



**US Army Corps
of Engineers**
Louisville District

FLOODWAY DELINEATION

PIGEON CREEK
EVANSVILLE - VANDERBURGH CO.
INDIANA

SECTION 22
PLANNING ASSISTANCE TO STATES

MARCH 1994

SECTION 22 STUDY
PIGEON CREEK
EVANSVILLE-VANDERBURGH CO. INDIANA

HYDROLOGIC ANALYSIS

Hydrologic analysis was carried out to establish the peak discharge-frequency relationships for a thirteen mile reach of Pigeon Creek in Evansville and Vanderburgh County, Indiana.

Natural discharge frequency values for Pigeon Creek were developed in accordance with methods presented in papers by Leo R. Beard, "Statistical Methods in Hydrology". An in depth study was made of available stream gages, within the study area, in accordance with the Water Resources Council, Bulletin 17B. The Pigeon Creek at Evansville gaging station, with 25 years of record (1961 through 1985) and a drainage area of 323 square miles, was utilized as the base for all subsequent discharge evaluations. The Pigeon Creek gage was located on the Oak Hill Road bridge at stream mile 7.17.

Determination of the discharge versus exceedence probabilities considered omission of low and high outliers, weighting with a regionalized skew and historically adjusting the preliminary results where possible. Previous studies for adjacent areas, with similar runoff characteristics, were examined to assure reasonableness of the adopted values. Final discharge frequency values for Pigeon Creek are shown in Table 1.

TABLE 1

DISCHARGE SUMMARY - PIGEON CREEK

Location	Stream Mile	Drainage Area (SQ MI)	Peak Discharges 100-Year (cfs)
Mouth	0.0	368	14,200
Oak Hill Road	7.17	324	13,500
I-164	12.50	260	11,900

The discharge values utilized in this current study have been updated and reflect only a minor adjustment to values presented in previous reports.

HYDRAULIC ANALYSIS

An analysis of the hydraulic characteristics of Pigeon Creek was carried out to determine the elevation of the 100-year flood. Cross sections were located at regular intervals along Pigeon

Creek and at significant changes in ground relief and land use or land cover. A HEC-2 computer model was developed utilizing aerial topographic mapping (1" = 200', 5' contour intervals). Bridge geometry was determined from as-built bridge plans and field surveys. Backwater computer models and/or calculations for previous studies could not be recovered; therefore, water surface profiles were developed using the HEC-2 computer step-backwater model compiled for this study.

Roughness coefficients (Manning's "n") depend on factors such as type and amount of vegetation, channel configuration and water depth. Historic flood profile reproduction and field inspection at each cross section provided adopted values. In conjunction with this approach, known roughness factors for comparable streams in adjacent watersheds were reviewed for consistency. Roughness coefficients developed for this report are 0.065-0.085 for overbank areas and 0.040-0.065 for the channel. The HEC-2 model was calibrated to a compromise reproduction of the May 1961 and March 1964 flood events.

Starting 100-year water surface elevations for Pigeon Creek backwater computations were determined by the slope area method. The Pigeon Creek profiles presented in this study include the Ohio River 100-year backwater surface elevation (378.0 NGVD) at the mouth of Pigeon Creek, Ohio River Mile 792.9.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). Selected cross section locations are also shown on the maps delineating the 100-year flood plain and floodway (Exhibit 2).

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD).

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

FLOODWAY

The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood height. The State of Indiana, as set down by the Indiana Flood Control Act of 1945 and the Natural Resources Commission Policy Guidelines, Section 6, adopted March 28, 1974, has designated that encroachment in the flood plain is limited to that which will cause no significant increase in flood height. As a result, no more than a 0.1 foot surcharge has been delineated for this study.

The floodway proposed in this study was computed at each cross section on the basis of equal conveyance reduction from each side of the flood plain. Results are presented in Table 2 for the cross sections located on the map.

