



## **CERTIFICATE OF AUTHENTICITY**

**THIS IS TO CERTIFY THAT THE FOLLOWING ELECTRONIC RECORDS ARE TRUE AND ACCURATE REPRODUCTIONS OF THE ORIGINAL RECORDS OF JAMES CITY COUNTY GENERAL SERVICES DEPARTMENT- STORMWATER DIVISION; WERE SCANNED IN THE REGULAR COURSE OF BUSINESS PURSUANT TO GUIDELINES ESTABLISHED BY THE LIBRARY OF VIRGINIA AND ARCHIVES; AND HAVE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.**

**BMP NUMBER: CC026**

**DATE VERIFIED: May 13, 2019**

**QUALITY ASSURANCE TECHNICIAN: Leah Hardenbergh**

**LOCATION: WILLIAMSBURG, VIRGINIA**



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**BMP NUMBER: CC-026**

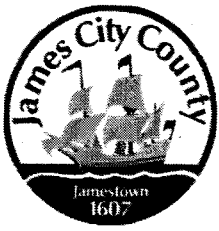
**DATE VERIFIED: March 15, 2012**

**QUALITY ASSURANCE TECHNICIAN:**

**Leah Hardenbergh**

*Leah Hardenbergh*

**LOCATION: WILLIAMSBURG, VIRGINIA**



# Stormwater Division

## MEMORANDUM

**DATE:** March 10, 2010  
**TO:** Michael J. Gillis, Virginia Correctional Enterprises Document Management Services  
**FROM:** Jo Anna Ripley, Stormwater  
**PO:** 270712  
**RE:** Files Approved for Scanning

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**General File ID or BMP ID:** CC026

**PIN:** 551-05-00-A

**Subdivision, Tract, Business or Owner**

**Name (if known):**

Commonwealth of Virginia

Located at the intersestion of Route 199 and John  
Tyler Lane in the City of Williamsburg

**Property Description:**

**Site Address:**

*(For internal use only)*

**Box** 10

**Drawer:** 6

**Agreements:** (in file as of scan date)

N

**Book or Doc#:**

**Page:**

### Comments

VDOT project #0199-047-103, C-504; BMP is located in the City of Williamsburg and is adjacent to 128 John Tyler Lane PIN 551-05-00-A

# Construction Drawings



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ROUTE 199

WETLAND  
PLANTS  
/ ON  
SHELF.

DITCH →

STILL BAY

x 90.75

\* 90.75

3-BN

3- EN

RIM DRAIN INLET  
94.75  
12-TD

**BIKE LANE**



MEDIAN PLANTING TYPICAL OF PREVIOUS TYPE

BOTTOM AREA = 31,400 SF  
TOP OF SLOPE = 38,500 SF  
REAR OF SHELF = 46,750 SF

Bush ends  
@ rear of still  
basin

SCALE 1" = 50'

REAR LINE  
OF SHELF

TOP OF SLOPE + LIMIT OF CLAY  
TOE OF SLOPE

PIKE LANE

Scale 1" = 50'



