U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

LEVEL II BRIDGE SCOUR ANALYSIS FOR STRUCTURES 12100771/30100 ON INTERSTATE 77, CROSSING LITTLE ROCKY CREEK IN CHESTER COUNTY, SOUTH CAROLINA

By Noel M. Hurley, Jr. and Stephen T. Benedict

Prepared in cooperation with the
SOUTH CAROLINA DEPARTMENT
OF TRANSPORTATION

Columbia, South Carolina

1994

UNIT ABBREVIATIONS

cubic foot per second	ft^3/s
feet per second	ft/s
foot	ft
mile	mi
millimeter	mm
square foot	ft^2
square mile	mi^2

OTHER ABBREVIATIONS

downstream	D/S
upstream	U/S
flood plain	f/p
median diameter of bed material	D_{50}
South Carolina Department of Transportation	SCDOT

In this report, the words "right" and "left" refer to directions that would be reported by an observer facing downstream.

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929-- a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

Level II bridge scour analysis for structures 12100771/30100 on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina

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This report provides the results of the detailed Level II analysis of scour potential at structures 12100771/30100 on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina (figure 1 in pocket; figures 5-10). The site is located in the Piedmont physiographic province near the town of Great Falls in the southeastern part of Chester County. The drainage area for the site is 47.6 mi^2, and is a predominately rural drainage basin with little development in recent years. In the vicinity of the study site, the land is covered by moderate to dense woods consisting of hardwoods and pines.

In the study area, Little Rocky Creek has a meandering channel with a slope of approximately 0.0013 ft/ft (6.9 ft/mi), an average channel top width of 64 ft and an average channel depth of 7.4 ft. The predominant channel bed material is sand (D_{50} is 0.95 mm) and the flood plain consists silt and coarse sand (D_{50} is 2.6 mm). In general, the banks have moderate woody vegetative cover and were noted to be relatively stable with some areas of localized bank failure at the time of the Level I and Level II site visits, July 9, 1990 and April 27 and 28, 1992, respectively.

The Interstate 77 crossing of Little Rocky Creek consists of twin 300-ft-long, two-lane bridges consisting of six 50-ft concrete spans, supported by steel H-pile tower bents with spillthrough abutments. Structure 121007730100 is the U/S bridge located on the south bound lane and structure 121007710100 is the D/S bridge located on the north bound lane. The lower one-third to one-half of both abutments are protected by rip rap. In this report, the words "right" and "left" refer to directions that would be reported by an observer facing downstream. Additional details describing conditions at the site are included in the Scour Report Summary.

Scour depths were computed using engineering judgement and the general guidelines described in Hydraulic Engineering Circular 18 (Richardson and others, 1993) and the Transportation Research Board Draft Paper, "Evaluating scour at bridges using WSPRO" (Arneson and others, 1992). Scour depths were calculated assuming an infinite

depth of erosive material and a homogeneous particle-size distribution. The results of the scour analysis are presented in tables 1 through 4 and graphs of the scour depths are shown in figures 2 and 3.

Scour depth calculations indicate that the maximum pile tip exposure will occur at bent 4 for both structures. At structure 121007730100, scour caused by the 100- and 500-year discharges will cause the pile tips at bent 4 to be exposed by 9.4 and 13.5 ft, respectively. In addition, at structure 121007710100, scour caused by the 100- and 500-year discharges will cause the pile tips at bent 4 to be exposed by 15.0 and 19.1 ft, respectively.

It should be noted that the SCDOT bridge plan borings (file number 12.476.5) show subsurface rock that could affect the scour depths presented in this study. For more information, see the SCDOT bridge plans in the pocket at the back of the report.

Table 1. --*Remaining pile/footing penetration at piers/bents for the 100-year discharge at structures 121007730100 (south bound bridge) on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina*

Pier/bent [1] number	Station from [2] left end of bridge (feet)	Pile tip/[3] footing elevation, SCDOT datum (feet)	Pile tip/ footing elevation, USGS datum (feet)	Ground elevation at pier/bent, USGS datum (feet)	Total [4] scour depth (feet)	Elevation of scour, USGS datum (feet)	Remaining[5] pile/footing penetration (feet)
100-year discharge is 8,620 cubic feet per second							
6	50	338.8	42.8	69.2	7.1	62.1	19.3
5	100	335.0	39.0	58.8	11.5	47.3	8.3
4	150	332.6	36.6	53.7	26.5	27.2	-9.4
3	200	336.8	40.8	60.5	24.7	35.8	-5.0
2	250	336.2	40.3	70.4	0.0	70.4	30.1

[1] Pier/bent number corresponds to South Carolina Department of Transportation (SCDOT) bridge plans, file number 12.476.5.

[2] Stations are determined from left to right looking downstream.

[3] Pile tip/footing elevations obtained from SCDOT bridge plans. The maximum elevation at each pier/bent is used.

[4] Total scour depth is the sum of the contraction and pier/bent scour depths.

[5] A negative number signifies undermining of pile tip/footing.

Note: The SCDOT bridge plan borings show subsurface rock that could reduce the scour depths presented in this table. For more information, refer to the plans in the pocket at the back of the report

Table 2. --*Remaining pile/footing penetration at piers/bents for the 500-year discharge at structures 121007730100 (south bound lane) on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina*

Pier/bent [1] number	Station from[2] left end of bridge (feet)	Pile tip/[3] footing elevation, SCDOT datum (feet)	Pile tip/ footing elevation, USGS datum (feet)	Ground elevation at pier/bent, USGS datum (feet)	Total [4] scour depth (feet)	Elevation of scour, USGS datum (feet)	Remaining[5] pile/footing penetration (feet)
500-year discharge is 12,800 cubic feet per second							
6	50	338.8	42.8	69.2	11.5	57.7	14.9
5	100	335.0	39.0	58.8	15.1	43.7	4.7
4	150	332.6	36.6	53.7	30.6	23.1	-13.5
3	200	336.8	40.8	60.5	28.7	31.8	-9.0
2	250	336.2	40.3	70.4	8.2	62.2	21.9

[1] Pier/bent number corresponds to South Carolina Department of Transportation (SCDOT) bridge plans, file number 12.476.5.

[2] Stations are determined from left to right looking downstream.

[3] Pile tip/footing elevations obtained from SCDOT bridge plans. The maximum elevation at each pier/bent is used.

[4] Total scour depth is the sum of the contraction and pier/bent scour depths.

[5] A negative number signifies undermining of pile tip/footing.

Note: The SCDOT bridge plan borings show subsurface rock that could reduce the scour depths presented in this table. For more information, refer to the plans in the pocket at the back of the report

Table 3. --*Remaining pile/footing penetration at piers/bents for the 100-year discharge at structures 121007710100 (north bound bridge) on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina*

Pier/bent [1] number	Station from [2] left end of bridge (feet)	Pile tip/[3] footing elevation, SCDOT datum (feet)	Pile tip/ footing elevation, USGS datum (feet)	Ground elevation at pier/bent, USGS datum (feet)	Total [4] scour depth (feet)	Elevation of scour, USGS datum (feet)	Remaining[5] pile/footing penetration (feet)
100-year discharge is 8,620 cubic feet per second							
6	50	338.5	42.5	68.2	7.1	61.1	18.6
5	100	339.3	43.3	57.7	11.5	46.2	2.9
4	150	336.4	40.4	51.9	26.5	25.4	-15.0
3	200	336.2	40.2	60.5	24.7	35.5	-4.7
2	250	338.0	42.0	70.9	0.0	70.9	28.9

[1] Pier/bent number corresponds to South Carolina Department of Transportation (SCDOT) bridge plans, file number 12.476.5.

[2] Stations are determined from left to right looking downstream.

[3] Pile tip/footing elevations obtained from SCDOT bridge plans. The maximum elevation at each pier/bent is used.

[4] Total scour depth is the sum of the contraction and pier/bent scour depths.

[5] A negative number signifies undermining of pile tip/footing.

Note: The SCDOT bridge plan borings show subsurface rock that could reduce the scour depths presented in this table. For more information, refer to the plans in the pocket at the back of the report

Table 4. --*Remaining pile/footing penetration at piers/bents for the 500-year discharge at structures 121007710100 (north bound bridge) on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina*

Pier/bent [1] number	Station from [2] left end of bridge (feet)	Pile tip/[3] footing elevation, SCDOT datum (feet)	Pile tip/ footing elevation, USGS datum (feet)	Ground elevation at pier/bent, USGS datum (feet)	Total [4] scour depth (feet)	Elevation of scour, USGS datum (feet)	Remaining[5] pile/footing penetration (feet)
500-year discharge is 12,800 cubic feet per second							
6	50	338.5	42.5	68.2	11.5	56.7	14.2
5	100	339.3	43.3	57.7	15.1	42.6	-0.7
4	150	336.4	40.4	51.9	30.6	21.3	-19.1
3	200	336.2	40.2	60.2	28.7	31.5	-8.7
2	250	338.0	42.0	70.9	8.2	62.7	20.7

[1] Pier/bent number corresponds to South Carolina Department of Transportation (SCDOT) bridge plans, file number 12.476.5.

[2] Stations are determined from left to right looking downstream.

[3] Pile tip/footing elevations obtained from SCDOT bridge plans. The maximum elevation at each pier/bent is used.

[4] Total scour depth is the sum of the contraction and pier/bent scour depths.

[5] A negative number signifies undermining of pile tip/footing.

Note: The SCDOT bridge plan borings show subsurface rock that could reduce the scour depths presented in this table. For more information, refer to the plans in the pocket at the back of the report

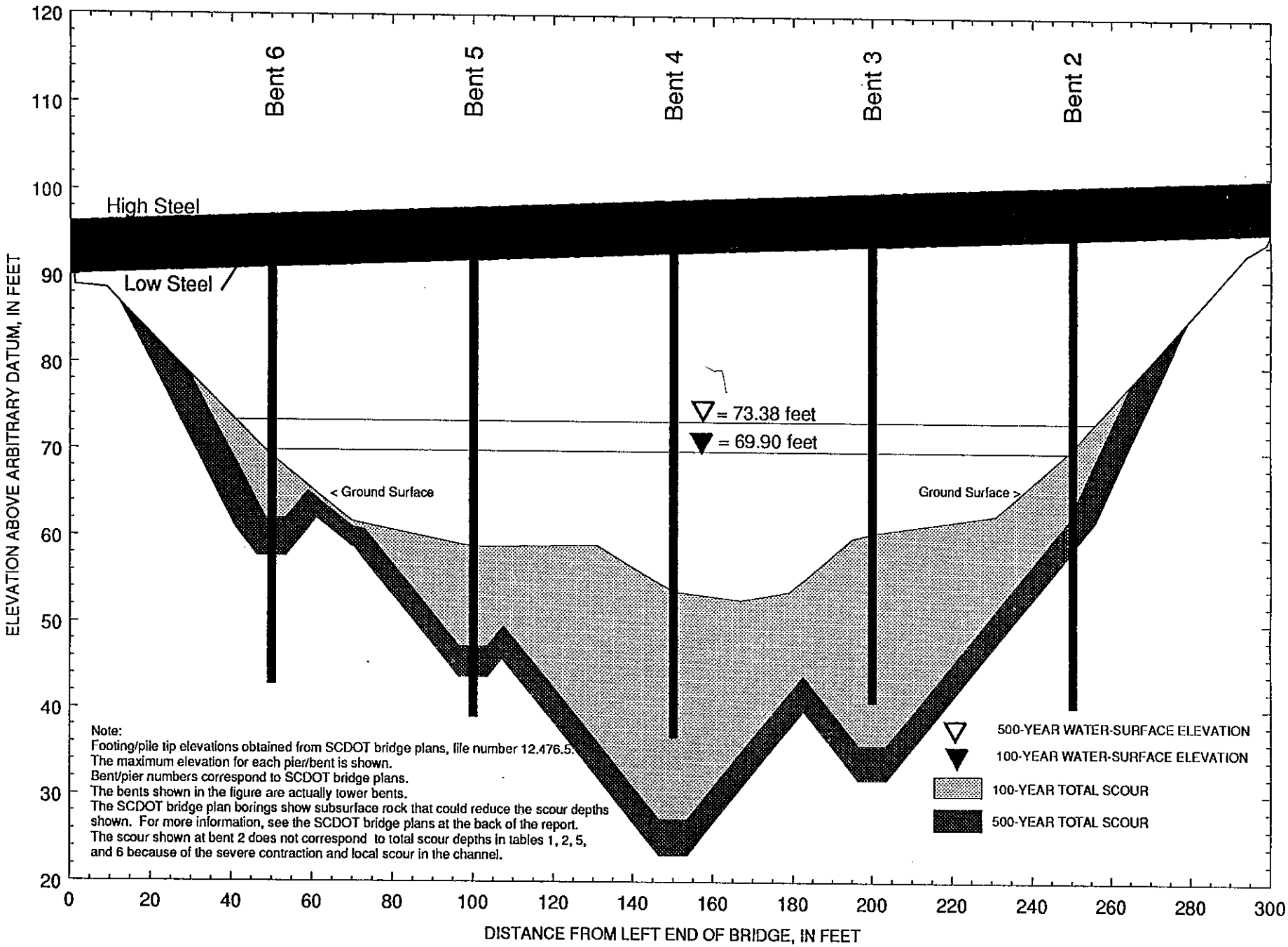

Figure 2.--Scour depths for the 100- and 500-year discharges at structure 121007730100 (south bound bridge) on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina.

