chl
Main Channel	0.588	10Yr	1634.00	220.60	228.13		229.33	0.003768	9.58	279.61	82.59	0.63
Main Channel	0.588	50Yr	3135.00	220.60	228.69	228.69	232.17	0.010112	16.51	329.22	93.03	1.05
Main Channel	0.588	25Yr	2522.00	220.60	228.46	228.46	230.95	0.007448	13.88	307.92	88.70	0.89
Main Channel	0.729	100Yr	4383.00	226.80	235.20		236.93	0.006558	11.81	462.09	117.79	0.79
Main Channel	0.729	10Yr	1634.00	226.80	232.02	232.01	233.59	0.009010	10.31	174.49	62.28	0.87
Main Channel	0.729	50Yr	3135.00	226.80	235.37		236.18	0.002984	8.10	482.41	120.19	0.53
Main Channel	0.729	25Yr	2522.00	226.80	234.19		235.19	0.004219	8.74	352.01	100.76	0.62
Main Channel	0.748	100Yr	4383.00	227.50	235.95		237.67	0.008576	11.44	440.05	95.30	0.89
Main Channel	0.748	10Yr	1634.00	227.50	233.68	233.04	234.46	0.007174	7.63	236.40	81.32	0.75
Main Channel	0.748	50Yr	3135.00	227.50	235.62		236.63	0.005459	8.74	409.27	93.26	0.70
Main Channel	0.748	25Yr	2522.00	227.50	234.73		235.72	0.006912	8.64	327.93	88.19	0.76
Main Channel	0.758	100Yr	4383.00	229.00	236.32	235.75	238.14	0.008208	11.94	442.47	99.17	0.89
Main Channel	0.758	10Yr	1634.00	229.00	234.02	233.39	234.82	0.006821	7.72	238.77	80.53	0.74
Main Channel	0.758	50Yr	3135.00	229.00	235.84	234.79	236.98	0.005704	9.38	397.54	97.19	0.73
Main Channel	0.758	25Yr	2522.00	229.00	235.03	234.26	236.10	0.006646	9.03	323.64	89.85	0.76
Main Channel	0.759		Bridge									
Main Channel	0.760	100Yr	4383.00	229.10	237.28	235.77	238.40	0.004995	9.18	531.92	103.62	0.65
Main Channel	0.760	10Yr	1634.00	229.10	234.20	233.41	234.90	0.005850	7.16	282.33	82.22	0.68
Main Channel	0.760	50Yr	3135.00	229.10	236.25	234.83	237.11	0.004795	7.97	435.35	98.91	0.62
Main Channel	0.760	25Yr	2522.00	229.10	235.39	234.31	236.22	0.005565	7.82	355.26	93.26	0.66
Main Channel	0.770	100Yr	4383.00	229.00	237.50		238.67	0.004906	10.16	562.98	121.70	0.70
Main Channel	0.770	10Yr	1634.00	229.00	234.47		235.23	0.006543	7.80	247.21	86.73	0.73
Main Channel	0.770	50Yr	3135.00	229.00	236.42		237.38	0.004893	9.02	436.73	110.30	0.68
Main Channel	0.770	25Yr	2522.00	229.00	235.61		236.53	0.005638	8.71	353.02	97.90	0.71
Main Channel	0.798	100Yr	4383.00	230.50	238.25	236.71	239.30	0.003510	9.28	631.86	134.84	0.61
Main Channel	0.798	10Yr	1634.00	230.50	235.36		235.97	0.003711	6.73	291.89	98.12	0.58
Main Channel	0.798	50Yr	3135.00	230.50	237.13		238.01	0.003563	8.34	484.37	128.37	0.60
Main Channel	0.798	25Yr	2522.00	230.50	236.43		237.22	0.003688	7.80	403.22	109.50	0.60
Main Channel	0.808	100Yr	4383.00	230.50	237.62	237.62	240.18	0.008735	14.33	369.55	74.91	0.96
Main Channel	0.808	10Yr	1634.00	230.50	235.24	234.80	236.36	0.006327	9.19	206.26	62.68	0.76
Main Channel	0.808	50Yr	3135.00	230.50	236.59	236.46	238.62	0.006354	12.58	295.57	69.64	0.92
Main Channel	0.808	25Yr	2522.00	230.50	236.05	235.85	237.75	0.007903	11.47	258.49	66.84	0.88



HEC-RAS Plan: Prop-1D River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crn W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froutde # Cst
Main Channel	1.596	100Yr	4071.00	238.40	248.06	244.97	249.11	0.001846	8.77	855.01	413.45	0.50
Main Channel	1.598	10Yr	1501.00	238.40	245.30	241.78	245.70	0.000979	5.11	293.91	81.59	0.34
Main Channel	1.598	50Yr	2885.00	238.40	247.73	243.62	248.33	0.001078	6.55	734.93	316.33	0.38
Main Channel	1.598	25Yr	2329.00	238.40	247.31	242.91	247.72	0.000796	5.46	628.13	192.40	0.32
Main Channel	1.608	100Yr	4071.00	238.40	248.02	245.38	249.39	0.003017	10.70	792.74	270.94	0.63
Main Channel	1.608	10Yr	1501.00	238.40	245.23	245.83	245.83	0.001845	6.55	306.23	69.57	0.46
Main Channel	1.608	50Yr	2885.00	238.40	247.69	248.44	248.44	0.001722	7.89	718.35	219.39	0.47
Main Channel	1.608	25Yr	2329.00	238.40	247.22	244.23	247.84	0.001482	7.05	617.00	204.41	0.43
Main Channel	1.850	100Yr	4071.00	242.10	253.18	253.18	254.38	0.002886	11.38	1175.51	534.38	0.62
Main Channel	1.850	10Yr	1501.00	242.10	248.39	248.39	250.37	0.007045	11.85	165.60	43.41	0.87
Main Channel	1.850	50Yr	2885.00	242.10	249.94	249.81	253.87	0.010600	17.06	239.44	51.70	1.12
Main Channel	1.850	25Yr	2329.00	242.10	249.79	249.79	252.50	0.007490	14.14	231.54	50.87	0.93
Main Channel	1.850	100Yr	4071.00	241.60	254.45	248.65	254.71	0.000418	5.05	1483.93	358.51	0.25
Main Channel	1.850	10Yr	1501.00	241.60	250.78	245.23	250.95	0.000337	3.62	559.38	136.76	0.21
Main Channel	1.850	50Yr	2885.00	241.60	254.94	247.22	255.04	0.000166	3.27	1683.74	386.40	0.16
Main Channel	1.850	25Yr	2329.00	241.60	253.14	246.46	253.30	0.000261	3.72	1063.08	282.66	0.19
Main Channel	1.854	Bridge										
Main Channel	1.858	100Yr	4071.00	241.40	254.55	248.47	254.77	0.000363	4.78	1590.91	375.35	0.23
Main Channel	1.858	10Yr	1501.00	241.40	251.23	245.03	251.48	0.000374	4.00	375.51	183.75	0.22
Main Channel	1.858	50Yr	2885.00	241.40	255.02	247.02	255.11	0.000150	3.14	1776.57	422.30	0.15
Main Channel	1.858	25Yr	2329.00	241.40	253.25	246.27	253.38	0.000225	3.51	1151.64	300.21	0.18
Main Channel	1.878	100Yr	4071.00	242.70	254.55	254.80	254.80	0.000568	5.36	1267.03	352.59	0.28
Main Channel	1.878	10Yr	1501.00	242.70	251.11	251.57	251.57	0.001012	5.64	332.65	176.70	0.35
Main Channel	1.878	50Yr	2885.00	242.70	255.03	255.12	255.12	0.000210	3.35	1442.66	383.52	0.17
Main Channel	1.878	25Yr	2329.00	242.70	253.21	253.42	253.42	0.000485	4.56	841.71	294.81	0.25
Main Channel	1.932	100Yr	4071.00	243.87	254.81	255.00	255.00	0.000813	5.12	1899.68	694.49	0.31
Main Channel	1.932	10Yr	1501.00	243.87	251.29	249.60	252.20	0.003635	7.65	197.97	53.85	0.59
Main Channel	1.932	50Yr	2885.00	243.87	255.12	255.20	255.20	0.000311	3.24	2120.69	714.59	0.19
Main Channel	1.932	25Yr	2329.00	243.87	253.35	253.66	253.66	0.001196	5.49	958.03	576.98	0.36
Main Channel	1.942	100Yr	4071.00	244.25	254.78	253.70	255.12	0.000977	6.50	1572.71	557.59	0.36
Main Channel	1.942	10Yr	1501.00	244.25	251.56	249.03	252.36	0.002029	7.22	214.34	42.00	0.49
Main Channel	1.942	50Yr	2885.00	244.25	255.11	251.32	255.24	0.000377	4.13	1760.17	574.40	0.23



HEC-RAS Plan: Prop-1D River: Coppermine Brook Reach: Main Channel (Continued)

Reach	Flow Sta	Profile	Q (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Ch W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Friction Coef
Main Channel	2.247	100Yr	4380.00	245.20	255.60	252.62	255.63	0.000184	2.82	5698.99	1338.76	0.16
Main Channel	2.247	10Yr	1605.00	245.20	252.75	250.04	252.82	0.000359	3.16	2071.99	1207.36	0.21
Main Channel	2.247	50Yr	3395.00	245.20	255.47	251.47	255.49	0.000120	2.27	5528.18	1332.90	0.13
Main Channel	2.247	25Yr	2409.00	245.20	254.14	252.06	254.17	0.000175	2.48	3788.74	1271.30	0.15
Main Channel	2.262	100Yr	4380.00	245.00	255.63		255.64	0.000086	1.94	7950.48	1517.24	0.11
Main Channel	2.262	10Yr	1605.00	245.00	252.83		252.84	0.000099	1.67	3918.79	1379.04	0.11
Main Channel	2.262	50Yr	3395.00	245.00	255.49		255.50	0.000056	1.55	7739.81	1506.85	0.09
Main Channel	2.262	25Yr	2409.00	245.00	254.17		254.18	0.000068	1.54	5799.06	1435.16	0.09
Main Channel	2.432	100Yr	4380.00	247.60	255.45		256.03	0.002333	9.09	1654.30	697.13	0.59
Main Channel	2.432	10Yr	1605.00	247.60	252.75		253.23	0.002564	7.08	582.99	285.10	0.57
Main Channel	2.432	50Yr	3395.00	247.60	255.38		255.75	0.001471	7.18	1608.99	677.68	0.46
Main Channel	2.432	25Yr	2409.00	247.60	254.11		254.44	0.001582	6.57	1010.07	375.45	0.47
Main Channel	2.442	100Yr	4380.00	246.89	255.69	252.20	256.15	0.001003	5.44	938.22	529.69	0.37
Main Channel	2.442	10Yr	1605.00	246.89	253.22	250.25	253.38	0.000526	3.15	510.17	111.46	0.26
Main Channel	2.442	50Yr	3395.00	246.89	255.53	251.59	255.82	0.000656	4.34	860.11	432.82	0.30
Main Channel	2.442	25Yr	2409.00	246.89	254.30	250.89	254.52	0.000628	3.81	632.66	115.26	0.29
Main Channel	2.444		Bridge									
Main Channel	2.446	100Yr	4380.00	247.05	255.99	252.06	256.36	0.000772	4.94	1157.97	712.44	0.33
Main Channel	2.446	10Yr	1605.00	247.05	253.26	250.11	253.40	0.000460	3.03	530.07	115.14	0.24
Main Channel	2.446	50Yr	3395.00	247.05	255.81	251.45	256.06	0.000514	3.97	1035.41	601.44	0.27
Main Channel	2.446	25Yr	2409.00	247.05	254.52	250.78	254.73	0.000480	3.61	687.50	119.21	0.26
Main Channel	2.456	100Yr	4380.00	246.90	256.05		256.42	0.001367	7.48	2228.41	787.85	0.45
Main Channel	2.456	10Yr	1605.00	246.90	253.24		253.46	0.001106	5.14	886.37	341.66	0.38
Main Channel	2.456	50Yr	3395.00	246.90	255.84		256.09	0.000938	6.09	2067.33	735.84	0.37
Main Channel	2.456	25Yr	2409.00	246.90	254.57		254.75	0.000839	5.15	1368.48	385.71	0.34
Main Channel	2.920	100Yr	4380.00	249.90	258.46		258.52	0.000641	4.62	3980.75	1427.62	0.29
Main Channel	2.920	10Yr	1605.00	249.90	256.18		256.35	0.001392	5.38	1254.99	882.08	0.41
Main Channel	2.920	50Yr	3395.00	249.90	257.88		257.96	0.000696	4.57	3182.33	1348.43	0.30
Main Channel	2.920	25Yr	2409.00	249.90	256.89		257.02	0.001145	5.30	1952.67	1095.05	0.38
Main Channel	3.140	100Yr	3038.00	252.00	259.02	255.99	259.04	0.000280	2.71	3946.87	1163.01	0.19
Main Channel	3.140	10Yr	1263.00	252.00	257.12	255.46	257.14	0.000335	2.31	1972.06	916.04	0.20

HEC-RAS Plan: Prop-1D River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cr W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Friction Coef
Main Channel	3.140	50Yr	2430.00	252.00	258.48	255.85	258.50	0.000286	2.57	3334.02	1092.36	0.19
Main Channel	3.140	25Yr	1841.00	252.00	257.74	255.67	257.76	0.000343	2.56	2560.19	996.02	0.20
Main Channel	3.678	100Yr	3038.00	257.10	262.01	262.73	264.46	0.030001	17.20	507.37	392.55	1.56
Main Channel	3.678	10Yr	1263.00	257.10	261.87	261.87	262.42	0.006717	7.93	452.64	386.84	0.73
Main Channel	3.678	50Yr	2430.00	257.10	262.22	262.51	263.31	0.013445	11.93	589.54	400.96	1.05
Main Channel	3.678	25Yr	1841.00	257.10	262.21	262.21	262.84	0.007758	9.06	588.26	400.83	0.80
Main Channel	3.860	100Yr	3038.00	263.10	271.33	271.54	272.92	0.004100	12.39	480.77	228.89	0.78
Main Channel	3.860	10Yr	1263.00	263.10	267.07	268.08	270.33	0.018422	15.48	104.91	44.08	1.45
Main Channel	3.860	50Yr	2430.00	263.10	270.03	270.48	272.26	0.006434	13.74	277.91	83.37	0.95
Main Channel	3.860	25Yr	1841.00	263.10	268.31	269.00	271.36	0.012305	15.47	165.85	54.37	1.25
Main Channel	3.870	100Yr	3038.00	266.18	272.40	272.40	273.33	0.004603	9.38	623.16	368.78	0.68
Main Channel	3.870	10Yr	1263.00	266.18	269.87	269.87	271.54	0.011921	10.38	121.67	62.42	1.00
Main Channel	3.870	50Yr	2430.00	266.18	271.95	271.95	272.92	0.004825	9.11	478.48	328.92	0.69
Main Channel	3.870	25Yr	1841.00	266.18	271.30	271.30	272.36	0.005503	8.94	311.78	240.96	0.72
Main Channel	3.876		Bridge									
Main Channel	3.882	100Yr	3038.00	264.30	275.47	272.57	276.00	0.001933	6.83	701.58	196.04	0.41
Main Channel	3.882	10Yr	1263.00	264.30	272.92	270.20	273.35	0.001926	5.39	250.28	79.68	0.39
Main Channel	3.882	50Yr	2430.00	264.30	275.19	271.76	275.57	0.001459	5.80	646.69	182.82	0.35
Main Channel	3.882	25Yr	1841.00	264.30	274.96	270.93	275.21	0.000952	4.60	606.72	172.55	0.28
Main Channel	3.892	100Yr	3038.00	265.10	274.86	273.14	276.48	0.005084	11.79	439.81	84.69	0.68
Main Channel	3.892	10Yr	1263.00	265.10	272.96	270.06	273.47	0.002046	6.44	304.69	62.69	0.41
Main Channel	3.892	50Yr	2430.00	265.10	274.83	272.22	275.88	0.003290	9.47	437.50	84.26	0.54
Main Channel	3.892	25Yr	1841.00	265.10	274.77	271.22	275.39	0.001934	7.23	432.61	83.33	0.42
Main Channel	3.903	100Yr	3038.00	265.70	275.14	273.70	276.82	0.005668	12.14	516.50	159.31	0.71
Main Channel	3.903	10Yr	1263.00	265.70	273.04	270.69	273.64	0.002672	6.99	281.85	64.47	0.47
Main Channel	3.903	50Yr	2430.00	265.70	274.96	272.72	276.13	0.003983	10.04	488.91	153.41	0.59
Main Channel	3.903	25Yr	1841.00	265.70	274.83	271.81	275.56	0.002480	7.84	467.94	151.23	0.47
Main Channel	3.948	100Yr	3038.00	267.60	277.29	276.10	277.93	0.002714	8.62	904.42	268.89	0.49
Main Channel	3.948	10Yr	1263.00	267.60	273.69	272.51	274.78	0.005682	9.06	198.17	51.96	0.66
Main Channel	3.948	50Yr	2430.00	267.60	276.36	275.45	277.12	0.003250	8.81	671.85	233.73	0.53
Main Channel	3.948	25Yr	1841.00	267.60	275.55	273.70	276.32	0.003361	8.37	494.58	202.87	0.53

HEC-RAS Plan: Prop-1D River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crt.W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sqft)	Top Width (ft)	Froude # Chl
Main Channel	3.985	100Yr	3038.00	269.32	277.95	276.71	278.37	0.002423	6.21	737.02	149.49	0.40
Main Channel	3.985	10Yr	1263.00	269.32	275.18	273.60	275.54	0.003249	5.29	336.04	139.30	0.43
Main Channel	3.985	50Yr	2430.00	269.32	277.24	275.23	277.62	0.002383	5.76	631.44	146.87	0.39
Main Channel	3.985	25Yr	1841.00	269.32	276.50	274.71	276.82	0.002274	5.21	523.43	144.15	0.37
Main Channel	4.084	100Yr	3038.00	277.00	284.74	284.74	286.72	0.010779	12.72	387.18	115.34	0.90
Main Channel	4.084	10Yr	1263.00	277.00	282.40	282.40	283.80	0.012557	9.97	166.27	73.14	0.90
Main Channel	4.084	50Yr	2430.00	277.00	284.06	284.06	285.89	0.011132	11.96	313.12	103.14	0.90
Main Channel	4.084	25Yr	1841.00	277.00	283.31	283.31	284.94	0.011560	11.04	240.64	89.60	0.89
Main Channel	4.084	100Yr	3038.00	278.40	286.98	282.71	287.34	0.001094	4.82	630.06	221.33	0.30
Main Channel	4.084	10Yr	1263.00	278.40	284.13	281.16	284.29	0.000862	3.16	399.62	93.21	0.25
Main Channel	4.084	50Yr	2430.00	278.40	286.18	282.23	286.47	0.001001	4.29	565.80	150.54	0.29
Main Channel	4.084	25Yr	1841.00	278.40	285.26	281.72	285.48	0.000923	3.75	490.94	105.37	0.27
Main Channel	4.100		Bridge									
Main Channel	4.106	100Yr	3038.00	278.30	287.04	282.63	287.38	0.000575	4.72	643.12	235.73	0.30
Main Channel	4.106	10Yr	1263.00	278.30	284.18	281.06	284.32	0.000441	3.07	411.32	93.55	0.24
Main Channel	4.106	50Yr	2430.00	278.30	286.24	282.13	286.51	0.000524	4.20	578.34	164.36	0.28
Main Channel	4.106	25Yr	1841.00	278.30	285.31	281.62	285.52	0.000479	3.66	503.02	111.18	0.26
Main Channel	4.116	100Yr	3038.00	277.10	285.71	287.00	290.59	0.011288	20.37	281.51	71.17	1.28
Main Channel	4.116	10Yr	1263.00	277.10	282.95	283.91	286.27	0.011573	15.50	120.14	45.54	1.20
Main Channel	4.116	50Yr	2430.00	277.10	284.80	286.30	289.51	0.012190	19.51	220.26	62.73	1.30
Main Channel	4.116	25Yr	1841.00	277.10	283.96	285.23	288.05	0.011924	17.72	170.85	54.98	1.26
Main Channel	4.368	100Yr	3038.00	297.30	305.26	305.26	308.02	0.014878	15.48	298.87	66.27	0.98
Main Channel	4.368	10Yr	1263.00	297.30	302.48	302.48	304.25	0.015497	11.69	144.59	45.62	0.93
Main Channel	4.368	50Yr	2430.00	297.30	304.61	304.61	306.90	0.013537	13.91	257.81	60.34	0.93
Main Channel	4.368	25Yr	1841.00	297.30	303.63	303.63	305.69	0.014321	12.94	201.56	53.54	0.93
Main Channel	4.378	100Yr	3038.00	298.00	304.79	306.47	309.65	0.026848	17.80	183.93	57.09	1.28
Main Channel	4.378	10Yr	1263.00	298.00	301.08	302.67	306.40	0.075141	18.51	68.25	25.19	1.98
Main Channel	4.378	50Yr	2430.00	298.00	303.55	305.52	308.68	0.037538	18.17	133.78	28.84	1.46
Main Channel	4.378	25Yr	1841.00	298.00	302.29	303.92	307.61	0.051555	18.50	99.49	26.52	1.68
Main Channel	4.378		Bridge									
Main Channel	4.379	100Yr	3038.00	300.70	309.93	307.93	310.86	0.001984	8.98	598.40	138.40	0.54

HEC-RAS Plan: Prop-1D River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Chl W.S. (ft)	E.G. Elev (ft)	F.G. Slope (ft/ft)	Vel Chl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	4.379	10Yr	1263.00	300.70	307.41	305.43	307.88	0.001399	6.01	315.92	92.89	0.43
Main Channel	4.379	50Yr	2430.00	300.70	309.23	307.20	310.01	0.001801	8.09	507.20	122.18	0.50
Main Channel	4.379	25Yr	1841.00	300.70	308.43	306.40	309.05	0.001578	7.06	418.96	105.50	0.46
Main Channel	4.389	100Yr	3038.00	300.90	309.80	308.86	311.12	0.004539	10.31	422.82	87.17	0.62
Main Channel	4.389	10Yr	1263.00	300.90	307.41	305.47	308.03	0.002998	6.75	240.70	64.61	0.48
Main Channel	4.389	50Yr	2430.00	300.90	309.15	307.55	310.23	0.004058	9.24	367.42	80.97	0.58
Main Channel	4.389	25Yr	1841.00	300.90	308.38	306.60	309.23	0.003546	8.08	307.91	73.74	0.53
Main Channel	4.644	100Yr	3038.00	317.60	325.62	326.31	327.76	0.010008	13.94	490.95	327.88	0.90
Main Channel	4.644	10Yr	1263.00	317.60	323.04	323.04	325.10	0.012817	11.90	121.93	33.14	0.95
Main Channel	4.644	50Yr	2430.00	317.60	325.21	325.99	327.43	0.010007	13.42	365.75	324.75	0.89
Main Channel	4.644	25Yr	1841.00	317.60	324.59	325.52	326.79	0.010013	12.63	213.42	123.29	0.88

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**COMBINATION OF MODIFYING CHANNEL DOWNSTREAM OF STEVENS  
STREET; LOWERING THE CHANNEL AT THE BRIDGE; AND RELOCATING  
THE BERM FURTHER FROM CHANNEL  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: Prop-Alt1E River: Coppermine Brook Reach: Main Channel

Reach	River Sta	Profile	O Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crt W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vet Cntl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # (Ch)
Main Channel	0.00	100Yr	4618.00	205.78	216.40	213.95	217.29	0.001889	8.56	1454.60	870.24	0.48
Main Channel	0.00	10Yr	1739.00	205.78	212.20	210.14	212.89	0.002467	6.80	312.65	100.21	0.50
Main Channel	0.00	50Yr	3360.00	205.78	216.00	212.38	216.48	0.001104	6.36	1133.80	609.08	0.36
Main Channel	0.00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42
Main Channel	0.051	100Yr	4618.00	207.98	217.01		217.95	0.003112	9.83	1488.87	766.70	0.59
Main Channel	0.051	10Yr	1739.00	207.98	212.94		214.26	0.007523	9.88	226.45	58.38	0.83
Main Channel	0.051	50Yr	3360.00	207.98	216.19		217.23	0.003301	9.46	922.33	623.67	0.60
Main Channel	0.051	25Yr	2677.00	207.98	214.77	213.57	216.24	0.005397	10.54	349.61	148.31	0.74
Main Channel	0.061	100Yr	4618.00	208.13	217.77		218.23	0.001951	7.02	1921.79	852.32	0.41
Main Channel	0.061	10Yr	1739.00	208.13	213.68		214.72	0.006043	8.23	224.97	54.11	0.66
Main Channel	0.061	50Yr	3360.00	208.13	217.09		217.54	0.001846	6.48	1383.32	730.80	0.40
Main Channel	0.061	25Yr	2677.00	208.13	215.33	213.77	216.59	0.005156	9.23	402.20	289.05	0.64
Main Channel	0.074	100Yr	4618.00	207.71	217.89		218.40	0.002218	8.84	2094.30	884.55	0.51
Main Channel	0.074	10Yr	1739.00	207.71	213.93		215.38	0.007039	10.94	247.89	60.94	0.83
Main Channel	0.074	50Yr	3360.00	207.71	217.18		217.74	0.002284	8.51	1507.00	760.61	0.51
Main Channel	0.074	25Yr	2677.00	207.71	215.17	214.78	217.70	0.009142	14.30	381.90	231.91	0.97
Main Channel	0.08	100Yr	4618.00	207.70	217.96		218.45	0.001454	7.14	2020.64	883.77	0.40
Main Channel	0.08	10Yr	1739.00	207.70	214.93		215.56	0.001803	6.38	294.36	140.75	0.43
Main Channel	0.08	50Yr	3360.00	207.70	217.38		217.80	0.001212	6.26	1539.47	776.25	0.36
Main Channel	0.08	25Yr	2677.00	207.70	217.79	213.33	217.98	0.000559	4.38	1869.24	851.40	0.25
Main Channel	0.094	100Yr	4618.00	207.19	218.40	216.97	218.56	0.000497	5.09	2404.49	920.63	0.28
Main Channel	0.094	10Yr	1739.00	207.19	214.75	212.82	215.82	0.002419	8.30	209.45	100.94	0.58
Main Channel	0.094	50Yr	3360.00	207.19	217.71	216.50	217.89	0.000605	4.90	1804.70	825.53	0.28
Main Channel	0.094	25Yr	2677.00	207.19	217.92	216.15	218.01	0.000262	3.58	1982.10	860.88	0.20
Main Channel	0.09		Bridge									
Main Channel	0.094	100Yr	4618.00	206.50	218.38	217.08	218.62	0.000577	5.64	1963.04	656.68	0.30
Main Channel	0.094	10Yr	1739.00	206.50	215.28	212.11	216.02	0.001383	6.95	250.22	167.94	0.44
Main Channel	0.094	50Yr	3360.00	206.50	217.70	214.56	217.94	0.000545	5.25	1532.85	612.62	0.29
Main Channel	0.094	25Yr	2677.00	206.50	217.97	213.58	218.08	0.000273	3.78	1697.82	629.88	0.21
Main Channel	0.114	100Yr	4618.00	207.65	218.42		218.68	0.000462	4.39	1977.46	607.48	0.26
Main Channel	0.114	10Yr	1739.00	207.65	216.04		216.15	0.000254	2.69	742.37	416.02	0.19
Main Channel	0.114	50Yr	3360.00	207.65	217.81		217.99	0.000345	3.61	1616.97	564.80	0.23

HEC-RAS Plan: Prop-Alt1F River: Coppermine Brook Reach: Main Channel (Continued)

Reach	Rever Site	Profile	Q Total (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Ch W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel/Can1 (ft/s)	Flow Area (sq ft)	Top Width (ft)	Friction # Ch
Main Channel	0.143	25Yr	2677.00	207.65	218.00		218.11	0.000196	2.77	1729.71	578.49	0.17
Main Channel	0.145	100Yr	4383.00	208.35	218.23	217.21	219.03	0.004666	9.69	1058.16	345.74	0.57
Main Channel	0.148	10Yr	1634.00	208.35	215.81		216.40	0.003826	7.13	438.52	198.01	0.49
Main Channel	0.148	50Yr	3135.00	208.35	217.66	216.46	218.25	0.003505	8.04	874.91	296.49	0.49
Main Channel	0.148	25Yr	2522.00	208.35	217.93	215.91	218.25	0.001887	6.02	958.48	319.89	0.36
Main Channel	0.224	100Yr	4383.00	210.13	218.56	219.72	222.54	0.009149	17.90	399.06	250.77	1.15
Main Channel	0.224	10Yr	1634.00	210.13	216.75		218.45	0.004724	10.70	179.23	40.38	0.79
Main Channel	0.224	50Yr	3135.00	210.13	217.98	219.23	221.66	0.008254	16.11	268.83	185.08	1.08
Main Channel	0.224	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Main Channel	0.306	100Yr	4383.00	211.80	224.44	224.44	225.93	0.002835	11.87	1089.54	394.17	0.62
Main Channel	0.306	10Yr	1634.00	211.80	219.02	218.84	221.48	0.007713	12.63	136.32	32.11	0.92
Main Channel	0.306	50Yr	3135.00	211.80	221.91	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Main Channel	0.308	100Yr	4383.00	212.00	224.87		225.99	0.002197	10.70	1253.39	405.50	0.56
Main Channel	0.308	10Yr	1634.00	212.00	219.01	219.00	221.60	0.008344	12.99	134.70	32.06	0.96
Main Channel	0.308	50Yr	3135.00	212.00	224.96	223.36	225.50	0.001065	7.49	1289.99	409.99	0.39
Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Main Channel	0.316	100Yr	4383.00	212.85	224.27	222.23	226.87	0.006155	12.94	338.67	38.91	0.72
Main Channel	0.316	10Yr	1634.00	212.85	221.70	218.31	222.34	0.002258	6.46	253.11	36.72	0.41
Main Channel	0.316	50Yr	3135.00	212.85	224.68	220.60	225.91	0.002756	8.89	352.50	39.26	0.48
Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Main Channel	0.320		Bridge									
Main Channel	0.326	100Yr	4383.00	214.38	228.32	223.28	228.98	0.001119	7.51	1390.63	413.71	0.37
Main Channel	0.326	10Yr	1634.00	214.38	221.71	219.37	222.58	0.002825	7.50	217.99	36.75	0.52
Main Channel	0.326	50Yr	3135.00	214.38	225.30	221.67	226.64	0.002416	9.28	337.77	68.38	0.51
Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Main Channel	0.336	100Yr	4383.00	216.00	228.97	223.82	229.07	0.000328	3.75	2905.67	468.56	0.20
Main Channel	0.336	10Yr	1634.00	216.00	221.88		222.80	0.006496	8.32	320.04	184.50	0.75
Main Channel	0.336	50Yr	3135.00	216.00	226.88	223.00	226.81	0.000523	4.06	1887.21	420.92	0.24
Main Channel	0.336	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000578	3.96	1530.68	402.92	0.25
Main Channel	0.588	100Yr	4383.00	220.60	231.45	231.45	233.08	0.004106	12.90	907.96	271.09	0.70

HEC-RAS Plan: Prop-AH1F River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch E (ft)	W.S. Elev (ft)	Cut W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froutd # Chl
Main Channel	0.588	10Yr	1634.00	220.60	228.13	228.69	229.33	0.003768	9.58	279.61	82.59	0.63
Main Channel	0.588	50Yr	3135.00	220.60	228.69	228.69	232.17	0.010112	16.51	329.22	93.03	1.05
Main Channel	0.588	25Yr	2522.00	220.60	228.46	228.46	230.95	0.007448	13.88	307.92	88.70	0.89
Main Channel	0.729	100Yr	4383.00	226.80	235.20	232.01	236.93	0.006558	11.81	462.09	117.79	0.79
Main Channel	0.729	10Yr	1634.00	226.80	232.02	232.01	233.59	0.009010	10.31	174.49	62.28	0.87
Main Channel	0.729	50Yr	3135.00	226.80	235.37	235.37	236.18	0.002984	8.10	482.41	120.19	0.53
Main Channel	0.729	25Yr	2522.00	226.80	234.19	234.19	235.19	0.004219	8.74	352.01	100.76	0.62
Main Channel	0.748	100Yr	4383.00	227.50	235.95	233.68	237.67	0.008576	11.44	440.05	95.30	0.89
Main Channel	0.748	10Yr	1634.00	227.50	233.68	233.04	234.46	0.007174	7.63	238.40	81.32	0.75
Main Channel	0.748	50Yr	3135.00	227.50	235.62	235.62	236.63	0.005459	8.74	409.27	93.26	0.70
Main Channel	0.748	25Yr	2522.00	227.50	234.73	234.73	235.72	0.006912	8.64	327.93	88.19	0.76
Main Channel	0.756	100Yr	4383.00	229.00	236.32	235.75	238.14	0.008208	11.94	442.47	99.17	0.89
Main Channel	0.756	10Yr	1634.00	229.00	234.02	233.39	234.82	0.006821	7.72	238.77	80.53	0.74
Main Channel	0.756	50Yr	3135.00	229.00	235.84	234.79	236.98	0.005704	9.38	397.54	97.19	0.73
Main Channel	0.756	25Yr	2522.00	229.00	235.03	234.26	236.10	0.006646	9.03	323.64	89.85	0.76
Main Channel	0.759		Bridge									
Main Channel	0.769	100Yr	4383.00	229.10	237.28	235.77	238.40	0.004995	9.18	531.92	103.62	0.65
Main Channel	0.769	10Yr	1634.00	229.10	234.20	233.41	234.90	0.005850	7.16	252.33	82.22	0.68
Main Channel	0.769	50Yr	3135.00	229.10	236.25	234.83	237.11	0.004795	7.97	435.35	98.91	0.62
Main Channel	0.769	25Yr	2522.00	229.10	235.39	234.31	236.22	0.005565	7.82	355.26	93.26	0.66
Main Channel	0.770	100Yr	4383.00	229.00	237.50	236.71	238.67	0.004906	10.16	562.98	121.70	0.70
Main Channel	0.770	10Yr	1634.00	229.00	234.47	233.23	235.23	0.006543	7.80	247.21	86.73	0.73
Main Channel	0.770	50Yr	3135.00	229.00	236.42	235.42	237.38	0.004893	9.02	436.73	110.30	0.68
Main Channel	0.770	25Yr	2522.00	229.00	235.61	235.61	236.53	0.005638	8.71	353.02	97.90	0.71
Main Channel	0.798	100Yr	4383.00	230.50	238.25	236.71	239.30	0.003510	9.28	631.86	134.84	0.61
Main Channel	0.798	10Yr	1634.00	230.50	235.36	235.36	235.97	0.003711	6.73	291.89	98.12	0.58
Main Channel	0.798	50Yr	3135.00	230.50	237.13	236.01	238.01	0.003563	8.34	484.37	128.37	0.60
Main Channel	0.798	25Yr	2522.00	230.50	236.43	236.43	237.22	0.003688	7.80	403.22	109.50	0.60
Main Channel	0.808	100Yr	4383.00	230.50	237.62	237.62	240.16	0.008735	14.33	369.55	74.91	0.96
Main Channel	0.808	10Yr	1634.00	230.50	235.24	234.80	236.36	0.006327	9.19	206.26	62.66	0.76
Main Channel	0.808	50Yr	3135.00	230.50	236.59	236.46	238.62	0.008354	12.58	295.57	69.64	0.92
Main Channel	0.808	25Yr	2522.00	230.50	236.05	235.85	237.75	0.007903	11.47	258.49	66.84	0.88