PIGEON CREEK FLOODWAY DATA

CROSS SECTION	STATION	FLOODWAY			WATER SURFACE ELEVATION		
		WIDTH	SECTION AREA	MEAN VELOCITY	WITH FLOODWAY	WITHOUT FLOODWAY	DIFFERENCES
A	.060	182.	2834.	5.0	359.7	359.6	.1
B	.100	181.	2892.	4.9	359.9	359.8	.1
C	.200	199.	2766.	5.1	360.1	360.0	.1
D	.290	155.	2596.	5.5	360.3	360.2	.1
E	.400	168.	2543.	5.6	360.7	360.6	.1
F	.610	169.	2666.	5.3	361.4	361.3	.1
G	.700	190.	3016.	4.7	361.9	361.8	.1
H	.790	163.	2484.	5.7	362.0	361.9	.1
I	.860	170.	2647.	5.4	362.3	362.2	.1
J	.950	219.	3024.	4.7	362.8	362.7	.1
K	1.200	205.	3299.	4.3	363.4	363.3	.1
L	1.400	201.	3267.	4.3	363.8	363.7	.1
M	1.610	259.	3482.	4.0	364.2	364.1	.1
N	1.800	449.	6182.	2.2	364.6	364.5	.1
O	2.000	505.	6238.	2.2	364.8	364.7	.1
P	2.060	448.	5657.	2.4	364.8	364.7	.1
Q	2.150	157.	2537.	5.4	364.8	364.7	.1
R	2.210	151.	2587.	5.3	365.0	364.9	.1
S	2.300	220.	3418.	4.0	365.5	365.4	.1
T	2.400	312.	4284.	3.2	365.7	365.6	.1
U	2.600	211.	3098.	4.5	366.0	365.9	.1
V	2.800	198.	3153.	4.4	366.4	366.3	.1
W	2.920	173.	2747.	5.0	366.6	366.5	.1
X	3.020	241.	3332.	4.1	366.9	366.8	.1
Y	3.300	221.	3328.	4.1	367.8	367.7	.1
Z	3.500	256.	3363.	4.1	368.7	368.6	.1
AA	3.670	268.	4562.	3.0	369.4	369.3	.1
BB	3.770	430.	5197.	2.7	369.6	369.5	.1
CC	4.000	533.	5208.	2.6	370.2	370.1	.1
DD	4.200	205.	3356.	4.1	370.9	370.8	.1
EE	4.400	602.	8758.	1.6	371.4	371.3	.1
FF	4.600	411.	4550.	3.0	371.8	371.7	.1
GG	4.810	307.	3848.	3.6	372.5	372.4	.1
HH	4.900	385.	5180.	2.7	372.9	372.8	.1
II	5.100	262.	3717.	3.7	373.4	373.3	.1
JJ	5.300	242.	3484.	3.9	374.2	374.1	.1
KK	5.500	155.	2669.	5.1	375.0	374.9	.1
LL	5.700	184.	3477.	3.9	376.0	375.9	.1
MM	5.800	233.	3634.	3.7	376.3	376.2	.1
NN	5.880	187.	3088.	4.4	376.6	376.5	.1
OO	6.000	206	3410.	4.0	377.2	377.1	.1
PP	6.200	743.	6419.	2.1	377.8	377.7	.1
QQ	6.500	258.	3744.	3.6	378.4	378.3	.1
RR	6.800	395.	4519.	3.0	379.3	379.2	.1
SS	7.110	583.	6097.	2.2	380.1	380.0	.1
TT	7.200	527.	5733.	2.4	380.4	380.3	.1
UU	7.500	441.	6265.	2.2	380.9	380.8	.1
VV	7.800	449.	6348.	2.1	381.3	381.2	.1
WW	8.100	1356.	17471.	.8	381.5	381.4	.1
XX	8.400	1037.	10679.	1.3	381.6	381.5	.1
YY	8.700	870.	10604.	1.3	381.8	381.7	.1
ZZ	9.000	942.	11778.	1.1	382.0	381.9	.1
a	9.300	658.	8965.	1.5	382.1	382.0	.1
b	9.600	1366.	17264.	.8	382.3	382.2	.1
c	9.773	1383.	17218.	.8	382.3	382.2	.1
d	9.875	1154.	12954.	1.0	382.3	382.2	.1
e	10.200	645.	7019.	1.9	382.6	382.5	.1
f	10.500	870.	8978.	1.5	383.0	382.9	.1
g	10.810	1077.	9349.	1.4	383.4	383.3	.1
h	10.910	957.	10062.	1.3	383.7	383.6	.1
i	11.200	600.	7588.	1.6	383.9	383.8	.1
j	11.500	1880.	17290.	.7	384.1	384.0	.1
k	11.800	2075.	18143.	.7	384.1	384.0	.1
l	12.130	2096.	18513.	.6	384.2	384.1	.1
m	12.430	1651.	13014	.9	384.3	384.2	.1

This is to certify that all work accomplished in the conduct of this Section 22 study for Evansville-Vanderburgh County, Indiana was done in accordance with the Scope of Work for the study. This work has been accomplished in accordance with sound and accepted engineering practice and provides the product as identified in the Scope of Work.