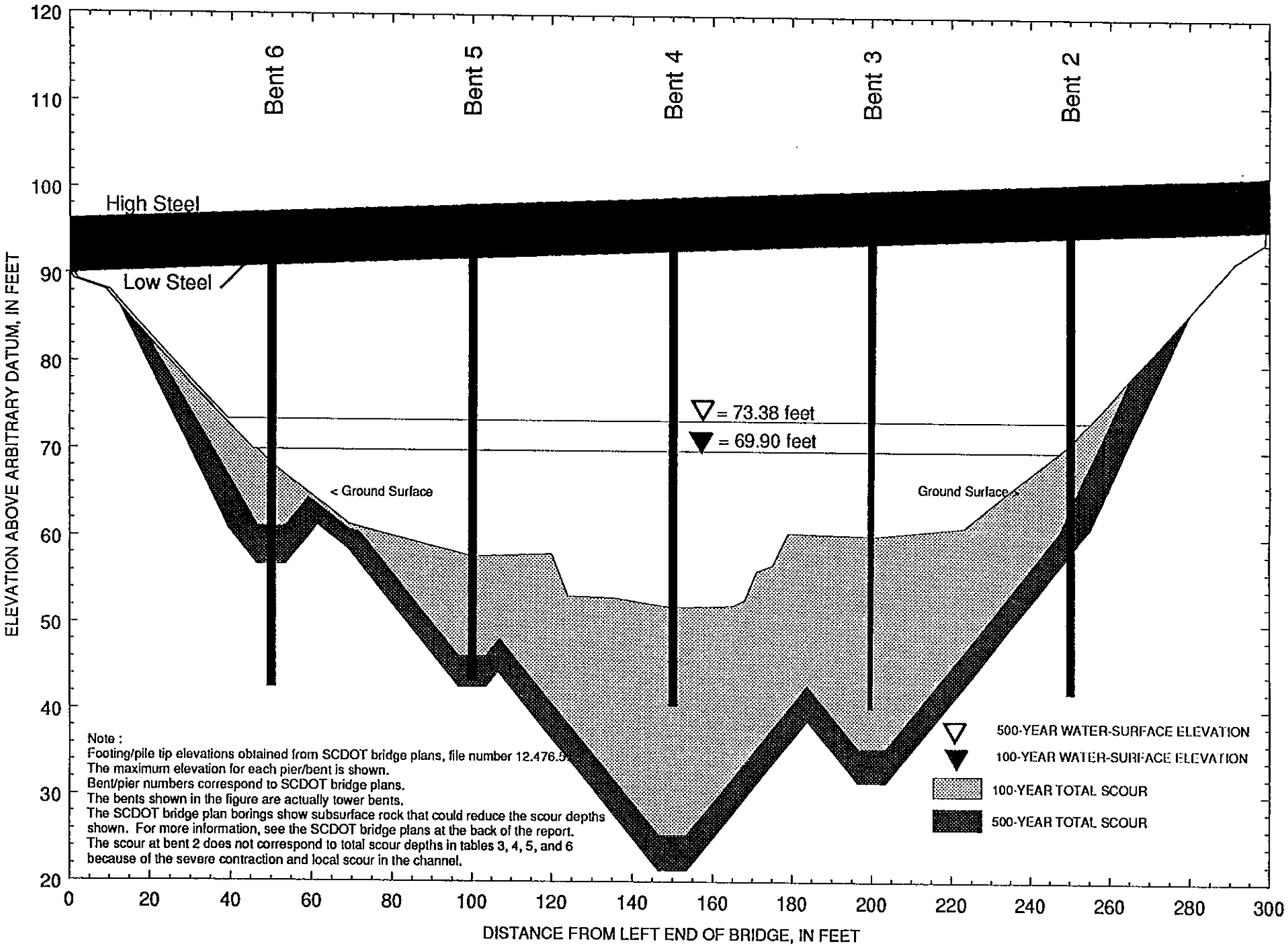

Figure 3.--Scour depths for the 100- and 500-year discharges at structure 121007710100 (north bound bridge) on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina.

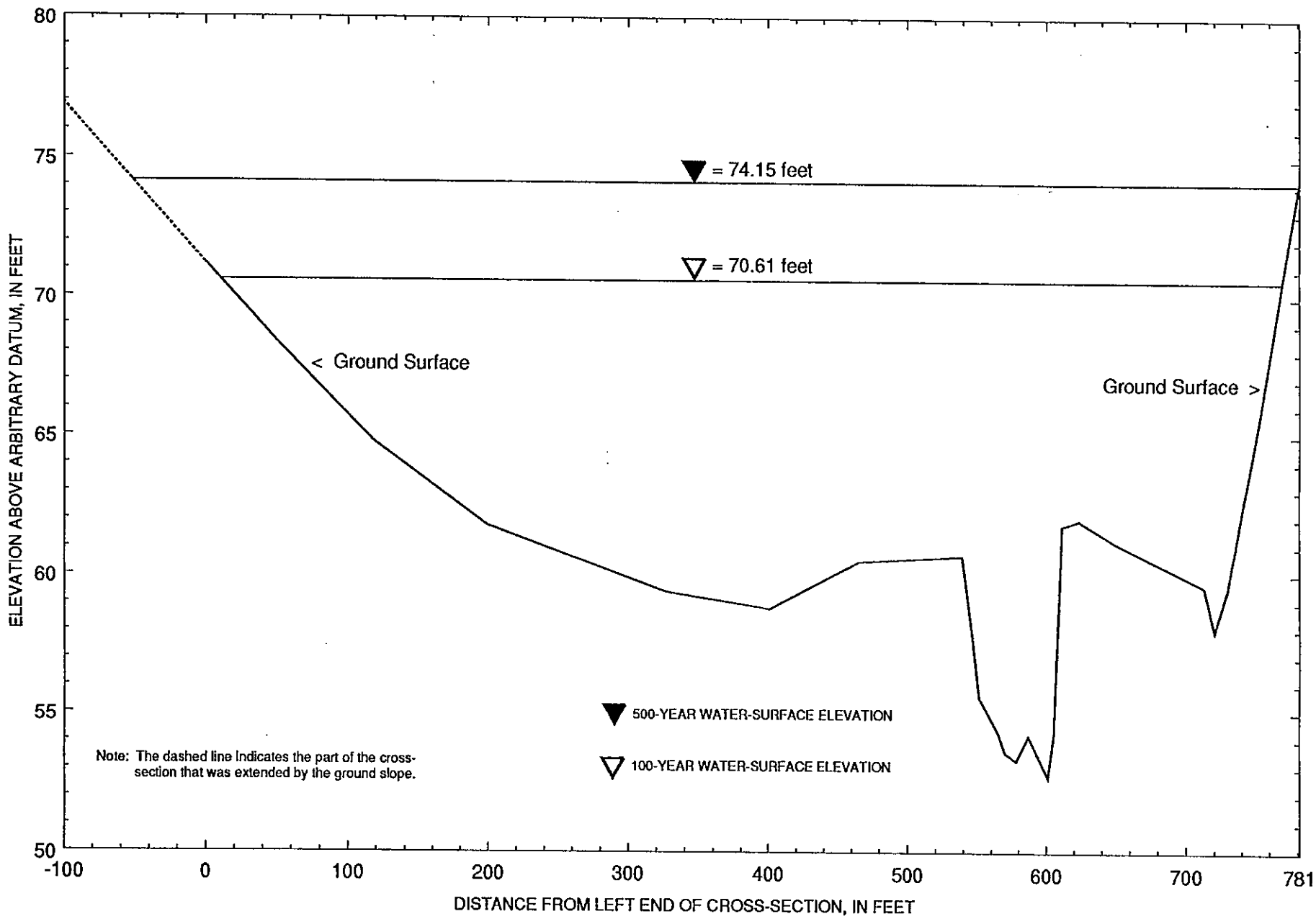

Figure 4.--Approach cross section at structures 12100771/30100 on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina.

Figure 5.--Channel upstream of structure 121007730100 on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina as viewed looking toward the bridge (April 28, 1992).

Figure 6.--Upstream channel as viewed from structure 121007730100 on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina (July 9, 1990).

Figure 7.--Downstream channel as viewed from structure 121007710100 on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina (July 9, 1990).

Figure 8.--Structure 121007730100 on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina as viewed from downstream (July 9, 1990).

Figure 9.--Debris on pile bent of structure 121007710100 on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina as viewed from downstream (July 9, 1990).

Figure 10.--Debris on pile bent of structure 121007730100 on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina as viewed from upstream (April 28, 1992).

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SCOUR REPORT SUMMARY

Structure Number 12100771/30100 *Stream* Little Rocky Creek

County Chester *Road* I-77 *District* 4

Description of Bridge

Bridge length 300 *ft* *Bridge width* 40(164) *ft* *Max span length* 50 *ft*

Alignment of bridge to road (on curve or straight) Straight

Abutment type Spillthrough *Embankment type* Sloping

Riprap on abutment? Yes *Date of inspection* 7-9-1990

Description of riprap 12- to 18-inch granite in good condition on all abutments. Only the lower one-third to one-half of the abutments are protected.

Brief description of piers/pile bents The five bents are tower bents that consist of six sets of 1.0 ft H piles.

Is bridge skewed to flood plain according to USGS topo map? Yes *Angle* 20

Is bridge located on a bend in channel? No *If so, describe (mild, moderate, severe)*

From the bridge plans (File 12.476.5), the stream at the site was originally divided by an island. During bridge construction the overflow channel was backfilled and the main channel was straightened.

Debris accumulation on bridge at time of Level I or Level II site visit:

	Date of inspection	*Percent of channel blocked horizontally*	*Percent of channel blocked vertically*
Level I	7-9-1990	40	100
Level II	4-27-1992	60	60

Potential for debris High: Much debris in channel U/S and D/S of the bridges. The tower pile bents are efficient debris catchers.

Describe any features near or at the bridge that may affect flow (include observation date).
On 7-9-1990, much debris had accumulated against the tower bents.

Description of Flood Plain

General topography Rolling hills with moderately sloping streams and relatively narrow flood plains

Flood-plain conditions at bridge site: downstream (D/S), upstream (U/S)

Date of inspection 4-27-1992

D/S left: Moderate to thick woods with many small trees and thick undergrowth

D/S right: Moderately thick medium-sized hardwoods and pines with many small saplings

U/S left: Moderately thick hardwoods with thick vines and undergrowth

U/S right: Moderately thick small to medium hardwoods with low undergrowth

Description of Channel

Average top width 64 *ft* *Average depth* 7.4 *ft*

Predominant bed material Sand *Bank material* Silt and coarse sand

Stream type (straight, meandering, braided, swampy, channelized) Little Rocky Creek is a meandering stream with many point bars.

Vegetative cover on channel banks near bridge: Date of inspection 7-9-1990

D/S left: Trees with some exposed roots and herbaceous growth on bank

D/S right: Sparse vegetative cover, areas of bare banks with spots of bank failure

U/S left: Trees with some exposed roots and herbaceous growth on bank

U/S right: Trees with some exposed roots and herbaceous growth on bank

Do banks appear stable? Yes/No *If not, describe location and type of instability and date of observation.* Fluvial erosion was observed at all inspection points except on the D/S right bank where areas of bank failure were observed. Overall, the banks are relatively stable with localized areas of bank failure.

Describe any obstructions in channel and date of observation. Much debris observed in channel and along flood plain U/S and D/S of the bridges. Additionally, the tower bents act as efficient debris catchers.

Hydrology

Drainage area 47.6 *mi*^{2}

Percentage of drainage area in physiographic provinces:

Physiographic province	*Percent of drainage area*
Piedmont (high flow)	100

Is drainage area considered rural or urban? Rural *Describe any significant urbanization and potential for development.* There is a low potential for urbanization. The chief uses of the area are forest production and beef cattle farming.

Is there a USGS gage on the stream of interest? No

USGS gage description _____

USGS gage number _____

Gage drainage area _____ *mi*^{2}

Is there a lake/pond that will significantly affect hydrology/hydraulics? No

If so, describe _____

Calculated Discharges

Q100 8,620 *ft*^{3}*/s* *Q500* 12,800 *ft*^{3}*/s*

Method used to determine discharges The site is located in the high-flow region of the central Piedmont of South Carolina. Therefore, the methods described by C.L. Sanders (w. comm., 12-93) were used. The peak flows were estimated using equations published in WRIR 87-4096, "Magnitude and frequency of floods in rural and urban basins of North Carolina", by Gunter, Mason, and Stamey, and by methods described in USGS Bulletin 17B.

Brief Description of the Water-Surface Profile Model (WSPRO) Analysis

Datum for WSPRO analysis (USGS survey, sea level, SCDOT plans) USGS survey

Datum tie between USGS survey and SCDOT plans Add 295.99 ft to the USGS datum to obtain the SCDOT plan's datum (file number 12.476.5).

Description of reference marks used to determine USGS datum. R.M. 1: Chiseled square on the U/S right abutment cap of the U/S bridge. Elevation: 100.00 ft (assumed). R.M. 2: Chiseled square on the D/S left abutment cap of the D/S bridge. Elevation: 94.32 ft.