HEC-RAS Plan: Prop-Alt F River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Cmpl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Flats # Cft
Main Channel	1.598	100Yr	4071.00	238.40	248.06	244.97	249.11	0.001846	8.77	855.01	413.45	0.50
Main Channel	1.598	10Yr	1501.00	238.40	245.30	241.78	245.70	0.000979	5.11	293.91	81.59	0.34
Main Channel	1.598	50Yr	2885.00	238.40	247.73	243.62	248.33	0.001078	6.55	734.93	316.33	0.38
Main Channel	1.598	25Yr	2329.00	238.40	247.31	242.91	247.72	0.000796	5.46	628.13	192.40	0.32
Main Channel	1.608	100Yr	4071.00	238.40	248.02	245.38	249.39	0.003017	10.70	792.74	270.94	0.63
Main Channel	1.608	10Yr	1501.00	238.40	245.23	241.78	245.83	0.001845	6.55	305.23	69.57	0.46
Main Channel	1.608	50Yr	2885.00	238.40	247.69	244.23	248.44	0.001722	7.89	718.35	219.39	0.47
Main Channel	1.608	25Yr	2329.00	238.40	247.22	244.23	247.84	0.001482	7.05	617.00	204.41	0.43
Main Channel	1.850	100Yr	4071.00	242.10	253.18	253.18	254.38	0.002886	11.38	1175.51	534.38	0.62
Main Channel	1.850	10Yr	1501.00	242.10	248.39	242.10	250.37	0.007045	11.85	165.60	43.41	0.87
Main Channel	1.850	50Yr	2885.00	242.10	249.94	249.81	253.87	0.010600	17.06	239.44	51.70	1.12
Main Channel	1.850	25Yr	2329.00	242.10	249.79	249.79	252.50	0.007490	14.14	231.54	50.87	0.93
Main Channel	1.860	100Yr	4071.00	241.60	254.45	248.65	254.71	0.000418	5.05	1483.93	358.51	0.25
Main Channel	1.860	10Yr	1501.00	241.60	250.78	245.23	250.95	0.000337	3.62	559.38	136.76	0.21
Main Channel	1.860	50Yr	2885.00	241.60	254.94	247.22	255.04	0.000166	3.27	1663.74	386.40	0.16
Main Channel	1.860	25Yr	2329.00	241.60	253.14	246.46	253.30	0.000261	3.72	1063.08	282.66	0.19
Main Channel	1.864		Bridge									
Main Channel	1.868	100Yr	4071.00	241.40	254.55	248.47	254.77	0.000363	4.78	1590.91	375.35	0.23
Main Channel	1.868	10Yr	1501.00	241.40	251.23	245.03	251.48	0.000374	4.00	375.51	183.75	0.22
Main Channel	1.868	50Yr	2885.00	241.40	255.02	247.02	255.11	0.000150	3.14	1776.57	422.30	0.15
Main Channel	1.868	25Yr	2329.00	241.40	253.25	246.27	253.38	0.000225	3.51	1151.64	300.21	0.18
Main Channel	1.878	100Yr	4071.00	242.70	254.55	254.55	254.80	0.000568	5.36	1267.03	352.59	0.28
Main Channel	1.878	10Yr	1501.00	242.70	251.11	245.11	251.57	0.001012	5.64	332.65	176.70	0.35
Main Channel	1.878	50Yr	2885.00	242.70	255.03	246.60	255.12	0.000210	3.35	1442.66	363.52	0.17
Main Channel	1.878	25Yr	2329.00	242.70	253.21	246.27	253.42	0.000485	4.56	841.71	294.81	0.25
Main Channel	1.932	100Yr	4071.00	243.87	254.81	249.60	255.00	0.000813	5.12	1899.68	694.49	0.31
Main Channel	1.932	10Yr	1501.00	243.87	251.29	249.60	252.20	0.003635	7.65	197.97	53.85	0.59
Main Channel	1.932	50Yr	2885.00	243.87	256.12	249.03	256.20	0.000311	3.24	2120.69	714.59	0.19
Main Channel	1.932	25Yr	2329.00	243.87	253.35	249.03	253.66	0.001196	5.49	958.03	576.98	0.36
Main Channel	1.942	100Yr	4071.00	244.25	254.78	253.70	255.12	0.000977	6.50	1672.71	557.59	0.36
Main Channel	1.942	10Yr	1501.00	244.25	251.56	249.03	252.36	0.002029	7.22	214.34	42.00	0.49
Main Channel	1.942	50Yr	2885.00	244.25	255.11	251.32	255.24	0.000377	4.13	1760.17	574.40	0.23



HEC-RAS Plan: Prop-Alt1F River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	O Total (cfs)	Min Ch El (ft)	W/S Elev (ft)	Crit W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Cnt (ft/s)	Flow Area (sq ft)	Top Width (ft)	Fronda # C/d
Main Channel	2.247	100Yr	4380.00	245.20	255.60	252.62	255.63	0.000184	2.82	5698.99	1338.76	0.16
Main Channel	2.247	10Yr	1605.00	245.20	252.75	250.04	252.82	0.000359	3.16	2071.99	1207.36	0.21
Main Channel	2.247	50Yr	3395.00	245.20	255.47	251.47	255.49	0.000120	2.27	5528.18	1332.90	0.13
Main Channel	2.247	25Yr	2409.00	245.20	254.14	252.06	254.17	0.000175	2.48	3788.74	1271.30	0.15
Main Channel	2.262	100Yr	4380.00	245.00	255.63		255.64	0.000086	1.94	7950.48	1517.24	0.11
Main Channel	2.262	10Yr	1605.00	245.00	252.83		252.84	0.000099	1.67	3918.79	1379.04	0.11
Main Channel	2.262	50Yr	3395.00	245.00	255.49		255.50	0.000056	1.55	7739.81	1506.85	0.09
Main Channel	2.262	25Yr	2409.00	245.00	254.17		254.18	0.000068	1.54	5799.06	1435.16	0.09
Main Channel	2.432	100Yr	4380.00	247.60	255.45		256.03	0.002333	9.09	1654.30	697.13	0.59
Main Channel	2.432	10Yr	1605.00	247.60	252.75		253.23	0.002564	7.08	582.99	285.10	0.57
Main Channel	2.432	50Yr	3395.00	247.60	255.38		255.75	0.001471	7.18	1608.99	677.68	0.46
Main Channel	2.432	25Yr	2409.00	247.60	254.11		254.44	0.001582	6.57	1010.07	375.45	0.47
Main Channel	2.442	100Yr	4380.00	246.89	255.69	252.20	256.15	0.001003	5.44	938.22	529.59	0.37
Main Channel	2.442	10Yr	1605.00	246.89	253.22	250.25	253.38	0.000526	3.15	510.17	111.46	0.26
Main Channel	2.442	50Yr	3395.00	246.89	255.53	251.59	256.82	0.000656	4.34	860.11	432.82	0.30
Main Channel	2.442	25Yr	2409.00	246.89	254.30	250.89	254.52	0.000628	3.81	632.66	115.26	0.29
Main Channel	2.444	Bridge										
Main Channel	2.446	100Yr	4380.00	247.05	255.99	252.06	256.36	0.000772	4.94	1157.97	712.44	0.33
Main Channel	2.446	10Yr	1605.00	247.05	253.26	250.11	253.40	0.000460	3.03	530.07	115.14	0.24
Main Channel	2.446	50Yr	3395.00	247.05	255.81	251.45	256.06	0.000514	3.97	1035.41	601.44	0.27
Main Channel	2.446	25Yr	2409.00	247.05	254.52	250.78	254.73	0.000480	3.61	687.50	119.21	0.26
Main Channel	2.456	100Yr	4380.00	246.90	256.05		256.42	0.001367	7.48	2228.41	787.85	0.45
Main Channel	2.456	10Yr	1605.00	246.90	253.24		253.46	0.001106	5.14	885.37	341.66	0.38
Main Channel	2.456	50Yr	3395.00	246.90	255.84		256.09	0.000938	6.09	2067.33	735.84	0.37
Main Channel	2.456	25Yr	2409.00	246.90	254.57		254.75	0.000839	5.15	1368.48	385.71	0.34
Main Channel	2.920	100Yr	4380.00	249.90	258.46		258.52	0.000641	4.62	3980.75	1427.62	0.29
Main Channel	2.920	10Yr	1605.00	249.90	256.18		256.35	0.001392	5.38	1254.99	882.08	0.41
Main Channel	2.920	50Yr	3395.00	249.90	257.88		257.96	0.000696	4.57	3182.33	1348.43	0.30
Main Channel	2.920	25Yr	2409.00	249.90	256.89		257.02	0.001145	5.30	1952.67	1095.05	0.38
Main Channel	3.140	100Yr	3038.00	252.00	259.02	255.99	259.04	0.000280	2.71	3946.87	1163.01	0.19
Main Channel	3.140	10Yr	1263.00	252.00	257.12	255.46	257.14	0.000335	2.31	1972.06	916.04	0.20

HEC-RAS Plan: Prop-Alt1F River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Cross Section	Min Ch El (ft)	W/S Elev (ft)	Ord W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frrouds # Chl
Main Channel	3.140	50Yr	2430.00	252.00	258.48	255.85	258.50	0.000286	2.57	3334.02	1092.36	0.19
Main Channel	3.140	25Yr	1841.00	252.00	257.74	255.87	257.76	0.000343	2.56	2560.19	996.02	0.20
Main Channel	3.678	100Yr	3038.00	257.10	262.49	262.49	263.38	0.006428	9.38	761.81	411.90	0.76
Main Channel	3.678	10Yr	1263.00	257.10	261.33	261.33	262.04	0.006456	7.17	312.27	364.90	0.67
Main Channel	3.678	50Yr	2430.00	257.10	262.18	262.18	263.00	0.006030	8.69	636.50	399.35	0.73
Main Channel	3.678	25Yr	1841.00	257.10	261.80	261.80	262.57	0.005728	7.98	490.63	384.24	0.70
Main Channel	3.860	100Yr	3038.00	260.00	264.40	266.28	270.56	0.033404	19.91	152.70	45.91	1.91
Main Channel	3.860	10Yr	1263.00	260.00	262.73	263.87	266.50	0.039836	15.58	81.05	39.95	1.93
Main Channel	3.860	50Yr	2430.00	260.00	263.92	265.53	269.26	0.034404	18.54	131.03	44.05	1.89
Main Channel	3.860	25Yr	1841.00	260.00	263.35	264.76	267.99	0.036730	17.27	106.59	42.09	1.91
Main Channel	3.870	100Yr	3038.00	263.18	268.56	269.20	272.32	0.014277	15.57	195.15	54.23	1.18
Main Channel	3.870	10Yr	1263.00	263.18	266.18	266.54	268.27	0.017167	11.58	109.05	46.29	1.18
Main Channel	3.870	50Yr	2430.00	263.18	268.34	268.34	270.95	0.010443	12.96	187.46	53.40	1.01
Main Channel	3.870	25Yr	1841.00	263.18	267.02	267.49	269.73	0.016054	13.20	139.50	49.05	1.19
Main Channel	3.876		Bridge									
Main Channel	3.892	100Yr	3038.00	264.30	272.11	270.31	273.73	0.005043	10.38	308.31	71.06	0.65
Main Channel	3.892	10Yr	1263.00	264.30	266.48	267.65	270.45	0.065701	15.99	78.99	44.18	1.91
Main Channel	3.892	50Yr	2430.00	264.30	267.84	269.48	273.39	0.047910	18.90	128.60	49.08	1.77
Main Channel	3.892	25Yr	1841.00	264.30	267.17	268.61	272.03	0.055710	17.69	104.06	45.66	1.84
Main Channel	3.892	100Yr	3038.00	265.10	273.76	272.60	274.01	0.001845	6.54	1520.16	616.00	0.40
Main Channel	3.892	10Yr	1263.00	265.10	270.07	270.07	271.90	0.012844	11.66	147.23	45.66	0.96
Main Channel	3.892	50Yr	2430.00	265.10	272.21	272.21	274.72	0.011349	14.14	259.29	58.62	0.96
Main Channel	3.892	25Yr	1841.00	265.10	271.21	271.21	273.41	0.011982	13.05	203.38	52.56	0.96
Main Channel	3.903	100Yr	3038.00	265.70	273.70	273.70	276.40	0.010911	15.00	326.23	70.24	0.96
Main Channel	3.903	10Yr	1263.00	265.70	271.21	270.89	272.56	0.008497	10.17	176.62	51.37	0.79
Main Channel	3.903	50Yr	2430.00	265.70	273.45	272.72	275.34	0.007929	12.51	309.20	68.09	0.81
Main Channel	3.903	25Yr	1841.00	265.70	272.41	271.81	274.05	0.008112	11.44	243.31	59.39	0.80
Main Channel	3.918	100Yr	3038.00	267.60	277.24	276.12	277.91	0.002817	8.76	888.28	266.77	0.50
Main Channel	3.918	10Yr	1263.00	267.60	273.36	272.51	274.62	0.007077	9.72	181.30	49.52	0.73
Main Channel	3.918	50Yr	2430.00	267.60	275.94	275.45	276.97	0.004436	9.94	572.85	216.52	0.62
Main Channel	3.918	25Yr	1841.00	267.60	274.48	273.70	276.13	0.007551	11.36	294.90	171.94	0.78

HEC-RAS Plan: Prop-Art1F River Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cr. W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	3.985	100Yr	3038.00	269.32	277.94	275.71	278.37	0.002437	6.22	735.48	149.45	0.40
Main Channel	3.985	10Yr	1263.00	269.32	275.11	273.50	275.50	0.003450	5.40	327.38	139.07	0.44
Main Channel	3.985	50Yr	2430.00	269.32	277.18	275.23	277.57	0.002477	5.84	622.85	146.65	0.40
Main Channel	3.985	25Yr	1841.00	269.32	276.56	274.71	276.87	0.002172	5.13	532.50	144.39	0.36
Main Channel	4.084	100Yr	3038.00	277.00	284.74	284.74	286.72	0.010779	12.72	387.18	115.34	0.90
Main Channel	4.084	10Yr	1263.00	277.00	282.40	282.40	283.80	0.012557	9.97	166.27	73.14	0.90
Main Channel	4.084	50Yr	2430.00	277.00	284.06	284.06	285.89	0.011120	11.95	313.27	103.16	0.90
Main Channel	4.084	25Yr	1841.00	277.00	283.30	283.30	284.94	0.011677	11.08	239.57	89.38	0.90
Main Channel	4.084	100Yr	3038.00	278.40	286.98	282.71	287.34	0.001094	4.82	630.06	221.33	0.30
Main Channel	4.084	10Yr	1263.00	278.40	284.13	281.16	284.29	0.000862	3.16	399.62	93.21	0.25
Main Channel	4.084	50Yr	2430.00	278.40	286.18	282.23	286.47	0.001002	4.30	565.75	150.49	0.29
Main Channel	4.084	25Yr	1841.00	278.40	285.26	281.72	285.48	0.000920	3.75	491.28	105.53	0.27
Main Channel	4.100		Bridge									
Main Channel	4.106	100Yr	3038.00	278.30	287.04	282.63	287.38	0.000575	4.72	643.12	235.73	0.30
Main Channel	4.106	10Yr	1263.00	278.30	284.18	281.06	284.32	0.000441	3.07	411.32	93.55	0.24
Main Channel	4.106	50Yr	2430.00	278.30	286.24	282.13	286.51	0.000524	4.20	578.29	164.31	0.28
Main Channel	4.106	25Yr	1841.00	278.30	285.31	281.62	285.52	0.000477	3.66	503.36	111.34	0.26
Main Channel	4.116	100Yr	3038.00	277.10	285.71	287.00	290.59	0.011288	20.37	281.51	71.17	1.28
Main Channel	4.116	10Yr	1263.00	277.10	282.95	283.91	286.27	0.011573	15.50	120.14	45.54	1.20
Main Channel	4.116	50Yr	2430.00	277.10	284.80	286.30	289.51	0.012190	19.51	220.26	62.73	1.30
Main Channel	4.116	25Yr	1841.00	277.10	283.96	285.23	288.05	0.011924	17.72	170.85	54.98	1.26
Main Channel	4.368	100Yr	3038.00	297.30	305.26	305.26	308.02	0.014878	15.48	298.67	66.27	0.98
Main Channel	4.368	10Yr	1263.00	297.30	302.48	302.48	304.25	0.015497	11.69	144.59	45.62	0.93
Main Channel	4.368	50Yr	2430.00	297.30	304.61	304.61	306.90	0.013537	13.91	257.81	60.34	0.93
Main Channel	4.368	25Yr	1841.00	297.30	303.63	303.63	305.69	0.014321	12.94	201.56	53.54	0.93
Main Channel	4.378	100Yr	3038.00	298.00	304.79	306.47	309.65	0.026948	17.80	183.93	57.09	1.28
Main Channel	4.378	10Yr	1263.00	298.00	301.08	302.67	306.40	0.075141	18.51	68.25	25.19	1.98
Main Channel	4.378	50Yr	2430.00	298.00	303.55	305.52	308.68	0.037538	18.17	133.78	28.84	1.46
Main Channel	4.378	25Yr	1841.00	298.00	302.29	303.92	307.61	0.051555	18.50	99.49	26.52	1.68
Main Channel	4.3785		Bridge									
Main Channel	4.379	100Yr	3038.00	300.70	309.93	307.93	310.86	0.001984	8.98	588.40	138.40	0.54

HEC-RAS Plan: Prop-Akt1F River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.C. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cal
Main Channel	4.379	10Yr	1263.00	300.70	307.41	305.43	307.88	0.001399	6.01	315.92	92.89	0.43
Main Channel	4.379	50Yr	2430.00	300.70	309.23	307.20	310.01	0.001801	8.09	507.20	122.18	0.50
Main Channel	4.379	25Yr	1841.00	300.70	308.43	306.40	309.05	0.001578	7.06	416.96	105.50	0.46
Main Channel	4.389	100Yr	3038.00	300.90	309.80	308.36	311.12	0.004539	10.31	422.82	87.17	0.62
Main Channel	4.389	10Yr	1263.00	300.90	307.41	305.47	308.03	0.002998	6.75	240.70	64.61	0.48
Main Channel	4.389	50Yr	2430.00	300.90	309.15	307.55	310.23	0.004058	9.24	367.42	80.97	0.58
Main Channel	4.389	25Yr	1841.00	300.90	308.38	306.60	309.23	0.003546	8.08	307.91	73.74	0.53
Main Channel	4.644	100Yr	3038.00	317.60	325.62	325.31	327.76	0.010008	13.94	490.95	327.88	0.90
Main Channel	4.644	10Yr	1263.00	317.60	323.04	323.04	325.10	0.012817	11.90	121.93	33.14	0.95
Main Channel	4.644	50Yr	2430.00	317.60	325.21	325.99	327.43	0.010007	13.42	355.75	324.75	0.89
Main Channel	4.644	25Yr	1841.00	317.60	324.59	325.52	326.79	0.010013	12.63	213.42	123.29	0.88

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**APPENDIX K**  
**FARMINGTON AVENUE ALTERNATIVES HEC-RAS MODEL OUTPUT**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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**REMOVAL OF THE FARMINGTON AVENUE BRIDGE  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: Alt-2A River: Coppermine Brook Reach: Main Channel

Reach	River Sta	Profile	Q Total (cfs)	Min Chl El (ft)	W/S Elev (ft)	Chl W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Freude # Chl
Main Channel	0.00	100Yr	4618.00	205.78	216.40	213.95	217.29	0.001889	8.56	1454.60	870.24	0.48
Main Channel	0.00	10Yr	1739.00	205.78	212.20	210.14	212.89	0.002467	6.80	312.65	100.21	0.50
Main Channel	0.00	50Yr	3360.00	205.78	216.00	212.38	216.48	0.001104	6.36	1133.80	609.08	0.36
Main Channel	0.00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42
Main Channel	0.051	100Yr	4618.00	207.98	217.01		217.95	0.003112	9.83	1488.87	766.70	0.59
Main Channel	0.051	10Yr	1739.00	207.98	212.94		214.26	0.007523	9.88	226.45	58.38	0.83
Main Channel	0.051	50Yr	3360.00	207.98	216.19		217.23	0.003301	9.46	922.33	623.67	0.60
Main Channel	0.051	25Yr	2677.00	207.98	214.77	213.57	216.24	0.006397	10.54	349.61	148.31	0.74
Main Channel	0.061	100Yr	4618.00	208.13	217.77		218.23	0.001951	7.02	1921.79	852.32	0.41
Main Channel	0.061	10Yr	1739.00	208.13	213.68		214.72	0.006043	8.23	224.97	54.11	0.66
Main Channel	0.061	50Yr	3360.00	208.13	217.09		217.54	0.001846	6.48	1383.32	730.80	0.40
Main Channel	0.061	25Yr	2677.00	208.13	215.33	213.77	216.59	0.005156	9.23	402.20	289.05	0.64
Main Channel	0.074	100Yr	4618.00	207.71	217.89		218.40	0.002218	8.84	2094.30	884.55	0.51
Main Channel	0.074	10Yr	1739.00	207.71	213.93		215.38	0.007039	10.94	247.89	60.94	0.83
Main Channel	0.074	50Yr	3360.00	207.71	217.18		217.74	0.002284	8.51	1507.00	760.61	0.51
Main Channel	0.074	25Yr	2677.00	207.71	215.17	214.78	217.70	0.009142	14.30	381.90	231.91	0.97
Main Channel	0.08	100Yr	4618.00	207.70	217.96		218.45	0.001454	7.14	2020.64	883.77	0.40
Main Channel	0.08	10Yr	1739.00	207.70	214.93		215.56	0.001803	6.38	294.36	140.75	0.43
Main Channel	0.08	50Yr	3360.00	207.70	217.38		217.80	0.001212	6.26	1539.47	776.25	0.36
Main Channel	0.08	25Yr	2677.00	207.70	217.79	213.33	217.98	0.000559	4.38	1869.24	851.40	0.25
Main Channel	0.084	100Yr	4618.00	207.19	218.40	216.97	218.56	0.000497	5.09	2404.49	920.63	0.28
Main Channel	0.084	10Yr	1739.00	207.19	214.75	212.82	215.82	0.002419	8.30	209.45	100.94	0.58
Main Channel	0.084	50Yr	3360.00	207.19	217.71	216.50	217.89	0.000505	4.90	1804.70	825.53	0.28
Main Channel	0.084	25Yr	2677.00	207.19	217.92	216.15	218.01	0.000262	3.58	1982.10	860.88	0.20
Main Channel	0.09		Bridge									
Main Channel	0.094	100Yr	4618.00	206.50	218.38	217.08	218.62	0.000577	5.64	1963.04	656.68	0.30
Main Channel	0.094	10Yr	1739.00	206.50	215.28	212.11	216.02	0.001383	6.95	250.22	167.94	0.44
Main Channel	0.094	50Yr	3360.00	206.50	217.70	214.56	217.94	0.000545	5.25	1532.85	612.62	0.29
Main Channel	0.094	25Yr	2677.00	206.50	217.97	213.58	218.08	0.000273	3.78	1697.82	629.88	0.21
Main Channel	0.114	100Yr	4618.00	207.65	218.42		218.68	0.000462	4.39	1977.46	607.48	0.26
Main Channel	0.114	10Yr	1739.00	207.65	216.04		216.15	0.000254	2.89	742.37	416.02	0.19
Main Channel	0.114	50Yr	3360.00	207.65	217.81		217.99	0.000345	3.61	1616.97	564.80	0.23

HEC-RAS Plan: Alt-2A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min. Ch/Elev (ft)	W/S Elev (ft)	Crit. W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cal
Main Channel	0.114	25Yr	2577.00	207.65	218.00		218.11	0.000196	2.77	1729.71	578.49	0.17
Main Channel	0.148	100Yr	4383.00	208.35	218.23	217.21	219.03	0.004666	9.69	1058.16	345.74	0.57
Main Channel	0.149	10Yr	1634.00	208.35	215.81		216.40	0.003826	7.13	438.52	198.01	0.49
Main Channel	0.145	50Yr	3135.00	208.35	217.66	216.46	218.25	0.003505	8.04	874.91	296.49	0.49
Main Channel	0.148	25Yr	2522.00	208.35	217.93	215.91	218.25	0.001887	6.02	958.46	319.89	0.36
Main Channel	0.224	100Yr	4383.00	210.13	218.56	219.72	222.54	0.009149	17.90	399.06	250.77	1.15
Main Channel	0.224	10Yr	1634.00	210.13	216.75		218.45	0.004724	10.70	179.23	40.38	0.79
Main Channel	0.224	50Yr	3135.00	210.13	217.98	219.23	221.66	0.008254	16.11	268.63	185.08	1.08
Main Channel	0.224	25Yr	2522.00	210.13	217.29	218.92	220.69	0.008190	14.96	202.99	62.08	1.06
Main Channel	0.306	100Yr	4383.00	211.80	224.44	224.44	225.93	0.002835	11.87	1089.54	394.17	0.62
Main Channel	0.306	10Yr	1634.00	211.80	219.02	218.84	221.48	0.007713	12.63	136.32	32.11	0.92
Main Channel	0.306	50Yr	3135.00	211.80	221.91	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Main Channel	0.306	100Yr	4383.00	212.00	224.87		225.99	0.002197	10.70	1253.39	405.50	0.56
Main Channel	0.308	10Yr	1634.00	212.00	219.01	219.00	221.60	0.008344	12.99	134.70	32.06	0.96
Main Channel	0.308	50Yr	3135.00	212.00	224.96	223.36	225.50	0.001065	7.49	1289.99	409.99	0.39
Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Main Channel	0.316	100Yr	4383.00	212.85	224.27	222.23	226.87	0.006155	12.94	338.67	38.91	0.72
Main Channel	0.316	10Yr	1634.00	212.85	221.70	218.31	222.34	0.002258	6.46	253.11	36.72	0.41
Main Channel	0.316	50Yr	3135.00	212.85	224.68	220.60	225.91	0.002756	8.89	352.50	39.26	0.48
Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Main Channel	0.320		Bridge									
Main Channel	0.326	100Yr	4383.00	214.38	228.32	223.28	228.98	0.001119	7.51	1390.63	413.71	0.37
Main Channel	0.326	10Yr	1634.00	214.38	221.71	219.37	222.58	0.002825	7.50	217.99	36.75	0.52
Main Channel	0.326	50Yr	3135.00	214.38	225.30	221.67	226.64	0.002416	9.28	337.77	68.38	0.51
Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Main Channel	0.336	100Yr	4383.00	216.00	228.97	223.82	229.07	0.000328	3.75	2905.67	468.56	0.20
Main Channel	0.336	10Yr	1634.00	216.00	221.88		222.80	0.006496	8.32	320.04	184.50	0.75
Main Channel	0.336	50Yr	3135.00	216.00	226.68	223.00	226.81	0.000523	4.05	1887.21	420.92	0.24
Main Channel	0.336	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000578	3.96	1530.68	402.92	0.25
Main Channel	0.585	100Yr	4383.00	220.60	231.45	231.45	233.08	0.004106	12.90	907.96	271.09	0.70

HEC-RAS Plan: Alt-2A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	O Total (cfs)	Min Chl El (ft)	W S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sqft)	Top Width (ft)	Friction Coef
Main Channel	0.588	10Yr	1634.00	220.60	228.13	228.69	229.33	0.003768	9.58	279.61	82.59	0.63
Main Channel	0.588	50Yr	3135.00	220.60	228.69	228.69	232.17	0.010112	16.51	329.22	93.03	1.05
Main Channel	0.588	25Yr	2522.00	220.60	228.46	228.46	230.95	0.007448	13.88	307.92	88.70	0.89
Main Channel	0.729	100Yr	4383.00	226.80	235.20	235.20	236.93	0.006558	11.81	462.09	117.79	0.79
Main Channel	0.729	10Yr	1634.00	226.80	232.02	232.01	233.59	0.009010	10.31	174.49	62.28	0.87
Main Channel	0.729	50Yr	3135.00	226.80	235.37	235.37	236.18	0.002984	8.10	482.41	120.19	0.53
Main Channel	0.729	25Yr	2522.00	226.80	234.19	234.19	235.19	0.004219	8.74	352.01	100.76	0.62
Main Channel	0.748	100Yr	4383.00	227.50	235.95	235.95	237.67	0.008576	11.44	440.05	95.30	0.89
Main Channel	0.748	10Yr	1634.00	227.50	233.68	233.04	234.46	0.007174	7.63	238.40	81.32	0.75
Main Channel	0.748	50Yr	3135.00	227.50	235.62	235.62	236.63	0.005459	8.74	409.27	93.26	0.70
Main Channel	0.748	25Yr	2522.00	227.50	234.73	234.73	235.72	0.006912	8.64	327.93	88.19	0.76
Main Channel	0.766	100Yr	4383.00	229.00	236.32	235.75	238.14	0.008208	11.94	442.47	99.17	0.89
Main Channel	0.766	10Yr	1634.00	229.00	234.02	233.39	234.82	0.006821	7.72	238.77	80.53	0.74
Main Channel	0.766	50Yr	3135.00	229.00	235.84	234.79	236.98	0.005704	9.38	397.54	97.19	0.73
Main Channel	0.766	25Yr	2522.00	229.00	235.03	234.26	236.10	0.006646	9.03	323.04	89.85	0.76
Main Channel	0.769		Bridge									
Main Channel	0.760	100Yr	4383.00	229.10	237.28	235.77	238.40	0.004995	9.18	531.92	103.62	0.65
Main Channel	0.760	10Yr	1634.00	229.10	234.20	233.41	234.90	0.005850	7.16	252.33	82.22	0.68
Main Channel	0.760	50Yr	3135.00	229.10	236.25	234.83	237.11	0.004795	7.97	435.35	98.91	0.62
Main Channel	0.760	25Yr	2522.00	229.10	235.39	234.31	236.22	0.005585	7.82	355.26	93.26	0.66
Main Channel	0.770	100Yr	4383.00	229.00	237.50	236.71	238.67	0.004906	10.16	562.98	121.70	0.70
Main Channel	0.770	10Yr	1634.00	229.00	234.47	235.23	235.23	0.006543	7.80	247.21	86.73	0.73
Main Channel	0.770	50Yr	3135.00	229.00	236.42	235.38	237.38	0.004893	9.02	436.73	110.30	0.68
Main Channel	0.770	25Yr	2522.00	229.00	235.61	236.53	236.53	0.005638	8.71	353.02	97.90	0.71
Main Channel	0.798	100Yr	4383.00	230.50	238.25	236.71	239.30	0.003510	9.28	631.86	134.84	0.61
Main Channel	0.798	10Yr	1634.00	230.50	235.36	235.97	235.97	0.003711	6.73	291.89	98.12	0.58
Main Channel	0.798	50Yr	3135.00	230.50	237.13	238.01	238.01	0.003563	8.34	484.37	128.37	0.60
Main Channel	0.798	25Yr	2522.00	230.50	236.43	237.22	237.22	0.003688	7.80	403.22	109.50	0.60
Main Channel	0.808	100Yr	4383.00	230.50	237.62	237.62	240.18	0.008735	14.33	369.55	74.91	0.96
Main Channel	0.808	10Yr	1634.00	230.50	235.24	234.80	236.36	0.006327	9.19	206.26	62.68	0.76
Main Channel	0.808	50Yr	3135.00	230.50	236.59	236.46	238.62	0.008354	12.58	295.57	69.64	0.92
Main Channel	0.808	25Yr	2522.00	230.50	236.05	235.85	237.75	0.007903	11.47	258.49	66.84	0.88



HEC-RAS Plan: Alt-2A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	Q Total (cfs)	Min Chl El (ft)	W/S Elev (ft)	Crit W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froutde # Chl
Main Channel	1.598	100Yr	4071.00	238.40	248.06	244.97	249.11	0.001846	8.77	855.01	413.45	0.50
Main Channel	1.598	10Yr	1501.00	238.40	245.30	241.78	245.70	0.000979	5.11	293.91	81.59	0.34
Main Channel	1.598	50Yr	2885.00	238.40	247.73	243.62	248.33	0.001078	6.55	734.93	316.33	0.38
Main Channel	1.598	25Yr	2329.00	238.40	247.31	242.91	247.72	0.000796	5.46	628.13	192.40	0.32
Main Channel	1.608	100Yr	4071.00	238.40	248.02		249.39	0.003017	10.70	792.74	270.94	0.63
Main Channel	1.608	10Yr	1501.00	238.40	245.23		245.83	0.001845	6.55	305.23	69.57	0.46
Main Channel	1.608	50Yr	2885.00	238.40	247.69		248.44	0.001722	7.89	718.35	219.39	0.47
Main Channel	1.608	25Yr	2329.00	238.40	247.22		247.84	0.001482	7.05	617.00	204.41	0.43
Main Channel	1.850	100Yr	4071.00	242.10	251.65		252.84	0.002406	9.29	748.82	318.62	0.56
Main Channel	1.850	10Yr	1501.00	242.10	247.92		248.54	0.002457	6.45	266.64	67.89	0.51
Main Channel	1.850	50Yr	2885.00	242.10	250.15		251.17	0.002529	8.38	433.31	101.03	0.55
Main Channel	1.850	25Yr	2329.00	242.10	249.43		250.24	0.002322	7.48	375.12	76.65	0.52
Main Channel	1.860	100Yr	4071.00	242.30	252.17		252.98	0.001555	8.17	784.79	226.50	0.46
Main Channel	1.860	10Yr	1501.00	242.30	248.22		248.65	0.001469	5.64	310.85	69.29	0.41
Main Channel	1.860	50Yr	2885.00	242.30	250.52		251.30	0.001749	7.67	495.13	117.64	0.47
Main Channel	1.860	25Yr	2329.00	242.30	249.77		250.35	0.001477	6.61	426.00	78.63	0.43
Main Channel	1.868	100Yr	4071.00	242.50	252.38	248.86	253.07	0.001378	7.70	865.75	250.39	0.43
Main Channel	1.868	10Yr	1501.00	242.50	248.30		248.73	0.001502	5.64	313.40	71.02	0.41
Main Channel	1.868	50Yr	2885.00	242.50	250.63	247.67	251.39	0.001763	7.64	517.86	140.44	0.47
Main Channel	1.868	25Yr	2329.00	242.50	249.85	247.02	250.43	0.001522	6.64	430.89	83.96	0.43
Main Channel	1.878	100Yr	4071.00	242.70	252.53	252.53	253.69	0.002598	10.07	649.00	275.81	0.58
Main Channel	1.878	10Yr	1501.00	242.70	247.47	247.38	249.30	0.008661	11.02	142.14	37.59	0.93
Main Channel	1.878	50Yr	2885.00	242.70	249.58	249.58	252.31	0.007903	13.67	227.08	43.15	0.95
Main Channel	1.878	25Yr	2329.00	242.70	248.77	248.77	251.21	0.008329	12.84	192.99	41.01	0.95
Main Channel	1.932	100Yr	4071.00	243.87	253.92		254.40	0.001948	7.37	1307.91	635.67	0.47
Main Channel	1.932	10Yr	1501.00	243.87	250.16	249.61	251.64	0.007572	9.76	153.77	36.12	0.83
Main Channel	1.932	50Yr	2885.00	243.87	253.01	252.91	253.73	0.002657	7.93	774.04	525.55	0.53
Main Channel	1.932	25Yr	2329.00	243.87	251.52	251.03	253.50	0.007495	11.32	219.15	132.14	0.86
Main Channel	1.942	100Yr	4071.00	244.25	253.86	253.70	254.67	0.002180	9.09	1078.59	506.79	0.53
Main Channel	1.942	10Yr	1501.00	244.25	251.08	249.03	252.01	0.002602	7.78	198.20	40.94	0.55
Main Channel	1.942	50Yr	2885.00	244.25	252.89	251.32	254.14	0.002943	9.80	573.47	448.50	0.61
Main Channel	1.942	25Yr	2329.00	244.25	253.82	250.46	254.10	0.000795	5.27	1062.39	504.86	0.31

HEC-RAS Plan: Alt-2A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min ChElev (ft)	WS Elev (ft)	Chl W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	1,946		Bridge									
Main Channel	1,950	100Yr	4071.00	244.46	254.57	253.98	255.12	0.001469	7.72	1362.92	641.67	0.43
Main Channel	1,950	10Yr	1501.00	244.46	251.31	248.83	252.14	0.002247	7.33	207.86	99.16	0.50
Main Channel	1,950	50Yr	2885.00	244.46	254.29	253.21	254.65	0.000950	6.09	1184.34	598.51	0.35
Main Channel	1,950	25Yr	2329.00	244.46	253.97	250.26	254.30	0.000818	5.53	1004.95	551.76	0.32
Main Channel	1,960	100Yr	4071.00	243.97	254.80		255.21	0.001558	6.69	1696.17	628.67	0.42
Main Channel	1,960	10Yr	1501.00	243.97	251.69		252.28	0.002570	6.45	325.75	136.07	0.50
Main Channel	1,960	50Yr	2885.00	243.97	254.44		254.71	0.001046	5.31	1471.16	597.83	0.34
Main Channel	1,960	25Yr	2329.00	243.97	254.12		254.35	0.000885	4.75	1285.97	571.20	0.31
Main Channel	2,087	100Yr	4380.00	245.49	255.34		255.35	0.000052	1.36	8616.28	1395.07	0.08
Main Channel	2,087	10Yr	1605.00	245.49	252.41		252.42	0.000036	0.88	4860.27	1193.28	0.06
Main Channel	2,087	50Yr	3395.00	245.49	254.80		254.81	0.000040	1.15	7875.26	1341.92	0.07
Main Channel	2,087	25Yr	2409.00	245.49	254.42		254.42	0.000024	0.86	7369.75	1307.77	0.05
Main Channel	2,236	100Yr	4380.00	245.30	255.40		255.43	0.000215	3.04	5542.32	1299.17	0.17
Main Channel	2,236	10Yr	1605.00	245.30	252.43		252.51	0.000575	3.92	1895.35	1152.12	0.26
Main Channel	2,236	50Yr	3395.00	245.30	254.85		254.87	0.000194	2.78	4828.92	1272.36	0.16
Main Channel	2,236	25Yr	2409.00	245.30	254.45		254.46	0.000135	2.25	4323.92	1252.48	0.13
Main Channel	2,244	100Yr	4380.00	245.30	255.42		255.44	0.000213	3.02	5560.58	1299.84	0.17
Main Channel	2,244	10Yr	1605.00	245.30	252.47		252.55	0.000538	3.81	1946.50	1154.32	0.25
Main Channel	2,244	50Yr	3395.00	245.30	254.86		254.88	0.000192	2.76	4845.04	1272.99	0.16
Main Channel	2,244	25Yr	2409.00	245.30	254.46		254.47	0.000134	2.24	4334.95	1252.92	0.13
Main Channel	2,245	100Yr	4380.00	245.30	255.42		255.44	0.000213	3.03	5559.79	1299.85	0.17
Main Channel	2,245	10Yr	1605.00	245.30	252.47		252.55	0.000538	3.81	1946.03	1154.34	0.25
Main Channel	2,245	50Yr	3395.00	245.30	254.86		254.88	0.000192	2.76	4844.22	1273.00	0.16
Main Channel	2,245	25Yr	2409.00	245.30	254.46		254.47	0.000134	2.24	4334.06	1252.93	0.13
Main Channel	2,246	100Yr	4380.00	244.90	255.42		255.44	0.000170	2.74	5854.01	1344.05	0.15
Main Channel	2,246	10Yr	1605.00	244.90	252.49		252.56	0.000342	3.09	2116.79	1209.07	0.20
Main Channel	2,246	50Yr	3395.00	244.90	254.86		254.88	0.000150	2.48	5113.64	1318.53	0.14
Main Channel	2,246	25Yr	2409.00	244.90	254.46		254.47	0.000103	2.00	4584.64	1299.87	0.12
Main Channel	2,246.5		Int Struct									
Main Channel	2,247	100Yr	4380.00	245.20	255.43	252.62	255.46	0.000207	2.96	5465.83	1330.75	0.17

HEC-RAS Plan: Alt-2A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	O Total (ft)	Min Ch E	W S Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froutde # Ch
Main Channel	2.247	10Yr	1605.00	245.20	252.50	250.04	252.60	0.000510	3.67	1765.25	1195.58	0.25
Main Channel	2.247	50Yr	3395.00	245.20	254.87	251.47	254.90	0.000188	2.72	4727.11	1304.92	0.16
Main Channel	2.247	25Yr	2409.00	245.20	254.46	252.06	254.48	0.000132	2.20	4204.09	1286.29	0.13
Main Channel	2.262	100Yr	4380.00	245.00	255.46		255.47	0.000095	2.01	7693.21	1504.55	0.11
Main Channel	2.262	10Yr	1605.00	245.00	252.62	252.62	252.63	0.000125	1.84	3624.90	1370.06	0.12
Main Channel	2.262	50Yr	3395.00	245.00	254.90	254.90	254.91	0.000080	1.78	6857.22	1465.80	0.10
Main Channel	2.262	25Yr	2409.00	245.00	254.49	254.49	254.49	0.000054	1.41	6254.37	1448.43	0.08
Main Channel	2.432	100Yr	4380.00	247.60	255.25		255.91	0.002680	9.57	1520.69	638.09	0.62
Main Channel	2.432	10Yr	1605.00	247.60	252.52	252.52	253.12	0.003316	7.79	498.52	269.58	0.64
Main Channel	2.432	50Yr	3395.00	247.60	254.82	254.82	255.22	0.001764	7.46	1296.34	423.29	0.50
Main Channel	2.432	25Yr	2409.00	247.60	254.44	254.44	254.70	0.001203	5.93	1137.86	397.51	0.41
Main Channel	2.442	100Yr	4380.00	246.89	255.57	252.20	256.05	0.001088	5.56	879.48	458.73	0.38
Main Channel	2.442	10Yr	1605.00	246.89	253.15	250.25	253.31	0.000553	3.19	502.52	111.21	0.26
Main Channel	2.442	50Yr	3395.00	246.89	254.93	251.59	255.29	0.000888	4.80	706.64	117.51	0.35
Main Channel	2.442	25Yr	2409.00	246.89	254.55	250.89	254.75	0.000547	3.64	661.90	116.15	0.27
Main Channel	2.444		Bridge									
Main Channel	2.446	100Yr	4380.00	247.05	255.92	252.06	256.30	0.000806	5.01	1105.01	666.75	0.34
Main Channel	2.446	10Yr	1605.00	247.05	253.19	250.11	253.34	0.000482	3.07	522.61	114.92	0.26
Main Channel	2.446	50Yr	3395.00	247.05	255.38	251.45	255.68	0.000642	4.29	833.11	347.87	0.30
Main Channel	2.446	25Yr	2409.00	247.05	254.79	250.78	254.98	0.000416	3.46	696.98	120.08	0.24
Main Channel	2.456	100Yr	4380.00	246.90	255.97		256.35	0.001437	7.62	2167.49	768.59	0.46
Main Channel	2.456	10Yr	1605.00	246.90	253.17	253.17	253.40	0.001186	5.28	860.30	339.22	0.39
Main Channel	2.456	50Yr	3395.00	246.90	255.41	254.41	255.72	0.001191	6.62	1775.41	630.74	0.42
Main Channel	2.456	25Yr	2409.00	246.90	254.85	254.85	255.01	0.000689	4.79	1477.50	394.97	0.31
Main Channel	2.920	100Yr	4380.00	249.90	258.45		258.52	0.000646	4.63	3969.89	1426.55	0.30
Main Channel	2.920	10Yr	1605.00	249.90	256.20	256.20	256.37	0.001354	5.32	1270.54	887.38	0.40
Main Channel	2.920	50Yr	3395.00	249.90	257.81	257.81	257.89	0.000782	4.72	3088.18	1338.78	0.31
Main Channel	2.920	25Yr	2409.00	249.90	256.90	256.90	257.02	0.001134	5.28	1960.67	1097.25	0.38
Main Channel	3.140	100Yr	3038.00	252.00	259.02	255.99	259.04	0.000281	2.71	3841.69	1162.43	0.19
Main Channel	3.140	10Yr	1263.00	252.00	257.13	255.46	257.14	0.000334	2.31	1974.33	916.37	0.20
Main Channel	3.140	50Yr	2430.00	252.00	258.45	255.85	258.46	0.000295	2.60	3296.63	1087.90	0.19
Main Channel	3.140	25Yr	1841.00	252.00	257.74	255.67	257.76	0.000342	2.56	2562.22	996.28	0.20

HEC-RAS Plan: Alt-2A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	G Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cri W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Crnt (ft/s)	Flow Area (sq ft)	Top Width (ft)	Friction Coef
Main Channel	3.678	100Yr	3038.00	257.10	262.01	262.73	264.47	0.030016	17.20	507.26	392.53	1.56
Main Channel	3.678	10Yr	1263.00	257.10	261.87	261.87	262.42	0.006717	7.93	452.64	386.84	0.73
Main Channel	3.678	50Yr	2430.00	257.10	262.22	262.51	263.31	0.013445	11.93	589.54	400.96	1.05
Main Channel	3.678	25Yr	1841.00	257.10	262.21	262.21	262.84	0.007768	9.06	588.26	400.83	0.80
Main Channel	3.860	100Yr	3038.00	263.10	271.33	271.54	272.92	0.004098	12.39	480.87	228.94	0.78
Main Channel	3.860	10Yr	1263.00	263.10	267.07	268.08	270.33	0.018422	15.48	104.91	44.08	1.45
Main Channel	3.860	50Yr	2430.00	263.10	270.03	270.48	272.26	0.009434	13.74	277.91	83.37	0.95
Main Channel	3.860	25Yr	1841.00	263.10	268.31	269.00	271.36	0.012305	15.47	165.85	54.37	1.25
Main Channel	3.870	100Yr	3038.00	266.18	272.40	272.40	273.33	0.004603	9.38	623.16	388.78	0.68
Main Channel	3.870	10Yr	1263.00	266.18	269.87	269.87	271.54	0.011921	10.38	121.67	62.42	1.00
Main Channel	3.870	50Yr	2430.00	266.18	271.95	271.95	272.92	0.004826	9.11	478.48	328.92	0.69
Main Channel	3.870	25Yr	1841.00	266.18	271.30	271.30	272.36	0.005503	8.94	311.78	240.96	0.72
Main Channel	3.875		Bridge									
Main Channel	3.882	100Yr	3038.00	264.30	272.78	272.00	273.36	0.004210	7.85	728.63	390.64	0.57
Main Channel	3.882	10Yr	1263.00	264.30	272.14	270.58	272.31	0.001318	4.07	530.52	287.81	0.31
Main Channel	3.882	50Yr	2430.00	264.30	272.45	271.67	272.94	0.003695	7.07	617.29	336.99	0.53
Main Channel	3.882	25Yr	1841.00	264.30	272.17	271.22	272.53	0.002716	5.87	539.63	293.39	0.45
Main Channel	3.892	100Yr	3038.00	265.10	273.13	271.66	273.55	0.003020	7.94	1177.35	482.14	0.50
Main Channel	3.892	10Yr	1263.00	265.10	272.24	272.24	272.37	0.000992	4.19	825.62	329.52	0.28
Main Channel	3.892	50Yr	2430.00	265.10	272.76	271.16	273.11	0.002537	7.04	1012.39	402.60	0.46
Main Channel	3.892	25Yr	1841.00	265.10	272.40	270.52	272.65	0.001855	5.82	880.57	347.28	0.39
Main Channel	3.903	100Yr	3038.00	265.70	273.65	273.65	276.39	0.011168	15.11	326.31	85.45	0.97
Main Channel	3.903	10Yr	1263.00	265.70	271.71	271.71	272.77	0.005966	9.07	203.36	54.73	0.67
Main Channel	3.903	50Yr	2430.00	265.70	272.71	272.71	275.23	0.011866	14.26	261.28	61.60	0.98
Main Channel	3.903	25Yr	1841.00	265.70	271.81	271.81	273.96	0.011883	12.95	208.70	55.37	0.95
Main Channel	3.948	100Yr	3038.00	267.60	277.27	277.27	277.84	0.002537	8.32	1149.89	478.40	0.48
Main Channel	3.948	10Yr	1263.00	267.60	273.30	273.30	274.60	0.007390	9.86	178.16	49.06	0.75
Main Channel	3.948	50Yr	2430.00	267.60	276.09	275.71	277.21	0.004549	10.19	632.01	381.51	0.63
Main Channel	3.948	25Yr	1841.00	267.60	274.85	274.85	276.18	0.005872	10.39	324.10	145.90	0.69
Main Channel	3.985	100Yr	3038.00	269.32	277.90	275.74	278.25	0.002192	5.88	1085.67	464.21	0.38
Main Channel	3.985	10Yr	1263.00	269.32	275.11	273.52	275.49	0.003395	5.96	346.32	173.06	0.44

HEC-RAS Plan: Alt-2A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Gr.W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vert Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frouté # Ch
Main Channel	4.985	50Yr	2430.00	289.32	277.47	275.25	277.75	0.001840	5.18	908.79	354.43	0.34
Main Channel	4.985	25Yr	1841.00	289.32	276.55	274.61	276.81	0.001991	4.90	650.18	247.81	0.35
Main Channel	4.984	100Yr	3038.00	277.00	284.74	284.74	286.72	0.010779	12.72	387.18	115.34	0.90
Main Channel	4.984	10Yr	1263.00	277.00	282.37	282.37	283.80	0.012846	10.05	164.61	72.74	0.91
Main Channel	4.984	50Yr	2430.00	277.00	284.06	284.06	285.89	0.011120	11.95	313.27	103.16	0.90
Main Channel	4.984	25Yr	1841.00	277.00	283.32	283.32	284.94	0.011474	11.02	241.44	89.76	0.89
Main Channel	4.994	100Yr	3038.00	278.40	286.98	282.71	287.34	0.001094	4.82	630.06	221.33	0.30
Main Channel	4.994	10Yr	1263.00	278.40	284.14	281.16	284.29	0.000858	3.16	400.25	93.23	0.25
Main Channel	4.994	50Yr	2430.00	278.40	286.18	282.23	286.47	0.001002	4.30	565.75	150.49	0.29
Main Channel	4.994	25Yr	1841.00	278.40	285.26	281.72	285.47	0.000924	3.75	490.69	105.25	0.27
Main Channel	4.100		Bridge									
Main Channel	4.106	100Yr	3038.00	278.30	287.04	282.63	287.38	0.000575	4.72	643.12	235.73	0.30
Main Channel	4.106	10Yr	1263.00	278.30	284.18	281.06	284.33	0.000438	3.07	411.93	93.57	0.24
Main Channel	4.106	50Yr	2430.00	278.30	286.24	282.13	286.51	0.000524	4.20	578.29	164.31	0.28
Main Channel	4.106	25Yr	1841.00	278.30	285.30	281.62	285.51	0.000479	3.66	502.78	111.06	0.26
Main Channel	4.116	100Yr	3038.00	277.10	285.71	287.00	290.59	0.011288	20.37	281.51	71.17	1.28
Main Channel	4.116	10Yr	1263.00	277.10	282.95	283.91	286.27	0.011573	15.50	120.14	45.54	1.20
Main Channel	4.116	50Yr	2430.00	277.10	284.80	286.30	289.51	0.012190	19.51	220.26	62.73	1.30
Main Channel	4.116	25Yr	1841.00	277.10	283.96	285.23	288.05	0.011924	17.72	170.85	54.98	1.26
Main Channel	4.368	100Yr	3038.00	297.30	305.26	305.26	308.02	0.014878	15.48	298.67	66.27	0.98
Main Channel	4.368	10Yr	1263.00	297.30	302.48	302.48	304.25	0.015497	11.69	144.59	45.62	0.93
Main Channel	4.368	50Yr	2430.00	297.30	304.61	304.61	306.90	0.013537	13.91	257.81	60.34	0.93
Main Channel	4.368	25Yr	1841.00	297.30	303.63	303.63	305.69	0.014321	12.94	201.56	53.54	0.93
Main Channel	4.378	100Yr	3038.00	298.00	304.79	306.47	309.65	0.026848	17.80	183.93	57.09	1.28
Main Channel	4.378	10Yr	1263.00	298.00	301.08	302.67	306.40	0.075141	18.51	68.25	25.19	1.98
Main Channel	4.378	50Yr	2430.00	298.00	303.55	305.52	308.68	0.037538	18.17	133.78	28.84	1.46
Main Channel	4.378	25Yr	1841.00	298.00	302.29	303.92	307.61	0.051555	18.50	99.49	26.52	1.88
Main Channel	4.378		Bridge									
Main Channel	4.379	100Yr	3038.00	300.70	309.93	307.93	310.86	0.001964	8.98	598.40	138.40	0.54
Main Channel	4.379	10Yr	1263.00	300.70	307.41	305.43	307.88	0.001399	6.01	315.92	92.89	0.43
Main Channel	4.379	50Yr	2430.00	300.70	309.23	307.20	310.01	0.001801	8.09	507.20	122.18	0.50

HEC-RAS Plan: Alt-2A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Wp. Cb/EI (ft)	W.S. Elev (ft)	Crit. W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cfl
Main Channel	4.379	25Yr	1841.00	300.70	308.43	306.40	309.05	0.001578	7.06	416.96	105.50	0.46
Main Channel	4.389	100Yr	3038.00	300.90	309.80	308.36	311.12	0.004539	10.31	422.82	87.17	0.62
Main Channel	4.586	10Yr	1263.00	300.90	307.41	305.47	308.03	0.002998	6.75	240.70	64.61	0.48
Main Channel	4.389	50Yr	2430.00	300.90	309.15	307.55	310.23	0.004058	9.24	367.42	80.97	0.58
Main Channel	4.389	25Yr	1841.00	300.90	308.38	306.60	309.23	0.003546	8.08	307.91	73.74	0.53
Main Channel	4.644	100Yr	3038.00	317.60	325.62	326.31	327.76	0.010008	13.94	490.95	327.88	0.90
Main Channel	4.644	10Yr	1263.00	317.60	323.04	323.04	325.10	0.012817	11.90	121.93	33.14	0.95
Main Channel	4.644	50Yr	2430.00	317.60	325.21	325.99	327.43	0.010007	13.42	355.75	324.75	0.89
Main Channel	4.644	25Yr	1841.00	317.60	324.59	325.52	326.79	0.010013	12.63	213.42	123.29	0.88

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**REMOVAL OF THE UNDERSIZED PRIVATE BRIDGE  
HEC-RAS MODEL OUTPUT**

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HECRAS Plan: Prop - 3A River: Coppemine Brook Reach: Main Channel

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev. (ft)	Crit W.S. (ft)	E.G. Elev. (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froutie # Off
Main Channel	0.90	100Yr	4618.00	205.78	216.40	213.95	217.29	0.001889	8.56	1454.60	870.24	0.48
Main Channel	0.90	10Yr	1739.00	205.78	212.20	210.14	212.89	0.002467	6.80	312.65	100.21	0.50
Main Channel	0.90	50Yr	3360.00	205.78	216.00	212.38	216.48	0.001104	6.36	1133.80	609.08	0.36
Main Channel	0.90	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42
Main Channel	0.951	100Yr	4618.00	207.98	217.01		217.95	0.003112	9.83	1488.87	766.70	0.59
Main Channel	0.951	10Yr	1739.00	207.98	212.94		214.26	0.007523	9.88	226.45	58.38	0.83
Main Channel	0.951	50Yr	3360.00	207.98	216.19		217.23	0.003301	9.46	922.33	623.67	0.60
Main Channel	0.951	25Yr	2677.00	207.98	214.77	213.57	216.24	0.005397	10.54	349.61	148.31	0.74
Main Channel	0.961	100Yr	4618.00	208.13	217.77		218.23	0.001951	7.02	1921.79	852.32	0.41
Main Channel	0.961	10Yr	1739.00	208.13	213.68		214.72	0.006043	8.23	224.97	54.11	0.66
Main Channel	0.961	50Yr	3360.00	208.13	217.09		217.54	0.001846	6.48	1363.32	730.80	0.40
Main Channel	0.961	25Yr	2677.00	208.13	215.33	213.77	216.59	0.005156	9.23	402.20	289.05	0.64
Main Channel	0.974	100Yr	4618.00	207.71	217.89		218.40	0.002218	8.84	2094.30	884.55	0.51
Main Channel	0.974	10Yr	1739.00	207.71	213.93		215.38	0.007039	10.94	247.89	60.94	0.83
Main Channel	0.974	50Yr	3360.00	207.71	217.18		217.74	0.002284	8.51	1507.00	760.61	0.51
Main Channel	0.974	25Yr	2677.00	207.71	215.17	214.78	217.70	0.009142	14.30	381.90	231.91	0.97
Main Channel	0.98	100Yr	4618.00	207.70	217.96		218.45	0.001454	7.14	2020.64	883.77	0.40
Main Channel	0.98	10Yr	1739.00	207.70	214.93		215.56	0.001803	6.38	294.36	140.75	0.43
Main Channel	0.98	50Yr	3360.00	207.70	217.38		217.80	0.001212	6.26	1539.47	776.25	0.36
Main Channel	0.98	25Yr	2677.00	207.70	217.79	213.33	217.98	0.000559	4.38	1869.24	651.40	0.25
Main Channel	0.984	100Yr	4618.00	207.19	218.40	216.97	218.56	0.000497	5.09	2404.49	920.63	0.28
Main Channel	0.984	10Yr	1739.00	207.19	214.75	212.82	215.82	0.002419	8.30	209.45	100.94	0.58
Main Channel	0.984	50Yr	3360.00	207.19	217.71	216.50	217.89	0.000505	4.90	1804.70	825.53	0.28
Main Channel	0.984	25Yr	2677.00	207.19	217.92	216.15	218.01	0.000282	3.58	1982.10	860.88	0.20
Main Channel	0.99	Bridge										
Main Channel	0.994	100Yr	4618.00	206.50	218.38	217.08	218.62	0.000577	5.64	1963.04	656.68	0.30
Main Channel	0.994	10Yr	1739.00	206.50	215.28	212.11	216.02	0.001363	6.95	250.22	167.94	0.44
Main Channel	0.994	50Yr	3360.00	206.50	217.70	214.56	217.94	0.000545	5.25	1532.85	612.62	0.29
Main Channel	0.994	25Yr	2677.00	206.50	217.97	213.58	218.08	0.000273	3.78	1697.82	629.88	0.21
Main Channel	0.114	100Yr	4618.00	207.65	218.42		218.68	0.000462	4.39	1977.46	607.48	0.26
Main Channel	0.114	10Yr	1739.00	207.65	216.04		216.15	0.000254	2.69	742.37	416.02	0.19
Main Channel	0.114	50Yr	3360.00	207.65	217.81		217.99	0.000345	3.61	1616.97	564.80	0.23

HEC-RAS Plan: Prop - 3A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	O. Total (ft)	Min. Chl El. (ft)	W. S. Elev. (ft)	Crit. W. S. (ft)	E.G. Elev. (ft)	E.G. Slope (ft/ft)	Vel. Chnl. (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	0.114	25Yr	2677.00	207.65	218.00		218.11	0.000196	2.77	1729.71	578.49	0.17
Main Channel	0.148	100Yr	4383.00	208.35	218.23	217.21	219.03	0.004666	9.69	1058.16	345.74	0.57
Main Channel	0.148	10Yr	1634.00	208.35	215.81		216.40	0.003826	7.13	438.52	198.01	0.49
Main Channel	0.148	50Yr	3135.00	208.35	217.66	216.46	218.25	0.003505	8.04	874.91	296.49	0.49
Main Channel	0.148	25Yr	2522.00	208.35	217.93	215.91	218.25	0.001887	6.02	958.48	319.89	0.36
Main Channel	0.224	100Yr	4383.00	210.13	218.56	219.72	222.54	0.009149	17.90	399.06	250.77	1.15
Main Channel	0.224	10Yr	1634.00	210.13	216.75		218.45	0.004724	10.70	179.23	40.38	0.79
Main Channel	0.224	50Yr	3135.00	210.13	217.98	219.23	221.66	0.008254	16.11	268.83	185.08	1.08
Main Channel	0.224	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Main Channel	0.306	100Yr	4383.00	211.80	224.44	224.44	225.93	0.002835	11.87	1089.54	394.17	0.62
Main Channel	0.306	10Yr	1634.00	211.80	219.02	218.84	221.48	0.007713	12.63	138.32	32.11	0.92
Main Channel	0.306	50Yr	3135.00	211.80	221.91	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Main Channel	0.308	100Yr	4383.00	212.00	224.87		225.99	0.002197	10.70	1253.99	406.50	0.56
Main Channel	0.308	10Yr	1634.00	212.00	219.01	219.00	221.60	0.008344	12.99	134.70	32.06	0.96
Main Channel	0.308	50Yr	3135.00	212.00	224.96	223.36	225.50	0.001085	7.49	1289.99	409.99	0.39
Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Main Channel	0.316	100Yr	4383.00	212.85	224.27	222.23	226.87	0.006155	12.94	338.67	38.91	0.72
Main Channel	0.316	10Yr	1634.00	212.85	221.70	218.31	222.34	0.002258	6.46	253.11	36.72	0.41
Main Channel	0.316	50Yr	3135.00	212.85	224.68	220.60	225.91	0.002756	8.89	352.50	39.26	0.48
Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Main Channel	0.320		Bridge									
Main Channel	0.326	100Yr	4383.00	214.38	228.32	223.28	228.98	0.001119	7.51	1390.63	413.71	0.37
Main Channel	0.326	10Yr	1634.00	214.38	221.71	219.37	222.58	0.002825	7.50	217.99	36.75	0.52
Main Channel	0.326	50Yr	3135.00	214.38	225.30	221.67	226.64	0.002416	9.28	337.77	68.38	0.51
Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Main Channel	0.336	100Yr	4383.00	216.00	228.97	223.82	229.07	0.000328	3.75	2905.67	468.56	0.20
Main Channel	0.336	10Yr	1634.00	216.00	221.88		222.80	0.006496	8.32	320.04	184.50	0.75
Main Channel	0.336	50Yr	3135.00	216.00	226.68	223.00	226.81	0.000523	4.05	1887.21	420.92	0.24
Main Channel	0.336	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000578	3.96	1530.68	402.92	0.25
Main Channel	0.588	100Yr	4383.00	220.60	231.45	231.45	233.08	0.004106	12.90	907.96	271.09	0.70

HEC-RAS Plan: Prop - 3A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Chl El (ft)	W.S. Elev (ft)	Chl W.S. (ft)	E.G. Elev (ft)	F.G. Slope (ft/ft)	Vel/Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Friction #/Chl
Main Channel	0.588	10Yr	1634.00	220.60	228.13	229.33	229.33	0.003768	9.58	279.61	82.59	0.63
Main Channel	0.588	50Yr	3135.00	220.60	228.69	228.69	232.17	0.010112	16.51	329.22	93.03	1.05
Main Channel	0.588	25Yr	2522.00	220.60	228.46	228.46	230.95	0.007448	13.88	307.92	86.70	0.89
Main Channel	0.729	100Yr	4383.00	226.80	235.20	236.93	236.93	0.006558	11.81	462.09	117.79	0.79
Main Channel	0.729	10Yr	1634.00	226.80	232.02	232.01	233.59	0.009010	10.31	174.49	62.28	0.87
Main Channel	0.729	50Yr	3135.00	226.80	235.37	236.18	236.18	0.002984	8.10	482.41	120.19	0.53
Main Channel	0.729	25Yr	2522.00	226.80	234.19	235.19	235.19	0.004219	8.74	352.01	100.76	0.62
Main Channel	0.748	100Yr	4383.00	227.50	235.95	237.67	237.67	0.008576	11.44	440.05	95.30	0.89
Main Channel	0.748	10Yr	1634.00	227.50	233.68	233.04	234.46	0.007174	7.63	238.40	81.32	0.75
Main Channel	0.748	50Yr	3135.00	227.50	235.62	236.63	236.63	0.005459	8.74	409.27	93.26	0.70
Main Channel	0.748	25Yr	2522.00	227.50	234.73	235.72	235.72	0.006912	8.64	327.93	86.19	0.76
Main Channel	0.758	100Yr	4383.00	229.00	236.32	235.75	238.14	0.008208	11.94	442.47	99.17	0.89
Main Channel	0.758	10Yr	1634.00	229.00	234.02	233.39	234.82	0.006821	7.72	238.77	80.53	0.74
Main Channel	0.758	50Yr	3135.00	229.00	235.84	234.79	236.98	0.005704	9.38	397.54	97.19	0.73
Main Channel	0.758	25Yr	2522.00	229.00	235.03	234.26	236.10	0.006646	9.03	323.64	89.85	0.76
Main Channel	0.759		Bridge									
Main Channel	0.760	100Yr	4383.00	229.10	237.28	235.77	238.40	0.004995	9.18	531.92	103.62	0.65
Main Channel	0.760	10Yr	1634.00	229.10	234.20	233.41	234.90	0.005850	7.16	252.33	82.22	0.68
Main Channel	0.760	50Yr	3135.00	229.10	236.25	234.83	237.11	0.004795	7.97	435.35	98.91	0.62
Main Channel	0.760	25Yr	2522.00	229.10	235.39	234.31	236.22	0.005585	7.82	355.26	93.26	0.66
Main Channel	0.770	100Yr	4383.00	229.00	237.50	236.71	238.67	0.004906	10.16	562.98	121.70	0.70
Main Channel	0.770	10Yr	1634.00	229.00	234.47	235.23	235.23	0.006543	7.80	247.21	86.73	0.73
Main Channel	0.770	50Yr	3135.00	229.00	236.42	237.38	237.38	0.004893	9.02	436.73	110.30	0.68
Main Channel	0.770	25Yr	2522.00	229.00	235.61	236.53	236.53	0.005638	8.71	353.02	97.90	0.71
Main Channel	0.798	100Yr	4383.00	230.50	238.25	236.71	239.30	0.003510	9.28	631.86	134.84	0.61
Main Channel	0.798	10Yr	1634.00	230.50	235.36	235.97	235.97	0.003711	6.73	291.89	98.12	0.58
Main Channel	0.798	50Yr	3135.00	230.50	237.13	238.01	238.01	0.003563	8.34	484.37	128.37	0.60
Main Channel	0.798	25Yr	2522.00	230.50	236.43	237.22	237.22	0.003688	7.80	403.22	109.50	0.60
Main Channel	0.808	100Yr	4383.00	230.50	237.62	237.62	240.18	0.008735	14.33	369.55	74.91	0.96
Main Channel	0.808	10Yr	1634.00	230.50	235.24	234.80	236.36	0.006327	9.19	206.26	62.68	0.76
Main Channel	0.808	50Yr	3135.00	230.50	236.59	236.46	238.62	0.008354	12.58	295.57	69.64	0.92
Main Channel	0.808	25Yr	2522.00	230.50	236.05	235.85	237.75	0.007903	11.47	258.49	66.84	0.88