Cross-Sections Used in WSPRO Analysis

*Cross-section ID	Section Reference Distance (SRD) in feet	**How cross-section was developed	Comments
T20	-1000	2	Shifted to SRD
T10	-500	2	Shifted to SRD
EXIT	-300	2	Exit section
FULV	0	2	Full valley section
BRID	0	1	U/S face of U/S bridge
APP	464	2	Approach section

* For location of cross-sections see topographic map included with report (figure 1). For more detail on how cross-sections were developed see WSPRO input file.

** Cross-section development: 1) survey at SRD 2) shift of survey data to SRD 3) modification of survey data based on topographic map 4) synthesized by combining channel survey data and topographic contours 5) other

Description of data and assumptions used in developing WSPRO model.

The survey data collected at the site includes cross-sections U/S and D/S of the bridges, four bridge cross-sections, and pile and bridge geometry. The cross-section elevations are relative to USGS Reference Marks 1 and 2.

Cross sections T20, T10, EXIT, and FULV (full valley) were developed by locating the D/S surveyed cross section at the appropriate SRD and adjusting the cross-section elevations by the channel slope (0.0013 ft/ft). The left end of these cross sections was lengthened by extending the slope of the two end ground shots of the survey. The U/S face of the U/S bridge was the most restrictive and, therefore, was used in the WSPRO analysis. The total width of the bridge crossing includes both bridges and the median. This width of 164 ft was determined from SCDOT bridge plans, file number 12.476.5. Additionally, The USGS topographic map of the area has not been updated to show the Interstate 77 bridges. Therefore, the skew angle of attack of 20 degrees used in the WSPRO analysis was determined in the field. This skew differs from the skew estimated from topographic maps because during bridge construction the overflow channel was backfilled and the main channel was straightened. There is a significant amount of brush growing on the overbanks at and under the bridges. Therefore, the Manning's roughness values for the overbanks at the bridges were increased to 0.080. The APP (approach) cross-section was developed by locating the U/S surveyed cross section at the appropriate SRD and adjusting the cross-section elevations by the channel slope. The left end of the cross section was lengthened by extending the slope of the two end ground shots of the survey.

The starting water-surface elevation used by the WSPRO Model was determined by the model using slope-conveyance. Tests for water-surface convergence indicated that using slope-conveyance to estimate the starting water-surface elevation was valid.

Bridge Hydraulics

Average embankment elevation 96.4 *ft*

Average low steel elevation 92.8 *ft*

100-year discharge 8,620 ft^3/s

Water-surface elevation at D/S bridge face 69.90 *ft*

Area of flow at D/S bridge face 1,921 ft^2

Average velocity in bridge opening 4.49 *ft/s*

Maximum WSPRO tube velocity at bridge 7.30 *ft/s*

Water-surface elevation at Approach section with bridge 70.61 *ft*

Water-surface elevation at Approach section without bridge 70.49 *ft*

Amount of backwater caused by bridge 0.12 *ft*

500-year discharge 12,800 ft^3/s

Water-surface elevation at D/S bridge face 73.38 *ft*

Area of flow at D/S bridge face 2,599 ft^2

Average velocity in bridge opening 4.92 *ft/s*

Maximum WSPRO tube velocity at bridge 8.21 *ft/s*

Water-surface elevation at Approach section with bridge 74.15 *ft*

Water-surface elevation at Approach section without bridge 74.05 *ft*

Amount of backwater caused by bridge 0.10 *ft*

Scour

Describe any special assumptions or considerations made in bridge scour analysis.

Scour depths were computed using engineering judgement and the general guidelines described in Hydraulic Engineering Circular 18 (Richardson and others, 1993) and the Transportation Research Board Draft Paper, "Evaluating scour at bridges using WSPRO" (Arneson and others, 1992). Scour depths were calculated assuming an infinite depth of erosive material and a homogeneous particle-size distribution. The results of the scour analysis are presented in tables 1 through 4 and graphs of the scour depths are shown in figures 2 and 3.

The site is located in the high-flow region of the central Piedmont of South Carolina. Contraction scour was analyzed by using the live-bed scour equation for the channel and the clear-water scour equation for the left and right overbank areas. It should be noted that for the 100-year discharge the right overbank was determined to aggrade 1.9 ft. However, this value was assumed to be zero as reflected in tables 1 and 3 and in figures 2 and 3. The channel shifts slightly to the left from the U/S to D/S bridges. The location of bent 4 changes from the left side of the channel to the right side of the channel and the location of bent 3 changes from the top of the right bank to the right flood plain. Therefore, bents 3 and 4 were analyzed as if each was located in the channel. The minimum bed elevation from the four bridge surveys was 51.5 ft. This elevation was used to determine the flow depth at bents 3 and 4. Additionally, because tower bents are effective debris catchers, the pier scour analysis was done assuming the debris accumulation clogged the face of each bent. Therefore, the width between piles at the face of each bent, determined at the ground surface, was used as the pile width in the scour computations. This assumption was made based on field observations of debris piles on the bents (figs. 9 and 10). The length (L) to width (a) ratio of the piles used to compute K_2 was set equal to the pier width because the

minimum value allowed for L/a is one.

The abutments are protected with 12- to 18-inch granite. The rip rap covers the lower one-third to one-half of the abutments; consequently, abutment scour analysis was not made at this site.

It should be noted that the SCDOT bridge plan borings show subsurface rock that could affect the scour depths calculated in this study. For more information, see the SCDOT bridge plans in the pocket at the back of the report.

WSPRO INPUT FILE

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T1          WSPRO PROFILES-- STRUCTURE 12100771/30100
T2          LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
T3          LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
*            Q100      Q500
Q            8620     12800
SK          0.0013    0.0013
*
*            CROSS SECTIONS T2 TO FULV WERE DEVELOPED BY LOCATING THE TEMPLATE
*            CROSS SECTION (TEM1) AT THE APPROPRIATE SECTION REFERENCE DISTANCE
*            (SRD) AND ADJUSTING THE ELEVATIONS BY THE CHANNEL SLOPE
*            (0.0013 FT/FT).  THIS TEMPLATE CROSS SECTION WAS SURVEYED 382 FT
*            D/S OF THE D/S BRIDGE FACE (DISTANCE DETERMINED FROM SURVEY NOTES).
*            THE LEFT END OF THE CROSS SECTION WAS LENGTHENED BY EXTENDING THE
*            SLOPE OF THE TWO END GROUND SHOTS OF THE SURVEY.
*
XT   TEM1     -382
GR          -50  76.0    0  72.8   72  68.2  121  64.6  130  62.6
GR          164  61.1  178  57.3  209  56.9  252  59.2  268  59.3
GR          272  53.3  285  52.6  298  53.1  307  52.9  318  53.3
GR          324  58.2  348  58.7  389  70.6  406  74.8
*
XS   T20    -1000 * * * 0.0013
GT
N            0.18      0.045      0.16
SA                 268        324
*
XS   T10     -500  *   *   *   0.0013
GT
N            0.18      0.045      0.16
SA                 268        324
*
XS   EXIT     -300  *   *   *   0.0013
GT
N            0.18      0.045     0.16
SA                 268        324
*
XS   FULV      0  *  *   *   0.0013
GT
*
*           THE UPSTREAM FACE OF THE UPSTREAM BRIDGE IS THE MOST RESTRICTIVE AND
*           WAS USED TO REPRESENT THE BRIDGE CROSSING.  THE TOTAL WIDTH OF THE
*           BRIDGE CROSSING INCLUDED BOTH BRIDGES AND THE MEDIAN.  THIS DISTANCE
*           OF 164 FT WAS DETERMINED FROM SCDOT BRIDGE PLANS.  BRIDGE SKEW
*           DETERMINED IN FIELD.
*
*              SRD     LSEL    SKEW
BR   BRID        0     92.8     20
GR            1  90.1    1.1  88.9    9  88.6   25  80.9   50  69.2
GR           70  61.7    100  58.8  131  59.0  150  53.7  167  52.7
GR          179  53.7    195  59.9  200  60.5  231  62.6  250  70.4
GR          275  83.2    294  93.1  299  94.4  300  95.6    1  90.1
N            0.08      0.045      0.08
SA                131        195
PW 1        53.7 2  58.8 2  58.8  4  60.5  4  60.5 6
PW 1        69.2 6  69.2 8  70.4  8  70.4 10  92.8 10
CD          3     160   2     96.4
*
*           KD CARD NOT REQUIRED AT THIS SITE.
```

```
*
*          THE U/S CROSS SECTION WAS SURVEYED 314 FT U/S OF THE U/S BRIDGE
*          FACE (SRD 478).  THIS CROSS SECTION WAS LOCATED AT THE APPROPRIATE
*          SRD (464) AND THE ELEVATIONS ADJUSTED BY THE CHANNEL SLOPE
*          (0.0013 FT/FT).  THE LEFT END OF THE CROSS SECTION WAS LENGTHENED
*          BY EXTENDING THE SLOPE OF THE TWO END GROUND SHOTS OF THE SURVEY.
*
XT   TEM2   478
GR         -100  76.9
GR            0  71.2   47  68.5  118  64.8  199  61.8  327  59.4
GR          401  58.8  465  60.5  539  60.7  546  57.9  551  55.6
GR          565  54.3  570  53.6  578  53.3  587  54.2  601  52.7
GR          605  54.3  611  61.8  623  62.0  649  61.2  713  59.6
GR          720  58.0  729  59.5  752  65.5  781  74.3
*
AS   APP  464   *   *   *   0.0013
GT
N          0.18     0.045    0.14
SA              539       611
BP         408
*
HP 1 BRID   69.90, ,69.90,8620
HP 2 BRID   70.15, ,70.15,8620
HP 1 APP    70.61, ,70.61,8620
HP 2 APP    70.61, ,70.61,8620
HP 1 BRID   73.38, ,73.38,12800
HP 2 BRID   73.61, ,73.61,12800
HP 1 APP    74.15, ,74.15,12800
HP 2 APP    74.15, ,74.15,12800
*
EX
ER
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WSPRO OUTPUT

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        WSPRO PROFILES-- STRUCTURE 12100771/30100
        LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
        LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
           *** RUN DATE & TIME: 01-10-94  06:51
    CROSS-SECTION PROPERTIES:  ISEQ =  5;  SECID = BRID ;  SRD =       0.

     WSEL  SA#     AREA        K   TOPW   WETP  ALPH    LEW    REW     QCR
            1     677.    52629.    78.    79.                      11343.
            2     894.   174954.    60.    62.                      19558.
            3     350.    23164.    51.    52.                       5222.
    69.90        1920.   250747.   188.   194.  1.67    49.   249.  26971.
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        WSPRO PROFILES-- STRUCTURE 12100771/30100
        LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
        LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
           *** RUN DATE & TIME: 01-10-94  06:51


    VELOCITY DISTRIBUTION:  ISEQ =  5;  SECID = BRID ;  SRD =       0.

         WSEL     LEW     REW    AREA        K        Q    VEL
        70.15    48.0   249.4  1967.6  259190.    8620.   4.38

X STA.        48.0       87.8      101.6      114.6      127.7      136.5
  A(I)            244.7      141.0      137.3      138.1       96.8
  V(I)             1.76       3.06       3.14       3.12       4.45

X STA.       136.5      142.2      146.9      151.1      154.9      158.7
  A(I)             72.5       65.9       62.8       59.6       60.4
  V(I)             5.94       6.54       6.86       7.23       7.13

X STA.       158.7      162.4      166.1      169.8      173.4      177.3
  A(I)             59.5       60.3       59.1       59.1       60.5
  V(I)             7.24       7.15       7.29       7.30       7.12

X STA.       177.3      181.5      186.4      193.9      210.4      249.4
  A(I)             63.6       68.0       84.5      149.0      224.7
  V(I)             6.78       6.33       5.10       2.89       1.92
```

WSPRO OUTPUT --Continued

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        WSPRO PROFILES-- STRUCTURE 12100771/30100
        LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
        LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
           *** RUN DATE & TIME: 01-10-94  06:51
    CROSS-SECTION PROPERTIES:  ISEQ =  6;  SECID = APP  ;  SRD =     464.

     WSEL  SA#     AREA        K   TOPW   WETP  ALPH    LEW    REW     QCR
             1    4497.  154985.   529.   529.                      74395.
             2    1125.  222371.    72.    77.                      25247.
             3    1414.   64394.   158.   160.                      24013.
    70.61         7036.  441750.   759.   766.  5.17    10.   769.  53473.
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        WSPRO PROFILES-- STRUCTURE 12100771/30100
        LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
        LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
           *** RUN DATE & TIME: 01-10-94  06:51


    VELOCITY DISTRIBUTION:  ISEQ =  6;  SECID = APP  ;  SRD =     464.

         WSEL     LEW     REW    AREA        K        Q    VEL
        70.61    10.0   768.9  7036.3  441750.    8620.   1.23

X STA.        10.0      228.5      286.2      336.1      382.4      427.8
  A(I)          1184.5      572.1      545.2      531.9      526.1
  V(I)            0.36       0.75       0.79       0.81       0.82

X STA.       427.8      481.0      538.1      550.2      557.4      564.0
  A(I)           556.9      571.0      146.5      110.2      104.6
  V(I)            0.77       0.75       2.94       3.91       4.12

X STA.       564.0      570.3      576.2      582.1      588.3      594.4
  A(I)           104.2      100.9      101.9      102.4      104.4
  V(I)            4.14       4.27       4.23       4.21       4.13

X STA.       594.4      600.1      607.1      659.2      702.5      768.9
  A(I)            98.7      117.3      480.3      442.4      534.7
  V(I)            4.36       3.67       0.90       0.97       0.81
```

WSPRO OUTPUT --Continued

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        WSPRO PROFILES-- STRUCTURE 12100771/30100
        LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
        LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
           *** RUN DATE & TIME: 01-10-94  06:51
    CROSS-SECTION PROPERTIES:  ISEQ =  5;  SECID = BRID ;  SRD =       0.