HECRAS Plan: Prop - 3A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	O. Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cnt W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	VEL(Chn) (ft/s)	Flow Area (sq ft)	Top Width (ft)	Fronda # Chl
Main Channel	1.598	100Yr	4071.00	238.40	248.06	244.97	249.11	0.001846	8.77	855.01	413.45	0.50
Main Channel	1.598	10Yr	1501.00	238.40	245.30	241.78	245.70	0.000979	5.11	293.91	81.59	0.34
Main Channel	1.598	50Yr	2885.00	238.40	247.73	243.62	248.33	0.001078	6.55	734.93	316.33	0.38
Main Channel	1.598	25Yr	2329.00	238.40	247.31	242.91	247.72	0.000796	5.46	628.13	192.40	0.32
Main Channel	1.608	100Yr	4071.00	238.40	248.02	245.38	249.39	0.003017	10.70	792.74	270.94	0.63
Main Channel	1.608	10Yr	1501.00	238.40	245.23	241.78	245.83	0.001845	6.55	305.23	69.57	0.46
Main Channel	1.608	50Yr	2885.00	238.40	247.69	243.62	248.44	0.001722	7.89	718.35	219.39	0.47
Main Channel	1.608	25Yr	2329.00	238.40	247.22	244.23	247.84	0.001482	7.05	617.00	204.41	0.43
Main Channel	1.850	100Yr	4071.00	242.10	253.18	253.18	254.38	0.002886	11.38	1175.51	534.38	0.82
Main Channel	1.850	10Yr	1501.00	242.10	248.39	248.39	250.37	0.007045	11.85	165.60	43.41	0.87
Main Channel	1.850	50Yr	2885.00	242.10	249.94	249.81	253.87	0.010600	17.06	239.44	51.70	1.12
Main Channel	1.850	25Yr	2329.00	242.10	249.79	249.79	252.50	0.007490	14.14	231.54	50.87	0.93
Main Channel	1.860	100Yr	4071.00	241.60	254.45	248.65	254.71	0.000418	5.05	1483.93	358.51	0.25
Main Channel	1.860	10Yr	1501.00	241.60	250.78	245.23	250.95	0.000337	3.62	559.38	136.76	0.21
Main Channel	1.860	50Yr	2885.00	241.60	254.94	247.22	255.04	0.000166	3.27	1663.74	386.40	0.16
Main Channel	1.860	25Yr	2329.00	241.60	253.14	246.46	253.30	0.000261	3.72	1063.08	282.66	0.19
Main Channel	1.864		Bridge									
Main Channel	1.868	100Yr	4071.00	241.40	254.55	248.47	254.77	0.000363	4.78	1590.91	375.35	0.23
Main Channel	1.868	10Yr	1501.00	241.40	251.23	245.03	251.48	0.000374	4.00	375.51	183.75	0.22
Main Channel	1.868	50Yr	2885.00	241.40	256.02	247.02	255.11	0.000150	3.14	1776.57	422.30	0.15
Main Channel	1.868	25Yr	2329.00	241.40	253.25	246.27	253.38	0.000225	3.51	1151.64	300.21	0.18
Main Channel	1.878	100Yr	4071.00	242.70	254.55		254.80	0.000568	5.36	1267.03	352.59	0.28
Main Channel	1.878	10Yr	1501.00	242.70	251.11		251.57	0.001012	5.64	332.65	176.70	0.35
Main Channel	1.878	50Yr	2885.00	242.70	255.03		255.12	0.000210	3.35	1442.66	383.52	0.17
Main Channel	1.878	25Yr	2329.00	242.70	253.21		253.42	0.000485	4.56	841.71	294.81	0.25
Main Channel	1.932	100Yr	4071.00	243.87	254.81		255.00	0.000813	5.12	1899.68	694.49	0.31
Main Channel	1.932	10Yr	1501.00	243.87	251.29	249.60	252.20	0.003635	7.65	197.97	53.85	0.59
Main Channel	1.932	50Yr	2885.00	243.87	255.12		255.20	0.000311	3.24	2120.69	714.59	0.19
Main Channel	1.932	25Yr	2329.00	243.87	253.35		253.66	0.001196	5.49	958.03	576.98	0.36
Main Channel	1.942	100Yr	4071.00	243.90	254.74		255.09	0.000993	6.57	1554.18	556.14	0.37
Main Channel	1.942	10Yr	1501.00	243.90	251.65		252.34	0.001746	6.82	242.96	42.19	0.46
Main Channel	1.942	50Yr	2885.00	243.90	255.10		255.23	0.000375	4.13	1756.11	573.42	0.23

HEC-RAS Plan: Prop - 3A River Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Chl El (ft)	W S Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Fronda # Chl
Main Channel	1.942	25Yr	2329.00	243.90	253.29		253.77	0.001187	6.47	804.42	472.72	0.39
Main Channel	1.950	100Yr	4071.00	243.93	254.71		255.16	0.001258	7.02	1467.37	652.61	0.38
Main Channel	1.950	10Yr	1501.00	243.93	251.82		252.40	0.001499	6.20	259.07	40.19	0.39
Main Channel	1.950	50Yr	2885.00	243.93	255.10		255.25	0.000450	4.30	1725.42	681.91	0.23
Main Channel	1.950	25Yr	2329.00	243.93	253.24		253.85	0.001477	6.88	655.78	438.34	0.40
Main Channel	1.960	100Yr	4071.00	243.97	254.82		255.23	0.001534	6.65	1708.72	630.35	0.41
Main Channel	1.960	10Yr	1501.00	243.97	252.01		252.50	0.002076	5.93	371.75	216.59	0.45
Main Channel	1.960	50Yr	2885.00	243.97	255.12		255.28	0.000619	4.33	1897.23	661.12	0.26
Main Channel	1.960	25Yr	2329.00	243.97	253.58		253.95	0.001392	5.66	994.47	511.44	0.38
Main Channel	2.087	100Yr	4390.00	245.49	255.35		255.36	0.000052	1.36	8633.66	1396.30	0.08
Main Channel	2.087	10Yr	1605.00	245.49	252.61		252.61	0.000031	0.84	5096.57	1204.52	0.06
Main Channel	2.087	50Yr	3395.00	245.49	255.34		255.35	0.000031	1.06	8615.26	1395.00	0.06
Main Channel	2.087	25Yr	2409.00	245.49	254.04		254.04	0.000029	0.93	6874.53	1285.98	0.06
Main Channel	2.236	100Yr	4390.00	245.30	255.41		255.44	0.000213	3.03	5658.04	1299.75	0.17
Main Channel	2.236	10Yr	1605.00	245.30	252.63		252.69	0.000428	3.45	2130.08	1162.19	0.23
Main Channel	2.236	50Yr	3395.00	245.30	255.38		255.39	0.000131	2.37	5510.83	1298.01	0.13
Main Channel	2.236	25Yr	2409.00	245.30	254.07		254.09	0.000188	2.58	3856.46	1233.80	0.16
Main Channel	2.244	100Yr	4390.00	245.30	255.43		255.45	0.000211	3.01	5576.15	1300.42	0.17
Main Channel	2.244	10Yr	1605.00	245.30	252.66		252.72	0.000410	3.38	2165.02	1163.69	0.22
Main Channel	2.244	50Yr	3395.00	245.30	255.39		255.40	0.000130	2.36	5621.94	1298.42	0.13
Main Channel	2.244	25Yr	2409.00	245.30	254.08		254.10	0.000186	2.57	3871.63	1234.41	0.15
Main Channel	2.245	100Yr	4390.00	245.30	255.43		255.45	0.000211	3.02	5575.36	1300.43	0.17
Main Channel	2.245	10Yr	1605.00	245.30	252.66		252.72	0.000411	3.39	2164.47	1163.71	0.22
Main Channel	2.245	50Yr	3395.00	245.30	255.39		255.40	0.000130	2.36	5621.05	1298.43	0.13
Main Channel	2.245	25Yr	2409.00	245.30	254.08		254.11	0.000186	2.57	3870.81	1234.42	0.15
Main Channel	2.246	100Yr	4390.00	244.90	255.43		255.46	0.000169	2.73	5870.12	1944.60	0.15
Main Channel	2.246	10Yr	1605.00	244.90	252.67		252.72	0.000271	2.80	2336.35	1217.42	0.18
Main Channel	2.246	50Yr	3395.00	244.90	255.39		255.40	0.000104	2.14	5813.67	1342.67	0.12
Main Channel	2.246	25Yr	2409.00	244.90	254.08		254.11	0.000141	2.27	4104.13	1292.70	0.13
Main Channel	2.2465		Inl Struct									
Main Channel	2.247	100Yr	4390.00	245.20	255.44	252.62	255.47	0.000205	2.95	5481.79	1331.30	0.17

HEC-RAS Plan: Prop - 3A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	Q Total (cfs)	Min Chl El (ft)	W.S. Elev. (ft)	Crit. W.S. (ft)	E.G. Elev. (ft)	E.G. Slope (ft/ft)	Vel. Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	2,247	10Yr	1605.00	245.20	252.68	250.04	252.76	0.000396	3.29	1982.18	1203.92	0.22
Main Channel	2,247	50Yr	3395.00	245.20	255.40	251.47	255.42	0.000127	2.32	5425.89	1329.38	0.13
Main Channel	2,247	25Yr	2409.00	245.20	254.09	252.06	254.12	0.000183	2.53	3729.08	1269.13	0.15
Main Channel	2,262	100Yr	4380.00	245.00	255.48		255.48	0.000094	2.01	7710.76	1505.42	0.11
Main Channel	2,262	10Yr	1605.00	245.00	252.77		252.78	0.000106	1.72	3630.08	1376.33	0.11
Main Channel	2,262	50Yr	3395.00	245.00	255.42		255.42	0.000059	1.57	7626.11	1501.22	0.09
Main Channel	2,262	25Yr	2409.00	245.00	254.13		254.13	0.000070	1.57	5734.04	1433.26	0.09
Main Channel	2,432	100Yr	4380.00	247.60	255.26		255.92	0.002657	9.54	1529.41	642.11	0.62
Main Channel	2,432	10Yr	1605.00	247.60	252.68		253.20	0.002766	7.29	543.34	280.46	0.59
Main Channel	2,432	50Yr	3395.00	247.60	255.30		255.69	0.001558	7.33	1553.77	653.20	0.48
Main Channel	2,432	25Yr	2409.00	247.60	254.06		254.41	0.001648	6.67	992.18	372.25	0.48
Main Channel	2,442	100Yr	4380.00	246.89	255.58	252.20	256.06	0.001063	5.55	883.53	463.95	0.38
Main Channel	2,442	10Yr	1605.00	246.89	253.20	250.25	253.35	0.000535	3.16	507.34	111.36	0.26
Main Channel	2,442	50Yr	3395.00	246.89	255.46	251.59	255.76	0.000679	4.39	833.45	394.38	0.30
Main Channel	2,442	25Yr	2409.00	246.89	254.26	250.89	254.49	0.000640	3.83	628.76	115.13	0.29
Main Channel	2,444		Bridge									
Main Channel	2,446	100Yr	4380.00	247.05	255.93	252.06	256.31	0.000801	5.00	1112.10	673.05	0.33
Main Channel	2,446	10Yr	1605.00	247.05	253.23	250.11	253.38	0.000468	3.04	527.31	115.06	0.24
Main Channel	2,446	50Yr	3395.00	247.05	255.77	251.45	256.02	0.000525	4.00	1012.57	578.41	0.27
Main Channel	2,446	25Yr	2409.00	247.05	254.48	250.78	254.69	0.000490	3.63	663.52	119.09	0.26
Main Channel	2,456	100Yr	4380.00	246.90	255.98		256.36	0.001427	7.60	2175.70	771.21	0.46
Main Channel	2,456	10Yr	1605.00	246.90	253.21		253.44	0.001135	5.19	876.09	340.76	0.39
Main Channel	2,456	50Yr	3395.00	246.90	255.80		256.05	0.000960	6.14	2038.93	726.28	0.38
Main Channel	2,456	25Yr	2409.00	246.90	254.53		254.72	0.000862	5.20	1353.92	384.46	0.35
Main Channel	2,920	100Yr	4380.00	249.90	258.45		258.52	0.000645	4.63	3971.17	1426.69	0.29
Main Channel	2,920	10Yr	1605.00	249.90	256.19		256.36	0.001377	5.36	1261.03	884.14	0.41
Main Channel	2,920	50Yr	3395.00	249.90	257.98		257.95	0.000701	4.58	3173.81	1347.56	0.30
Main Channel	2,920	25Yr	2409.00	249.90	256.89		257.02	0.001145	5.30	1953.07	1095.16	0.38
Main Channel	3,140	100Yr	3038.00	252.00	259.02	255.99	259.04	0.000281	2.71	3942.40	1162.51	0.19
Main Channel	3,140	10Yr	1263.00	252.00	257.12	255.46	257.14	0.000334	2.31	1972.93	916.17	0.20
Main Channel	3,140	50Yr	2430.00	252.00	258.48	255.85	258.50	0.000287	2.58	3330.56	1091.95	0.19
Main Channel	3,140	25Yr	1841.00	252.00	257.74	255.67	257.76	0.000343	2.56	2560.28	998.03	0.20

HEC-RAS Plan: Prop - 3A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch.E (ft)	W/S Elev (ft)	Crit W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #	Chl
Main Channel	3.678	100Yr	3038.00	257.10	262.01	262.73	264.47	0.030016	17.20	507.26	392.53	1.56	
Main Channel	3.678	10Yr	1263.00	257.10	261.87	261.87	262.42	0.006717	7.93	452.64	386.84	0.73	
Main Channel	3.678	50Yr	2430.00	257.10	262.22	262.51	263.31	0.013445	11.93	589.54	400.96	1.05	
Main Channel	3.678	25Yr	1841.00	257.10	262.21	262.21	262.84	0.007758	9.06	588.26	400.83	0.80	
Main Channel	3.860	100Yr	3038.00	263.10	271.33	271.54	272.92	0.004098	12.39	480.87	228.94	0.78	
Main Channel	3.860	10Yr	1263.00	263.10	267.07	268.08	270.33	0.018422	15.48	104.91	44.08	1.45	
Main Channel	3.860	50Yr	2430.00	263.10	270.03	270.48	272.26	0.006434	13.74	277.91	83.37	0.95	
Main Channel	3.860	25Yr	1841.00	263.10	268.31	269.00	271.36	0.012305	15.47	165.85	54.37	1.25	
Main Channel	3.870	100Yr	3038.00	266.18	272.40	272.40	273.33	0.004603	9.38	623.16	368.78	0.68	
Main Channel	3.870	10Yr	1263.00	266.18	269.87	269.87	271.54	0.011921	10.38	121.67	62.42	1.00	
Main Channel	3.870	50Yr	2430.00	266.18	271.95	271.95	272.92	0.004825	9.11	478.48	328.92	0.69	
Main Channel	3.870	25Yr	1841.00	266.18	271.30	271.30	272.36	0.005503	8.94	311.78	240.96	0.72	
Main Channel	3.876		Bridge										
Main Channel	3.882	100Yr	3038.00	264.30	272.78	272.00	273.36	0.004210	7.85	728.63	390.64	0.57	
Main Channel	3.882	10Yr	1263.00	264.30	272.14	270.58	272.31	0.001318	4.07	530.92	287.81	0.31	
Main Channel	3.882	50Yr	2430.00	264.30	272.45	271.67	272.94	0.003695	7.07	617.29	336.99	0.53	
Main Channel	3.882	25Yr	1841.00	264.30	272.17	271.22	272.53	0.002716	5.87	539.63	293.39	0.45	
Main Channel	3.892	100Yr	3038.00	265.10	273.13	271.66	273.55	0.003020	7.94	1177.35	482.14	0.50	
Main Channel	3.892	10Yr	1263.00	265.10	272.24	272.24	272.37	0.000992	4.19	825.62	329.52	0.28	
Main Channel	3.892	50Yr	2430.00	265.10	272.76	271.16	273.11	0.002537	7.04	1012.39	402.60	0.46	
Main Channel	3.892	25Yr	1841.00	265.10	272.40	270.52	272.65	0.001855	5.82	880.57	347.28	0.39	
Main Channel	3.903	100Yr	3038.00	265.70	273.65	273.65	276.39	0.011168	15.11	326.31	85.45	0.97	
Main Channel	3.903	10Yr	1263.00	265.70	271.71	271.71	272.77	0.006966	9.07	203.36	54.73	0.67	
Main Channel	3.903	50Yr	2430.00	265.70	272.71	272.71	275.23	0.011866	14.26	261.28	61.60	0.98	
Main Channel	3.903	25Yr	1841.00	265.70	271.81	271.81	273.96	0.011893	12.95	208.70	55.37	0.95	
Main Channel	3.948	100Yr	3038.00	267.60	277.27	277.27	277.84	0.002537	8.32	1149.89	478.40	0.48	
Main Channel	3.948	10Yr	1263.00	267.60	273.30	273.30	274.60	0.007390	9.86	178.16	49.06	0.75	
Main Channel	3.948	50Yr	2430.00	267.60	276.09	275.71	277.21	0.004549	10.19	632.01	381.51	0.83	
Main Channel	3.948	25Yr	1841.00	267.60	274.85	274.85	276.18	0.005872	10.39	324.10	145.90	0.69	
Main Channel	3.985	100Yr	3038.00	269.32	277.90	275.74	278.25	0.002192	5.88	1085.67	464.21	0.38	
Main Channel	3.985	10Yr	1263.00	269.32	275.11	273.52	275.49	0.003395	5.36	346.32	173.06	0.44	

HEC-RAS Plan: Prop - 3A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froutde #	Chl
Main Channel	4.985	50Yr	2430.00	277.47	275.25	277.75	0.001840	5.18	908.79	354.43		0.34
Main Channel	4.985	25Yr	1841.00	276.55	274.61	276.81	0.001991	4.90	650.18	247.81		0.35
Main Channel	4.084	100Yr	3038.00	284.74	284.74	286.72	0.010779	12.72	387.18	115.34		0.90
Main Channel	4.084	10Yr	1263.00	282.37	282.37	283.80	0.012846	10.05	164.61	72.74		0.91
Main Channel	4.084	50Yr	2430.00	284.06	284.06	285.89	0.011120	11.95	313.27	103.16		0.90
Main Channel	4.084	25Yr	1841.00	283.32	283.32	284.94	0.011474	11.02	241.44	89.76		0.89
Main Channel	4.094	100Yr	3038.00	286.98	282.71	287.34	0.001094	4.92	630.06	221.33		0.30
Main Channel	4.094	10Yr	1263.00	284.14	281.16	284.29	0.000858	3.16	400.25	93.23		0.25
Main Channel	4.094	50Yr	2430.00	286.18	282.23	286.47	0.001002	4.30	565.75	150.49		0.29
Main Channel	4.094	25Yr	1841.00	285.26	281.72	285.47	0.000924	3.75	490.69	105.25		0.27
Main Channel	4.100		Bridge									
Main Channel	4.106	100Yr	3038.00	287.04	282.63	287.38	0.000575	4.72	643.12	235.73		0.30
Main Channel	4.106	10Yr	1263.00	284.18	281.06	284.33	0.000438	3.07	411.93	93.57		0.24
Main Channel	4.106	50Yr	2430.00	286.24	282.13	286.51	0.000524	4.20	578.29	164.31		0.28
Main Channel	4.106	25Yr	1841.00	285.30	281.62	285.51	0.000479	3.66	502.78	111.06		0.26
Main Channel	4.116	100Yr	3038.00	285.71	287.00	290.59	0.011288	20.37	281.51	71.17		1.28
Main Channel	4.116	10Yr	1263.00	282.95	283.91	286.27	0.011573	15.50	120.14	45.54		1.20
Main Channel	4.116	50Yr	2430.00	284.80	286.30	289.51	0.012190	19.51	220.26	62.73		1.30
Main Channel	4.116	25Yr	1841.00	283.96	285.23	288.05	0.011924	17.72	170.85	54.98		1.26
Main Channel	4.368	100Yr	3038.00	305.26	305.26	308.02	0.014878	15.48	298.67	66.27		0.98
Main Channel	4.368	10Yr	1263.00	302.48	302.48	304.25	0.015497	11.69	144.59	45.62		0.93
Main Channel	4.368	50Yr	2430.00	304.61	304.61	306.90	0.013537	13.91	257.81	60.34		0.93
Main Channel	4.368	25Yr	1841.00	303.63	303.63	305.69	0.014321	12.94	201.56	53.54		0.93
Main Channel	4.374	100Yr	3038.00	304.79	306.47	309.65	0.026848	17.80	183.93	57.09		1.28
Main Channel	4.374	10Yr	1263.00	301.08	302.67	306.40	0.075141	18.51	68.25	25.19		1.98
Main Channel	4.378	50Yr	2430.00	303.55	305.52	308.68	0.037538	18.17	133.78	28.84		1.46
Main Channel	4.378	25Yr	1841.00	302.29	303.92	307.61	0.051555	18.50	99.49	26.52		1.58
Main Channel	4.378		Bridge									
Main Channel	4.379	100Yr	3038.00	309.93	307.93	310.86	0.001984	8.98	598.40	138.40		0.54
Main Channel	4.379	10Yr	1263.00	307.41	305.43	307.88	0.001399	6.01	315.92	92.89		0.43
Main Channel	4.379	50Yr	2430.00	309.23	307.20	310.01	0.001801	8.09	507.20	122.18		0.50

HEC-RAS Plan: Prop - 3A River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Chl El (ft)	W/S Elev (ft)	Crit W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	4,379	25Yr	1841.00	300.70	308.43	306.40	309.05	0.001578	7.06	416.96	105.50	0.46
Main Channel	4,389	100Yr	3038.00	300.90	309.80	308.36	311.12	0.004539	10.31	422.82	87.17	0.62
Main Channel	4,389	10Yr	1263.00	300.90	307.41	305.47	308.03	0.002998	6.75	240.70	64.61	0.48
Main Channel	4,389	50Yr	2430.00	300.90	309.15	307.55	310.23	0.004058	9.24	367.42	80.97	0.58
Main Channel	4,389	25Yr	1841.00	300.90	308.38	306.60	309.23	0.003546	8.08	307.91	73.74	0.53
Main Channel	4,644	100Yr	3038.00	317.60	325.62	326.31	327.76	0.010008	13.94	490.95	327.88	0.90
Main Channel	4,644	10Yr	1263.00	317.60	323.04	323.04	325.10	0.012817	11.90	121.93	33.14	0.95
Main Channel	4,644	50Yr	2430.00	317.60	325.21	325.99	327.43	0.010007	13.42	355.75	324.75	0.89
Main Channel	4,644	25Yr	1841.00	317.60	324.59	325.52	326.79	0.010013	12.63	213.42	123.29	0.88

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**REMOVAL OF FARMINGTON AVENUE BRIDGE AND UNDERSIZED  
PRIVATE BRIDGE  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: Pr 2A+3A(B) River: Copperline Brook Reach: Main Channel

Reach	River Sta	Profile	Q Total (cfs)	Min Chl El (ft)	W/S Elev (ft)	Grnt W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froutie # Chl
Main Channel	0.00	100Yr	4618.00	206.78	216.40	213.95	217.29	0.001889	8.56	1454.60	870.24	0.48
Main Channel	0.00	10Yr	1739.00	205.78	212.20	210.14	212.89	0.002467	6.80	312.65	100.21	0.50
Main Channel	0.00	50Yr	3360.00	205.78	216.00	212.38	216.48	0.001104	6.36	1133.80	609.08	0.36
Main Channel	0.00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42
Main Channel	0.051	100Yr	4618.00	207.98	217.01		217.95	0.003112	9.83	1488.87	766.70	0.59
Main Channel	0.051	10Yr	1739.00	207.98	212.94		214.26	0.007523	9.88	226.45	58.38	0.83
Main Channel	0.051	50Yr	3360.00	207.98	216.19		217.23	0.003301	9.46	922.33	623.67	0.60
Main Channel	0.051	25Yr	2677.00	207.98	214.77	213.57	216.24	0.005397	10.54	349.61	148.31	0.74
Main Channel	0.061	100Yr	4618.00	208.13	217.77		218.23	0.001951	7.02	1921.79	852.32	0.41
Main Channel	0.061	10Yr	1739.00	208.13	213.68		214.72	0.006043	8.23	224.97	54.11	0.66
Main Channel	0.061	50Yr	3360.00	208.13	217.09		217.54	0.001846	6.48	1383.32	730.80	0.40
Main Channel	0.061	25Yr	2677.00	208.13	215.33	213.77	216.59	0.005156	9.23	402.20	289.05	0.84
Main Channel	0.074	100Yr	4618.00	207.71	217.89		218.40	0.002218	8.84	2094.30	884.55	0.51
Main Channel	0.074	10Yr	1739.00	207.71	213.93		215.38	0.007039	10.94	247.89	60.94	0.83
Main Channel	0.074	50Yr	3360.00	207.71	217.18		217.74	0.002284	8.51	1507.00	760.61	0.51
Main Channel	0.074	25Yr	2677.00	207.71	215.17	214.78	217.70	0.009142	14.30	381.90	231.91	0.97
Main Channel	0.08	100Yr	4618.00	207.70	217.96		218.45	0.001454	7.14	2020.64	883.77	0.40
Main Channel	0.08	10Yr	1739.00	207.70	214.93		215.56	0.001803	6.38	294.36	140.75	0.43
Main Channel	0.08	50Yr	3360.00	207.70	217.38		217.80	0.001212	6.26	1539.47	776.25	0.36
Main Channel	0.08	25Yr	2677.00	207.70	217.79	213.33	217.98	0.000559	4.38	1869.24	851.40	0.25
Main Channel	0.084	100Yr	4618.00	207.19	218.40	216.97	218.56	0.000497	5.09	2404.49	920.63	0.28
Main Channel	0.084	10Yr	1739.00	207.19	214.75	212.82	215.82	0.002419	8.30	209.45	100.94	0.58
Main Channel	0.084	50Yr	3360.00	207.19	217.71	216.50	217.89	0.000505	4.90	1804.70	825.53	0.28
Main Channel	0.084	25Yr	2677.00	207.19	217.92	216.15	218.01	0.000282	3.58	1982.10	860.88	0.20
Main Channel	0.09	Bridge										
Main Channel	0.094	100Yr	4618.00	206.50	218.38	217.08	218.62	0.000577	5.64	1963.04	656.68	0.30
Main Channel	0.094	10Yr	1739.00	206.50	215.28	212.11	216.02	0.001363	6.95	250.22	167.94	0.44
Main Channel	0.094	50Yr	3360.00	206.50	217.70	214.56	217.94	0.000545	5.25	1532.85	612.62	0.29
Main Channel	0.094	25Yr	2677.00	206.50	217.97	213.58	218.06	0.000273	3.78	1697.82	629.88	0.21
Main Channel	0.114	100Yr	4618.00	207.65	218.42		218.68	0.000462	4.99	1977.46	607.48	0.26
Main Channel	0.114	10Yr	1739.00	207.65	216.04		216.15	0.000254	2.89	742.37	416.02	0.19
Main Channel	0.114	50Yr	3360.00	207.65	217.81		217.99	0.000345	3.61	1616.97	564.80	0.23

HEC-RAS Plan: Pr 2A+3A(B) River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	Crt W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chfml (ft/s)	Flow Area (sqft)	Top Width (ft)	Froude # Ch
Main Channel	0.111	25Yr	2677.00	207.65	218.00	218.11	0.000196	2.77	1729.71	578.49	0.17
Main Channel	0.148	100Yr	4383.00	208.35	218.23	219.03	0.004666	9.69	1058.16	345.74	0.57
Main Channel	0.148	10Yr	1634.00	208.35	215.81	216.40	0.003826	7.13	438.52	198.01	0.49
Main Channel	0.148	50Yr	3135.00	208.35	217.66	218.25	0.003505	8.04	874.91	296.49	0.49
Main Channel	0.148	25Yr	2522.00	208.35	217.93	218.25	0.001887	6.02	958.48	319.89	0.36
Main Channel	0.224	100Yr	4383.00	210.13	218.56	222.54	0.009149	17.90	399.06	250.77	1.15
Main Channel	0.224	10Yr	1634.00	210.13	216.75	218.45	0.004724	10.70	179.23	40.38	0.79
Main Channel	0.224	50Yr	3135.00	210.13	217.98	221.66	0.008254	16.11	268.83	185.08	1.08
Main Channel	0.224	25Yr	2522.00	210.13	217.29	220.59	0.008190	14.96	202.99	62.08	1.06
Main Channel	0.305	100Yr	4383.00	211.80	224.44	225.93	0.002835	11.87	1089.54	394.17	0.62
Main Channel	0.305	10Yr	1634.00	211.80	219.02	221.48	0.007713	12.63	138.32	32.11	0.92
Main Channel	0.305	50Yr	3135.00	211.80	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Main Channel	0.305	25Yr	2522.00	211.80	221.04	223.97	0.006394	14.02	232.20	74.98	0.88
Main Channel	0.308	100Yr	4383.00	212.00	224.87	225.99	0.002197	10.70	1253.39	405.50	0.56
Main Channel	0.308	10Yr	1634.00	212.00	219.01	221.60	0.008344	12.99	134.70	32.06	0.96
Main Channel	0.308	50Yr	3135.00	212.00	224.96	225.50	0.001065	7.48	1289.99	409.99	0.39
Main Channel	0.308	25Yr	2522.00	212.00	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Main Channel	0.315	100Yr	4383.00	212.85	224.27	226.87	0.006155	12.94	338.67	38.91	0.72
Main Channel	0.315	10Yr	1634.00	212.85	221.70	222.34	0.002258	6.46	253.11	36.72	0.41
Main Channel	0.315	50Yr	3135.00	212.85	224.68	225.91	0.002755	8.89	352.50	39.26	0.48
Main Channel	0.315	25Yr	2522.00	212.85	223.74	224.70	0.002434	7.85	321.09	38.46	0.45
Main Channel	0.320		Bridge								
Main Channel	0.326	100Yr	4383.00	214.38	228.92	228.98	0.001119	7.51	1390.63	413.71	0.37
Main Channel	0.326	10Yr	1634.00	214.38	221.71	222.58	0.002825	7.50	217.99	36.75	0.52
Main Channel	0.325	50Yr	3135.00	214.38	225.30	226.64	0.002416	9.28	337.77	68.38	0.51
Main Channel	0.326	25Yr	2522.00	214.38	224.88	225.82	0.001803	7.79	323.60	60.07	0.44
Main Channel	0.336	100Yr	4383.00	216.00	228.97	229.07	0.000328	3.75	2905.67	468.56	0.20
Main Channel	0.336	10Yr	1634.00	216.00	221.88	222.80	0.006496	8.32	320.04	184.50	0.75
Main Channel	0.336	50Yr	3135.00	216.00	226.68	226.81	0.000523	4.05	1887.21	420.92	0.24
Main Channel	0.336	25Yr	2522.00	216.00	225.81	225.95	0.000578	3.96	1630.68	402.92	0.25
Main Channel	0.568	100Yr	4383.00	220.60	231.45	233.08	0.004106	12.90	907.96	271.09	0.70

HEC-RAS Plan: Pr 2A-3A(Br) River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	Q Total (cfs)	Min ChElev (ft)	W.S. Elev (ft)	Ch W.S. (ft)	E.G. Elev (ft)	F.G. Slope (ft/ft)	Vel/Crpt (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frroude # Ch1
Main Channel	0.588	10Yr	1634.00	220.60	228.13		229.33	0.003768	9.58	279.61	82.59	0.63
Main Channel	0.588	50Yr	3135.00	220.60	228.69	228.69	232.17	0.010112	16.51	329.22	93.03	1.05
Main Channel	0.588	25Yr	2522.00	220.60	228.46	228.46	230.95	0.007448	13.88	307.92	88.70	0.89
Main Channel	0.729	100Yr	4383.00	226.80	235.20		236.93	0.006558	11.81	462.09	117.79	0.79
Main Channel	0.729	10Yr	1634.00	226.80	232.02	232.01	233.59	0.009010	10.31	174.49	62.28	0.87
Main Channel	0.729	50Yr	3135.00	226.80	235.37		236.18	0.002984	8.10	482.41	120.19	0.53
Main Channel	0.729	25Yr	2522.00	226.80	234.19		235.19	0.004219	8.74	352.01	100.76	0.62
Main Channel	0.748	100Yr	4383.00	227.50	235.95		237.67	0.008576	11.44	440.05	95.30	0.89
Main Channel	0.748	10Yr	1634.00	227.50	233.68	233.04	234.46	0.007174	7.63	238.40	81.32	0.75
Main Channel	0.748	50Yr	3135.00	227.50	235.62		236.63	0.005459	8.74	409.27	93.26	0.70
Main Channel	0.748	25Yr	2522.00	227.50	234.73		235.72	0.006912	8.64	327.93	86.19	0.76
Main Channel	0.758	100Yr	4383.00	229.00	236.32		238.14	0.008208	11.94	442.47	99.17	0.89
Main Channel	0.758	10Yr	1634.00	229.00	234.02	233.39	234.82	0.006821	7.72	238.77	80.53	0.74
Main Channel	0.758	50Yr	3135.00	229.00	235.84	234.79	236.98	0.005704	9.38	397.54	97.19	0.73
Main Channel	0.758	25Yr	2522.00	229.00	235.03	234.26	236.10	0.006646	9.03	323.64	89.85	0.76
Main Channel	0.759		Bridge									
Main Channel	0.760	100Yr	4383.00	229.10	237.28		238.40	0.004995	9.18	531.92	103.62	0.65
Main Channel	0.760	10Yr	1634.00	229.10	234.20	233.41	234.90	0.005850	7.16	252.33	82.22	0.68
Main Channel	0.760	50Yr	3135.00	229.10	236.25	234.83	237.11	0.004795	7.97	435.35	98.91	0.62
Main Channel	0.760	25Yr	2522.00	229.10	235.39	234.31	236.22	0.005565	7.82	355.26	93.26	0.66
Main Channel	0.770	100Yr	4383.00	229.00	237.50		238.67	0.004906	10.16	562.98	121.70	0.70
Main Channel	0.770	10Yr	1634.00	229.00	234.47		235.23	0.006543	7.80	247.21	86.73	0.73
Main Channel	0.770	50Yr	3135.00	229.00	236.42		237.38	0.004893	9.02	436.73	110.30	0.68
Main Channel	0.770	25Yr	2522.00	229.00	235.61		236.53	0.005638	8.71	353.02	97.90	0.71
Main Channel	0.798	100Yr	4383.00	230.50	238.25	236.71	239.30	0.003510	9.28	631.86	134.84	0.61
Main Channel	0.798	10Yr	1634.00	230.50	235.36		235.97	0.003711	6.73	291.89	96.12	0.58
Main Channel	0.798	50Yr	3135.00	230.50	237.13		238.01	0.003663	8.34	484.37	128.37	0.60
Main Channel	0.798	25Yr	2522.00	230.50	236.43		237.22	0.003688	7.80	403.22	109.50	0.60
Main Channel	0.808	100Yr	4383.00	230.50	237.62	237.62	240.18	0.008735	14.33	369.55	74.91	0.96
Main Channel	0.808	10Yr	1634.00	230.50	236.24	234.80	236.36	0.006327	9.19	206.26	62.68	0.76
Main Channel	0.808	50Yr	3135.00	230.50	236.59	236.46	238.62	0.008354	12.58	295.57	69.64	0.92
Main Channel	0.808	25Yr	2522.00	230.50	236.05	235.85	237.75	0.007903	11.47	258.49	66.84	0.88



HEC-RAS Plan: Pr 2A+3A(Br) River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch Elevation (ft)	W.S. Elev (ft)	Chf. W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Flouide # Chl
Main Channel	1.598	100Yr	4071.00	238.40	248.06	244.97	249.11	0.001846	8.77	855.01	413.45	0.50
Main Channel	1.598	10Yr	1501.00	238.40	245.30	241.78	245.70	0.000979	5.11	293.91	81.59	0.34
Main Channel	1.598	50Yr	2885.00	238.40	247.73	243.62	248.33	0.001078	6.55	734.93	316.33	0.38
Main Channel	1.598	25Yr	2329.00	238.40	247.31	242.91	247.72	0.000796	5.46	628.13	192.40	0.32
Main Channel	1.608	100Yr	4071.00	238.40	248.02		249.39	0.003017	10.70	792.74	270.94	0.63
Main Channel	1.608	10Yr	1501.00	238.40	245.23		245.83	0.001845	6.55	305.23	69.57	0.46
Main Channel	1.608	50Yr	2885.00	238.40	247.69		248.44	0.001722	7.89	718.35	219.39	0.47
Main Channel	1.608	25Yr	2329.00	238.40	247.22		247.84	0.001482	7.05	617.00	204.41	0.43
Main Channel	1.850	100Yr	4071.00	242.10	251.65		252.84	0.002406	9.29	748.82	318.62	0.56
Main Channel	1.850	10Yr	1501.00	242.10	247.92		248.54	0.002457	6.45	266.64	67.89	0.51
Main Channel	1.850	50Yr	2885.00	242.10	250.15		251.17	0.002529	8.38	453.31	161.03	0.55
Main Channel	1.850	25Yr	2329.00	242.10	249.43		250.24	0.002322	7.48	375.12	76.85	0.52
Main Channel	1.860	100Yr	4071.00	242.30	252.17	249.36	252.98	0.001555	8.17	784.79	226.50	0.46
Main Channel	1.860	10Yr	1501.00	242.30	247.95	245.93	248.70	0.002369	6.95	215.86	67.71	0.52
Main Channel	1.860	50Yr	2885.00	242.30	249.94	247.92	251.46	0.003200	9.88	291.94	79.65	0.63
Main Channel	1.860	25Yr	2329.00	242.30	249.30	247.17	250.48	0.002800	8.72	287.23	75.77	0.58
Main Channel	1.891		Bridge									
Main Channel	1.858	100Yr	4071.00	242.50	254.71	249.56	254.92	0.000397	4.76	1604.55	384.80	0.24
Main Channel	1.858	10Yr	1501.00	242.50	248.07	246.13	248.84	0.002492	7.06	212.61	69.59	0.53
Main Channel	1.858	50Yr	2885.00	242.50	251.54	248.12	252.06	0.001104	6.49	674.76	201.56	0.38
Main Channel	1.858	25Yr	2329.00	242.50	249.43	247.37	250.63	0.002884	6.79	264.88	77.80	0.59
Main Channel	1.878	100Yr	4071.00	242.70	254.74		254.94	0.000394	4.55	1415.69	364.99	0.23
Main Channel	1.878	10Yr	1501.00	242.70	248.26		248.98	0.002642	6.89	227.16	49.67	0.53
Main Channel	1.878	50Yr	2885.00	242.70	251.36		252.24	0.001833	7.83	459.58	200.66	0.48
Main Channel	1.878	25Yr	2329.00	242.70	249.85		250.79	0.002495	7.99	309.46	53.87	0.54
Main Channel	1.932	100Yr	4071.00	243.87	254.91		255.07	0.000526	4.39	2083.84	701.31	0.25
Main Channel	1.932	10Yr	1501.00	243.87	249.09		250.05	0.004870	7.85	191.12	44.69	0.67
Main Channel	1.932	50Yr	2885.00	243.87	251.85	249.89	253.04	0.003524	8.84	386.18	270.27	0.60
Main Channel	1.932	25Yr	2329.00	243.87	250.59		251.83	0.004678	8.94	260.42	47.50	0.67
Main Channel	1.942	100Yr	4071.00	243.90	254.87		255.13	0.000642	5.42	1721.58	560.75	0.30
Main Channel	1.942	10Yr	1501.00	243.90	249.43		250.25	0.003149	7.34	212.68	47.30	0.58
Main Channel	1.942	50Yr	2885.00	243.90	251.95	249.85	253.22	0.002862	9.19	347.68	168.54	0.59

HEC-RAS Plan: Pr 2A+3A(Br) River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Chl W.S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Channel	1.942	25Yr	2329.00	243.90	250.87		252.03	0.003185	8.75	283.26	50.48	0.61
Main Channel	1.950	100Yr	4071.00	243.83	254.85		255.17	0.000770	5.70	1657.37	663.18	0.30
Main Channel	1.950	10Yr	1501.00	243.83	249.72		250.35	0.002271	6.40	240.35	46.02	0.47
Main Channel	1.950	50Yr	2885.00	243.83	252.26	249.39	253.32	0.002381	8.36	395.30	290.74	0.51
Main Channel	1.950	25Yr	2329.00	243.83	251.20		252.14	0.002502	7.83	310.70	48.96	0.51
Main Channel	1.960	100Yr	4071.00	243.97	254.90		255.21	0.000874	5.48	1873.07	636.51	0.32
Main Channel	1.960	10Yr	1501.00	243.97	249.84		250.48	0.002783	6.45	232.87	48.37	0.52
Main Channel	1.960	50Yr	2885.00	243.97	252.90		253.47	0.001695	6.48	789.87	429.82	0.42
Main Channel	1.960	25Yr	2329.00	243.97	251.56		252.29	0.002442	6.99	418.55	142.44	0.50
Main Channel	2.067	100Yr	4380.00	245.49	255.32		255.33	0.000052	1.37	8589.63	1393.20	0.08
Main Channel	2.067	10Yr	1605.00	245.49	250.78	248.13	250.79	0.000139	1.43	3009.72	1061.08	0.11
Main Channel	2.067	50Yr	3395.00	245.49	253.64		253.65	0.000073	1.41	6369.01	1263.36	0.09
Main Channel	2.067	25Yr	2409.00	245.49	252.50		252.50	0.000076	1.30	4959.92	1188.03	0.09
Main Channel	2.236	100Yr	4380.00	245.30	255.38		255.41	0.000217	3.05	5518.16	1298.28	0.17
Main Channel	2.236	10Yr	1605.00	245.30	251.61	251.61	252.07	0.002363	7.30	966.04	1111.31	0.52
Main Channel	2.236	50Yr	3395.00	245.30	253.72		253.79	0.000523	4.19	3428.89	1216.46	0.26
Main Channel	2.236	25Yr	2409.00	245.30	252.54		252.70	0.001097	5.47	2025.00	1157.69	0.36
Main Channel	2.244	100Yr	4380.00	245.30	255.40		255.42	0.000215	3.04	5536.65	1298.96	0.17
Main Channel	2.244	10Yr	1605.00	245.30	252.10		252.26	0.000962	4.91	1624.32	1136.00	0.34
Main Channel	2.244	50Yr	3395.00	245.30	253.76		253.82	0.000504	4.12	3472.56	1218.24	0.25
Main Channel	2.244	25Yr	2409.00	245.30	252.64		252.77	0.000956	5.15	2137.42	1162.51	0.34
Main Channel	2.245	100Yr	4380.00	245.30	255.40		255.42	0.000215	3.04	5535.88	1298.97	0.17
Main Channel	2.245	10Yr	1605.00	245.30	252.10		252.26	0.000962	4.91	1524.46	1136.05	0.34
Main Channel	2.245	50Yr	3395.00	245.30	253.76		253.82	0.000504	4.13	3472.10	1218.26	0.25
Main Channel	2.245	25Yr	2409.00	245.30	252.64		252.77	0.000956	5.15	2137.47	1162.56	0.34
Main Channel	2.246	100Yr	4380.00	244.90	255.40		255.43	0.000172	2.75	5829.31	1343.21	0.15
Main Channel	2.246	10Yr	1605.00	244.90	252.17		252.28	0.000532	3.74	1728.54	1194.16	0.25
Main Channel	2.246	50Yr	3395.00	244.90	253.76		253.82	0.000374	3.60	3692.21	1267.79	0.22
Main Channel	2.246	25Yr	2409.00	244.90	252.66		252.78	0.000616	4.21	2328.03	1217.11	0.27
Main Channel	2.2465		Inl Struct									
Main Channel	2.247	100Yr	4380.00	245.20	255.41	252.63	255.44	0.000210	2.98	5441.39	1329.91	0.17

HEC-RAS Plan: Pr 2A+3A(Br) River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch E1 (ft)	W/S Elev (ft)	CR W/S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frroude # Ch
Main Channel	2247	10Yr	1605.00	245.20	252.17	250.04	252.96	0.000822	4.52	1381.74	1180.68	0.31
Main Channel	2247	50Yr	3395.00	245.20	253.77	251.47	253.85	0.000497	4.06	3321.96	1254.24	0.25
Main Channel	2247	25Yr	2409.00	245.20	252.67	252.02	252.85	0.000901	4.96	1973.95	1203.61	0.33
Main Channel	2262	100Yr	4380.00	245.00	255.45		255.45	0.000096	2.02	7666.34	1503.22	0.11
Main Channel	2262	10Yr	1605.00	245.00	252.39		252.40	0.000164	2.06	3311.57	1360.42	0.14
Main Channel	2262	50Yr	3395.00	245.00	253.87		253.88	0.000171	2.39	5364.25	1422.38	0.15
Main Channel	2262	25Yr	2409.00	245.00	252.88	251.00	252.90	0.000213	2.46	3984.22	1381.03	0.16
Main Channel	2432	100Yr	4380.00	247.60	255.23		255.90	0.002715	9.61	1507.54	631.98	0.63
Main Channel	2432	10Yr	1605.00	247.60	252.27		253.05	0.004462	8.70	431.95	262.57	0.74
Main Channel	2432	50Yr	3395.00	247.60	253.63		254.60	0.004781	10.82	839.23	343.74	0.80
Main Channel	2432	25Yr	2409.00	247.60	252.77	252.77	253.83	0.005649	10.54	568.92	266.48	0.85
Main Channel	2442	100Yr	4380.00	246.89	255.56	252.20	256.04	0.001076	5.57	873.28	450.59	0.38
Main Channel	2442	10Yr	1605.00	246.89	253.14	250.25	253.30	0.000557	3.20	501.41	111.17	0.26
Main Channel	2442	50Yr	3395.00	246.89	254.44	251.59	254.87	0.001149	5.23	649.69	115.78	0.39
Main Channel	2442	25Yr	2409.00	246.89	253.88	250.89	254.15	0.000765	4.14	581.59	113.78	0.32
Main Channel	2444		Bridge									
Main Channel	2446	100Yr	4380.00	247.05	255.91	252.06	256.29	0.000810	5.02	1099.14	661.49	0.34
Main Channel	2446	10Yr	1605.00	247.05	253.18	250.11	253.33	0.000485	3.08	521.53	114.89	0.25
Main Channel	2446	50Yr	3395.00	247.05	254.93	251.45	255.29	0.000767	4.76	712.51	120.54	0.33
Main Channel	2446	25Yr	2409.00	247.05	254.22	250.78	254.44	0.000568	3.80	694.73	118.24	0.28
Main Channel	2456	100Yr	4380.00	246.90	256.96		256.35	0.001445	7.63	2160.68	766.41	0.46
Main Channel	2456	10Yr	1605.00	246.90	253.16		253.39	0.001198	5.30	856.67	338.87	0.40
Main Channel	2456	50Yr	3395.00	246.90	255.00		255.34	0.001397	6.92	1537.82	530.03	0.45
Main Channel	2456	25Yr	2409.00	246.90	254.26		254.48	0.001058	5.61	1249.02	375.30	0.38
Main Channel	2920	100Yr	4380.00	249.90	258.45		258.52	0.000647	4.63	3968.47	1426.43	0.30
Main Channel	2920	10Yr	1605.00	249.90	256.20		256.37	0.001350	5.31	1272.52	888.06	0.40
Main Channel	2920	50Yr	3395.00	249.90	257.72		257.81	0.000834	4.93	2967.36	1326.30	0.33
Main Channel	2920	25Yr	2409.00	249.90	256.90		257.03	0.001128	5.27	1984.92	1098.42	0.38
Main Channel	3140	100Yr	3038.00	252.00	259.02	255.99	259.04	0.000281	2.71	3941.12	1162.37	0.19
Main Channel	3140	10Yr	1263.00	252.00	257.13	255.46	257.14	0.000334	2.31	1974.61	916.40	0.20
Main Channel	3140	50Yr	2430.00	252.00	258.40	255.85	258.42	0.000307	2.64	3251.82	1082.53	0.20
Main Channel	3140	25Yr	1841.00	252.00	257.74	255.67	257.76	0.000341	2.56	2563.32	996.42	0.20

HEC-RAS Plan: Pr-2A+3A(Br) River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta.	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Chf W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Flonde # CFI
Main Channel	3.678	100Yr	3038.00	257.10	262.01	262.73	264.47	0.030016	17.20	507.26	392.53	1.56
Main Channel	3.678	10Yr	1263.00	257.10	261.87	261.87	262.42	0.006717	7.93	452.64	386.84	0.73
Main Channel	3.678	50Yr	2430.00	257.10	262.22	262.50	263.31	0.013419	11.92	590.02	401.00	1.05
Main Channel	3.678	25Yr	1841.00	257.10	262.21	262.21	262.84	0.007758	9.06	588.26	400.83	0.80
Main Channel	3.660	100Yr	3038.00	263.10	271.33	271.64	272.92	0.004098	12.39	480.87	228.94	0.78
Main Channel	3.660	10Yr	1263.00	263.10	267.07	268.08	270.33	0.018422	15.48	104.91	44.08	1.46
Main Channel	3.660	50Yr	2430.00	263.10	270.03	270.48	272.26	0.006434	13.74	277.91	83.37	0.95
Main Channel	3.660	25Yr	1841.00	263.10	268.31	269.00	271.36	0.012305	15.47	165.85	54.37	1.26
Main Channel	3.670	100Yr	3038.00	266.18	272.40	272.40	273.33	0.004603	9.38	623.16	368.78	0.68
Main Channel	3.670	10Yr	1263.00	266.18	269.87	269.87	271.54	0.011921	10.38	121.67	62.42	1.00
Main Channel	3.670	50Yr	2430.00	266.18	271.95	271.95	272.92	0.004825	9.11	478.48	328.92	0.69
Main Channel	3.670	25Yr	1841.00	266.18	271.30	271.30	272.36	0.005503	8.94	311.78	240.96	0.72
Main Channel	3.676		Bridge									
Main Channel	3.882	100Yr	3038.00	264.30	272.78	272.00	273.36	0.004210	7.85	728.63	390.64	0.57
Main Channel	3.882	10Yr	1263.00	264.30	272.14	270.58	272.91	0.001318	4.07	530.52	287.81	0.31
Main Channel	3.882	50Yr	2430.00	264.30	272.45	271.67	272.94	0.003695	7.07	617.29	336.99	0.53
Main Channel	3.882	25Yr	1841.00	264.30	272.17	271.22	272.53	0.002716	5.87	539.63	293.39	0.45
Main Channel	3.892	100Yr	3038.00	265.10	273.13	271.66	273.55	0.003020	7.94	1177.35	482.14	0.50
Main Channel	3.892	10Yr	1263.00	265.10	272.24	272.37	272.97	0.000992	4.19	825.62	329.52	0.28
Main Channel	3.892	50Yr	2430.00	265.10	272.76	271.16	273.11	0.002537	7.04	1012.39	402.60	0.46
Main Channel	3.892	25Yr	1841.00	265.10	272.40	270.52	272.65	0.001855	5.82	890.57	347.28	0.39
Main Channel	3.903	100Yr	3038.00	265.70	273.65	273.65	276.39	0.011168	15.11	326.31	85.45	0.97
Main Channel	3.903	10Yr	1263.00	265.70	271.71	271.71	272.77	0.005966	9.07	203.36	54.73	0.67
Main Channel	3.903	50Yr	2430.00	265.70	272.71	272.71	275.23	0.011866	14.26	261.28	61.60	0.98
Main Channel	3.903	25Yr	1841.00	265.70	271.81	271.81	273.96	0.011883	12.95	208.70	55.37	0.95
Main Channel	3.948	100Yr	3038.00	267.60	277.27	277.27	277.84	0.002537	8.32	1149.89	478.40	0.48
Main Channel	3.948	10Yr	1263.00	267.60	273.30	273.30	274.60	0.007390	9.86	178.16	49.06	0.75
Main Channel	3.948	50Yr	2430.00	267.60	276.09	275.71	277.21	0.004549	10.19	632.01	381.51	0.63
Main Channel	3.948	25Yr	1841.00	267.60	274.85	274.85	276.18	0.005872	10.39	324.10	145.90	0.69
Main Channel	3.985	100Yr	3038.00	269.32	277.90	275.74	278.25	0.002192	5.88	1085.67	464.21	0.38
Main Channel	3.985	10Yr	1263.00	269.32	275.11	273.52	275.49	0.003395	5.36	346.32	173.06	0.44

HEC-RAS Plan: Pr-2A+3A(Br) River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Ch W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Flowline #	Chl
Main Channel	4.985	50Yr	2430.00	269.32	277.47	275.25	277.75	0.001840	5.18	908.79	354.43		0.34
Main Channel	4.985	25Yr	1841.00	269.32	276.55	274.61	276.81	0.001991	4.90	650.18	247.81		0.35
Main Channel	4.084	100Yr	3038.00	277.00	284.74	284.74	286.72	0.010779	12.72	387.18	115.34		0.90
Main Channel	4.084	10Yr	1263.00	277.00	282.37	282.37	283.80	0.012846	10.05	164.61	72.74		0.91
Main Channel	4.084	50Yr	2430.00	277.00	284.06	284.06	285.89	0.011120	11.95	313.27	103.16		0.90
Main Channel	4.084	25Yr	1841.00	277.00	283.32	283.32	284.94	0.011474	11.02	241.44	89.76		0.89
Main Channel	4.094	100Yr	3038.00	278.40	286.98	282.71	287.34	0.001094	4.82	630.06	221.33		0.30
Main Channel	4.094	10Yr	1263.00	278.40	284.14	281.16	284.29	0.000858	3.16	400.25	93.23		0.25
Main Channel	4.094	50Yr	2430.00	278.40	286.18	282.23	286.47	0.001002	4.30	565.75	150.49		0.29
Main Channel	4.094	25Yr	1841.00	278.40	285.26	281.72	285.47	0.000924	3.75	490.69	105.25		0.27
Main Channel	4.100		Bridge										
Main Channel	4.106	100Yr	3038.00	278.30	287.04	282.83	287.38	0.000575	4.72	643.12	235.73		0.30
Main Channel	4.106	10Yr	1263.00	278.30	284.18	281.06	284.33	0.000438	3.07	411.93	93.57		0.24
Main Channel	4.106	50Yr	2430.00	278.30	286.24	282.13	286.51	0.000524	4.20	578.29	164.31		0.28
Main Channel	4.106	25Yr	1841.00	278.30	285.30	281.62	285.51	0.000479	3.66	502.78	111.06		0.26
Main Channel	4.116	100Yr	3038.00	277.10	285.71	287.00	290.59	0.011288	20.37	281.51	71.17		1.28
Main Channel	4.116	10Yr	1263.00	277.10	282.95	283.91	286.27	0.011573	15.50	120.14	45.54		1.20
Main Channel	4.116	50Yr	2430.00	277.10	284.80	286.30	289.51	0.012190	19.51	220.26	62.73		1.30
Main Channel	4.116	25Yr	1841.00	277.10	283.96	285.23	288.05	0.011924	17.72	170.85	54.98		1.26
Main Channel	4.368	100Yr	3038.00	297.30	305.26	305.26	308.02	0.014878	15.48	298.67	66.27		0.98
Main Channel	4.368	10Yr	1263.00	297.30	302.48	302.48	304.25	0.015497	11.69	144.59	45.62		0.93
Main Channel	4.368	50Yr	2430.00	297.30	304.61	304.61	306.90	0.019537	13.91	257.81	60.34		0.93
Main Channel	4.368	25Yr	1841.00	297.30	303.63	303.63	305.69	0.014321	12.94	201.56	53.54		0.93
Main Channel	4.378	100Yr	3038.00	298.00	304.79	306.47	309.65	0.026848	17.80	183.93	57.09		1.28
Main Channel	4.378	10Yr	1263.00	298.00	301.08	302.67	306.40	0.075141	18.51	68.25	25.19		1.98
Main Channel	4.378	50Yr	2430.00	298.00	303.55	305.52	308.68	0.037538	18.17	133.78	28.84		1.46
Main Channel	4.378	25Yr	1841.00	298.00	302.29	303.92	307.61	0.051555	18.50	99.49	26.52		1.68
Main Channel	4.3785		Bridge										
Main Channel	4.379	100Yr	3038.00	300.70	309.93	307.93	310.86	0.001984	8.96	588.40	186.40		0.54
Main Channel	4.379	10Yr	1263.00	300.70	307.41	305.43	307.88	0.001399	6.01	315.92	92.89		0.43
Main Channel	4.379	50Yr	2430.00	300.70	309.23	307.20	310.01	0.001801	8.09	507.20	122.18		0.50

HEC-RAS Plan: Pr-2A+3A(Br) River: Coppermine Brook Reach: Main Channel (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Grf W.S (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Crm (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froutde # Ch
Main Channel	4.379	25Yr	1841.00	300.70	308.43	306.40	309.05	0.001578	7.06	416.96	105.50	0.46
Main Channel	4.389	100Yr	3038.00	300.90	309.80	308.36	311.12	0.004539	10.31	422.82	87.17	0.62
Main Channel	4.389	10Yr	1263.00	300.90	307.41	305.47	308.03	0.002998	6.75	240.70	64.61	0.48
Main Channel	4.389	50Yr	2430.00	300.90	309.15	307.55	310.23	0.004058	9.24	367.42	80.97	0.58
Main Channel	4.389	25Yr	1841.00	300.90	308.38	306.60	309.23	0.003546	8.08	307.91	73.74	0.53
Main Channel	4.644	100Yr	3038.00	317.60	325.62	326.31	327.76	0.010008	13.94	490.95	327.88	0.90
Main Channel	4.644	10Yr	1263.00	317.60	323.04	323.04	325.10	0.012817	11.90	121.93	33.14	0.95
Main Channel	4.644	50Yr	2430.00	317.60	325.21	325.99	327.43	0.010007	13.42	355.75	324.75	0.89
Main Channel	4.644	25Yr	1841.00	317.60	324.59	325.52	326.79	0.010013	12.63	213.42	123.29	0.88

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**APPENDIX L**  
**FREDERICK STREET ALTERNATIVES HEC-RAS MODEL OUTPUT**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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HEC-RAS Plan: Pr-All 4A Locations: User Defined

River	Reach	River Sta	Profile	Q Total (cfs)	Min ChElev (ft)	W.S. Elev (ft)	Gr.W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Velocity (ft/s)	Flow Area (sq.ft)	Top Width (ft)	Profile #
Coppermine Brook	Main Channel	0.336	10Yr	1634.00	216.00	221.85	218.31	222.79	0.006701	8.41	314.87	182.68	0.76
Coppermine Brook	Main Channel	0.336	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000578	3.96	1530.68	402.92	0.25
Coppermine Brook	Main Channel	0.336	50Yr	3135.00	216.00	226.68	223.00	226.81	0.000523	4.05	1887.21	420.92	0.24
Coppermine Brook	Main Channel	0.336	100Yr	4383.00	216.00	228.97	223.82	229.07	0.000328	3.75	2905.67	468.56	0.20
Coppermine Brook	Main Channel	0.326	10Yr	1634.00	214.38	221.69	219.37	222.57	0.002851	7.52	217.38	36.73	0.52
Coppermine Brook	Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Coppermine Brook	Main Channel	0.326	50Yr	3135.00	214.38	225.30	221.67	226.64	0.002416	9.28	337.77	68.38	0.51
Coppermine Brook	Main Channel	0.326	100Yr	4383.00	214.38	228.32	223.28	228.98	0.001119	7.51	1390.63	413.71	0.37
Coppermine Brook	Main Channel	0.320	Bridge										
Coppermine Brook	Main Channel	0.316	10Yr	1634.00	212.85	221.68	218.31	222.33	0.002276	6.47	252.51	36.70	0.41
Coppermine Brook	Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Coppermine Brook	Main Channel	0.316	50Yr	3135.00	212.85	224.68	220.60	225.91	0.002766	8.89	352.50	39.26	0.48
Coppermine Brook	Main Channel	0.316	100Yr	4383.00	212.85	224.27	222.23	226.87	0.006155	12.94	338.67	38.91	0.72
Coppermine Brook	Main Channel	0.308	10Yr	1634.00	212.00	219.06	219.00	221.61	0.008100	12.87	136.27	32.31	0.95
Coppermine Brook	Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Coppermine Brook	Main Channel	0.308	50Yr	3135.00	212.00	224.96	223.36	225.50	0.001065	7.49	1289.99	409.99	0.39
Coppermine Brook	Main Channel	0.308	100Yr	4383.00	212.00	224.87		225.99	0.002197	10.70	1253.39	405.50	0.56
Coppermine Brook	Main Channel	0.306	10Yr	1634.00	211.80	219.09	218.84	221.48	0.007431	12.49	140.36	32.43	0.91
Coppermine Brook	Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Coppermine Brook	Main Channel	0.306	50Yr	3135.00	211.80	221.91	221.91	225.20	0.006456	15.12	307.69	97.77	0.90
Coppermine Brook	Main Channel	0.306	100Yr	4383.00	211.80	224.44	224.44	225.93	0.002635	11.87	1089.54	394.17	0.62
Coppermine Brook	Main Channel	0.224	10Yr	1634.00	210.13	216.48		218.38	0.005621	11.29	168.20	39.49	0.86
Coppermine Brook	Main Channel	0.224	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Coppermine Brook	Main Channel	0.224	50Yr	3135.00	210.13	217.98	219.23	221.66	0.008254	16.11	268.83	185.08	1.08
Coppermine Brook	Main Channel	0.224	100Yr	4383.00	210.13	218.56	219.72	222.54	0.009149	17.90	399.06	260.77	1.15
Coppermine Brook	Main Channel	0.189	10Yr	1634.00	209.35	216.95		217.34	0.002019	5.37	406.22	97.07	0.36
Coppermine Brook	Main Channel	0.189	25Yr	2522.00	209.35	218.84	215.12	219.09	0.001236	4.94	887.70	392.14	0.29
Coppermine Brook	Main Channel	0.189	50Yr	3135.00	209.35	219.93	215.81	220.07	0.000698	4.01	1331.89	421.00	0.22
Coppermine Brook	Main Channel	0.189	100Yr	4383.00	209.35	219.67	218.24	220.01	0.001713	6.17	1221.61	414.02	0.35
Coppermine Brook	Main Channel	0.146	10Yr	1634.00	208.35	214.17	214.17	216.22	0.015648	11.92	163.42	44.90	0.94
Coppermine Brook	Main Channel	0.146	25Yr	2522.00	208.35	215.66	215.66	218.22	0.014330	13.58	235.12	51.50	0.94
Coppermine Brook	Main Channel	0.148	50Yr	3135.00	208.35	216.54	216.54	219.40	0.013773	14.60	282.40	57.63	0.94
Coppermine Brook	Main Channel	0.148	100Yr	4383.00	208.35	219.18	219.18	219.57	0.002337	7.33	1535.59	462.07	0.41
Coppermine Brook	Main Channel	0.137	10Yr	1634.00	208.00	214.95	211.46	215.07	0.000497	2.74	597.02	118.95	0.22

HEC-RAS Plan: P--Alt 4A Locations: User Defined (Continued)

River	Reach	River Sta	Promis	Q Total (cfs)	Min Sp.EI (ft)	W.S. Elev (ft)	Grd W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/m)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frroude #	Chl
Coppermine Brook	Main Channel	0.131	25Yr	2522.00	208.00	216.95	212.13	217.09	0.000412	2.99	842.77	126.93	0.20	0.20
Coppermine Brook	Main Channel	0.131	50Yr	3135.00	208.00	217.75	212.54	217.88	0.000384	3.01	1405.21	352.72	0.20	0.20
Coppermine Brook	Main Channel	0.131	100Yr	4883.00	208.00	218.44	213.31	218.63	0.000494	3.73	1720.46	506.16	0.23	0.23
Coppermine Brook	Main Channel	0.114	10Yr	1739.00	207.65	214.91	210.87	215.03	0.000328	2.72	640.22	119.67	0.21	0.21
Coppermine Brook	Main Channel	0.114	25Yr	2677.00	207.65	216.92	211.62	217.05	0.000274	2.99	969.20	211.85	0.20	0.20
Coppermine Brook	Main Channel	0.114	50Yr	3360.00	207.65	217.70	212.11	217.84	0.000284	3.13	1659.40	557.49	0.20	0.20
Coppermine Brook	Main Channel	0.114	100Yr	4618.00	207.65	218.38	212.92	218.58	0.000347	3.80	2054.30	604.65	0.23	0.23
Coppermine Brook	Main Channel	0.094	10Yr	1739.00	207.38	213.86	213.86	214.87	0.002506	8.18	228.43	43.63	0.58	0.58
Coppermine Brook	Main Channel	0.094	25Yr	2677.00	207.38	215.43	215.43	216.86	0.002687	9.55	299.76	47.29	0.62	0.62
Coppermine Brook	Main Channel	0.094	50Yr	3360.00	207.38	217.35	217.35	217.77	0.000870	6.49	1137.27	521.59	0.37	0.37
Coppermine Brook	Main Channel	0.094	100Yr	4618.00	207.38	218.14	218.14	218.51	0.000817	6.63	1610.46	641.31	0.36	0.36
Coppermine Brook	Main Channel	0.084	10Yr	1739.00	207.15	213.41	213.41	214.71	0.003836	9.25	201.10	45.55	0.69	0.69
Coppermine Brook	Main Channel	0.084	25Yr	2677.00	207.15	214.97	214.97	216.70	0.003770	10.81	277.53	52.54	0.71	0.71
Coppermine Brook	Main Channel	0.084	50Yr	3360.00	207.15	216.40	216.40	217.63	0.002418	9.79	630.62	500.07	0.59	0.59
Coppermine Brook	Main Channel	0.084	100Yr	4618.00	207.15	218.12	218.12	218.47	0.000866	6.62	1840.31	876.04	0.36	0.36
Coppermine Brook	Main Channel	0.08	10Yr	1739.00	207.07	213.45	213.45	214.57	0.004434	8.50	204.56	46.95	0.72	0.72
Coppermine Brook	Main Channel	0.08	25Yr	2677.00	207.07	215.18	215.18	216.50	0.003858	9.22	290.48	52.43	0.69	0.69
Coppermine Brook	Main Channel	0.08	50Yr	3360.00	207.07	216.32	214.60	217.57	0.003241	9.14	574.34	561.30	0.64	0.64
Coppermine Brook	Main Channel	0.08	100Yr	4618.00	207.07	217.18	217.18	218.36	0.003037	9.57	1126.50	738.72	0.63	0.63
Coppermine Brook	Main Channel	0.074	10Yr	1739.00	207.21	213.26	213.26	214.41	0.006487	8.62	201.84	48.06	0.74	0.74
Coppermine Brook	Main Channel	0.074	25Yr	2677.00	207.21	215.08	215.08	216.34	0.005272	9.02	296.91	56.15	0.69	0.69
Coppermine Brook	Main Channel	0.074	50Yr	3360.00	207.21	216.31	214.50	217.42	0.004026	8.86	603.86	584.17	0.62	0.62
Coppermine Brook	Main Channel	0.074	100Yr	4618.00	207.21	217.29	217.29	218.17	0.003161	8.47	1264.69	763.52	0.56	0.56
Coppermine Brook	Main Channel	0.061	10Yr	1739.00	207.13	212.91	212.91	213.94	0.005902	8.15	221.30	51.12	0.64	0.64
Coppermine Brook	Main Channel	0.061	25Yr	2677.00	207.13	214.75	214.75	215.99	0.004782	9.04	321.43	58.26	0.61	0.61
Coppermine Brook	Main Channel	0.061	50Yr	3360.00	207.13	216.08	216.08	217.14	0.003519	8.73	721.62	549.33	0.54	0.54
Coppermine Brook	Main Channel	0.061	100Yr	4618.00	207.13	217.12	217.12	217.95	0.002884	8.58	1387.89	734.71	0.50	0.50
Coppermine Brook	Main Channel	0.051	10Yr	1739.00	206.98	212.91	212.91	213.62	0.003044	6.80	266.93	58.31	0.53	0.53
Coppermine Brook	Main Channel	0.051	25Yr	2677.00	206.98	214.84	214.84	215.69	0.002389	7.48	403.49	169.58	0.50	0.50
Coppermine Brook	Main Channel	0.051	50Yr	3360.00	206.98	216.23	216.23	216.89	0.001638	6.99	986.25	629.72	0.43	0.43
Coppermine Brook	Main Channel	0.051	100Yr	4618.00	206.98	217.14	217.14	217.77	0.001598	7.40	1631.38	789.30	0.43	0.43
Coppermine Brook	Main Channel	0.00	10Yr	1739.00	205.78	212.20	210.14	212.89	0.002467	6.80	312.65	100.21	0.50	0.50
Coppermine Brook	Main Channel	0.00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42	0.42
Coppermine Brook	Main Channel	0.00	50Yr	3360.00	205.78	216.00	212.38	216.48	0.001104	6.36	1133.80	608.08	0.36	0.36
Coppermine Brook	Main Channel	0.00	100Yr	4618.00	205.78	216.40	213.96	217.29	0.001899	8.56	1454.60	870.24	0.48	0.48

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**REMOVAL OF FREDERICK STREET CROSSING  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: P1-4B(6X8) Locations: User Defined Profile: 25Yr