     WSEL  SA#     AREA        K   TOPW   WETP  ALPH    LEW    REW     QCR
            1     959.   88339.    85.    87.                       18318.
            2    1103.  248417.    60.    62.                       26814.
            3     538.   43351.    57.    60.                        9354.
    73.38        2599.  380107.   202.   209.  1.68    41.   256.  40884.
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        WSPRO PROFILES-- STRUCTURE 12100771/30100
        LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
        LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
           *** RUN DATE & TIME: 01-10-94  06:51


    VELOCITY DISTRIBUTION:  ISEQ =  5;  SECID = BRID ;  SRD =       0.

         WSEL     LEW     REW    AREA        K        Q    VEL
        73.61    40.6   256.3  2645.8  389521.   12800.   4.84

X STA.        40.6       83.3       97.4      109.7      122.6      133.5
  A(I)            329.9      183.1      171.4      178.0      150.0
  V(I)             1.94       3.49       3.73       3.60       4.27

X STA.       133.5      139.7      145.1      149.8      154.0      158.2
  A(I)             95.5       89.3       85.2       79.2       80.1
  V(I)             6.70       7.17       7.52       8.09       7.99

X STA.       158.2      162.3      166.4      170.4      174.4      178.8
  A(I)             78.8       79.7       78.0       78.0       81.9
  V(I)             8.12       8.03       8.21       8.21       7.81

X STA.       178.8      183.5      189.5      199.5      215.7      256.3
  A(I)             85.0       95.7      133.2      191.3      302.5
  V(I)             7.53       6.69       4.81       3.35       2.12
```

WSPRO OUTPUT --Continued

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        WSPRO PROFILES-- STRUCTURE 12100771/30100
        LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
        LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
           *** RUN DATE & TIME: 01-10-94  06:51
    CROSS-SECTION PROPERTIES:  ISEQ =  6;  SECID = APP  ;  SRD =     464.

     WSEL  SA#     AREA        K   TOPW   WETP  ALPH    LEW    REW     QCR
            1    6479.  264562.   591.   591.                     121732.
            2    1380.  312499.    72.    77.                      34293.
            3    1994.  108692.   170.   172.                      38792.
    74.15        9853.  685752.   833.   841.  5.05   -52.   781.  85568.
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        WSPRO PROFILES-- STRUCTURE 12100771/30100
        LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
        LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
           *** RUN DATE & TIME: 01-10-94  06:51


    VELOCITY DISTRIBUTION:  ISEQ =  6;  SECID = APP  ;  SRD =     464.

         WSEL     LEW     REW    AREA        K        Q    VEL
        74.15   -52.1   780.6  9853.3  685752.   12800.   1.30

X STA.       -52.1      199.1      258.3      310.2      356.1      400.8
  A(I)          1695.3      765.9      724.8      678.7      678.1
  V(I)            0.38       0.84       0.88       0.94       0.94

X STA.       400.8      448.1      500.7      543.0      552.7      560.3
  A(I)           698.1      720.5      575.6      165.7      143.7
  V(I)            0.92       0.89       1.11       3.86       4.45

X STA.       560.3      567.5      574.3      581.0      587.9      594.8
  A(I)           143.7      140.3      137.8      139.8      140.4
  V(I)            4.45       4.56       4.64       4.58       4.56

X STA.       594.8      601.2      619.4      665.4      706.6      780.6
  A(I)           135.1      279.5      586.8      571.6      731.9
  V(I)            4.74       2.29       1.09       1.12       0.87
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WSPRO OUTPUT --Continued

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        WSPRO PROFILES-- STRUCTURE 12100771/30100
        LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
        LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
           *** RUN DATE & TIME: 01-10-94  06:51

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

T20  :XS   ******    56.    2927.  0.57 *****   68.97   61.34   8620.   68.40
    -1000. ******   384.  238898.  4.21 ***** *******    0.36    2.94

T10  :XS     500.    56.    2929.  0.57  0.65   69.62 *******   8620.   69.06
     -500.   500.   384.  239116.  4.21  0.00    0.01    0.36    2.94

EXIT :XS     200.    56.    2932.  0.57  0.26   69.89 *******   8620.   69.33
     -300.   200.   384.  239381.  4.21  0.00    0.01    0.36    2.94

FULV :FV     300.    56.    2934.  0.57  0.39   70.29 *******   8620.   69.72
        0.   300.   384.  239498.  4.21  0.00    0.00    0.36    2.94
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                              "APP  "     KRATIO =  1.81

APP  :AS     464.    12.    6948.  0.12  0.33   70.62 *******   8620.   70.49
      464.   464.   769.  434559.  5.17  0.00    0.00    0.16    1.24
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

BRID :BR     300.    48.    1921.  0.36  0.37   70.26   63.67   8620.   69.90
        0.   300.   249.  250826.  1.15  0.00    0.00    0.27    4.49

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
      3.   1.   1.  0.931  0.039   92.80 ****** ****** ******

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

APP  :AS     304.    10.    7039.  0.12  0.22   70.73   62.69   8620.   70.61
      464.   329.   769.  441960.  5.17  0.25    0.00    0.16    1.22

      M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
     0.736  0.381  273411.   454.   654.    70.50

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>
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WSPRO OUTPUT --Continued

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        WSPRO PROFILES-- STRUCTURE 12100771/30100
        LITTLE ROCKY CREEK AT I-77 NR GREAT FALLS, CHESTER COUNTY
        LEVELII BRIDGE SCOUR ANALYSIS 1/94 BY NMH
           *** RUN DATE & TIME: 01-10-94  06:51

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

T20  :XS   ******     2.    4175.  0.70 *****   72.55   63.50  12800.   71.86
    -1000. ******   397.  354913.  4.76 ***** *******    0.36    3.07

T10  :XS     500.     2.    4178.  0.69  0.65   73.21 *******  12800.   72.51
     -500.   500.   397.  355175.  4.76  0.00    0.01    0.36    3.06

EXIT :XS     200.     2.    4182.  0.69  0.26   73.48 *******  12800.   72.78
     -300.   200.   397.  355523.  4.76  0.00    0.01    0.36    3.06

FULV :FV     300.     2.    4183.  0.69  0.39   73.87 *******  12800.   73.18
        0.   300.   397.  355674.  4.76  0.00    0.00    0.36    3.06
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                              "APP  "     KRATIO =  1.91

APP  :AS     464.   -50.    9769.  0.13  0.32   74.18 *******  12800.   74.05
     464.    464.   780.  678094.  5.06  0.00    0.00    0.15    1.31
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

BRID :BR     300.    41.    2599.  0.46  0.36   73.84   65.49  12800.   73.38
        0.   300.   256.  380136.  1.22  0.00    0.00    0.27    4.92

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       3.   1.   1.  0.907  0.042   92.80 ****** ****** ******

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

APP  :AS     304.   -52.    9850.  0.13  0.21   74.28   63.94  12800.   74.15
     464.    331.   781.  685473.  5.05  0.23    0.00    0.15    1.30

      M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
     0.742  0.404  408285.   443.   658.    74.04

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>
```

PIER SCOUR COMPUTATIONS
FOR
Little Rocky Creek at I-77, Str. 12100771/30100, Chester Co., SC
Q100 Computed by NMH 2-23-94

HYDRAULIC VARIABLES USED IN CSU EQUATION

PIER NUMBER	6	5	4	3	2
PIER STATION (FT)	50	100	150	200	250
LOCATION OF PIER	lfp	lfp	mcl	trb	rfp
Y1: DEPTH (FT)	1.0	11.4	18.7	18.7	0.0
V1: VEL. (FPS)	3.1	3.1	6.6	6.6	0.0
a: PIER WIDTH (FT)	7.9	10.5	12.1	10.3	2.0
L: PIER LENGTH (FT)	7.9	10.5	12.1	10.3	6.0
PIER SHAPE	1	1	1	1	1
ATTACK ANGLE	20	20	20	20	20
K1 (SHAPE COEF.)	1.00	1.00	1.00	1.00	1.00
K2 (ANGLE COEF.)	1.00	1.00	1.00	1.00	1.44
FROUDE NO.	0.55	0.16	0.27	0.27	0.00

COMPUTED SCOUR DEPTHS USING CSU EQUATION

SCOUR DEPTH (FT)	5.94	9.93	15.99	14.40	0.00
MAX SCOUR DEPTH (FT)	6.54	10.92	17.59	15.84	0.00

"MAX SCOUR DEPTH" includes an additional 10 percent of the computed CSU scour depth as recommended in HEC 18

THE COMPUTED PIER SKEW CORRECTION COEFFICIENT WAS FOUND
BY EXTRAPOLATING THE LEFT END OF THE TABLE BACK TO 1 AT PIER NO. 6

THE COMPUTED PIER SKEW CORRECTION COEFFICIENT WAS FOUND
BY EXTRAPOLATING THE LEFT END OF THE TABLE BACK TO 1 AT PIER NO. 5

THE COMPUTED PIER SKEW CORRECTION COEFFICIENT WAS FOUND
BY EXTRAPOLATING THE LEFT END OF THE TABLE BACK TO 1 AT PIER NO. 4

THE COMPUTED PIER SKEW CORRECTION COEFFICIENT WAS FOUND
BY EXTRAPOLATING THE LEFT END OF THE TABLE BACK TO 1 AT PIER NO. 3

THE COMPUTED PIER SKEW CORRECTION COEFFICIENT WAS FOUND
BY EXTRAPOLATING THE LEFT END OF THE TABLE BACK TO 1 AT PIER NO. 2

CONTRACTION SCOUR COMPUTATIONS
FOR
Little Rocky Creek at I-77, Str. 12100771/30100, Chester Co., SC 2-23-94
Q100 Case Computed by NMH

LIVE-BED SCOUR COMPUTATIONS

	MAIN CHANNEL	CONTRACTED SECTION
DISCHARGE (CFS)	4340.	6010.
BOTTOM WIDTH (FT)	72.0	58.1
MANNINGS n	0.045	0.045
AVERAGE DEPTH (FT)	17.2	

ENERGY SLOPE	0.00140
D50 (FT)	0.0031
FALL VELOCITY (FPS)	0.47
K1 COEF.	0.64
K2 COEF.	0.21

COMPUTED DEPTH AT CONTRACTED SECTION (FT)	=	26.1
DEPTH AT MAIN CHANNEL (FT)	=	17.2
DEPTH OF CONTRACTION SCOUR (FT)	=	8.9

LEFT OVERBANK IN BRIDGE OPENING
CLEAR-WATER CONTRACTION SCOUR COMPUTATIONS

DISCHARGE IN CONTRACTED SECTION (CFS)	=	1810.
WIDTH OF CONTRACTED SECTION (FT)	=	57.3
MEDIAN GRAIN SIZE (FT)	=	0.0107
COMPUTED DEPTH OF CONTRACTED SECTION (FT)	=	9.1
AVERAGE FLOOD PLAIN DEPTH (FT)	=	8.5
DEPTH OF CONTRACTION SCOUR (FT)	=	0.6

RIGHT OVERBANK IN BRIDGE OPENING
CLEAR-WATER CONTRACTION SCOUR COMPUTATIONS

DISCHARGE IN CONTRACTED SECTION (CFS)	=	796.
WIDTH OF CONTRACTED SECTION (FT)	=	33.8
MEDIAN GRAIN SIZE (FT)	=	0.0107
COMPUTED DEPTH OF CONTRACTED SECTION (FT)	=	7.1
AVERAGE FLOOD PLAIN DEPTH (FT)	=	9.0
DEPTH OF CONTRACTION SCOUR (FT)	=	-1.9

PIER SCOUR COMPUTATIONS
FOR
Little Rocky Creek at I-77, Str. 12100771/30100, Chester Co., SC 2-23-94
Q500 Computed by NMH

HYDRAULIC VARIABLES USED IN CSU EQUATION

PIER NUMBER	6	5	4	3	2
PIER STATION (FT)	50	100	150	200	250
LOCATION OF PIER	lfp	lfp	mcl	trb	rfp
Y1: DEPTH (FT)	4.4	14.8	22.1	22.1	3.2
V1: VEL. (FPS)	3.7	3.7	7.4	7.4	3.3
a: PIER WIDTH (FT)	7.9	10.5	12.1	10.3	8.1
L: PIER LENGTH (FT)	7.9	10.5	12.1	10.3	8.1
PIER SHAPE	1	1	1	1	1
ATTACK ANGLE	20	20	20	20	20
K1 (SHAPE COEF.)	1.00	1.00	1.00	1.00	1.00
K2 (ANGLE COEF.)	1.00	1.00	1.00	1.00	1.00
FROUDE NO.	0.31	0.17	0.28	0.28	0.33