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Floar Area (sq ft)	Top Width (ft)	Frrouse # Chl
Coppermine Brook	Main Channel	0.396	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000578	3.96	1530.65	402.92	0.25
Coppermine Brook	Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Coppermine Brook	Main Channel	0.320	25Yr	Bridge									
Coppermine Brook	Main Channel	0.316	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Coppermine Brook	Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.88
Coppermine Brook	Main Channel	0.294	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.93
Coppermine Brook	Main Channel	0.199	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Coppermine Brook	Main Channel	0.148	25Yr	2522.00	209.35	218.84	215.12	219.09	0.01236	4.94	887.70	392.14	0.29
Coppermine Brook	Main Channel	0.131	25Yr	2522.00	208.35	215.66	215.66	218.22	0.014330	13.58	235.12	51.50	0.94
Coppermine Brook	Main Channel	0.115	25Yr	2522.00	208.00	216.34	212.30	216.55	0.000711	3.90	765.06	124.46	0.27
Coppermine Brook	Bypass Channel	2.0	25Yr	2522.00	207.85	216.22	216.47	216.47	0.000597	4.19	855.34	452.43	0.29
Coppermine Brook	Bypass Channel	1.5	25Yr	911.09	207.85	216.38	210.86	216.41	0.000071	1.47	927.02	468.08	0.10
Coppermine Brook	Bypass Channel	1.0	25Yr	Culvert									
Coppermine Brook	Bypass Channel	1.0	25Yr	911.09	205.78	215.23	215.28	215.28	0.000123	2.01	876.40	291.82	0.12
Coppermine Brook	Frederick Street	0.114	25Yr	1610.91	207.86	216.27	216.41	216.41	0.000352	3.03	722.85	456.95	0.22
Coppermine Brook	Frederick Street	0.094	25Yr	1610.91	205.41	215.86	211.16	216.31	0.000887	5.49	293.66	34.20	0.32
Coppermine Brook	Frederick Street	0.09	25Yr	Bridge									
Coppermine Brook	Frederick Street	0.094	25Yr	1610.91	207.19	215.10	212.73	215.95	0.001898	7.43	216.75	39.60	0.51
Coppermine Brook	Frederick Street	0.05	25Yr	1610.91	207.70	215.22	215.76	215.76	0.001712	5.90	272.85	52.56	0.46
Coppermine Brook	Frederick Street	0.074	25Yr	1610.91	207.71	215.16	215.70	215.70	0.002503	5.89	273.29	56.48	0.47
Coppermine Brook	Frederick Street	0.061	25Yr	1610.91	208.13	215.00	215.53	215.53	0.002280	5.93	299.53	59.24	0.42
Coppermine Brook	Frederick Street	0.051	25Yr	1610.91	207.98	215.03	215.39	215.39	0.001157	4.91	398.07	224.38	0.34
Coppermine Brook	Frederick Street	0.02	25Yr	1610.91	205.78	214.97	215.16	215.16	0.000443	3.74	803.97	275.90	0.22
Coppermine Brook	At Confluence	0.01	25Yr	2677.00	205.78	214.50	215.11	215.11	0.001568	6.75	684.38	230.66	0.42
Coppermine Brook	At Confluence	0.00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42

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**CONSTRUCTION OF A HIGH OVERFLOW CULVERT BENEATH EXISTING  
PARKING LOT  
HEC-RAS MODEL OUTPUT**

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**REPLACEMENT OF FREDERICK STREET BRIDGE WITH LARGER  
STRUCTURE  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: Pr-4C Locations: User Defined Profile: 25Yr

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Cut W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Flow Area (sq ft)	Top Width (ft)	Frroude # Chl
Coppermine Brook	Main Channel	0.336	25Yr	2522.00	216.00	225.91	222.55	225.96	0.000578	3.96	1530.68	402.92	0.25
Coppermine Brook	Main Channel	0.326	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001903	7.79	323.60	60.07	0.44
Coppermine Brook	Main Channel	0.316	25Yr	Bridge									
Coppermine Brook	Main Channel	0.308	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Coppermine Brook	Main Channel	0.305	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Coppermine Brook	Main Channel	0.294	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006394	14.02	232.20	74.98	0.88
Coppermine Brook	Main Channel	0.289	25Yr	2522.00	210.13	217.29	218.92	220.59	0.008190	14.96	202.99	62.08	1.06
Coppermine Brook	Main Channel	0.148	25Yr	2522.00	209.35	218.84	215.12	219.09	0.001236	4.94	887.58	392.13	0.29
Coppermine Brook	Main Channel	0.131	25Yr	2522.00	208.35	215.66	215.66	218.22	0.014314	13.57	235.22	51.51	0.94
Coppermine Brook	Main Channel	0.114	25Yr	2522.00	208.00	215.59	212.13	215.81	0.000816	3.74	673.61	121.49	0.28
Coppermine Brook	Main Channel	0.094	25Yr	2677.00	207.85	215.28		215.68	0.001161	5.27	621.15	149.94	0.39
Coppermine Brook	Main Channel	0.09	25Yr	2677.00	207.38	215.24	210.92	215.58	0.000590	4.71	567.95	74.14	0.30
Coppermine Brook	Main Channel	0.084	25Yr	Bridge									
Coppermine Brook	Main Channel	0.084	25Yr	2677.00	207.15	215.02	210.92	215.39	0.000653	4.84	552.53	94.88	0.31
Coppermine Brook	Main Channel	0.074	25Yr	2677.00	207.07	215.04		215.34	0.000717	4.44	602.29	92.76	0.31
Coppermine Brook	Main Channel	0.074	25Yr	2677.00	207.21	215.01		215.32	0.001053	4.41	607.35	103.36	0.32
Coppermine Brook	Main Channel	0.061	25Yr	2677.00	207.13	214.58		215.18	0.002284	6.26	451.17	77.61	0.42
Coppermine Brook	Main Channel	0.051	25Yr	2677.00	206.98	214.55		215.05	0.001490	5.73	491.30	82.13	0.39
Coppermine Brook	Main Channel	0.00	25Yr	2677.00	205.78	214.50	209.69	214.74	0.000564	4.13	911.91	241.23	0.25

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**CONSTRUCTION OF COMPOUND CHANNEL BEHIND BLACK BEAR AUTO  
HEC-RAS MODEL OUTPUT**

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HEC-RAS Plan: Pr-All 4D Locations: User Defined Profile: 25Yr

River	Reach	River Sta	Profile	Q Total (cfs)	Min Chl El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Profile # Chl
Coppermine Brook	Main Channel	0.336	25Yr	2522.00	216.00	225.81	222.55	225.95	0.000578	3.96	1530.68	402.92	0.25
Coppermine Brook	Main Channel	0.328	25Yr	2522.00	214.38	224.88	220.79	225.82	0.001803	7.79	323.60	60.07	0.44
Coppermine Brook	Main Channel	0.320	25Yr	2522.00	212.85	223.74	219.72	224.70	0.002434	7.85	321.09	38.46	0.45
Coppermine Brook	Main Channel	0.308	25Yr	2522.00	212.00	221.46	221.46	224.06	0.005451	13.33	267.04	98.08	0.83
Coppermine Brook	Main Channel	0.306	25Yr	2522.00	211.80	221.04	221.29	223.97	0.006384	14.02	232.20	74.98	0.88
Coppermine Brook	Main Channel	0.224	25Yr	2522.00	210.13	218.03	216.37	218.83	0.002429	8.78	504.47	232.28	0.59
Coppermine Brook	Main Channel	0.189	25Yr	2522.00	209.35	218.31	218.31	218.41	0.000645	3.43	1295.78	378.28	0.21
Coppermine Brook	Main Channel	0.145	25Yr	2522.00	208.35	216.94	215.12	218.01	0.005495	9.48	395.65	77.58	0.60
Coppermine Brook	Main Channel	0.131	25Yr	2522.00	208.00	217.52	212.49	217.64	0.000339	2.85	1234.24	337.86	0.19
Coppermine Brook	Main Channel	0.114	25Yr	2677.00	207.85	217.44	212.67	217.60	0.000319	3.44	1469.15	549.31	0.22
Coppermine Brook	Main Channel	0.094	25Yr	2677.00	205.41	217.24	212.84	217.53	0.000706	5.29	1041.52	522.59	0.29
Coppermine Brook	Main Channel	0.89	25Yr	2677.00	207.19	215.29	214.42	217.53	0.004749	11.99	223.27	39.88	0.81
Coppermine Brook	Main Channel	0.884	25Yr	2677.00	207.70	215.70	215.70	216.95	0.003657	8.97	298.56	54.09	0.67
Coppermine Brook	Main Channel	0.874	25Yr	2677.00	207.71	215.52	215.52	216.81	0.005624	9.10	294.20	58.10	0.71
Coppermine Brook	Main Channel	0.061	25Yr	2677.00	208.13	214.67	214.67	216.32	0.007577	10.43	280.61	57.98	0.76
Coppermine Brook	Main Channel	0.051	25Yr	2677.00	207.98	214.75	213.13	215.88	0.003756	8.60	347.96	145.02	0.62
Coppermine Brook	Main Channel	0.00	25Yr	2677.00	205.78	214.50	211.32	215.11	0.001560	6.76	683.90	230.46	0.42

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**CONSTRUCTION OF HIGH OVERFLOW CULVERT AT THEIS STEEL AND  
BLACK BEAR AUTO**

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HEC-RAS Plan: Prop 4E Locations: User Defined Profile: 25Yr

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Coppermine Brook	Main Channel	0.336	25Yr	2522.00	216.00	225.81	223	225.95	0.00	3.96	1531	403	0.25
Coppermine Brook	Main Channel	0.326	25Yr	2522.00	214.38	224.88	221	225.82	0.00	7.79	324	60	0.44
Coppermine Brook	Main Channel	0.320		Bridge									
Coppermine Brook	Main Channel	0.316	25Yr	2522.00	212.85	223.74	220	224.70	0.00	7.85	321	38	0.45
Coppermine Brook	Main Channel	0.308	25Yr	2522.00	212.00	221.46	221	224.06	0.01	13.33	267	98	0.83
Coppermine Brook	Main Channel	0.306	25Yr	2522.00	211.80	221.04	221	223.97	0.01	14.02	232	75	0.88
Coppermine Brook	Main Channel	0.224	25Yr	2522.00	210.13	217.42	219	220.55	0.01	14.60	209	43	1.02
Coppermine Brook	Main Channel	0.189	25Yr	2522.00	209.35	218.67	215	218.98	0.00	5.41	829	298	0.32
Coppermine Brook	Main Channel	0.148	25Yr	2522.00	208.35	217.58	215	218.65	0.00	9.29	471	166	0.57
Coppermine Brook	Main Channel	0.131	25Yr	2522.00	208.00	218.21	212	218.30	0.00	2.51	1514	502	0.16
Coppermine Brook	Main Channel	0.114	25Yr	2677.00	207.85	218.16	213	218.27	0.00	2.95	1882	596	0.18
Coppermine Brook	Main Channel	0.084	25Yr	2677.00	205.41	218.12	213	218.24	0.00	3.70	1568	640	0.20
Coppermine Brook	Main Channel	0.09		Bridge									
Coppermine Brook	Main Channel	0.084	25Yr	2677.00	207.19	215.29	214	217.53	0.00	11.99	223	40	0.81
Coppermine Brook	Main Channel	0.08	25Yr	2677.00	207.70	215.70		216.95	0.00	8.97	299	54	0.67
Coppermine Brook	Main Channel	0.074	25Yr	2677.00	207.71	215.52		216.81	0.01	9.10	294	58	0.71
Coppermine Brook	Main Channel	0.061	25Yr	2677.00	208.13	214.67		216.32	0.01	10.43	281	58	0.76
Coppermine Brook	Main Channel	0.051	25Yr	2677.00	207.98	214.75	213	215.88	0.00	8.60	348	145	0.62
Coppermine Brook	Main Channel	0.00	25Yr	2677.00	205.78	214.50	211	215.11	0.00	6.76	684	230	0.42

HEC-RAS Plan: Pr-4F Locations: User Defined Profile: 25Yr

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crtt W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Coppermine Brook	Frederick1	0.189	25Yr	1789.41	209.35	217.29	214	217.69	0.00	5.53	444	141	0.36
Coppermine Brook	Frederick1	0.148	25Yr	1789.41	208.35	215.28	214	216.78	0.01	10.33	216	50	0.74
Coppermine Brook	Frederick1	0.131	25Yr	1789.41	208.00	216.14	212	216.28	0.00	2.86	741	124	0.20
Coppermine Brook	Frederick1	0.115	25Yr	1789.41	207.85	216.08		216.22	0.00	3.06	792	440	0.21
Coppermine Brook	Bypass Channel	1.5		Culvert									
Coppermine Brook	Bypass Channel	2.0	25Yr	624.58	207.85	216.16	210	216.18	0.00	1.05	830	447	0.07
Coppermine Brook	Bypass Channel	1.0	25Yr	624.58	205.78	215.27		215.29	0.00	1.37	887	294	0.08
Coppermine Brook	Frederick Street	0.114	25Yr	1164.83	207.85	216.12		216.20	0.00	2.27	653	443	0.17
Coppermine Brook	Frederick Street	0.094	25Yr	1164.83	205.41	215.91	210	216.14	0.00	3.94	295	34	0.23
Coppermine Brook	Frederick Street	0.09		Bridge									
Coppermine Brook	Frederick Street	0.084	25Yr	1164.83	207.79	215.41	212	215.81	0.00	5.13	227	40	0.34
Coppermine Brook	Frederick Street	0.08	25Yr	1164.83	207.70	215.46		215.72	0.00	4.07	286	53	0.31
Coppermine Brook	Culvert-BikBear	0.223	25Yr	732.59	209.00	217.64	211	217.70	0.00	2.12	345	40	0.13
Coppermine Brook	Culvert-BikBear	0.222		Culvert									
Coppermine Brook	Culvert-BikBear	0.079	25Yr	732.59	208.00	215.61		215.70	0.00	2.41	304	40	0.15
Coppermine Brook	Frederick2	0.074	25Yr	1552.42	207.71	215.16		215.66	0.00	5.88	273	56	0.46
Coppermine Brook	Frederick2	0.061	25Yr	1552.42	208.13	215.01		215.50	0.00	5.70	300	59	0.40
Coppermine Brook	Frederick2	0.051	25Yr	1552.42	207.98	215.04		215.37	0.00	4.72	401	228	0.33
Coppermine Brook	Frederick2	0.02	25Yr	1552.42	205.78	214.99		215.16	0.00	3.59	808	277	0.22
Coppermine Brook	At Confluence	0.01	25Yr	2677.00	205.78	214.50		215.11	0.00	6.75	684	231	0.42
Coppermine Brook	At Confluence	0.00	25Yr	2677.00	206.78	214.50	211	215.11	0.00	6.76	684	230	0.42
Coppermine Brook	Main Channel	0.336	25Yr	2522.00	216.00	225.81	223	225.95	0.00	3.96	1531	403	0.25
Coppermine Brook	Main Channel	0.326	25Yr	2522.00	214.36	224.86	221	225.82	0.00	7.79	324	60	0.44
Coppermine Brook	Main Channel	0.320		Bridge									
Coppermine Brook	Main Channel	0.316	25Yr	2522.00	212.85	223.74	220	224.70	0.00	7.85	321	38	0.45
Coppermine Brook	Main Channel	0.308	25Yr	2522.00	212.00	221.46	221	224.06	0.01	13.33	267	98	0.83
Coppermine Brook	Main Channel	0.306	25Yr	2522.00	211.80	221.04	221	223.97	0.01	14.02	232	75	0.88
Coppermine Brook	Main Channel	0.224	25Yr	2522.00	210.13	217.29	219	220.59	0.01	14.96	203	62	1.06

HEC-RAS Plan: Pr-4F(6X24) Locations: User Defined Profile: 25Yr

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crt W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Coppermine Brook	Frederick1	0.189	25Yr	1025.76	209.95	216.31	213	216.51	0.00	3.79	348	85	0.27
Coppermine Brook	Frederick1	0.146	25Yr	1025.76	208.35	215.74	213	216.15	0.00	5.44	239	52	0.37
Coppermine Brook	Frederick1	0.131	25Yr	1025.76	208.00	215.96	211	216.00	0.00	1.89	719	123	0.12
Coppermine Brook	Frederick1	0.115	25Yr	1025.76	207.85	215.94		215.99	0.00	1.80	736	309	0.13
Coppermine Brook	Bypass Channel	1.5		Culvert									
Coppermine Brook	Bypass Channel	2.0	25Yr	469.07	207.85	215.97	210	215.98	0.00	0.82	745	358	0.06
Coppermine Brook	Bypass Channel	1.0	25Yr	469.07	205.78	215.28		215.29	0.00	1.02	891	295	0.06
Coppermine Brook	Frederick Street	0.114	25Yr	556.88	207.85	215.96		215.98	0.00	1.72	588	355	0.08
Coppermine Brook	Frederick Street	0.094	25Yr	556.88	205.41	215.92	209	215.97	0.00	1.88	298	34	0.11
Coppermine Brook	Frederick Street	0.09		Bridge									
Coppermine Brook	Frederick Street	0.084	25Yr	556.88	207.19	215.78	211	215.86	0.00	2.31	247	41	0.15
Coppermine Brook	Frederick Street	0.08	25Yr	556.88	207.70	215.79		215.85	0.00	1.83	308	209	0.14
Coppermine Brook	Culvert-BikBear	0.223	25Yr	1496.25	209.00	216.31	212	216.49	0.00	3.41	439	60	0.22
Coppermine Brook	Culvert-BikBear	0.222		Culvert									
Coppermine Brook	Culvert-BikBear	0.079	25Yr	1496.25	208.00	215.64		215.81	0.00	3.26	459	60	0.21
Coppermine Brook	Frederick2	0.074	25Yr	1707.93	207.71	215.16		215.77	0.00	6.25	273	56	0.50
Coppermine Brook	Frederick2	0.061	25Yr	1707.93	208.13	214.97		215.57	0.00	6.31	298	59	0.45
Coppermine Brook	Frederick2	0.051	25Yr	1707.93	207.98	215.01		215.42	0.00	5.23	394	219	0.37
Coppermine Brook	Frederick2	0.02	25Yr	1707.93	205.78	214.95		215.15	0.00	3.98	796	273	0.24
Coppermine Brook	At Confluence	0.01	25Yr	2677.00	205.78	214.50		215.11	0.00	6.75	684	231	0.42
Coppermine Brook	At Confluence	0.00	25Yr	2677.00	205.78	214.50	211	215.11	0.00	6.76	684	230	0.42
Coppermine Brook	Main Channel	0.336	25Yr	2522.00	216.00	225.81	223	225.95	0.00	3.96	1531	403	0.25
Coppermine Brook	Main Channel	0.326	25Yr	2522.00	214.36	224.88	221	225.82	0.00	7.79	324	60	0.44
Coppermine Brook	Main Channel	0.320		Bridge									
Coppermine Brook	Main Channel	0.316	25Yr	2522.00	212.85	223.74	220	224.70	0.00	7.85	321	38	0.45
Coppermine Brook	Main Channel	0.308	25Yr	2522.00	212.00	221.46	221	224.06	0.01	13.33	267	98	0.83
Coppermine Brook	Main Channel	0.306	25Yr	2522.00	211.80	221.04	221	223.97	0.01	14.02	232	75	0.88
Coppermine Brook	Main Channel	0.224	25Yr	2522.00	210.13	217.29	219	220.59	0.01	14.96	203	62	1.06

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**APPENDIX M**  
**DRAFT MODEL FLOODPLAIN ORDINANCES**

Coppermine Brook Drainage Analysis  
Bristol, Connecticut

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**STATE OF CONNECTICUT  
DEPARTMENT OF ENVIRONMENTAL PROTECTION**

**MODEL FLOODPLAIN MANAGEMENT REGULATIONS  
NATIONAL FLOOD INSURANCE PROGRAM (NFIP)**

**Inland/Riverine Community (A Zones only)  
Level "D" Community**

**April 2007**

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**NOTES:**

Text in italics is for information purposes only and can be deleted.

Text that is bolded and in brackets, **[bold text]**, must be completed by the community and unbolded.

## **1.0 STATUTORY AUTHORIZATION AND PURPOSE**

### **1.1 STATUTORY AUTHORIZATION**

The Legislature of the State of Connecticut has in Title 7, Chapter 98, Section 7-148(c)(7)(A) and in Title 8, Chapter 124, Section 8-2 of the General Statutes delegated the responsibility to local governmental units to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the **[Governing Body]** of the **[Municipality]**, Connecticut, does ordain as follows:

### **1.2 FINDING OF FACT**

The flood hazard areas of the **[Municipality]** are subject to periodic flood inundation which results in the loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare.

These flood losses are caused by the cumulative effect of obstructions in the floodplains causing increases in flood heights and velocities, and by the occupancy in flood hazard areas by uses vulnerable to floods or hazards to other lands which are inadequately elevated, floodproofed, or otherwise unprotected from flood damage. Uncontrolled development and use of the floodplains can adversely affect the community.

The **[Municipality]** has voluntarily participated in the National Flood Insurance Program (NFIP) since **[date of entry into the regular program]**. The NFIP is founded on a mutual agreement between the federal government and each participating community. Local, state and federal governments must share roles and responsibilities to meet the goals and objectives of the NFIP. The community's role is of paramount importance. Property owners are able to receive federally-subsidized flood insurance only if the community enacts and enforces the minimum floodplain regulations required for participation in the NFIP.

### **1.3 STATEMENT OF PURPOSE**

It is the purpose of this **[ordinance/regulation]** to regulate floodplain development, promote public health, safety, and general welfare, and minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- 1.3.1 To protect human life and health, and prevent damage to property;
- 1.3.2 To minimize expenditure of public funds for costly flood control projects;
- 1.3.3 To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- 1.3.4 To minimize prolonged business interruptions and other economic disruptions;
- 1.3.5 To minimize damage to public facilities, infrastructure and utilities, such as water and gas mains, electric, telephone and sewer lines, and streets and bridges, located in the floodplain;
- 1.3.6 To help maintain a stable tax base by providing for the sound use and development of flood

hazard areas in such a manner as to minimize flood damage and flood blight areas;

- 1.3.7 To insure that potential buyers are notified that property is in a flood hazard area;
- 1.3.8 To prevent increase in flood heights that could increase flood damage and result in conflicts between property owners;
- 1.3.9 To ensure that those who occupy the flood hazard areas assume responsibility for their actions; and
- 1.3.10 To discourage development in a floodplain if there is any practicable alternative to locate the activity, use or structure outside of the floodplain.

#### **1.4 OBJECTIVES**

In order to accomplish its purposes, this [ordinance/regulation] includes objectives, methods and provisions that:

- 1.4.1 Restrict or prohibit uses which are dangerous to health, safety and property due to flood or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
- 1.4.2 Require that uses vulnerable to floods, including facilities that serve such uses, be protected against flood damage at the time of initial construction;
- 1.4.3 Control the alteration of natural floodplains, stream channels, and natural protective barriers that are involved in the accommodation of flood waters;
- 1.4.4 Control filling, grading, dredging and other development which may increase erosion or flood damage; and
- 1.4.5 Prevent or regulate the construction of barriers or obstructions which will unnaturally divert flood waters or which may increase flood hazards to other lands.

#### **2.0 DEFINITIONS**

Unless specifically defined below, words and phrases used in this [ordinance/regulation] shall have the same meaning as they have in common usage and to give this [ordinance/regulation] its most reasonable application.

**Area of Shallow Flooding** (*for a community with AO or AH Zones only*) - A designated AO, AH, AR/AO, AR/AH, or VO zone on a community's Flood Insurance Rate Map (FIRM) with a one percent or greater annual chance of flooding to an average depth of one to three feet where a clearly defined channel does not exist, where the path of flooding is unpredictable, and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.

**Base Flood** - The flood having a one (1) percent chance of being equaled or exceeded in any given

year, also referred to as the one hundred (100) year flood, as published by the Federal Emergency Management Agency (FEMA) as part of a Flood Insurance Study (FIS) and depicted on a Flood Insurance Rate Map (FIRM).

**Base Flood Elevation (BFE)** – The elevation of the crest of the base flood or 100-year flood. The height in relation to mean sea level expected to be reached by the waters of the base flood at pertinent points in the floodplains of coastal and riverine areas.

**Basement** – Any area of the building having its floor subgrade (below ground level) on all sides.

**Building** – see definition for “Structure”.

**Cost** – As related to substantial improvements, the cost of any reconstruction, rehabilitation, addition, alteration, repair or other improvement of a structure shall be established by a detailed written contractor’s estimate. The estimate shall include, but not be limited to: the cost of materials (interior finishing elements, structural elements, utility and service equipment); sales tax on materials, building equipment and fixtures, including heating and air conditioning and utility meters; labor; built-in appliances; demolition and site preparation; repairs made to damaged parts of the building worked on at the same time; contractor’s overhead; contractor’s profit; and grand total. Items to be excluded include: cost of plans and specifications, survey costs, permit fees, outside improvements such as septic systems, water supply wells, landscaping, sidewalks, fences, yard lights, irrigation systems, and detached structures such as garages, sheds, and gazebos.

**Development** – Any man-made change to improved or unimproved real estate, including but not limited to the construction of buildings or structures; the construction of additions, alterations or substantial improvements to buildings or structures; the placement of buildings or structures; mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment; the storage, deposition, or extraction of materials; and the installation, repair or removal of public or private sewage disposal systems or water supply facilities.

**Existing Manufactured Home Park or Subdivision** – A manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured home are to be affixed (including, as a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before the effective date of the floodplain management regulations adopted by a community.

**Expansion to an Existing Manufactured Home Park or Subdivision** – The preparation of additional sites by the construction of facilities for servicing the lots on which the manufacturing homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

**Federal Emergency Management Agency (FEMA)** - The federal agency that administers the National Flood Insurance Program (NFIP).

**Finished Living Space** – Fully enclosed areas below the base flood elevation (BFE) that are not considered a basement cannot have finished living space and needs to be designed to be exposed to flood forces. These spaces can only to be used for parking, building access or limited storage. Finished living space can include, but is not limited to, a space that is heated and/or cooled,

contains finished floors (tile, linoleum, hardwood, etc.), has sheetrock walls that may or may not be painted or wallpapered, and other amenities such as furniture, appliances, bathrooms, fireplaces and other items that are easily damaged by floodwaters and expensive to clean, repair or replace.

**Flood or Flooding** – A general and temporary condition of partial or complete inundation of normally dry land areas from either the overflow of inland or tidal waters, or the unusual and rapid accumulation or runoff of surface waters from any source.

**Flood Insurance Rate Map (FIRM)** – The official map of a community on which the Federal Emergency Management Agency (FEMA) has delineated both the special flood hazard areas (100-year floodplain) and the insurance risk premium zones applicable to a community. FIRM published after January 1990 may also show the limits of the regulatory floodway.

**Flood Insurance Study (FIS)** – The official study of a community in which the Federal Emergency Management Agency (FEMA) has conducted a technical engineering evaluation and determination of local flood hazards, flood profiles and water surface elevations. The Flood Insurance Rate Maps (FIRM), which accompany the FIS, provide both flood insurance rate zones and base flood elevations, and may provide the regulatory floodway limits.

**Floodway** – The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one (1.0) foot. For the purposes of these regulations, the term “Regulatory Floodway” is synonymous in meaning with the term “Floodway”.

**Functionally Dependent Use or Facility** – A use or facility that cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities. The term does not include seafood processing facilities, long-term storage, manufacturing, sales or service facilities.

**Highest Adjacent Grade (HAG)** – The highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

**Historic Structure** – Any structure that is: (a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of the Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register; (b) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historic significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district; (c) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or (d) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either: (1) By an approved state program as determined by the Secretary of the Interior or (2) Directly by the Secretary of the Interior in states without approved programs.

**Lowest Floor** – The lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage, in an area other than a basement area is not considered a building's lowest floor, provided that such an area meets the design requirements specified in Section 5.3.1.3 of this [ordinance or regulation].

**Manufactured Home** – A structure, transportable in one (1) or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term also includes park trailers, travel trailers, recreational vehicles and other similar vehicles or transportable structures placed on a site for one hundred and eighty (180) consecutive days or longer and intended to be improved property.

**Manufactured Home Park or Subdivision** – A parcel or contiguous parcels of land divided into two (2) or more manufactured home lots for rent or sale.

**Market Value** – The market value of the structure shall be determined by **(an independent appraisal by a professional appraiser; the property's tax assessment, minus land value; the replacement cost minus depreciation of the structure; the structure's Actual Cash Value)** prior to the start of the initial repair or improvement, or in the case of damage, the value of the structure prior to the damage occurring.

**Mean Sea Level (MSL)** – The North American Vertical Datum (NAVD) of 1988 or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map (FIRM) are referenced.

**New Construction** – Structures for which the "start of construction" commenced on or after **[effective date of floodplain regulations, date of initial adoption]**, the effective date of the floodplain management regulations, and includes any subsequent improvements to such structures.

**New Manufactured Home Park or Subdivision** – A manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after the effective date, **[effective date of floodplain ordinance/regulations, date of initial adoption]**, of the floodplain management regulation adopted by the community.

**Recreational Vehicle** – A vehicle which is: (a) built on a single chassis; (b) four hundred (400) square feet or less when measured at the largest horizontal projection; (c) designed to be self-propelled or permanently towable by a light duty truck; and (d) designed primarily not for use as a permanent dwelling but as a temporary living quarters for recreational, camping, travel, or seasonal use.

**Special Flood Hazard Area (SFHA)** – The land in the floodplain within a community subject to a one (1) percent or greater chance of flooding in any given year. SFHAs are determined utilizing the base flood elevations (BFE) provided on the flood profiles in the Flood Insurance Study (FIS) for a community. BFEs provided on Flood Insurance Rate Map (FIRM) are only approximate (rounded up or down) and should be verified with the BFEs published in the FIS for a specific location. SFHAs include, but are not necessarily limited to, the land shown as Zones A, A1-30, AE, AO, AH, and the Coastal High Hazard Areas shown as Zones V, V1-30, and VE on a FIRM. The SFHA is also called the Area of Special Flood Hazard.

**Start of Construction** – For other than new construction or substantial improvements under the Coastal Barrier Resources Act (P.L. 97-348), includes substantial improvement and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition placement, substantial improvement or other improvement was within one

hundred and eighty (180) days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation, or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erections of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

**Structure** – A walled and roofed building which is principally above ground, including a manufactured home, a gas or liquid storage tank, or other man-made facilities or infrastructures.

**Substantial Damage** – Damage of any origin sustained by a structure, whereby the cost of restoring the structure to its pre-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

**Substantial Improvement** – Any combination of repairs, reconstruction, rehabilitation, alterations, additions or other improvements to a structure, taking place during a ten (10) year period, in which the cumulative cost equals or exceeds fifty (50) percent of the market value of the structure as determined at the beginning of such ten (10) year period. This term includes structures that have incurred “substantial damage”, regardless of the actual repair work performed. For purposes of this definition, “substantial improvement” is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include either: (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions; or (2) Any alteration of a “historic” structure, provided that the alteration will not preclude the structure’s continued designation as a “historic structure”.

**Variance** - A grant of relief by a community from the terms of the floodplain management [ordinance/regulation] that allows construction in a manner otherwise prohibited and where specific enforcement would result in unnecessary hardship.

**Violation** – Failure of a structure or other development to be fully compliant with the community’s floodplain management [ordinance/regulations]. A structure or other development without required permits, lowest floor elevation documentation, flood-proofing certificates or required floodway encroachment calculations is presumed to be in violation until such time as that documentation is provided.

**Water Surface Elevation** – The height, in relation to the North American Vertical Datum (NAVD) of 1988 (or other datum, where specified), of floods of various magnitudes and frequencies in the floodplains of coastal or riverine areas.

### 3.0 **GENERAL PROVISIONS**

### **3.1 AREAS TO WHICH THIS [ORDINANCE/REGULATION] APPLIES**

This [ordinance/regulation] shall apply to all Special Flood Hazard Areas (SFHA) within the [Municipality].

### **3.2 BASIS FOR ESTABLISHING THE SPECIAL FLOOD HAZARD AREAS (SFHA)**

The Special Flood Hazard Areas (SFHA) identified by the Federal Emergency Management Agency (FEMA) in its Flood Insurance Study (FIS) for the [Municipality], dated [date of most recent FIS], and accompanying Flood Insurance Rate Maps (FIRM) and/or Flood Boundary and Floodway Maps (FBFM), dated [date of most recent FIRM and/or FBFM], and other supporting data, and any subsequent revisions thereto, are adopted by reference and declared to be a part of this [ordinance/regulation]. Since mapping is legally adopted by reference into this [ordinance/regulation] it must take precedence when more restrictive until such time as a map amendment or map revision is obtained from FEMA.

The SFHA includes any area shown on the FIRM as Zones A, A1-30, AE, AO, and AH, including areas designated as a floodway on a FIRM or FBFM. SFHAs are determined utilizing the base flood elevations (BFE) provided on the flood profiles in the Flood Insurance Study (FIS) for a community. BFEs provided on Flood Insurance Rate Map (FIRM) are only approximate (rounded up or down) and should be verified with the BFEs published in the FIS for a specific location. Also included are areas of potential, demonstrable or historical flooding, including any area contiguous with but outside the SFHA identified by FEMA, and where the land surface elevation is lower than the base flood elevation (BFE) as shown in the FIS, and the area is not protected from flooding by a natural or man-made feature. The FIRM, FBFM and FIS are on file in the [Municipal Office], [Office Location], [Municipality].

### **3.3 STRUCTURES ALREADY IN COMPLIANCE**

A structure or development already in compliance with this [ordinance/regulation] shall not be made non-compliant by any alteration, modification, repair, reconstruction or improvement and must also comply with other applicable local, state, and federal regulations. No structure or land shall hereafter be located, extended, converted, modified or structurally altered without full compliance with the terms of this [ordinance/regulation] and other applicable regulations.

### **3.4 ABROGATION AND GREATER RESTRICTIONS**

This [ordinance/regulation] is not intended to repeal, abrogate or impair any existing easements, covenants, or deed restrictions. However, where this [ordinance/regulation] and another ordinance, regulation easement, covenant or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

### **3.5 INTERPRETATION**

In the interpretation and application of this [ordinance/regulation], all provisions shall be: 1) considered as minimum requirements; 2) liberally construed in favor of the governing body, and; 3) deemed neither to limit nor repeal any other powers granted under State statutes.