COMPUTED SCOUR DEPTHS USING CSU EQUATION

SCOUR DEPTH (FT)	7.82	11.08	17.21	15.50	7.27
MAX SCOUR DEPTH (FT)	8.60	12.19	18.93	17.04	7.99

"MAX SCOUR DEPTH" includes an additional 10 percent of the computed CSU scour depth as recommended in HEC 18

THE COMPUTED PIER SKEW CORRECTION COEFFICIENT WAS FOUND
BY EXTRAPOLATING THE LEFT END OF THE TABLE BACK TO 1 AT PIER NO. 6

THE COMPUTED PIER SKEW CORRECTION COEFFICIENT WAS FOUND
BY EXTRAPOLATING THE LEFT END OF THE TABLE BACK TO 1 AT PIER NO. 5

THE COMPUTED PIER SKEW CORRECTION COEFFICIENT WAS FOUND
BY EXTRAPOLATING THE LEFT END OF THE TABLE BACK TO 1 AT PIER NO. 4

THE COMPUTED PIER SKEW CORRECTION COEFFICIENT WAS FOUND
BY EXTRAPOLATING THE LEFT END OF THE TABLE BACK TO 1 AT PIER NO. 3

THE COMPUTED PIER SKEW CORRECTION COEFFICIENT WAS FOUND
BY EXTRAPOLATING THE LEFT END OF THE TABLE BACK TO 1 AT PIER NO. 2

CONTRACTION SCOUR COMPUTATIONS
FOR
Little Rocky Creek at I-77, Str. 12100771/30100, Chester Co., SC 2-23-94
Q500 Computed by NMH

LIVE-BED SCOUR COMPUTATIONS

	MAIN CHANNEL	CONTRACTED SECTION
DISCHARGE (CFS)	5830.	8360.
BOTTOM WIDTH (FT)	72.0	58.1
MANNINGS n	0.045	0.045
AVERAGE DEPTH (FT)	20.8	

ENERGY SLOPE	0.00130
D50 (FT)	0.0031
FALL VELOCITY (FPS)	0.47
K1 COEF.	0.64
K2 COEF.	0.21

COMPUTED DEPTH AT CONTRACTED SECTION (FT)	=	32.5
DEPTH AT MAIN CHANNEL (FT)	=	20.8
DEPTH OF CONTRACTION SCOUR (FT)	=	11.7

LEFT OVERBANK IN BRIDGE OPENING
CLEAR-WATER CONTRACTION SCOUR COMPUTATIONS

DISCHARGE IN CONTRACTED SECTION (CFS)	=	2980.
WIDTH OF CONTRACTED SECTION (FT)	=	57.3
MEDIAN GRAIN SIZE (FT)	=	0.0107
COMPUTED DEPTH OF CONTRACTED SECTION (FT)	=	13.9
AVERAGE FLOOD PLAIN DEPTH (FT)	=	11.0
DEPTH OF CONTRACTION SCOUR (FT)	=	2.9

RIGHT OVERBANK IN BRIDGE OPENING
CLEAR-WATER CONTRACTION SCOUR COMPUTATIONS

DISCHARGE IN CONTRACTED SECTION (CFS)	=	1460.
WIDTH OF CONTRACTED SECTION (FT)	=	33.8
MEDIAN GRAIN SIZE (FT)	=	0.0107
COMPUTED DEPTH OF CONTRACTED SECTION (FT)	=	11.9
AVERAGE FLOOD PLAIN DEPTH (FT)	=	11.7
DEPTH OF CONTRACTION SCOUR (FT)	=	0.2

1210077 1 0100
1210077 30100

FED. ROAD DIV. NO.	STATE	COUNTY	FILE NO.	F. A. PROJ. NO.	ROUTE NO.	SHEET NO.	TOTAL SHEETS
3	S. C.	CHESTER	12.476.5	I-77-1(31)	I-77	1	15

INDEX OF SHEETS

1. TITLE SHEET
2&2a. APPROACH SLABS
3. STANDARD WELDING SHEET
4. STANDARD NOTES
5. STANDARD DETAILS
6. TYPICAL ROAD SECTION
7&7a. ROAD PLAN AND PROFILE
8. BRIDGE PLAN AND PROFILE
9. END BENTS 1 & 7
10. INTERIOR BENTS 2-6
11. BLANK
12. 50' SPAN SUPERSTRUCTURE
13. SUPERSTRUCTURE DETAILS
14. 50' PRESTRESSED BEAM DETAILS
15. EXPANSION JOINT DETAILS

SOUTH CAROLINA
STATE HIGHWAY DEPARTMENT
COLUMBIA

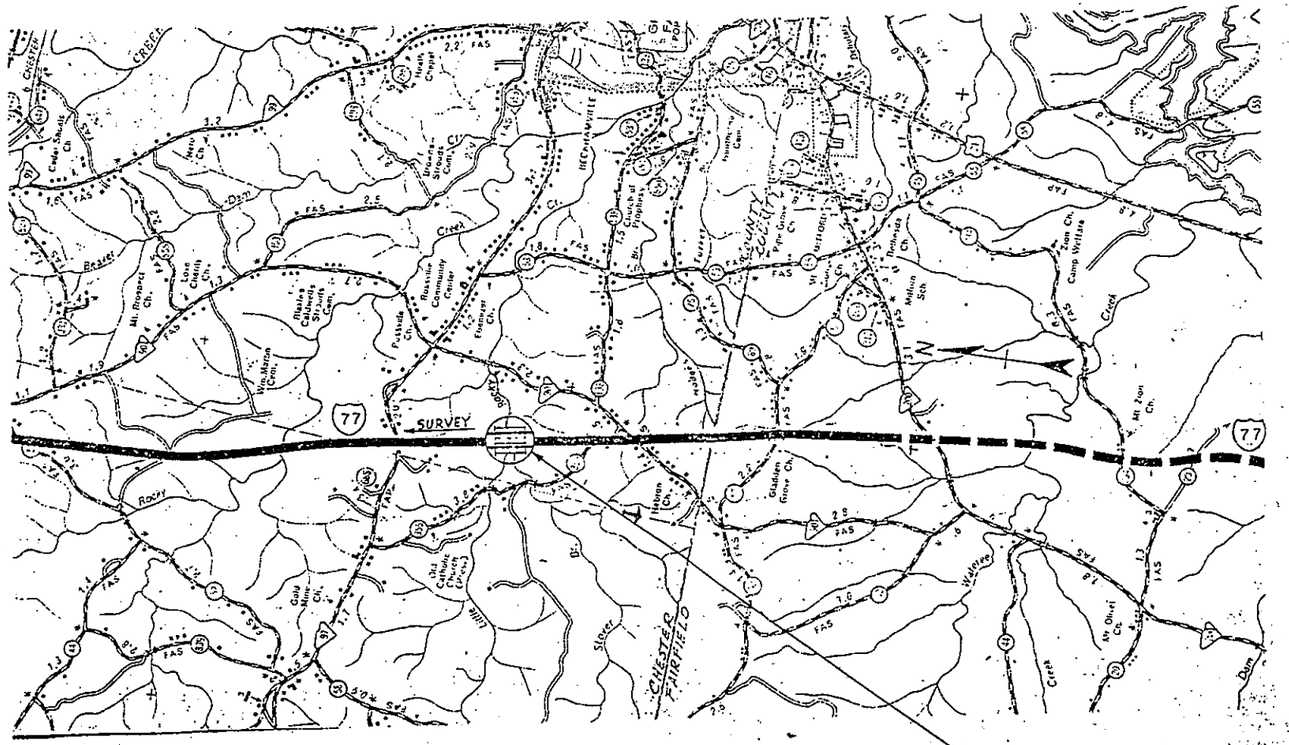
PLAN AND PROFILE OF PROPOSED
STATE HIGHWAY

FED. AID PROJECT NO. I-77-1(31)
FILE NO. 12.476.5
ROUTE I-77
CHESTER COUNTY
TWIN BRIDGES OVER LITTLE ROCKY CREEK

SUMMARY OF ESTIMATED QUANTITIES (BOTH LANES)

Item	Quantity	Unit
CONCRETE-CLASS "A"	1,345.4	C.Y.
REINFORCING STEEL	285,636	LBS.
50' PRESTRESSED CONCRETE BEAMS (3'-0")	96	EACH
STRUCTURAL STEEL (SWAY BRACES)	21,985	LBS.
*HP12X53 STEEL BEARING PILING	6580	L.F.
8" PIPE SLOPE DRAIN	150	L.F.
INTAKE SPILLWAY ASSEMBLIES	2	EACH

*NOTE: STRUCTURAL STEEL IN PILES SHALL CONTAIN NOT LESS THAN 0.2% COPPER.



Construct Twin 300'-0" R.C.(Prestressed) Bridges over Little Rocky Creek from sta. 3203+20.00 to sta. 3206+20.00 along I-77.

LAYOUT

Net Length of Roadway	0.000 Miles
Net Length of Bridges	0.057 Miles
Net Length of Project	0.057 Miles
Length of Exceptions	0.000 Miles
Gross Length of Project	0.057 Miles

CONVENTIONAL SIGNS

State Line	Trolley Poles
County Line	Power Poles
City or Town Limits	Telephone or Telegraph Poles
Property Line	Marsh
Fence	Trees
Retaining Wall	Brush
Existing Road	Stumps
℄ and R.O.W. Lines of	Buildings
Proposed Road	Bridge
Railroad	Concrete Box Culvert
Levee or Embankment	Pipe Culvert
Guard Rail	Drop Inlet and Culvert
Point of Intersection (P.I.) △	Hub on Center Line

LEGEND

PROPOSED PROJECT
OTHER ROADS

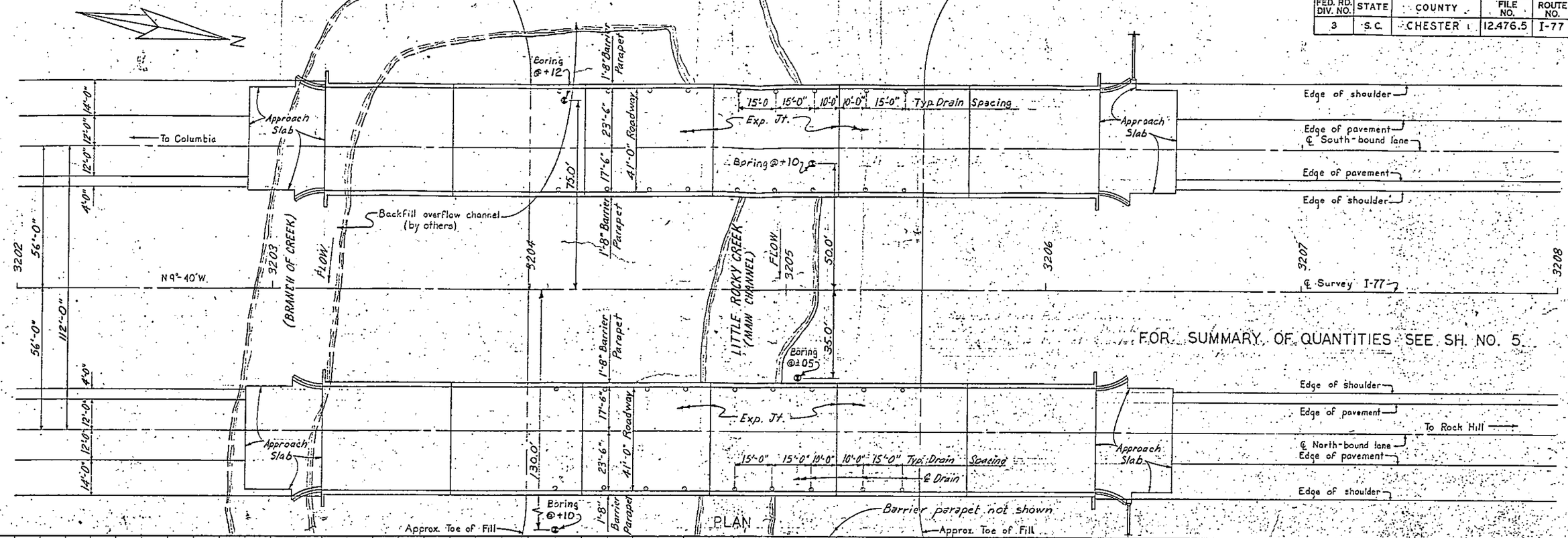
Note: All workmanship and materials on this project to conform with South Carolina State Highway Department Standard Specifications for Highway Construction Edition of 1972

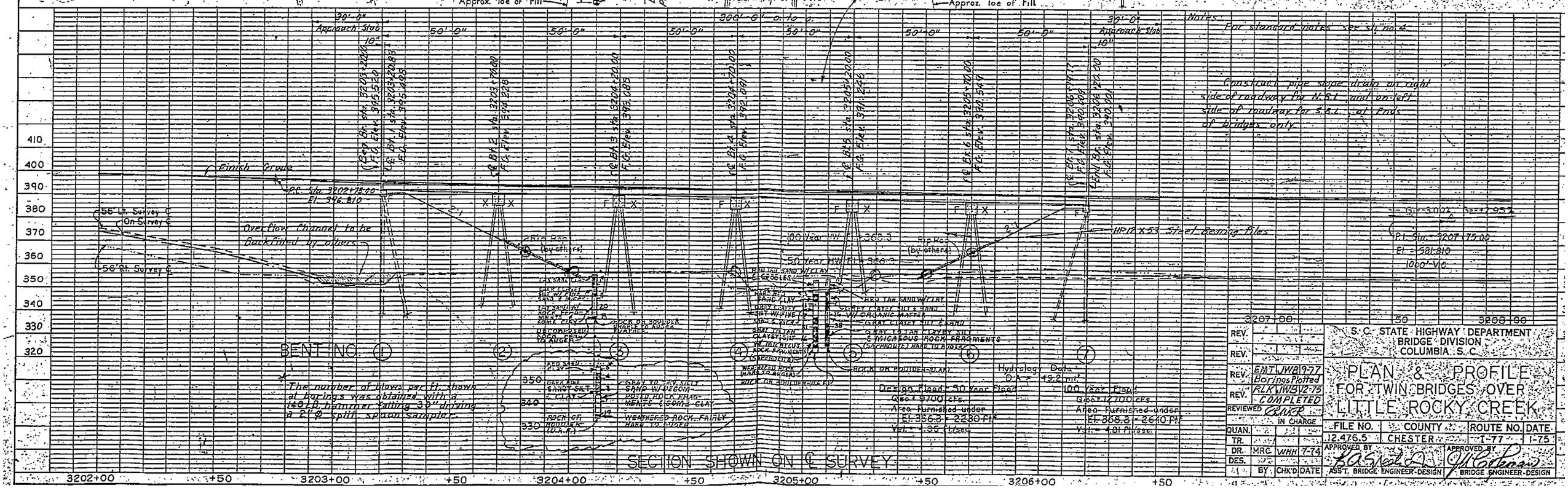
RECOMMENDED BY:
10-12-77
BRIDGE ENGINEER-DESIGN DATE

APPROVED:
10-14-7
STATE HIGHWAY ENGINEER DATE

DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
APPROVED:
[redacted] [redacted]
DISTRICT ENGINEER DATE
[redacted] [redacted]

FED. RD. DIV. NO.	STATE	COUNTY	FILE NO.	ROUTE NO.	SHEET NO.
3	S.C.	CHESTER	12.476.5	I-77	8





REV.			
REV.			
REV.	EMT	JWB	9-77 Borings Plotted
REV.	RLK	JWB	12-75 COMPLETED
REVIEWED			
IN CHARGE			
QUAN.			
TR.			
DR.	MRC	WHH	7-74
DES.			
	BY	CHK'D	DATE

S.C. STATE HIGHWAY DEPARTMENT
BRIDGE DIVISION
COLUMBIA, S.C.

PLAN & PROFILE FOR TWIN BRIDGES OVER LITTLE ROCKY CREEK

FILE NO.	COUNTY	ROUTE NO.	DATE
12.476.5	CHESTER	I-77	1-75

APPROVED BY: ASST. BRIDGE ENGINEER-DESIGN

APPROVED BY: BRIDGE ENGINEER-DESIGN

PILE RECORD ON FILE NO. 12.476.5

FED. ROAD DIV. NO.	STATE	COUNTY	FILE NO.	ROUTE NO.	SHEET NO.	TOTAL SHEETS
3	S.C.	CHESTER	12.476.5	I-77	18	2-

WEIGHT OF HAMMER 2750 TYPE SINGLE ACTING DIESEL

NORTH BOUND BRIDGE

DATE	BENT NO.	FOOTING	PILE NO.	DIAM. AT BUTT	DIAM. AT TIP	ORIG. LENGTH	BUILD-UP OR SPLICE	TOTAL LENGTH	LENGTH C.O.	NET LENGTH	ELEV. C.O.	ELEV. OF TIP WHEN PLAN BEARING VALUE IS OBTAINED	ELEV. PILE TIP	ELEV. ORIG. GROUND OR BOTTOM OF FOOTING	PEN. IN GROUND OR BELOW FOOTING	PEN. PER BLOW	FALL OF HAMMER	BEARING VALUE	PAY LENGTH	C.O. @ 40 %
2-21-78	1		1			68'-4"	0.000	68'-4"	16'-1"	52'-3"	389.750		337.500	388.750	51.250	0.1500	6'	66.00	52'-3"	
2-21-78	1		2			65'-1½"	0.000	65'-1½"	12'-10½"	52'-3"	389.750		334.500	388.750	54.250	0.1375	6'	69.47	52'-3"	
2-21-78	1		3			77'-4½"	0.000	77'-4½"	24'-2½"	53'-2"	389.750		336.600	388.750	52.150	0.1375	6'	69.47	53'-2"	
2-21-78	1		4			71'-11"	0.000	71'-11"	20'-3"	51'-2"	389.750		338.580	388.750	50.167	0.175	6'	66.00	51'-2"	
2-21-78	1		5			67'-6"	0.000	67'-6"	16'-3"	51'-3"	389.750		338.500	388.750	50.250	0.1375	6'	57.71	51'-3"	
2-21-78	1		6			66'-4"	0.000	66'-4"	14'-6"	51'-4"	389.750		337.420	388.750	51.333	0.150	6'	66.00	52'-4"	
2-22-78	2		1			51'-1"	0.000	51'-1"	0.000	51'-1"	387.960		336.860	356.000	19.120	0.075	6'	92.57	51'-1"	
2-22-78	2		1-A			53'-5¾"	0.000	53'-5¾"	0.000	53'-5¾"	387.960		334.910	356.000	21.090	0.1625	6'	62.86	53'-5¾"	
2-22-78	2		2			50'-8⅝"	0.000	50'-8⅝"	0.000	50'-8⅝"	387.960		337.270	356.000	18.730	0.2125	6'	62.80	50'-8⅝"	
2-22-78	2		2-A			51'-2¾"	0.000	51'-2¾"	0.000	51'-2¾"	387.960		336.760	356.000	19.240	0.200	6'	REFUSAL	51'-2¾"	
2-22-78	2		3			51'-1½"	0.000	51'-1½"	0.000	51'-1½"	387.960		336.830	356.000	19.170	0.250	6'	62.14	51'-1½"	
2-6-78	2		4			49'-11½"	0.000	49'-11½"	0.000	49'-11½"	387.960		339.080	356.000	17.920	0.125	6'	73.33	49'-11½"	
2-2-78	2		4-A			50'-3½"	0.000	50'-3½"	0.000	50'-3½"	387.960		337.670	356.000	18.330	0.175	6'	60.00	50'-3½"	
2-6-78	2		5			51'-4½"	0.000	51'-4½"	0.000	51'-4½"	387.960		337.580	356.000	18.420	0.175	6'	60.00	51'-4½"	
2-2-78	2		5			51'-10½"	0.000	51'-10½"	0.000	51'-10½"	387.960		336.120	356.000	19.880	0.125	6'	73.33	51'-10½"	
2-6-78	2		5-A			51'-6⅞"	0.000	51'-6⅞"	0.000	51'-6⅞"	387.960		336.330	356.000	19.610	0.175	6'	60.00	51'-6⅞"	
2-6-78	2		6			50'-11¾"	0.000	50'-11¾"	0.000	50'-11¾"	387.960		336.980	356.000	19.020	0.1625	6'	62.86	50'-11¾"	
2-6-78	2		6-A			51'-9¾"	0.000	51'-9¾"	0.000	51'-9¾"	387.960		336.150	356.000	19.850	0.000	6'	REFUSAL	51'-9¾"	
2-13-78	3		1			52'-1¾"	0.000	52'-1¾"	0.000	52'-1¾"	386.820		334.670	356.100	21.430	0.075	6'	92.57	52'-1¾"	
2-13-78	3		1-A			51'-10¾"	0.000	51'-10¾"	0.000	51'-10¾"	386.820		334.730	356.100	21.170	0.075	6'	92.57	51'-10¾"	
2-13-78	3		2			50'-7½"	0.000	50'-7½"	0.000	50'-7½"	386.820		336.190	356.100	20.010	0.1125	6'	77.65	50'-7½"	
2-13-78	3		2-A			52'-3"	0.000	52'-3"	0.000	52'-3"	386.820		334.570	356.100	21.630	0.175	6'	60.00	52'-3"	
2-13-78	3		3			51'-1½"	0.000	51'-1½"	0.000	51'-1½"	386.820		335.660	356.100	20.440	0.200	6'	55.00	51'-1½"	
2-13-78	3		3-A			50'-10¾"	0.000	50'-10¾"	0.000	50'-10¾"	386.820		335.940	356.100	20.160	0.100	6'	82.50	50'-10¾"	
2-13-78	3		4			51'-11½"	0.000	51'-11½"	0.000	51'-11½"	386.820		334.890	356.000	21.110	0.075	6'	92.57	51'-11½"	
2-13-78	3		4-A			52'-4"	0.000	52'-4"	0.000	52'-4"	386.820		334.490	355.900	21.410	0.1875	6'	57.39	52'-4"	
2-13-78	3		5			51'-10"	0.000	51'-10"	0.000	51'-10"	386.820		334.990	355.900	21.910	0.150	6'	66.00	51'-10"	
2-13-78	3		5-A			52'-9½"	0.000	52'-9½"	0.000	52'-9½"	386.820		334.030	355.800	21.770	0.1875	6'	57.39	52'-9½"	
2-13-78	3		6			54'-1½"	0.000	54'-1½"	0.000	54'-1½"	386.820		332.900	355.900	23.100	0.1875	6'	57.39	54'-1½"	
2-14-78	3		6-A			53'-9½"	0.000	53'-9½"	0.000	53'-9½"	386.820		333.030	356.000	22.970	0.1625	6'	62.86	53'-9½"	
2-16-78	4		1			52'-1½"	0.000	52'-1½"	-0.000	52'-1½"	385.830		333.810	354.000	20.190	0.150	6'	66.00	52'-1½"	
2-16-78	4		1-A			49'-5⅝"	0.000	49'-5⅝"	0.000	49'-5⅝"	385.830		336.350	348.800	12.450	0.175	6'	60.00	49'-5⅝"	
2-16-78	4		2			52'-7½"	0.000	52'-7½"	0.000	52'-7½"	385.830		333.210	354.100	18.890	0.200	6'	55.00	52'-7½"	
2-16-78	4		2-A			52'-1½"	0.000	52'-1½"	0.000	52'-1½"	385.830		333.670	348.400	14.730	0.200	6'	55.00	52'-1½"	
2-16-78	4		3			53'-4½"	0.000	53'-4½"	0.000	53'-4½"	385.830		332.460	352.900	21.440	0.1375	6'	69.47	53'-4½"	
2-16-78	4		3-A			49'-6½"	0.000	49'-6½"	0.000	49'-6½"	385.830		336.300	348.400	12.100	0.175	6'	60.00	49'-6½"	
2-16-78	4		4			52'-7½"	0.000	52'-7½"	0.000	52'-7½"	385.830		333.170	352.100	18.930	0.1563	6'	64.36	52'-7½"	
2-16-78	4		4-A			50'-5⅜"	0.000	50'-5⅜"	0.000	50'-5⅜"	385.830		335.380	348.400	13.020	0.1625	6'	62.86	50'-5⅜"	
2-16-78	4		5			50'-8⅝"	0.000	50'-8⅝"	0.000	50'-8⅝"	385.830		335.110	353.200	18.090	0.150	6'	66.00	50'-8⅝"	
2-16-78	4		5-A			52'-6⅝"	0.000	52'-6⅝"	0.000	52'-6⅝"	385.830		333.280	348.400	15.120	0.175	6'	60.00	52'-6⅝"	
2-16-78	4		6			52'-11½"	0.000	52'-11½"	0.000	52'-11½"	385.830		332.880	352.400	19.520	0.0375	6'	120.00	52'-11½"	
2-16-78	4		6-A			51'-3⅜"	0.000	51'-3⅜"	0.000	51'-3⅜"	385.830		334.540	348.400	13.860	0.150	6'	66.00	51'-3⅜"	
2-22-78	5		1			50'-3½"	0.000	50'-3½"	0.000	50'-3½"	384.990		334.626	354.410	19.712	0.100	6'	82.50	50'-3½"	
2-21-78	5		1-A			51'-10"	0.000	51'-10"	0.000	51'-10"	384.990		333.157	354.300	21.143	0.200	6'	55.00	51'-10"	
2-21-78	5		2			52'-4"	0.000	52'-4"	0.000	52'-4"	384.990		332.657	354.440	21.783	0.100	6'	82.50	52'-4"	
2-21-78	5		2-A			47'-1⅝"	0.000	47'-1⅝"	0.000	47'-1⅝"	384.990		335.855	354.360	18.505	0.125	6'	73.00	47'-1⅝"	
2-21-78	5		3			50'-7½"	0.000	50'-7½"	0.000	50'-7½"	384.990		334.396	354.320	19.994	0.100	6'	82.50	50'-7½"	
2-21-78	5		3-A			48'-1½"	0.000	48'-1½"	0.000	48'-1½"	384.990		336.865	354.320	17.455	0.125	6'	73.00	48'-1½"	
2-21-78	5		4			47'-11"	0.000	47'-11"	0.000	47'-11"	384.990		337.073	354.320	17.247	0.100	6'	82.50	47'-11"	
2-21-78	5		4-A			45'-7⅞"	0.000	45'-7⅞"	0.000	45'-7⅞"	384.990		339.334	354.280	14.946	0.100	6'	82.50	45'-7⅞"	
2-21-78	5		5			47'-4⅞"	0.000	47'-4⅞"	0.000	47'-4⅞"	384.990		337.584	354.360	16.676	0.100	6'	82.50	47'-4⅞"	
2-21-78	5		5-A			46'-4⅜"	0.000	46'-4⅜"	0.000	46'-4⅜"	384.990		338.625	354.290	15.665	0.0375	6'	120.00	46'-4⅜"	
2-21-78	5		6			50'-2"	0.000	50'-2"	0.000	50'-2"	384.990		334.828	354.190	19.362	0.100	6'	82.50	50'-2"	
2-21-78	5		6-A			46'-6⅜"	0.000	46'-6⅜"	0.000	46'-6⅜"	384.990		338.428	354.210	15.782	0.150	6'	66.00	46'-6⅜"	
2-14-78	6		1			45'-9½"	0.000	45'-9½"	0.000	45'-9½"	384.290		338.690	356.100	17.602	0.200	6'	55.00	45'-9½"	
2-14-78	6		1-A			47'-6⅝"	0.000	47'-6⅝"	0.000	47'-6⅝"	384.290		336.780	356.100	19.320	0.1625	6'	62.86	47'-6⅝"	
2-13-78	6		2			48'-10½"	0.000	48'-10½"	0.000	48'-10½"	384.290		335.451	356.100	20.649	0.175	6'	60.00	48'-10½"	
2-13-78	6		2-A			48'-0⅝"	0.000	48'-0⅝"	0.000	48'-0⅝"	384.290		336.285	356.100	19.815	0.200	6'	55.00	48'-0⅝"	
2-14-78	6		3			48'-0⅝"	0.000	48'-0⅝"	0.000	48'-0⅝"	384.290		336.248	356.100	19.852	0.200	6'	55.00	48'-0⅝"	
2-13-78	6		3-A			47'-10⅝"	0.000	47'-10⅝"	0.000	47'-10⅝"	384.290		336.431	356.100	19.669	0.200	6'	55.00	47'-10⅝"	
2-13-78	6		4			50'-1⅞"	0.000	50'-1⅞"	0.000	50'-1⅞"	384.290		334.144	356.100	21.956	0.206	6'	53.88	50'-1⅞"	
2-14-78	6		4-A			49'-2⅝"	0.000	49'-2⅝"	0.000	49'-2⅝"	384.290		335.061	356.100	21.039	0.200	6'	55.00	49'-2⅝"	
2-14-78	6		5			48'-4⅜"	0.000	48'-4⅜"	0.000	48'-4⅜"	384.290		335.694	356.100	20.206	0.225	6'	50.77	48'-4⅜"	
2-14-78	6		5-A			50'-6⅝"	0.000	50'-6⅝"	0.000	50'-6⅝"	384.290		333.769	356.100	22.331	0.250	6'	47.14	50'-6⅝"	
2-14-78	6		6			52'-3⅜"	0.000	52'-3⅜"	0.000	52'-3⅜"	384.290		331.978	356.100	24.122	0.250	6'	47.14	52'-3⅜"	
2-14-78	6		6-A			52'-5⅝"	0.000	52'-5⅝"	0.000	52'-5⅝"	384.290		331.800	356.100	24.300	0.250	6'	47.14	52'-5⅝"	
2-24-78	7		1			39'-4"	0.000	39'-4"	0.000	39'-4"	384.260		344.927	383.260	38.333	0.200	6'	55.00	39'-4"	
2-24-78	7		2			33'-4"	0.000	33'-4"	0.000	33'-4"	384.260		351.232	383.260	32.028	0.125	6'	73.33	33'-4"	
2-24-78	7		3			39'-1½"	0.000	39'-1½"	0.000	39'-1½"	384.260		345.114	383.260	38.146	0.250	6'	47.14	39'-1½"	
2-24-78	7		4			39'-0"	0.000	39'-0"	0.000	39'-0"	384.260		345.260	383.260	38.000	0.2625	6'	45.52	39'-0"	
2-25-78	7		5			36'-4½"	0.000	36'-4½"	0.000	36'-4½"	384.260		347.885	383.260	35.375	0.150	6'	66.00	36'-4½"	
2-24-78	7		6			36'-1⅜"	0.000	36'-1⅜"	0.000	36'-1⅜"	384.260		348.145	383.260	35.115	0.1125	6'	77.65	36'-1⅜"	
TOTAL										3772'-4"									3572'-4"	