### **3.6 WARNING AND DISCLAIMER OF LIABILITY**

The degree of flood protection required by this [ordinance/regulation] is considered the minimum reasonable for regulatory purposes and is based on scientific and engineering consideration and research. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This [ordinance/regulation] does not imply or guarantee that land outside the Special Flood Hazard Area or uses permitted in such areas will be free from flooding and flood damages. This [ordinance/regulation] shall not create liability on the part of the [Municipality] or by any officer or employee thereof for any flood damages that result from reliance on this [ordinance/regulation] or any administrative decision lawfully made thereunder. The [Municipality], its officers and employees shall assume no liability for another person's reliance on any maps, data or information provided by the [Municipality].

### **3.7 SEVERABILITY**

If any section, subsection, paragraph, sentence, clause, or phrase of this [ordinance/regulation] should be declared invalid for any reason whatsoever, such decision shall not affect the remaining portions of this [ordinance/regulation], which shall remain in full force and effect; and to this end the provisions of this [ordinance/regulation] are hereby declared to be severable.

### **4.0 ADMINISTRATION**

#### **4.1 DESIGNATION OF THE LOCAL ADMINISTRATOR**

The [title of local administrator] is hereby appointed to administer, implement and enforce the provisions of this [ordinance/regulation].

#### **4.2 CERTIFICATION**

Where required under this [ordinance/regulation], a Connecticut registered professional engineer or architect shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of this [ordinance/regulation]. Such certification must be provided to the [title of local administrator].

#### **4.3 ESTABLISHMENT OF THE FLOODPLAIN DEVELOPMENT PERMIT**

A Floodplain Development Permit shall be required in conformance with the provisions of this [ordinance/regulation] prior to the commencement of any development activities. Permits issued under this [ordinance/regulation] shall expire if actual construction of a permitted structure does not commence within one hundred and eighty (180) days of the permit approval date.

**OR**

#### **ESTABLISHMENT OF THE FLOOD MANAGEMENT SECTION OF THE [DEVELOPMENT/BUILDING/ZONING] PERMIT**

The flood management section of the [Development/Building/Zoning] Permit must be completed in conformance with the provisions of this [ordinance/regulation] prior to the commencement of any development activities. Permits issued under this [ordinance/regulation] shall expire if actual construction of a permitted structure does not commence within one hundred

and eighty (180) days of the permit approval date.

#### 4.4 PERMIT APPLICATION PROCEDURES

A **[floodplain development/development/building/zoning]** permit is hereby established for all construction and other development to be undertaken in Special Flood Hazard Areas in this community. Prior to any development activities, application for a **[floodplain development/development/building/zoning]** permit shall be made to the **[title of local administrator]** on forms provided and may include, but not be limited to, plans in duplicate drawn to scale showing, at a minimum, the property lines and location of the parcel; the nature, location, dimensions, and elevations of the area in question; limit and extent of the 100-year floodplain and/or floodway boundary and base flood elevation(s); existing and proposed structures, fill, storage of materials, drainage facilities and the location of the foregoing. Specifically, the following information is required to be submitted to the **[title of local administrator]**:

##### 4.4.1 Application Stage

The applicant shall provide at least the following information, where applicable. Additional information may be required on the permit application form.

- 4.4.1.1 Base flood elevation (BFE) for the site in question as determined in the FEMA Flood Insurance Study (FIS) or Flood Insurance Rate Map (FIRM). The FIS flood profiles provide more accurate BFE data than the FIRM. The extent of the 100-year floodplain and floodway must be depicted with a boundary line on any site plans and shown in relation to existing and proposed structures or development;
- 4.4.1.2 Elevation in relation to mean sea level of the proposed lowest floor, including basement, of all new construction, substantial improvements or repairs to structures that have sustained substantial damage;
- 4.4.1.3 Elevation in relation to mean sea level to which any non-residential new construction, substantial improvements or repair to structures that have sustained substantial damage will be dry flood-proofed;
- 4.4.1.4 Description of the extent to which any watercourse will be altered or relocated as a result of the proposed development. Computations by a licensed professional engineer must be submitted that demonstrate that the altered or relocated segment will provide equal or greater conveyance than the original stream segment. The applicant must submit any maps, computations or other materials required by the Federal Emergency Management Agency (FEMA) in order to officially amend or revise the Flood Insurance Rate Map. The applicant must pay any fees or other costs assessed by FEMA for this purpose. The applicant must also provide assurances that the conveyance capacity of the altered or relocated stream segment will be maintained;
- 4.4.1.5 A statement and supporting documentation (all costs of project, market value of structure, etc.) verifying that the proposed alterations to an existing structure meets or does not meet the criteria of the substantial improvement and/or substantial damage definition. If a development meets the definition of substantial improvement and/or substantial damage, the structure must be brought into compliance with all floodplain regulations as if it was new construction;
- 4.4.1.6 Where applicable the following certifications by a Connecticut registered engineer or architect are required, and must be provided to the **[title of local administrator]**. The design and methods of construction must be certified to be in accordance with

accepted standards of practice and with the provisions of Section 5.3.

- (a) Non-residential flood-proofing must meet the provisions of Section 5.3.1.2;
- (b) Fully enclosed areas below the base flood elevation (BFE) must meet the minimum design criteria in Section 5.3.1.3;
- (c) No (0.00) increase in floodway water surface elevations are allowed. Any development in a floodway must meet the provisions of Section 5.3.4;

#### **4.4.2 Construction Stage**

Upon completion of the applicable portion of construction, the applicant shall provide verification to the **[title of local administrator]** of the following as is applicable:

4.4.2.1. Lowest floor elevation shall be verified for:

- (a) A structure in Zones A, AE, A1-30, AO or AH is the top of the lowest floor (including basement);
- (b) A non-residential structure which has been dry flood-proofed is the elevation to which the flood-proofing is effective (Note: For insurance purposes, a dry flood-proofed, non-residential structure is rated based on the elevation of its lowest floor unless it is floodproofed to one foot above the BFE.);

4.4.2.2 Deficiencies detected by the review of the above listed shall be corrected by the permit holder immediately and prior to further progressive work being permitted to proceed. Failure to submit the survey or failure to make said corrections required hereby, shall be cause to issue a stop-work order for the project.

### **4.5 DUTIES AND RESPONSIBILITIES OF THE LOCAL ADMINISTRATOR**

Duties of the **[title of local administrator]** shall include, but not be limited to:

- 4.5.1 Review all permit applications for completeness, particularly with the requirements of Section 4.4.1.
- 4.5.2 Review all permit applications to determine whether the proposed development and building sites will be reasonably safe from flooding.
- 4.5.3 Review all development permits to assure that the permit requirements of this **[ordinance/regulation]** have been satisfied.
- 4.5.4 Review all permit applications to assure that all necessary federal or state permits have been received. Require that copies of such permits be provided and maintained on file with the permit application. Such permits include, but are not limited to, Stream Channel Encroachment Line (SCEL) Permit, Coastal Area Management (CAM) Permit, Water Diversion Permit, Dam Safety Permit, and Army Corps of Engineers 401 and 404 Permits.
- 4.5.5 Notify the regional planning agency and affected municipality at least thirty-five (35) days prior to a public hearing if any change of regulation or use of a flood zone will affect an area within five hundred (500) feet of another municipality.
- 4.5.6 Notify the adjacent communities and the Department of Environmental Protection (DEP), Inland Water Resources Division, prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency.
- 4.5.7 Assure that maintenance is provided within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished.
- 4.5.8 Obtain, record and maintain the elevation (in relation to mean sea level) of the lowest floor (including basement) of all new construction, substantial improvements or repair to a structure that has sustained substantial damage.

- 4.5.9 Obtain, record and maintain the elevation (in relation to mean sea level) to which the new construction, substantial improvement or repair to a structure that has sustain substantial damage has been flood-proofed.
- 4.5.10 When flood-proofing is utilized for a particular structure, the **[title of local administrator]** shall obtain certification from a registered professional engineer or architect, in accordance with Section 5.3.1.2.
- 4.5.11 Where interpretation is needed as to the exact location of boundaries of the area of special flood hazard (for example, where there appears to be a conflict between a mapped boundary and actual field conditions) the **[title of local administrator]** shall make necessary interpretation. The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided in this **[ordinance/regulation]**.
- 4.5.12 Require the applicant to provide base flood elevation data for all proposed development, including manufactured home parks and subdivisions.
- 4.5.13 When base flood elevation data or floodway data have not been provided in accordance with Section 3.2 and Section 4.4, the **[title of local administrator]** shall obtain, review and reasonably utilize any base flood elevation and floodway data available from a federal, state or other source in order to administer the provisions of Section 5.0.
- 4.5.14 All records pertaining to the provisions of this **[ordinance/regulation]** shall be obtained and maintained in the office of the **[title of local administrator]**.
- 4.5.15 Upon completion of the permitted development and prior to issuance of a Certificate of Occupancy (CO), necessary as-built surveys (prepared by a Connecticut Licensed Professional as per Connecticut State Statutes) and engineering and architectural certifications shall be provided to the **[title of local administrator]** demonstrating compliance with the approved plans and standards set forth in Section 4.4.

## **5.0 PROVISIONS FOR FLOOD HAZARD REDUCTION**

### **5.1 GENERAL STANDARDS**

In all Special Flood Hazard Areas (SFHAs) the following provisions are required:

- 5.1.1 New construction, substantial improvements, and structures that have sustained substantial damage shall be constructed using methods and practices that minimize flood damage.
- 5.1.2 New construction, substantial improvements, and structures that have sustained substantial damage shall be constructed with materials and utility equipment resistant to flood damage.
- 5.1.3 New construction, substantial improvements, and repairs to structures that have sustained substantial damage shall be anchored to prevent flotation, collapse or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.
- 5.1.4 New construction, **substantial improvements and repair to structures that have sustained substantial damage** cannot be constructed or located entirely or partially over water unless they are a functionally dependent use or facility.

- 5.1.5 Electrical, heating, ventilation, plumbing, air conditioning equipment, HVAC ductwork, and other service facilities, or any machinery or utility equipment or connections servicing a structure shall be elevated to or above the base flood elevation (BFE) to prevent water from entering or accumulating within the components during conditions of flooding. This includes, but is not limited to, furnaces, oil or propane tanks, air conditioners, heat pumps, hot water heaters, ventilation ductwork, washer and dryer hook-ups, electrical junction boxes, and circuit breaker boxes.
- 5.1.6 New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.
- 5.1.7 New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharges from the system into flood waters.
- 5.1.8 On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding.
- 5.1.9 Above-ground storage tanks (oil, propane, etc.) which are located outside or inside of the structure *must either be elevated above the base flood elevation (BFE) on a concrete pad, or be securely anchored with tie-down straps to prevent flotation or lateral movement, have the top of the fill pipe extended above the BFE, and have a screw fill cap that does not allow for the infiltration of flood water.*
- 5.2.10 In any portion of a watercourse that is altered or relocated, the flood carrying capacity must be maintained. Notify adjacent communities and the Connecticut Department of Environmental Protection (DEP), Inland Water Resources Division prior to any alteration or relocation of a watercourse.
- 5.1.11 If **any** portion of a structure lies within the Special Flood Hazard Area (SFHA), the entire structure is considered to be in the SFHA. The entire structure must meet the construction requirements of the flood zone. The structure includes any attached additions, garages, decks, sunrooms, or any other structure attached to the main structure. Decks or porches that extend into a more restrictive flood zone will require the entire structure to meet the standards of the more restrictive zone.
- 5.1.12 If a structure lies within two or more flood zones, the construction standards of the most restrictive zone apply to the entire structure (i.e., V zone is more restrictive than A zone; structure must be built to the highest BFE). The structure includes any attached additions, garages, decks, sunrooms, or any other structure attached to the main structure. (Decks or porches that extend into a more restrictive zone will require the entire structure to meet the requirements of the more restrictive zone.)

5.1.13 Compensatory Storage. The water holding capacity of the floodplain, except those areas which are tidally influenced, shall not be reduced. Any reduction caused by filling, new construction or substantial improvements involving an increase in footprint to the structure, shall be compensated for by deepening and/or widening of the floodplain. Storage shall be provided on-site, unless easements have been gained from adjacent property owners; it shall be provided within the same hydraulic reach and a volume not previously used for flood storage; it shall be hydraulically comparable and incrementally equal to the theoretical volume of flood water at each elevation, up to and including the 100-year flood elevation, which would be displaced by the proposed project. Such compensatory volume shall have an unrestricted hydraulic connection to the same waterway or water body. Compensatory storage can be provided off-site if approved by the municipality.

5.1.14 Equal Conveyance. Within the floodplain, except those areas which are tidally influenced, as designated on the Flood Insurance Rate Map (FIRM) for the community, encroachments resulting from filling, new construction or substantial improvements involving an increase in footprint of the structure, are prohibited unless the applicant provides certification by a registered professional engineer demonstrating, with supporting hydrologic and hydraulic analyses performed in accordance with standard engineering practice, that such encroachments shall not result in any (0.00 feet) increase in flood levels (base flood elevation). Work within the floodplain and the land adjacent to the floodplain, including work to provide compensatory storage shall not be constructed in such a way so as to cause an increase in flood stage or flood velocity.

## **5.2 STANDARDS FOR WATERCOURSES WITHOUT ESTABLISHED BASE FLOOD ELEVATIONS (UN-NUMBERED A ZONE), ADOPTED FLOODWAYS AND/OR FLOOD MAPPING**

5.2.1 The [title of local administrator] shall require base flood elevation (BFE) data be provide with any application for new construction, substantial improvement, repair to structures which have sustained substantial damage or other development in Zone A without a FEMA-published BFE (un-numbered A Zone). The [title of local administrator] shall obtain, review and reasonably utilize any BFE and floodway data available from a federal, state or other source, including data developed for subdivision proposals, as criteria for requiring that new construction, substantial improvements, repair to structures which have sustained substantial damage or other development in un-numbered A Zones on the community's Flood Insurance Rate Map (FIRM) meet the standards in Section 4.4 and Section 5.3. If no BFE can be determined, the lowest floor, including basement, must be elevated to two (2) feet above the highest adjacent grade next to the structure.

5.2.2 When BFEs have been determined within Zones A1-30 and AE on the community's FIRM but a regulatory floodway has not been designated, the [title of local administrator] must require that no new construction, substantial improvements, repair to structures which have sustained substantial damage or other development, including fill, shall be permitted which will increase the water surface elevation of the base flood more than one (1.0) foot at any point within the community when all existing and anticipated development is considered cumulatively with the proposed development.

- 5.2.3 The **[title of local administrator]** may request floodway data of an applicant for watercourses without FEMA-published floodways. When such data is provided by an applicant or whenever such data is available from any other source (in response to the municipality's request or not), the community shall adopt a regulatory floodway based on the principle that the floodway must be able to convey the waters of the base flood without increasing the water surface elevation more than one (1.0) foot at any point within the community.
- 5.2.4 The **[title of local administrator]** shall obtain, review and reasonably utilize any BFE and floodway data available from a federal, state or other source, as criteria for requiring that new construction, substantial improvements, repair to structures which have sustained substantial damage or other development in any area of potential, demonstrable or historical flooding within the community meet the standards in Section 4.4 and Section 5.3.
- 5.2.5 Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, a community may approve certain development in Zones A1-30, AE, AH, on the community's FIRM which increases the water surface elevation of the base flood by more than one (1.0) foot, provided that the community first completes all of the provisions required by Section 65.12.

### 5.3 **SPECIFIC STANDARDS**

#### 5.3.1 Construction Standards in Special Flood Hazard Areas (SFHA), Zones A, A1-30, AE.

##### 5.3.1.1 Residential Construction.

All new construction, substantial improvements, and repair to structures that have sustained substantial damage which are residential structures shall have the bottom of the lowest floor, including basement, elevated to or above the base flood elevation (BFE). Electrical, plumbing, machinery or other utility equipment that service the structure must be elevated to or above the BFE.

##### 5.3.1.2 Non-Residential Construction.

All new construction, substantial improvements, and repair to structures that have sustained substantial damage which are commercial, industrial or non-residential structures shall:

- (a) Have the bottom of the lowest floor, including basement, elevated to or above the base flood elevation (BFE); or
- (b) In lieu of being elevated, non-residential structures may be dry flood-proofed to one (1) foot above the BFE provided that together with all attendant utilities and sanitary facilities the areas of the structure below the required elevation are watertight with walls substantially impermeable to the passage of water, and provided that such structures are composed of structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy. A Connecticut registered professional engineer or architect shall review and/or develop structural design specifications and plans for the construction, and shall certify that the design and methods of construction are in accordance with acceptable standards of practice

for meeting the provisions of this section. Such certification shall be provided to the **[title of local administrator]** on the FEMA Floodproofing Certificate, Form 81-65.

- (c) Electrical, plumbing, machinery or other utility equipment that service the structure must be elevated to or above the BFE.

#### 5.3.1.3 Fully Enclosed Areas Below The Base Flood Elevation Of Elevated Buildings.

All new construction, substantial improvements, or repair of substantial damage to residential or non-residential structures that include fully enclosed areas formed by a foundation and other exterior walls below the base flood elevation (BFE) of an elevated building, shall be designed to preclude finished living space and be designed to allow for the entry and exit of flood waters to automatically equalize hydrostatic flood forces on exterior walls (wet flood-proofing). Designs for complying with this requirement must either be certified by a Connecticut registered professional engineer or architect, or meet the following minimum criteria listed in sections (a)-(g) below:

- (a) Provide a minimum of two (2) openings (hydraulic flood vents) having a total net area of not less than one square inch for every one square foot of enclosed area subject to flooding. These hydraulic openings must be located on at least two different walls. Only the area (square footage) that lies below the BFE can be used in the calculation of net area of vents required. If the structure has more than one enclosed area, openings must be installed in the exterior walls of each enclosed area so that flood waters can enter directly from the outside;

- (b) The bottom of all openings shall be no higher than one (1) foot above grade. At least one side of the structure's fully enclosed area must be at or above grade. Fill placed around the foundation walls must be graded so that the elevation inside the enclosed area is equal to or higher than the adjacent outside elevation on at least one side of the building. The finished floor of the enclosed area shall be no lower than the bottom of the foundation openings. The foundation slab of a residential structure, including the slab of a crawlspace, must be set equal to the outside finished grade on at least one side of the building;

- (c) The openings may be equipped with screens, louvers, valves or other coverings or devices provided they permit the automatic entry and exit of flood waters in both directions without any external influence or control such as human intervention, including the use of electrical and other non-automatic mechanical means. Other coverings may be designed and certified by an engineer or approved by the **[title of local administrator]**;

- (d) The area cannot be used as finished living space. Use of the enclosed area shall be the minimum necessary and shall only be used for the parking of vehicles, building access or limited storage. Access to the enclosed area shall be the minimum necessary to allow for the parking of vehicles (garage door) or limited storage of maintenance equipment used in connection with the premises (standard exterior door) or entry to the living area (stairway or elevator). The enclosed area shall not be used for human habitation or partitioned into separate rooms;

- (e) All interior walls, floor, and ceiling materials located below the BFE shall be unfinished and resistant to flood damage.

- (f) Electrical, plumbing, HVAC ductwork, machinery or other utility equipment and connections that service the structure (including, but not limited to, furnaces, oil or propane tanks, air conditioners, heat pumps, hot water heaters, ventilation, washers, dryers, electrical junction boxes, circuit breaker boxes and food freezers) are prohibited in the fully enclosed area below the BFE. Utilities or service equipment located in this enclosed area, even if elevated above the BFE in the space, will subject the structure to increased flood insurance rates.
- (g) A residential building with a structurally attached garage having the floor slab below the BFE is considered an enclosed area below the BFE and must meet the standards of Sections 5.3.1.3 (a)-(f). A garage attached to a residential structure, constructed with the garage floor slab below the BFE, must be designed to allow for the automatic entry and exit of floodwaters in both directions. Flood openings or vents are required in the exterior walls of the garage or in the garage doors. The human intervention necessary to open garage doors when flooding occurs is not an acceptable means of meeting the openings requirements. In addition to the automatic entry of floodwaters, the areas of the garage below BFE must be constructed with flood resistant materials. Garages attached to non-residential structures must also meet the aforementioned requirements or be dry floodproofed as per the requirements of Section 5.3.1.2.

### 5.3.2 Manufactured (Mobile) Homes and Recreational Vehicles (RVs).

5.3.2.1 In all Special Flood Hazard Areas (SFHA), any manufactured (mobile) homes to be newly placed, undergoing a substantial improvement or repaired as a result of substantial damage, shall be elevated so that the bottom of the lowest floor is at or above the base flood elevation (BFE). The manufactured home must also meet all the construction standards per Section 5.3.1. This includes SFHAs outside a manufactured home park or subdivision, in a new manufactured home park or subdivision, in an expansion to an existing manufactured home park or subdivision, or on a site in an existing park which a manufactured home has incurred substantial damage as a result of a flood.

5.3.2.2 All manufactured (mobile) homes within a SFHA shall be placed on a permanent foundation which itself is securely anchored and to which the structure is securely anchored so that it will resist flotation, lateral movement and hydrostatic pressures. Anchoring may include, but not be limited to, the use of over-the-top or frame ties to ground anchors.

5.3.2.3 All manufactured (mobile) homes within a SFHA shall be installed using methods and practices which minimize flood damage. Adequate access and drainage should be provided. Elevation construction standards include piling foundations placed no more than ten (10) feet apart, and reinforcement is provided for piers more than six (6) feet above ground level.

5.3.2.4 Recreational vehicles placed on sites within a SFHA shall either (i) be on the site for fewer than 180 consecutive days, and (ii) be fully licensed and ready for highway use, OR (iii) meet all the general standard of Section 5.1 and the elevation and anchoring requirement of Section 5.3.2.1, 5.3.2.2, and 5.3.2.3. A recreational vehicle is ready

### 5.3.3 Floodways

Located within Special Flood Hazard Areas (SFHA) are areas designated as floodways on the community's Flood Insurance Rate Maps (FIRM) or Flood Boundary and Floodway Maps (FBFM). Since the floodway is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles and has erosion potential, no encroachments, including fill, new construction, substantial improvements, repairs to substantially damaged structures and other developments shall be permitted unless certification, with supporting technical data, by a Connecticut licensed professional engineer is provided demonstrating that encroachments shall not result in any (0.00 feet) increase in flood levels during occurrence of the base flood discharge. Fences in the floodway must be aligned with the flow and be of an open design. A permit may be given which allows encroachments resulting in increases in base flood elevations provided the community first obtains a conditional floodway revision by meeting the requirements of C.F.R. 44, Chapter 1, Subsection 65.12.

#### 5.3.4 Standards for Development in Areas of Shallow Flooding (Zones AO and AH)

Located within the Special Flood Hazard Areas (SFHA) are areas designated as shallow flooding areas (AO and AH Zones). These areas have flood hazards associated with base flood depths of one (1) to three (3) feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and indeterminate. In AO and AH zones, the following provisions apply:

- 5.3.4.1 For residential structures, all new construction, substantial improvements and repair to structures that have sustained substantial damage shall have the lowest floor, including basement, elevated to the depth number specified on the Flood Insurance Rate Map (FIRM), in feet, above the highest adjacent grade. If no depth number is specified, the lowest floor, including basement, shall be elevated, at least two (2) feet above the highest adjacent grade.
- 5.3.4.2 For non-residential structures, all new construction, substantial improvements and repair to structures that have sustained substantial damage shall:
  - (a) Have the lowest floor, including basement, elevated to the depth number specified on the Flood Insurance Rate Map (FIRM), in feet, above the highest adjacent grade. If no depth number is specified, the lowest floor, including basement, shall be elevated at least two (2) feet above the highest adjacent grade; or
  - (b) Together with attendant utility and sanitary facilities be completely flood-proofed to or above the depth number, in feet, specified on the FIRM above the highest adjacent grade, or if no depth number is specified at least two (2) feet above the highest adjacent grade, so that any space below that level is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. Designs for complying with this requirement must be certified by either a Connecticut licensed professional engineer or architect.

- 5.3.4.3 On-site drainage for all proposed structures in AO and AH Zones located on slopes shall provide adequate drainage paths to guide flood waters around and away from such structures.

## **6.0 DESIGN STANDARDS FOR SUBDIVISION PROPOSALS**

If a proposed subdivision, including the placement of a manufactured home park or subdivision, is located in a Special Flood Hazard Area (SFHA) the following requirements shall apply:

- 6.1 All subdivision proposals shall be consistent with the need to minimize flood damage;
- 6.2 All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage;
- 6.3 All subdivision proposals shall have adequate drainage provided to reduce exposure to flood hazards; and
- 6.4 In all special flood hazard areas where base flood elevation (BFE) data is not available, the applicant shall provide a hydrologic and hydraulic engineering analysis performed by a Connecticut licensed professional engineer that generates BFEs for all subdivision proposals and other proposed development, including manufactured home parks and subdivisions. The **[title of local administrator]** shall require the applicant to provide BFE data for all subdivision proposals, including manufactured home parks and subdivisions, as per Section 4.5.12.

## **7.0 VARIANCE PROCEDURES**

### **7.1 ESTABLISHMENT OF VARIANCE PROCESS**

- 7.1.1 The **[local appeal board]**, as established by the **[Municipality]**, shall hear and decide appeals and requests for variances from the requirements of this **[ordinance/regulation]**.
- 7.1.2 The **[local appeal board]** shall hear and decide appeals when it is alleged there is an error in any requirement, decision or determination made by the **[title of local administrator]** in the enforcement or administration of this **[ordinance/regulation]**.
- 7.1.3 Any person aggrieved by the decision of the **[local appeal board]** or any person owning land which abuts or is within a radius of one hundred (100) feet of the land in question may appeal within fifteen (15) days after such decision to the State Superior Court of **[Judicial District]**, as provided in Section 8-8 of the General Statutes of Connecticut.
- 7.1.4 The **[local administrator]** shall maintain the records of all appeal actions and report any variances to the Federal Emergency Management Agency (FEMA) upon request.

### **7.2 SPECIFIC SITUATION VARIANCES**

#### **7.2.1 Buildings on a Historic Register**

Variances may be issued for the reconstruction, rehabilitation or restoration of structures listed on the National Register of Historic Places, the State Inventory of Historic Places, or any locally-adopted historic district without regard to the procedures set forth in the remainder of this section and provided the proposed reconstruction, rehabilitation or restoration will not result in the structure losing its historical designation.

#### **7.2.2 Functionally Dependent Use or Facility**

Variations may be issued for new construction and substantial improvements and other development necessary for the conduct of a functionally dependent use or facility provided the structure or other development is protected by methods that minimize flood damage, creates no additional threat to public safety and meet all the requirements of Section 8.4.

#### 7.2.3 Floodway Prohibition

Variations shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.

### 7.3 CONSIDERATIONS FOR GRANTING OF VARIANCES

In passing upon such applications, the [local appeal board] shall consider all technical evaluations, all relevant factors, all standards specified in other sections of this [ordinance/regulation] and the items listed below as 7.3.1 – 7.3.11. Upon consideration of these factors and the purposes of this [ordinance/regulation], the [local appeal board] may attach such conditions to the granting of variations as it deems necessary to further the purposes of this [ordinance/regulation].

- 7.3.1 The danger that materials may be swept onto other lands to the injury of others;
- 7.3.2 The danger to life and property due to flooding or erosion damage;
- 7.3.3 The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;
- 7.3.4 The importance of the services provided by the proposed facility to the community;
- 7.3.5 The necessity of the facility to waterfront location, in the case of a functionally dependent facility;
- 7.3.6 The availability of alternative locations not subject to flooding or erosion damage for the proposed use;
- 7.3.7 The compatibility of the proposed use with existing and anticipated development;
- 7.3.8 The relationship of the proposed use to the comprehensive plan and floodplain management program for that area;
- 7.3.9 The safety access to the property in times of flood for ordinary and emergency vehicles;
- 7.3.10 The expected heights, velocity, duration, rate of rise and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site; and
- 7.3.11 The costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, and streets and bridges.

## 7.4 CONDITIONS FOR VARIANCES

- 7.4.1 Variances shall only be used upon a determination that the variance is the minimum necessary to afford relief considering the flood hazard; and in the instance of a historical building, a determination that the variance is the minimum necessary as not to destroy the historic character and design of the building and result in the loss of historic designation of the building. Variances pertain to a piece of property and are not personal in nature. A properly issued variance is granted for a parcel of property with physical characteristics so unusual that complying with the regulation would create an exceptional hardship to the applicant or the surrounding property owners. Those characteristics must be unique to that property and not be shared by adjacent parcels. For example, economic or financial hardship is not sufficient cause for a variance, nor are inconvenience, aesthetic considerations, physical handicaps, personal preferences or disapproval of one's neighbors.
- 7.4.2 Variances shall only be used upon (i) a showing of good and sufficient cause, (ii) a determination that failure to grant the variance would result in exceptional hardship, and; (iii) a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisance, damage the rights or property values of other persons in the area, cause fraud on or victimization of the public, or conflict with existing local laws, ordinances or regulations. Only hardships that are based on unusual or unique physical characteristics of the property in question, characteristics that are not shared by adjacent parcels, shall qualify to meet subsection (ii) above. Claims of hardship based on the structure, on economic gain or loss, or on personal or self-created circumstances are not sufficient cause for the granting of a variance.
- 7.4.3 No variance may be issued within a regulatory floodway that will result in any increase in the 100-year flood levels. A variance may be issued for new construction, substantial improvements and other development necessary for the conduct of a "functionally dependent use" provided that there is good and sufficient cause for providing relief; and the variance does not cause a rise in the 100-year flood level within a regulatory floodway. The structure and other development must be protected by methods that minimize flood damages.
- 7.4.4 Any applicant to whom a variance is granted shall be given written notice that the structure will be permitted to be built with the lowest floor elevation below the base flood elevation (BFE) and the elevation, and that the cost of flood insurance will be commensurate with the increased risk resulting from the lowest floor elevation.

## 8.0 ENFORCEMENT

- 8.1 Each **[Floodplain/Development/Building/Zoning]** Permit shall authorize, as a condition of approval, the **[title of local administrator]** or designated agents to make regular inspections of the subject property. The **[title of local administrator]** or designated agents are also authorized to inspect any property in a Special Flood Hazard Area (SFHA) where it appears that violations of these regulations may be taking place.
- 8.2 If the **[title of local administrator]** finds that any person is undertaking any construction,

substantial improvement, filling, or any other activity or maintaining a condition which in violation of these regulations, the **[title of local administrator]** shall:

- 8.2.1 Issue a written order by certified mail, return receipt requested, to the subject property owner, ordering that the activity cease and ordering the property owner to either seek to obtain a **[Floodplain Development/Building/Zoning]** Permit prior to continuing with the activity or, if appropriate, ordering that all violations and/or obstructions be removed from the Special Flood Hazard Area (SFHA) immediately.
- 8.2.2 Notify the **[Building Official/Inspector]** and request that any **[floodplain/building/zoning/development]** permit(s) in force be revoked or suspended and that a stop work order be issued.
- 8.2.3 The **[title of local administrator]** may suspend or revoke a Floodplain Development Permit if it is found that the applicant has not complied with the terms, conditions or limitations set forth in the permit or has exceeded the scope of work as set forth in the application including application plans. Prior to revoking any permit, the **[title of local administrator]** shall issue notice to the permittee, personally or by certified mail, return receipt requested, setting forth the facts or conduct which warrants the intended action.
- 8.2.4 Failure to comply with any written order issued under this section shall be considered a violation of these regulations and is subject to the penalties described in Section 10.0.
- 8.2.5 In the event violations or obstructions are not promptly removed from the Special Flood Hazard Area (SFHA), the **[title of local administrator]** may cause such removal and remediation work to be performed utilizing bond money held in escrow pursuant to Section 3.0 of this **[ordinance/regulation]**, or may direct the **[director of public works or appropriate agent]** to cause such work to be done and to place a lien against the property.
- 8.2.6 Any person subjected to enforcement action pursuant to this **[ordinance/regulation]**, may appeal any requirement, decision, or determination of the **[title of local administrator]** to the **[local appeals board]**, in accordance with Section 6.0 of this **[ordinance/regulation]**. Such person shall provide such information as necessary including appropriate certifications from a registered professional engineer or architect in order to substantiate the claim that the requirement, decision, or determination of the **[title of local administrator]** was in error or unwarranted.

## 9.0 **PENALTIES FOR VIOLATION**

Any violation of the provisions of this **[ordinance/regulation]** or failure to comply with any of its requirements, including violation of conditions and safeguards established in connection with grant of variances or special exceptions, shall constitute a misdemeanor. Any person who violates this **[ordinance/regulation]** or fails to comply with any of its requirements shall, upon conviction thereof, be fined a penalty of **[\$250.00]** per day **[or imprisoned for not more than ten (10) days]**

**for each day of violation, or both,]** and in addition shall pay all costs and reasonable legal fees involved in the case. Nothing herein contained shall prevent the **[Municipality]** from taking such lawful action as is necessary to prevent or remedy any violation.

**STATE OF CONNECTICUT  
DEPARTMENT OF ENVIRONMENTAL PROTECTION**

**HIGHER REGULATORY STANDARDS FOR USE WITH MODEL  
FLOODPLAIN MANAGEMENT REGULATIONS**

**Inland/Riverine Community (A Zones only)  
Level "D" Community**

**April 2007**

## **FLOODWAY RESTRICTIONS**

The boundaries of the floodway are determined by simulating encroachments, or loss of conveyance, on each side of the floodplain. Portions of the floodplain are assumed in the model to be “filled in” or otherwise obstructed on each side resulting in equal reductions in conveyance of floodwaters. Under NFIP minimum standards, the allowable degree of encroachment is “limited” by a maximum increase in water surface elevation of one foot at any point along the watercourse. This concept was developed on the concept that increases of less than one foot would not result in dangerous increases in flood flow velocity. However, since the studies developed using this concept did not account for watershed hydrology changes such as increased runoff, use of the one foot rise floodway may allow for too much development in the flood fringe, reducing floodwater storage capacity and accelerating flood flow velocity, leading to actual flood increases of well over one foot, as well as increased erosion and other detrimental impacts. A community may impose stricter floodway standards than the NFIP minimum of one foot of rise. **A new floodway standard can impose no rise or a lower rise, such as 0.5 foot, 0.1 or 0.01 foot.** Generally, the smaller the allowable rise, the greater the portion of the 100-year floodplain that is reserved as floodway. Stricter regulations can prohibit all development within the floodway, with a **0.00 foot** rise.

*MODEL LANGUAGE: Change the standard one (1.0) foot rise in sections 5.2.2 and 5.2.3 to a lower number, such as 0.5, 0.1, 0.01 or 0.00 foot.*

### **5.2 STANDARDS FOR WATERCOURSES WITHOUT ESTABLISHED BASE FLOOD ELEVATIONS (UN-NUMBERED A ZONE) OR WITH FLOOD ELEVATIONS BUT NO ADOPTED FLOODWAY**

5.2.2 When BFEs have been determined within Zones A1-30 and AE on the community’s FIRM but a regulatory floodway has not been designated, the **[title of local administrator]** must require that no new construction, substantial improvements, repair to structures which have sustained substantial damage or other development, including fill, shall be permitted which will increase the water surface elevation of the base flood more than **one (1.0)** foot at any point within the community when all existing and anticipated development is considered cumulatively with the proposed development.

5.2.3 The **[title of local administrator]** may request floodway data of an applicant for watercourses without FEMA-published floodways. When such data is provided by an applicant or whenever such data is available from any other source (in response to the municipality’s request or not), the community shall adopt a regulatory floodway based on the principle that the floodway must be able to convey the waters of the base flood without increasing the water surface elevation more than **one (1.0)** foot at any point along the watercourse.

## FREEBOARD

Freeboard is an additional height requirement above the base flood elevation (BFE) that provides a margin of safety against unknown risks. Freeboard requirements of at least one foot for new or substantially improved structures can be used to account for future floodplain development, uncertainties with the flood modeling methodologies, and factors that could contribute to flood heights greater than the base flood such as wave action, obstructed bridge openings, debris and ice jams and the effects of urbanization in a watershed.

*MODEL LANGUAGE: Change standard language in sections 5.3.1.1, 5.3.1.2, 5.3.2.1 (and 5.3.5.1 and 5.3.5.2 if applicable to your community) to one foot above the base flood elevation (BFE). Two or three feet above BFE is also acceptable.*

### 5.3 SPECIFIC STANDARDS

Construction Standards in Special Flood Hazard Areas (SFHA), Zones A, A1-30, AE.

#### 5.3.1.1 Residential Construction.

All new construction, substantial improvements, and repair to structures that have sustained substantial damage which are residential structures shall have the bottom of the lowest floor, including basement, elevated **one foot above** the base flood elevation (BFE). Electrical, plumbing, machinery or other utility equipment that service the structure must be elevated to or above the BFE.

#### 5.3.1.2 Non-Residential Construction.

All new construction, substantial improvement, and repair to structures that have sustained substantial damage which are commercial, industrial or non-residential structures shall:

- (a) Have the bottom of the lowest floor, including basement, elevated **one foot above** the base flood elevation (BFE); or

#### 5.3.2 Manufactured (Mobile) Homes and Recreational Vehicles (RVs).

5.3.2.1 In all Special Flood Hazard Areas (SFHA), any manufactured (mobile) homes to be newly placed, undergoing a substantial improvement or repaired as a result of substantial damage, shall be elevated so that the bottom of the lowest floor is **one foot above** the base flood elevation (BFE). The manufactured home must also meet all the construction standards per Section 5.3.1. This includes SFHAs outside a manufactured home park or subdivision, in a new manufactured home park or subdivision, in an expansion to an existing manufactured home park or subdivision, or on a site in an existing park which a manufactured home has incurred substantial damage as a result of a flood.

#### 5.3.4 Standards for Development in Areas of Shallow Flooding (Zones AO and AH)

Located within the Special Flood Hazard Areas (SFHA) are areas designated as shallow flooding areas (AO and AH Zones). These areas have flood hazards associated with base flood depths of one (1) to three (3) feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and indeterminate. In AO and AH zones, the following provisions apply:

- 5.3.4.1 For residential structures, all new construction, substantial improvements and repair to structures that have sustained substantial damage shall have the lowest floor, including basement, elevated to **one foot above** the depth number specified on the Flood Insurance Rate Map (FIRM), in feet, above the highest adjacent grade. If no depth number is specified, the lowest floor, including basement, shall be elevated, at least **three (3)** feet above the highest adjacent grade.
- 5.3.4.2 For non-residential structures, all new construction, substantial improvements and repair to structures that have sustained substantial damage shall:
- (a) Have the lowest floor, including basement, elevated to **one foot above** the depth number specified on the Flood Insurance Rate Map (FIRM), in feet, above the highest adjacent grade. If no depth number is specified, the lowest floor, including basement, shall be elevated at least **three (3)** feet above the highest adjacent grade; or
  - (b) Together with attendant utility and sanitary facilities be completely flood-proofed to or above the depth number, in feet, specified on the FIRM above the highest adjacent grade, or if no depth number is specified at least **three (3)** feet above the highest adjacent grade, so that any space below that level is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. Designs for complying with this requirement must be certified by either a Connecticut licensed professional engineer or architect.

#### **CUMULATIVE SUBSTANTIAL IMPROVEMENT RULE**

A single large improvement or repair project is clearly a substantial improvement no matter how many separate permits are issued. However, the NFIP regulations do not require that smaller individual improvements made over a period of years and that add up to 50% be considered a substantial improvement. Theoretically, the property owner could beat the system by applying for a 40% improvement project one year and applying for another 40% project the next year. Communities can reduce flood damage by counting improvement and repair projects cumulatively so that buildings will be brought into compliance sooner. The State of Connecticut recommends in this model that municipalities calculate substantial improvements over a 10-year period (FEMA is a one year minimum). However, this number can be higher, such as 15, 20, 25 year or over the life of the structure.

*Model Definition: Change the bolded text to the desired length of time to calculate a*

*substantial improvement. One year is the FEMA NFIP minimum standard. The State of Connecticut model recommendation is 10 years.*

**Substantial Improvement** – Any combination of repairs, reconstruction, rehabilitation, alterations, additions or other improvements to a structure, taking place during a **ten (10) year** period, in which the cumulative cost equals or exceeds fifty (50) percent of the market value of the structure as determined at the beginning of such **ten (10) year** period. This term includes structures that have incurred “substantial damage”, regardless of the actual repair work performed. For purposes of this definition, “substantial improvement” is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include either: (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions; or (2) Any alteration of a “historic” structure, provided that the alteration will not preclude the structure’s continued designation as a “historic structure”.

#### **LOWER SUBSTANTIAL IMPROVEMENT & SUBSTANTIAL DAMAGE THRESHOLD**

Another way to bring more buildings into compliance with the standards for new construction is to use a lower number than 50% in the substantial improvement and substantial damage requirement. A building is more likely to be brought up to code sooner if the threshold is lower, such as 25%, 30% or 40%. In communities with many older buildings that are exposed to flood damage, this is an effective means of speeding up compliance. The substantial improvement exceptions for historic structures and previously identified code violations can also be eliminated from the definition in order to bring more buildings into compliance sooner.

*Model Definitions: Change the percent improvement or damage to a number lower than 50% as noted below. The substantial improvement exceptions for historic structures and previously identified code violations can also be eliminated from the definition in order to bring more buildings into compliance sooner. The bolded text at the end of the substantial improvement definition can be removed.*

**Substantial Damage** – Damage of any origin sustained by a structure, whereby the cost of restoring the structure to its pre-damaged condition would equal or exceed **fifty (50) percent** of the market value of the structure before the damage occurred.

**Substantial Improvement** – Any combination of repairs, reconstruction, rehabilitation, alterations, additions or other improvements to a structure, taking place during a ten (10) year period, in which the cumulative cost equals or exceeds **fifty (50) percent** of the market value of the structure as determined at the beginning of such ten (10) year period. This term includes structures that have incurred “substantial damage”, regardless of the actual repair work performed. For purposes of this definition, “substantial improvement” is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. **The term does not, however, include either: (1) Any project for improvement of a structure to correct existing violations of state or local**

**health, sanitary, or safety code specifications code enforcement official and which are the minimum necessary to assure safe living conditions; or (2) Any alteration of a “historic” structure, provided that the alteration will not preclude the structure’s continued designation as a “historic structure”.**

## **DRY LAND ACCESS**

Fire prevention, evacuation and rescue operations are common emergency response activities associated with flooding. The success of these efforts greatly depends on readily available access. To ensure access, some communities have enacted provisions requiring that all roads and other access facilities are elevated to or above the base flood elevation.

*Model Language: Add Sections 4.4.1.7 and Section 5.1.15.*

4.4.1.5A statement as to whether or not there will be dry land access to the structure during the 100-year flood event. **Dry land access must be provided in Zones A, AE, A1-30, AO and AH;**

**5.1.15 Dry Land Access. Each new residential or non-residential development in the Special Flood Hazard Area (Zones A, A1-30, AE, AO, AH) shall have direct access to a walkway, driveway, or roadway whose surface elevation is not less than the base flood elevation (BFE) and such escape route shall lead directly out of the floodplain area.**

## **MAINTAIN ELEVATION CERTIFICATES & FLOODPROOFING CERTIFICATES**

Maintaining FEMA Elevation Certificates and Floodproofing Certificates on file in the municipality aids both local officials and residents to find elevation and floodproofing data for a structure.

**Model Language: Add bold text to Section 4.4.2.1 (a) and (b). Add bolded text to Sections 4.5.8 and 4.5.9.**

### **4.4.2 Construction Stage**

Upon completion of the applicable portion of construction, the applicant shall provide verification to the **[title of local administrator]** of the following as is applicable:

4.4.2.1. Lowest floor elevation shall be verified for:

- (a) A structure in Zones A, AE, A1-30, AO or AH is the top of the lowest floor (including basement). **An elevation certificate prepared by a Connecticut licensed land surveyor, engineer or architect must be provided;**
- (b) A non-residential structure which has been dry flood-proofed is the elevation to which the flood-proofing is effective ((Note: For insurance purposes, a dry flood-proofed, non-residential structure is rated based on the elevation of its lowest floor unless it is floodproofed to one foot above the BFE). **A FEMA**

**Floodproofing Certificate (FEMA Form 81-65) prepared by a Connecticut licensed engineer or architect must be provided;**

- 4.5.8 Obtain, record and maintain the elevation (in relation to mean sea level) of the lowest floor (including basement) of all new construction, substantial improvements or repair to a structure that has sustained substantial damage. **The [title of local administrator] shall require and maintain Elevation Certificates provided by the applicant and prepared by a Connecticut licensed land surveyor, engineer or architect containing this information.**
- 4.5.9 Obtain, record and maintain the elevation (in relation to mean sea level) to which the new construction, substantial improvement or repair to a structure that has sustain substantial damage has been flood-proofed. **The [title of local administrator] shall require and maintain FEMA Floodproofing Certificates for Non-Residential Structures (FEMA Form 81-65). Floodproofing Certificate provided by the applicant and prepared by a Connecticut licensed engineer or architect containing this information.**

### ENGINEERED FOUNDATIONS

Proper foundation design and construction is critical for building “survivability” in the event of a flood. The advantage of better foundation design is essentially a hardened building envelope that can survive floodwater pressures and debris impacts on exterior walls and foundation members. This in turn reduces the potential for structural failure, which by itself can lead to failure of load bearing supports, floor and wall to foundation connections, and ultimately floodwater intrusion into the structure. Stronger foundations mean less flood damage, fewer repair costs, building sustainability, and protection of the investment.

*Model Language: Add the bolded text as 4.4.1.6 (d).*

- 4.5.8.1 Where applicable the following certifications by a Connecticut registered engineer or architect are required, and must be provided to the [title of local administrator]. The design and methods of construction must be certified to be in accordance with accepted standards of practice and with the provisions of Section 5.3.
- (a) Non-residential flood-proofing must meet the provisions of Section 5.3.1.2;
  - (b) Fully enclosed areas below the base flood elevation (BFE) must meet the minimum design criteria in Section 5.3.1.3;
  - (c) No (0.00) increase in floodway heights are allowed. Any development in a floodway must meet the provisions of Section 5.3.5;
  - (d) Support structures and other foundation members shall be certified by a registered professional engineer or architect as designed in accordance with ASCE24, Flood Resistant Design and Construction.**

### PROHIBITING FULLY ENCLOSED AREAS BELOW BASE FLOOD ELEVATION

Fully enclosed areas below the base flood elevation, which are to be unfinished spaces allowed to

flood, are often converted to finished living space by owners after the certificate of occupancy is given or by a new owner who is unaware of the restrictions on this space. Prohibiting the construction of these areas eliminates this problem.

*MODEL LANGUAGE: Change Section 5.3.1.3 to the bold text below.*

**5.3.1.3 Fully Enclosed Areas Below The Base Flood Elevation (BFE) are prohibited for all new construction, substantial improvements, or repairs of substantial damage to residential or non-residential structures. These areas are formed by solid foundation walls below the base flood elevation that are designed to allow for the automatic entry and exit of flood waters and do not contain finished living space.**

### **MANUFACTURED (MOBLE) HOMES AND RECREATIONAL VEHICLES**

Manufactured (mobile) homes and recreational vehicles intended to be improved property can be very susceptible to flood damage if not adequately anchored and elevated. Many municipalities prohibit these structures entirely in the SFHA.

*Model Language: Delete current language under Section 5.3.2 and add the following.*

- 5.3.2.1 Manufactured (Mobile) Homes are prohibited in all Special Flood Hazard Areas (SFHAs). This includes SFHAs in outside a manufactured home park or subdivision, in a new manufactured home park or subdivision, in an expansion to an existing manufactured home park or subdivision, or on a site in an existing park which a manufactured home has incurred substantial damage as a result of a flood.
- 5.3.2.2 Recreational vehicles placed on a site in a SFHA for one hundred and eighty (180) consecutive days or longer and intended to be improved property are prohibited. Recreational vehicles placed on sites in SFHA for fewer than 180 consecutive days must be fully licensed and ready for highway use. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.

### **PROTECTING CRITICAL FACILITIES**

Certain facilities are considered to be critical developments because they are critical to the community's public health and safety, are essential to the orderly functioning of a community, store or produce highly volatile, toxic or water-reactive materials, or house occupants that may be insufficiently mobile to avoid loss of life or injury. Examples of these facilities include: jails, hospitals, fire stations, police stations, nursing homes, wastewater treatment facilities, drinking water plants, and gas/oil/propane storage facilities.

*Model Definition: Add the following definition for a Critical Facility.*

**Critical Facility – A development which is critical to the community's public health and**

safety, are essential to the orderly functioning of a community, store or produce highly volatile, toxic or water-reactive materials, or house occupants that may be insufficiently mobile to avoid loss of life or injury. Examples of critical facilities include: jails, hospitals, fire stations, police stations, nursing homes, wastewater treatment facilities, drinking water plants, and gas/oil/propane storage facilities.

*Model Language: Add either of the following as Section 5.3.5 – Critical Facilities.*

**5.3.5** Critical facilities shall be elevated or dry floodproofed to the 500-year flood elevation or be elevated to the highest known historical flood elevation (where records are available), whichever is greater. If no data exists establishing the 500-year flood elevation or the highest known historical flood elevation, the applicant shall provide a hydrologic and hydraulic engineering analysis that generates 500-year flood elevation data. Such facilities must also be located and constructed to be safely accessed and evacuated at any time during the 500-year flood event.

OR

**5.35** Critical facilities are prohibited in all Special Flood Hazard Areas (SFHA).

### FILL

The minimum NFIP regulations do not address the placement of fill. Fill in the floodplain causes several problems including adverse impacts on adjacent property owners, water quality impacts (increased turbidity and siltation) and loss of flood storage capacity. Fill standards generally address quantity, quality, location, stability and compaction of fill. FEMA's Technical Bulletin 10-01, *Ensuring that Structures Built on Fill in or near Special Flood Hazard Areas are Reasonably Safe from Flooding*, contains fill quality and compaction standards.

*Model Language: Add the following as Section 5.3.6.*

**5.3.6** Standards for the Placement of Fill in the Special Flood Hazard Area, Zones A, A1-30, and AE.

The following standards apply to all fill activities in the Special Flood Hazard Area:

- (a) Fill material, upon which structures will be constructed or placed, must be compacted to 95 percent of the Maximum Dry Density obtainable with the Standard Proctor Test method according to the ASTM Standard D-698 or an acceptable equivalent method. Fill soils must be fine-grained soils of low permeability, such as those classified as CH, CL, SC, or ML according to ASTM Standard D-2487, *Classification of Soils for Engineering Purposes*.
- (b) Fill slopes shall not be steeper than one foot vertical to two feet horizontal.
- (c) Adequate protection against erosion and scour is provided for fill slopes. When expected velocities during the occurrence of the base flood of five feet per second armoring with stone or rock protection shall be provided. When expected velocities during the base flood are five feet per second or less

- protection shall be provided by covering them with vegetative cover.
- (d) Fill shall be composed of clean granular or earthen material. Fill material must be homogeneous and isotropic. The soil must be all of one material and the engineering properties must be the same in all directions.**

## **SUBDIVISION REGULATIONS**

The NFIP does contain minimum federal regulations for subdivisions in floodplains. The following are some additional requirements.

*Model Language: Add the following bolded text to Section 6.0 – Design Standards for Subdivision Proposal.*

### **6.0 DESIGN STANDARDS FOR SUBDIVISION PROPOSALS**

If a proposed subdivision is located in a Special Flood Hazard Area (SFHA) the following requirements shall apply:

- 6.1 All subdivision proposals shall be consistent with the need to minimize flood damage;
- 6.2 All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage;
- 6.3 All subdivision proposals shall have adequate drainage provided to reduce exposure to flood hazards; and
- 6.4 In all special flood hazard areas where base flood elevation (BFE) data is not available, the applicant shall provide a hydrologic and hydraulic engineering analysis performed by a Connecticut licensed professional engineer that generates BFEs for all subdivision proposals and other proposed development, including manufactured home parks and subdivisions. **The [title of local administrator] shall require the applicant to provide BFE data for all subdivision proposals, including manufactured home parks and subdivisions, as per Section 4.5.12.**
- 6.5 All subdivision proposals shall provide the boundary of the SFHA, the floodway boundary, and base flood elevation.**
- 6.6 Approval shall not be given for streets within a subdivision which would be subject to flooding. All street surfaces must be located at or above the base flood elevation.**
- 6.7 In subdivisions, all proposed lots or parcels that will be future building sites shall have a minimum buildable area outside the natural (non-filled) 100-year floodplain. The buildable area shall be large enough to accommodate any primary structures and associated structures such as sheds, barns, swimming pools, detached garages, on-site sewage disposal systems, and water supply wells, if applicable.**

## **USE RESTRICTIONS**

Some uses should be prohibited or limited in the floodplain because they are dangerous to health, safety or property during a flood. Some examples are critical facilities or dangerous materials but more can be added. Chemicals such as fuels, paints, oils, fertilizers, and other toxic substances in

flood waters become absorbed into walls and other surfaces, leading to residual deposits, biological and chemical contamination, and odors that can render a structure unsafe and uninhabitable, with extensive cleanup and environmental health costs. Hazardous chemical materials are best kept out of any known flood risk areas but at minimum should be stored in floodproofed containers above the base flood elevation and outside of the floodway.

There are several ways in which materials storage affects flood damages. Many types of materials used in construction activities, for example, can easily float off site during a flood, becoming flood borne debris. Such debris collects against bridges, fences, and in channels and culverts, causing blockages that may increase flood stages upstream and in higher velocity flood zones, can cause impact damage to buildings and other structures and choke off a stream's carrying capacity, increasing flood stages. Examples would include lumber yards, building supply centers, and manufacturing facilities.

*Model Definitions: Add the following definitions for Critical Facility and Dangerous Material.*

**Critical Facility** – A development which is critical to the community's public health and safety, are essential to the orderly functioning of a community, store or produce highly volatile, toxic or water-reactive materials, or house occupants that may be insufficiently mobile to avoid loss of life or injury.

**Examples of critical facilities include:** jails, hospitals, fire stations, police stations, nursing homes, wastewater treatment facilities, drinking water plants, and gas/oil/propane storage facilities.

**Dangerous Material** – Any material or substance which may pose an unreasonable risk to the health and safety of individuals, property, water supplies and/or the environment if discharged or released. These materials or substances may be defined as explosive, blasting agent, flammable gas, non-flammable gas, combustible liquid, flammable liquid, flammable solid, organic peroxide, oxidizer, poison, irritating material, etiologic agent, radioactive material, corrosive material, other regulated material.

*Model Language: Add the following as Section 5.3.8*

#### **5.3.8 Prohibited Uses**

The following uses are prohibited in the Special Flood Hazard Area (SFHA):

- (a) Storage or processing of dangerous materials.
- (b) Critical facilities.
- (c) The storage of material or equipment that, in time of flooding, could become buoyant and pose an obstruction to flow in identified floodway areas is prohibited. Construction materials and inventory at lumber yards, building supply centers, manufacturing facilities, and landscaping or garden supply stores are included. Storage of material or equipment not otherwise prohibited shall be firmly anchored to prevent flotation or lateral movement.

*Or*

**5.3.8 Special Provisions Applicable to Dangerous Materials. All new construction, substantial improvements, or repair to a structure that has sustained**

**substantial damage, including underground storage facilities, which will be used for the production or storage of any substance defined as a "Dangerous Material" shall be prohibited in any Special Flood Hazard Area (SFHA). All such structures and facilities shall be prohibited within any SFHA unless those portions of the structure or facility used for the production or storage of any dangerous material or substance are elevated or dry floodproofed to or above the elevation of the 500-year flood, and so designed as to prevent pollution from the structure or facility during the event of the 500-year flood. All new and substantially improved underground storage facilities shall be prohibited within any SFHA unless designed and constructed to withstand the flood depths, pressures, velocities, impact and uplift forces and other factors associated with the 500-year flood, and to prevent the infiltration of flood waters into the facilities and discharges from the facilities to flood waters. Specifically exempt from this section is oil or petroleum liquids of a volume of not more than 550 gallons, stored in interior storage facilities and used solely for on-site heating or intermittent stationary power production.**

**STATE OF CONNECTICUT  
NATIONAL FLOOD INSURANCE PROGRAM (NFIP)  
ORDINANCE / REGULATION REVIEW CHECK LIST**

**COMMUNITY:** \_\_\_\_\_ **CIRCLE ONE: Ordinance / Regulation**  
**EFFECTIVE DATE OF ORDINANCE/REGULATION:** \_\_\_\_\_  
**COMMUNITY LEVEL (D or E):** \_\_\_\_\_ (*D = A Zones Only, E = A Zones & V Zones*)  
**REVIEWER'S NAME:** \_\_\_\_\_ **REVIEW DATE:** \_\_\_\_\_

ITEM DESCRIPTION <i>[Note that the "Item Description" is a synopsis of the regulatory requirements and should not be construed as a complete description. Refer to the actual language in 44 CFR Chapter 1, Parts 59.1 &amp; 60.3. (December 6, 2002 Edition)]</i>	COMMUNITY LEVEL		APPLICABLE SECTION OF ORDINANCE OR REGULATION
	D	E	
1. Require permits for all proposed construction and other developments, including placement of manufactured homes, within SFHAs on the FIRM. [60.3 (b)(1)]			
2. Review proposed development to assure that all necessary permits have been received from other State and Federal agencies from which approval is required. [60.3(a)(2)]			
3. Review all permit applications to determine whether proposed building sites will be reasonably safe from flooding. Require that all new construction and substantial improvements in flood-prone areas:			
(a) Be designed and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. [60.3(a)(3)(i)]			
(b) Be constructed with materials resistant to flood damage. [60.3(a)(3)(ii)]			
(c) Be constructed by methods and practices that minimize flood damages. [60.3(a)(3)(iii)]			
(d) Be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located to prevent water from entering or accumulating within the components during conditions of flooding. [60.3(a)(3)(iv)]			
4. Require new and replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the systems. [60.3(a)(5)]			
5. Require new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters. [60.3(a)(6)(i)]			
6. Require on-site waste disposal systems be located to avoid impairment to them or contamination from them during flooding. [60.3(a)(6)(ii)]			
7. In the absence of base flood elevation and floodway data, obtain, review and utilize any data available from a Federal, State, or other source to assure that new or substantially improved residential structures are elevated to or above the base flood elevation and non-residential structures are either elevated or flood-proofed to or above the BFE. [60.3(b)(4)]			

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8. Where base flood elevation data is utilized, obtain and maintain records of the lowest floor and flood-proofing elevations for new construction and substantial improvements. [60.3(b)(5)(i)(ii)(iii)]			
9. Notify adjacent communities and the CTDEP prior to any alteration or relocation of a watercourse. [60.3(b)(6)]			
10. Assure that the flood carrying capacity within the altered or relocated watercourse is maintained. [60.3(b)(7)]			
11. Require all new construction and substantial improvements of <b>residential</b> structures within A1-30, AE, and AH Zones have the lowest floor, including basement, elevated to or above the base flood elevation. [60.3(c)(2)]			
12. Require all new construction and substantial improvements of <b>non-residential</b> structures within A1-30, AE, and AH Zones: (i) have their lowest floor, including basement, elevated to or above the base flood elevation <b>OR</b> , (ii) together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. [60.3(c)(3)]			
13. Require certification by a registered professional engineer or architect where a <b>non-residential</b> structure is intended to be made watertight below the base flood elevation that the design and method of construction meet the requirements of 60.3(c)(3). <i>See Item 12 above for requirements.</i> [60.3(c)(4)]			
14. Require for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for the parking of vehicles, building access, or limited storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of flood waters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect, or meet or exceed the following criteria: a minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of flood waters. [60.3(c)(5)]			
15. In AO Zones, require all new construction and substantial improvements of <b>residential</b> structures have their lowest floor, including basement, elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least 2 feet if no depth number is specified). [60.3(c)(7)] <i>Note: Not required if the community has no AO zones.</i>			

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<p>16. In AO Zones, require all new construction and substantial improvements of <b><i>non-residential</i></b> structures: (i) have their lowest floor, including basement, elevated above the highest adjacent grade at least as high as the depth number specified in feet on the FIRM (at least 2 feet if no depth number is specified), <b>OR</b> (ii) together with attendant utility and sanitary facilities be completely flood-proofed to that level.  [60.3(c)(8)] <i>Note: Not required if community has no AO zones.</i></p>			
<p>17. In AO and AH Zones, require adequate drainage paths around structures on slopes, to guide water around and away from structures. [60.3(c)(11)] <i>Note: Not required if no AO or AH zones.</i></p>			
<p>18. Require all manufactured homes be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. [60.3(b)(8)]</p>			
<p>19. Require that manufactured homes placed or substantially improved within Zones A1-30, AH and AE which meet one of the following location criteria:  (i) Outside of a manufactured home park or subdivision,  (ii) In a new manufactured home park or subdivision,  (iii) In an expansion to an existing manufactured home park or subdivision, or  (iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred substantial damage as a result of a flood,   be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement. [60.3(c)(6)]</p>			
<p>20. Require all recreational vehicles placed on sites within Zones A1-30, AH and AE must be either: (i) on the site for fewer than 180 consecutive days, and be fully licensed and ready for highway use, <b>OR</b> (ii) meet the elevation and anchoring requirements of a manufactured home. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions. [60.3(c)(14)]</p>			
<p>21. Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the base flood elevation more than 1 foot at any point in the community.  [60.3(c)(10)] <i>Note: Not required if all floodways are designated.</i></p>			
<p>22. Select and adopt a regulatory floodway that must carry the waters of the base flood without increasing the base flood elevation more than 1 foot at any point. [60.3(d)(2)]</p>			

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23. In a regulatory floodway, prohibit any encroachments, including fill, new construction, substantial improvements and other developments, unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any (0.00) increase in flood levels during the base flood discharge. [60.3(d)(3)]			
24. Review subdivision proposals to assure that: (a) Such proposals minimize flood damage. [60.39(a)(4)(i)]			
(b) All public utilities and facilities are located & constructed to minimize or eliminate flood damage. [60.3(a)(4)(ii)]			
(c) Adequate drainage is provided. [60.3(a)(4)(iii)]			
25. Require base flood elevation data for all new subdivision proposals and other proposed developments greater than 50 lots or 5 acres, whichever is the lesser. [60.3(b)(3)]			
26. In Zones V1-30, VE, and V, obtain & maintain the elevation of the bottom of the lowest structural member of the lowest floor of all new & substantially improved structures. [(60.3(e)(2)]			
27. In Zones V1-30, VE, and V, require that all new construction and substantial improvements are elevated on pilings or columns so that: (a) The bottom of the lowest horizontal structural member of the lowest floor is elevated to or above the base flood elevation and the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse & lateral movement due to the effects of wind & water loads acting simultaneously on the building. [(60.3(e)(4)]			
(b) A registered professional engineering or architect shall develop or review the structural design and certify that the design and methods of construction meet the elevation and anchoring requirements at 60.3(e)(4)(i)&(ii). [(60.3(e)(4)]			
(c) Have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. A breakaway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. [(60.3(e)(5)]			
28. In Zones V1-30, VE, and V:			
(a) All new construction is located landward of the reach of mean high tide. [(60.3(e)(3)]			
(b) Prohibit the use of fill for structural support of buildings. [(60.3(e)(6)]			
(c) Prohibit the alternation of sand dunes which would increase potential flood damage. [(60.3(e)(7)]			
29. Require that manufactured homes placed or substantially improved within Zones V1-30, V and VE, which meet one of the following location criteria: (i) Outside a manufactured home park or subdivision,			

(ii) In a new manufactured home park or subdivision, (iii) In an expansion to an existing manufactured home park or subdivision, or (iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred substantial damage as a result of a flood, meet the standards in 60.3(e)(2)-(7). <i>(Items 26, 27 &amp; 28 above)</i> [60.3(e)(8)]			
30. Require all recreational vehicles to be placed on sites within Zones V1-30, V, and VE must be either: (i) on site for fewer than 180 consecutive days, be fully licensed and ready for highway use, <b>OR</b> (ii) meet the elevation and anchoring requirements of a manufactured home. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions. [60.3(e)(9)]			
31. Adopt or reference the correct maps and date. [60.3(b)]			
32. Adopt or reference the correct Flood Insurance Study (FIS) and date. [60.3(c)]			
33. Following map date: "and any subsequent revision thereto, are adopted by reference and declared to be a part of this ordinance/regulation. Since mapping is legally adopted by reference into this ordinance/regulation it must take precedence when more restrictive until such time as a map amendment is obtained."			
34. Citation of Statutory Authorization.			
35. Variance section with elevation criteria and insurance notice. [60.6(a)]			
36. Adequate enforcement provisions including a violations and penalty section specifying actions community will take to assure compliance.			
37. Framework for administrating the ordinance (permit system, office for administering the ordinance, etc.)			
38. Effective Date of Ordinance or Regulation			
39. Adoption Date of Ordinance or Regulation			
40. Signature of Appropriate Official(s) and Certification.			
41. Purpose Section Citing Health, Safety, and Welfare Reasons for Adoption.			
42. Disclaimer of Liability Section.			
43. Abrogation and Greater Restriction Section.			
44. Severability Section.			
45. Compensatory Storage (CT 5.1.13)			
46. Equal Conveyance (CT 5.1.14)			
47. Above ground oil tanks (CT 5.1.9) optional, CT recommends			
48. Portion of Structure in Flood Zone (CT 5.1.11) optional			
49. Structures in 2 Flood Zones (CT 5.1.12) optional			
52. No Structures Entirely or Partially over water (CT 5.1.4) opt.			
<b>REQUIRED DEFINITIONS</b>	<b>Y/N</b>	<b>***</b>	<b>APPLICABLE SECTION</b>
*** A = Add, C=Clarify, N/A= Not Applicable, R=Remove			
Area of Shallow Flooding ( <i>community with AO, AH, VO Zones</i> )			
Base Flood			

Base Flood Elevation (BFE)			
Basement			
Breakaway Wall ( <i>community with V Zones</i> )			
Building			
Coastal High Hazard Area ( <i>community with V Zones</i> )			
Cost ( <i>optional, CT recommended</i> )			
Development			
Existing Manufactured Home Park or Subdivision			
Expansion to an Existing Manufactured Home Park or Subdivision			
Federal Emergency Management Agency (FEMA)			
<i>Finished Living Space (optional, CT recommended)</i>			
Flood or Flooding			
Flood Insurance Rate Map (FIRM)			
Flood Insurance Study (FIS)			
Floodway [Regulatory Floodway]			
Functionally Dependent Use or Facility			
Highest Adjacent Grade (HAG) ( <i>for community with AO/AH</i> )			
Historic Structure			
Lowest Floor			
Manufactured Home ( <i>include Recreational Vehicles, more restrictive</i> )			
Manufactured Home Park or Subdivision			
Market Value			
Mean Sea Level (MSL) in datum of NAVD of 1988			
New Construction ( <i>add initial effective date of ordinance/ regulation</i> )			
New Manufactured Home Park or Subdivision			
Recreational Vehicle			
Sand Dunes ( <i>for community with V zones only</i> )			
Special Flood Hazard Area (SFHA)			
Start of Construction ( <i>add substantial improvement sentence to end of definition if does not already exist as per federal definition.</i> )			
Structure			
Substantial Damage			
Substantial Improvement ( <i>add 10 year time period, more restrictive</i> )			
Variance			
Violation			
Water Surface Elevation in datum of NAVD of 1988			
<b>REMOVE THESE DEFINITIONS IF FOUND</b>	<b>Y/N</b>	<b>***</b>	<b>APPLICABLE SECTION</b>
Habitable Floor			
Mobile Home			
Flood Boundary and Floodway Map (FBFM)			
Flood Hazard Boundary Map (FHBM)			
<b>OPTIONAL DEFINITIONS</b>	<b>Y/N</b>	<b>***</b>	<b>APPLICABLE SECTION</b>
Accessory Structure			
Addition			
Appeal			
Appurtenant Structure			
Crawl Space			
Critical Uses or Facilities			
Dangerous Materials			
Dry Floodproofing			
Elevated Building - A Zone			

Elevated Building - V Zone			
Erosion			
Existing Construction			
Floodplain or Flood-prone Area			
Flood-proofing			
Floor			
Freeboard			
Non-Residential Structure			
Primary Frontal Dune			
Principally Above Ground			
Residential Structure			
Riverine			
Sheet Flow Area <i>(for community with AO, AH, VO zones only)</i>			
Underground Storage Facilities			
Wet Floodproofing			

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