SOUTH BOUND BRIDGE

DATE	BENT NO.	FOOTING	PILE NO.	DIAM. AT BUTT	DIAM. AT TIP	ORIG. LENGTH	BUILD-UP OR SPLICE	TOTAL LENGTH	LENGTH C.O.	NET LENGTH	ELEV. C.O.	ELEV. OF TIP WHEN PLAN BEARING VALUE IS OBTAINED	ELEV. PILE TIP	ELEV. ORIG. GROUND OR BOTTOM OF FOOTING	PEN. IN GROUND OR BELOW FOOTING	PEN. PER BLOW	FALL OF HAMMER	BEARING VALUE	PAY LENGTH	C.O. @ 40 %
2-22-78	1		1			80'-4½"	0.000	80'-4½"	36'-11½"	43'-4¾"	389.750		346.360	388.750	42.390	0.050	6'	110.00	43'-4¾"	
2-22-78	1		2			80'-4½"	0.000	80'-4½"	27'-10½"	52'-6"	389.750		337.250	388.750	51.500	0.200	6'	55.00	52'-6"	
2-22-78	1		3			80'-4½"	0.000	80'-4½"	31'-6"	48'-10½"	389.750		340.800	388.750	47.870	0.1375	6'	69.47	48'-10½"	
2-22-78	1		4			80'-4½"	0.000	80'-4½"	27'-8¼"	52'-8¼"	389.750		337.060	388.750	51.690	0.0875	6'	88.00	52'-8¼"	
2-22-78	1		5			80'-5"	0.000	80'-5"	27'-1¼"	53'-3½"	389.750		336.460	388.750	52.290	0.150	6'	66.00	53'-3½"	
2-22-78	1		6			80'-5½"	0.000	80'-5½"	26'-0"	54'-5½"	389.750		335.290	388.750	53.460	0.1625	6'	62.86	54'-5½"	
2-7-78	2		1			53'-4½"	0.000	53'-4½"	0.000	53'-4½"	387.960		334.580	356.000	21.420	0.175	6'	60.00	53'-4½"	
2-7-78	2		1-A			55'-4½"	0.000	55'-4½"	0.000	55'-4½"	387.960		332.610	356.000	23.390	0.1625	6'	62.86	55'-4½"	
2-7-78	2		2			54'-1"	0.000	54'-1"	0.000	54'-1"	387.960		333.890	356.000	22.110	0.150	6'	66.00	54'-1"	
2-7-78	2		2-A			55'-3½"	0.000	55'-3½"	0.000	55'-3½"	387.960		332.650	356.000	23.350	0.125	6'	73.00	55'-3½"	
2-7-78	2		3			55'-9⅞"	0.000	55'-9⅞"	0.000	55'-9⅞"	387.960		332.140	356.000	23.860	0.175	6'	60.00	55'-9⅞"	
2-7-78	2		3-A			54'-1½"	0.000	54'-1½"	0.000	54'-1½"	387.960		333.810	356.000	22.190	0.200	6'	55.00	54'-1½"	
2-7-78	2		4			53'-11"	0.000	53'-11"	0.000	53'-11"	387.960		334.040	356.000	21.960	0.2125	6'	52.80	53'-11"	
2-7-78	2		4-A			54'-5⅜"	0.000	54'-5⅜"	0.000	54'-5⅜"	387.960		333.490	356.000	22.510	0.1188	6'	75.41	54'-5⅜"	
2-7-78	2		5			52'-10⅜"	0.000	52'-10⅜"	0.000	52'-10⅜"	387.960		335.060	356.000	20.940	0.100	6'	82.50	52'-10⅜"	
2-7-78	2		5-A			54'-9¾"	0.000	54'-9¾"	0.000	54'-9¾"	387.960		333.190	356.000	22.810	0.2375	6'	66.89	54'-9¾"	
2-7-78	2		6			52'-¼"	0.000	52'-¼"	0.000	52'-¼"	387.960		335.960	356.000	20.040	0.0875	6'	88.00	52'-¼"	
2-7-78	2		6-A			51'-8⅜"	0.000	51'-8⅜"	0.000	51'-8⅜"	387.960		336.250	356.000	19.750	0.150	6'	66.00	51'-8⅜"	
2-7-78	3		1			55'-3¾"	0.000	55'-3¾"	0.000	55'-3¾"	386.820		331.790	356.160	24.370	0.125	6'	73.33	55'-3¾"	
2-7-78	3		1-A			56'-7¾"	0.000	56'-7¾"	0.000	56'-7¾"	386.820		330.220	356.160	25.940	0.1625	6'	62.86	56'-7¾"	
2-8-78	3		2			53'-5¾"	0.000	53'-5¾"	0.000	53'-5¾"	386.820		333.390	356.160	22.770	0.200	6'	55.00	53'-5¾"	
2-8-78	3		2-A			54'-4"	0.000	54'-4"	0.000	54'-4"	386.820		332.490	356.160	23.670	0.050	6'	110.00	54'-4"	
2-8-78	3		3			55'-3¾"	0.000	55'-3¾"	0.000	55'-3¾"	386.820		331.760	356.060	24.300	0.0875	6'	REFUSAL	55'-3¾"	
2-9-78	3		3-A			52'-8⅜"	0.000	52'-8⅜"	0.000	52'-8⅜"	386.820		334.120	356.060	21.940	0.150	6'	66.00	52'-8⅜"	
2-9-78	3		4			54'-2⅝"	0.000	54'-2⅝"	0.000	54'-2⅝"	386.820		332.660	356.060	23.400	0.200	6'	55.00	54'-2⅝"	
2-9-78	3		4-A			51'-9⅞"	0.000	51'-9⅞"	0.000	51'-9⅞"	386.820		335.000	356.060	21.060	0.0875	6'	88.00	51'-9⅞"	
2-9-78	3		5			50'-4¾"	0.000	50'-4¾"	0.000	50'-4¾"	386.820		336.800	356.060	19.260	0.100	6'	82.50	50'-4¾"	
2-9-78	3		5-A			51'-5⅞"	0.000	51'-5⅞"	0.000	51'-5⅞"	386.820		335.390	356.060	20.670	0.0875	6'	88.00	51'-5⅞"	
2-9-78	3		6			53'-8⅜"	0.000	53'-8⅜"	0.000	53'-8⅜"	386.820		333.120	356.360	23.240	0.200	6'	55.00	53'-8⅜"	
2-9-78	3		6-A			55'-8⅜"	0.000	55'-8⅜"	0.000	55'-8⅜"	386.820		331.090	356.360	25.270	0.1125	6'	77.65	55'-8⅜"	
6-19-78	4		1			55'-9⅞"	0.000	55'-9⅞"	0.000	55'-9⅞"	385.830		330.033	347.910	19.877	0.075	6'	92.57	55'-9⅞"	
6-19-78	4		1-A			56'-1¼"	0.000	56'-1¼"	0.000	56'-1¼"	385.830		329.705	349.910	20.205	0.100	6'	82.50	56'-1¼"	
6-16-78	4		2			54'-8⅝"	0.000	54'-8⅝"	0.000	54'-8⅝"	385.830		331.153	349.910	18.757	0.150	6'	66.00	54'-8⅝"	
6-16-78	4		2-A			54'-1⅛"	0.000	54'-1⅛"	0.000	54'-1⅛"	385.830		330.861	349.910	19.049	0.150	6'	66.00	54'-1⅛"	
6-16-78	4		3			55'-2¼"	0.000	55'-2¼"	0.000	55'-2¼"	385.830		330.643	349.840	19.197	0.150	6'	66.00	55'-2¼"	
6-16-78	4		3-A			53'-3¼"	0.000	53'-3¼"	0.000	53'-3¼"	385.830		332.569	349.840	17.281	0.0375	6'	120.00	53'-3¼"	
6-16-78	4		4			57'-0⅜"	0.000	57'-0⅜"	0.000	57'-0⅜"	385.830		328.799	349.840	21.041	0.150	6'	66.00	57'-0⅜"	
6-16-78	4		4-A			53'-11⅝"	0.000	53'-11⅝"	0.000	53'-11⅝"	385.830		331.882	349.840	17.958	0.125	6'	73.00	53'-11⅝"	
6-16-78	4		5			56'-10⅜"	0.000	56'-10⅜"	0.000	56'-10⅜"	385.830		328.934	349.840	20.906	0.1125	6'	77.65	56'-10⅜"	
6-19-78	4		5-A			57'-4⅞"	0.000	57'-4⅞"	0.000	57'-4⅞"	385.830		328.466	349.540	21.080	0.150	6'	66.00	57'-4⅞"	
6-19-78	4		6			54'-11½"	0.000	54'-11½"	0.000	54'-11½"	385.830		330.851	349.540	18.689	0.100	6'	82.50	54'-11½"	
6-19-78	4		6-A			53'-7½"	0.000	53'-7½"	0.000	53'-7½"	385.830		332.265	349.540	17.335	0.100	6'	82.50	53'-7½"	
6-20-78	5		1			51'-7¾"	0.000	51'-7¾"	0.000	51'-7¾"	384.990		333.344	354.690	21.346	0.100	6'	82.50	51'-7¾"	
6-20-78	5		1-A			51'-4¾"	0.000	51'-4¾"	0.000	51'-4¾"	384.990		333.596	354.780	21.186	0.100	6'	82.50	51'-4¾"	
6-19-78	5		2			51'-10½"	0.000	51'-10½"	0.000	51'-10½"	384.990		333.074	354.720	21.646	0.100	6'	82.50	51'-10½"	
6-19-78	5		2-A			51'-0¼"	0.000	51'-0¼"	0.000	51'-0¼"	384.990		333.969	354.750	20.781	0.125	6'	73.00	51'-0¼"	
6-20-78	5		3			51'-9⅞"	0.000	51'-9⅞"	0.000	51'-9⅞"	384.990		333.167	354.750	21.583	0.200	6'	55.00	51'-9⅞"	
6-20-78	5		3-A			54'-1⅛"	0.000	54'-1⅛"	0.000	54'-1⅛"	384.990		330.834	354.760	23.926	0.225	6'	50.77	54'-1⅛"	
6-20-78	5		4			50'-11"	0.000	50'-11"	0.000	50'-11"	384.990		334.073	354.770	21.697	0.150	6'	66.00	50'-11"	
6-20-78	5		4-A			54'-3⅜"	0.000	54'-3⅜"	0.000	54'-3⅜"	384.990		330.709	354.790	24.081	0.200	6'	55.00	54'-3⅜"	
6-20-78	5		5			51'-0¼"	0.000	51'-0¼"	0.000	51'-0¼"	384.990		333.940	354.790	20.842	0.150	6'	66.00	51'-0¼"	
6-20-78	5		5-A			51'-9⅞"	0.000	51'-9⅞"	0.000	51'-9⅞"	384.990		333.209	354.800	21.591	0.175	6'	60.00	51'-9⅞"	
6-20-78	5		6			53'-7⅞"	0.000	53'-7⅞"	0.000	53'-7⅞"	384.990		331.375	354.760	23.385	0.150	6'	66.00	53'-7⅞"	
6-20-78	5		6-A			49'-11¾"	0.000	49'-11¾"	0.000	49'-11¾"	384.990		335.011	354.860	19.849	0.100	6'	82.50	49'-11¾"	
TOTAL										2884'-7"									2884'-7"	
GRAND TOTAL																			6456'-11"	

NOTES CONCERNING ANY UNUSUAL FOUNDATION CONDITIONS

BENT NO.	FOOTING	PILE NO.	REMARKS

NOTES:
PAY LENGTH SHOULD INCLUDE ALLOWANCE FOR SPLICING STEEL PIECES AND ANY OTHER AUTHORIZED ALLOWANCES.
NUMBERING PILES: A SKETCH OF BENT OR FOOTING TO BE DRAWN ON THIS SHEET AND PILES TO BE NUMBERED. ALSO FLOW OF STREAM TO BE SHOWN.
PENETRATION PER BLOW: GIVE THIS INFORMATION IN DECIMALS OF AN INCH.

PILE RECORD FILE NO.

PILE RECORD ON FILE NO. 12.476-5

FED. ROAD CIV. NO	STATE	COUNTY	FILE NO.	ROUTE NO.	SHEET NO.	TOTAL SHEETS
3	S.C.	CHESTER	12.476-5	S-77	17	24

WEIGHT OF HAMMER 2750 TYPE SINGLE ACTING DIESEL

SOUTH BOUND BRIDGE

DATE	BENT NO.	FOOTING	PILE NO.	DIAM. AT BUTT	DIAM. AT TIP	ORIG. LENGTH	BUILD-UP OR SPLICE	TOTAL LENGTH	LENGTH C.O.	NET LENGTH	ELEV. C.O.	ELEV. OF TIP WHEN PLAN BEARING VALUE IS OBTAINED	ELEV PILE TIP	ELEV ORIG GROUND OR BOTTOM OF FOOTING	PEN IN GROUND OR BELOW FOOTING	PEN. PER BLOW	FALL OF HAMMER	BEARING VALUE	PAY LENGTH	C.O. @ 40 %
6-15-78	6		1			47'-11½"	0'-0"	47'-11½"	0'-0"	47'-11½"	384.290		336.311	356.100	19.789	0.200	6'	55.00	47'-11½"	
6-15-78	6		1-A			47'-7½"	0'-0"	47'-7½"	0'-0"	47'-7½"	384.290		336.644	356.100	19.456	0.1875	6'	57.39	47'-7½"	
6-15-78	6		2			48'-9⅝"	0'-0"	48'-9⅝"	0'-0"	48'-9⅝"	384.290		335.466	356.100	20.612	0.150	6'	66.00	48'-9⅝"	
6-15-78	6		2-A			48'-5⅝"	0'-0"	48'-5⅝"	0'-0"	48'-5⅝"	384.290		335.847	356.100	20.253	0.100	6'	55.00	48'-5⅝"	
6-15-78	6		3			48'-8⅝"	0'-0"	48'-8⅝"	0'-0"	48'-8⅝"	384.290		335.545	356.100	20.555	0.175	6'	60.00	48'-8⅝"	
6-15-78	6		3-A			47'-5⅝"	0'-0"	47'-5⅝"	0'-0"	47'-5⅝"	384.290		336.847	356.100	19.253	0.1875	6'	57.39	47'-5⅝"	
6-15-78	6		4			46'-10⅝"	0'-0"	46'-10⅝"	0'-0"	46'-10⅝"	384.290		337.405	356.100	18.695	0.175	6'	60.00	46'-10⅝"	
6-15-78	6		4-A			47'-8⅝"	0'-0"	47'-8⅝"	0'-0"	47'-8⅝"	384.290		336.561	356.100	19.539	0.1875	6'	57.39	47'-8⅝"	
6-15-78	6		5			46'-11½"	0'-0"	46'-11½"	0'-0"	46'-11½"	384.290		337.316	356.100	18.784	0.1875	6'	57.39	46'-11½"	
6-15-78	6		5-A			45'-6½"	0'-0"	45'-6½"	0'-0"	45'-6½"	384.290		338.769	356.100	17.331	0.175	6'	60.00	45'-6½"	
6-15-78	6		6			47'-3½"	0'-0"	47'-3½"	0'-0"	47'-3½"	384.290		336.978	356.100	19.122	0.250	6'	47.14	47'-3½"	
6-15-78	6		6-A			42'-9⅞"	0'-0"	42'-9⅞"	0'-0"	42'-9⅞"	384.290		337.467	356.100	18.633	0.1875	6'	57.39	42'-9⅞"	
8-25-78	7		1			40'-6"	0'-0"	40'-6"	0'-0"	40'-6"	384.261		343.761	383.261	39.500	0.200	6'	55.00	40'-6"	
8-25-78	7		2			40'-6½"	0'-0"	40'-6½"	0'-0"	40'-6½"	384.261		343.719	383.261	39.542	0.1875	6'	73.33	40'-6½"	
8-25-78	7		3			40'-5½"	0'-0"	40'-5½"	0'-0"	40'-5½"	384.261		343.803	383.261	39.459	0.2500	6'	47.14	40'-5½"	
8-25-78	7		4			40'-4½"	0'-0"	40'-4½"	0'-0"	40'-4½"	384.261		343.886	383.261	39.375	0.2583	6'	45.52	40'-4½"	
8-25-78	7		5			40'-4"	0'-0"	40'-4"	0'-0"	40'-4"	384.261		343.928	383.261	39.333	0.2583	6'	46.00	40'-4"	
8-25-78	7		6			40'-5½"	0'-0"	40'-5½"	0'-0"	40'-5½"	384.261		343.803	383.261	39.458	0.2125	6'	77.65	40'-5½"	
									0				2492					61		
													312.3465							
								SHEET TOTAL =	812'-11⅝"				SHEET TOTAL =						812'-11⅝"	✓
TOTAL								SBL	3697'-6⅝"										3697'-6⅝"	
GRAND TOTAL								NBL & SBL	7269'-11½"				NBL & SBL						7,269'-11½"	✓

TOTAL

NOTES CONCERNING ANY UNUSUAL FOUNDATION CONDITIONS

BENT NO.	FOOTING	PILE NO.	REMARKS

NOTES:

PAY LENGTH SHOULD INCLUDE ALLOWANCE FOR SPLICING STEEL PILES AND ANY OTHER AUTHORIZED ALLOWANCES.

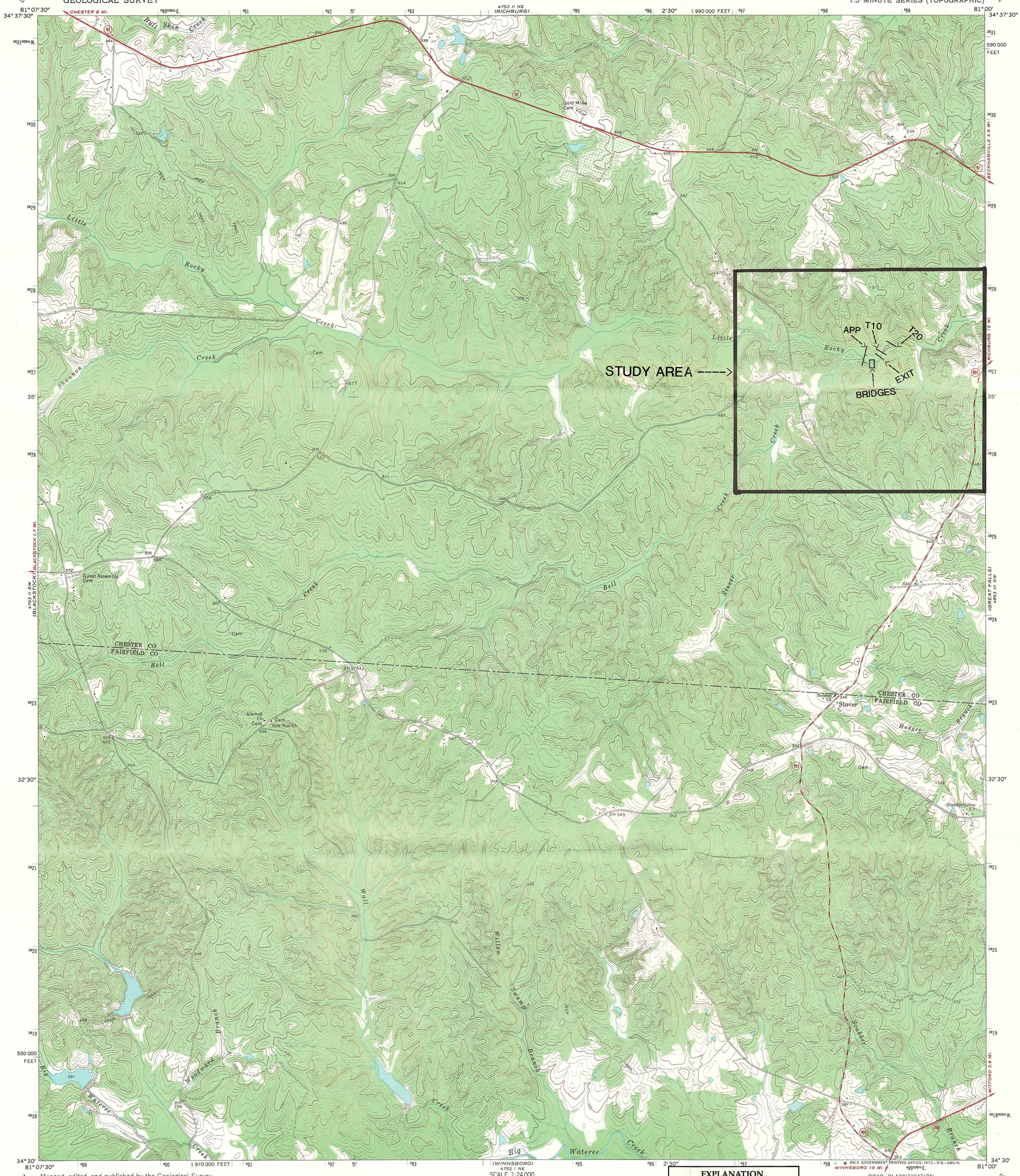
NUMBERING PILES: A SKETCH OF BENT OR FOOTING TO BE DRAWN ON THIS SHEET AND PILES TO BE NUMBERED, ALSO FLOW OF STREAM TO BE SHOWN.

PENETRATION PER BLOW: GIVE THIS INFORMATION IN DECIMALS OF AN INCH.

PILE RECORD FILE NO.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STOVER QUADRANGLE
SOUTH CAROLINA
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and South Carolina Geodetic Survey

Topography by photogrammetric methods from aerial photographs taken 1968. Field checked 1969

Polyconic projection. 1927 North American datum
10,000-foot grid based on South Carolina coordinate system, north zone
1000-meter Universal Transverse Mercator grid ticks, zone 17, shown in blue

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

MN GN
2½° 44 MILS
0°02' 1 MIL
UTM GRID AND 1969 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

1 ½ 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

EXPLANATION

—— EXIT cross-section

S.C.
QUADRANGLE LOCATION

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

☆U.S. GOVERNMENT PRINTING OFFICE: 1973—516—080/6

STOVER, S. C.
N3430—W8100/7.5
1969
AMS 4753 II SE—SERIES V846

36D

Figure 1.--Topography of study area and location of cross sections used in WSPRO analysis for structures 12100771/30100 on Interstate 77, crossing Little Rocky Creek in Chester County, South Carolina.