MEDIAN PLANTING TYPICAL OF PREVIOUS TYPE

Buck ends  
@ rear of ST. 11  
basin

RED  
CEDAR

AR

AR

AR

AR

AR

AR

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AR

3:1 slope

2:1 slope

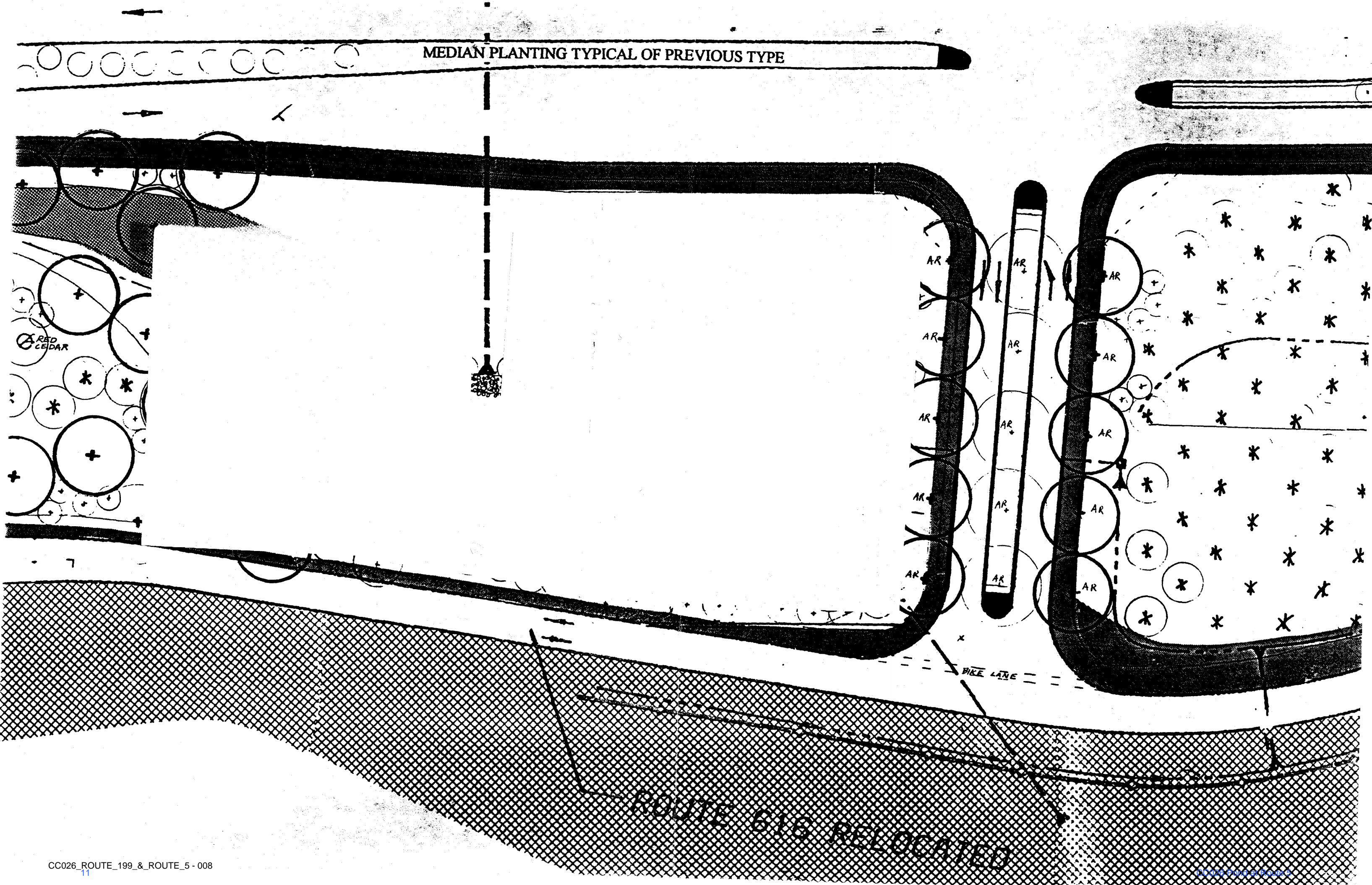
BIKE LANE

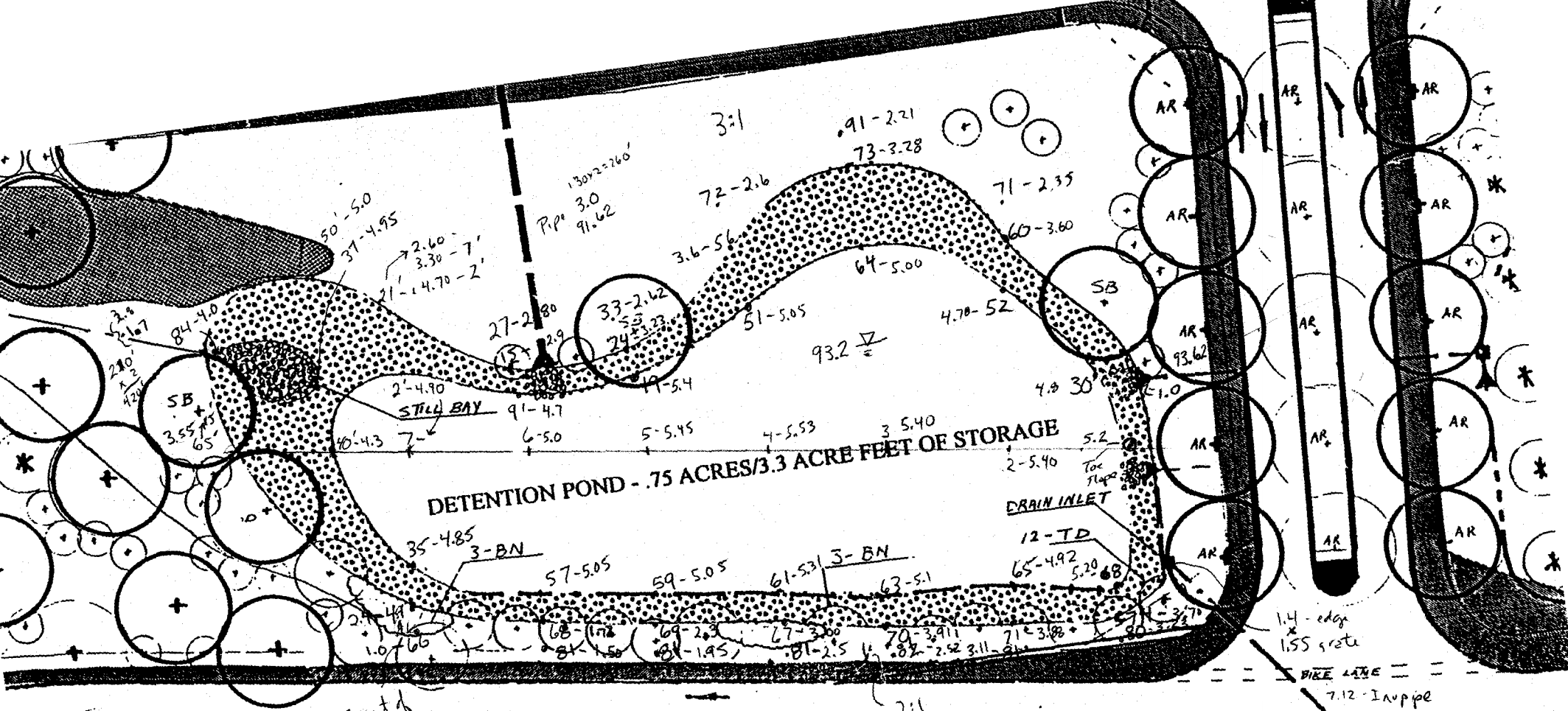
Scale 1"=50'

ROUTE 618 RELOCATED



MEDIAN PLANTING TYPICAL OF PREVIOUS TYPE





BOTTOM- 31,465  
 31,387  
 31,425 = 0.72 ac  
 START Bench 38,634  
 38,517  
 38,500 = 0.88 ac  
 Top Bench 45,442  
 46,644  
 46,750 = 1.07

1"=60'

94.62  
 1.40  
 93.22

7.12  
 87.5-  
 94.62 - HI

94.62









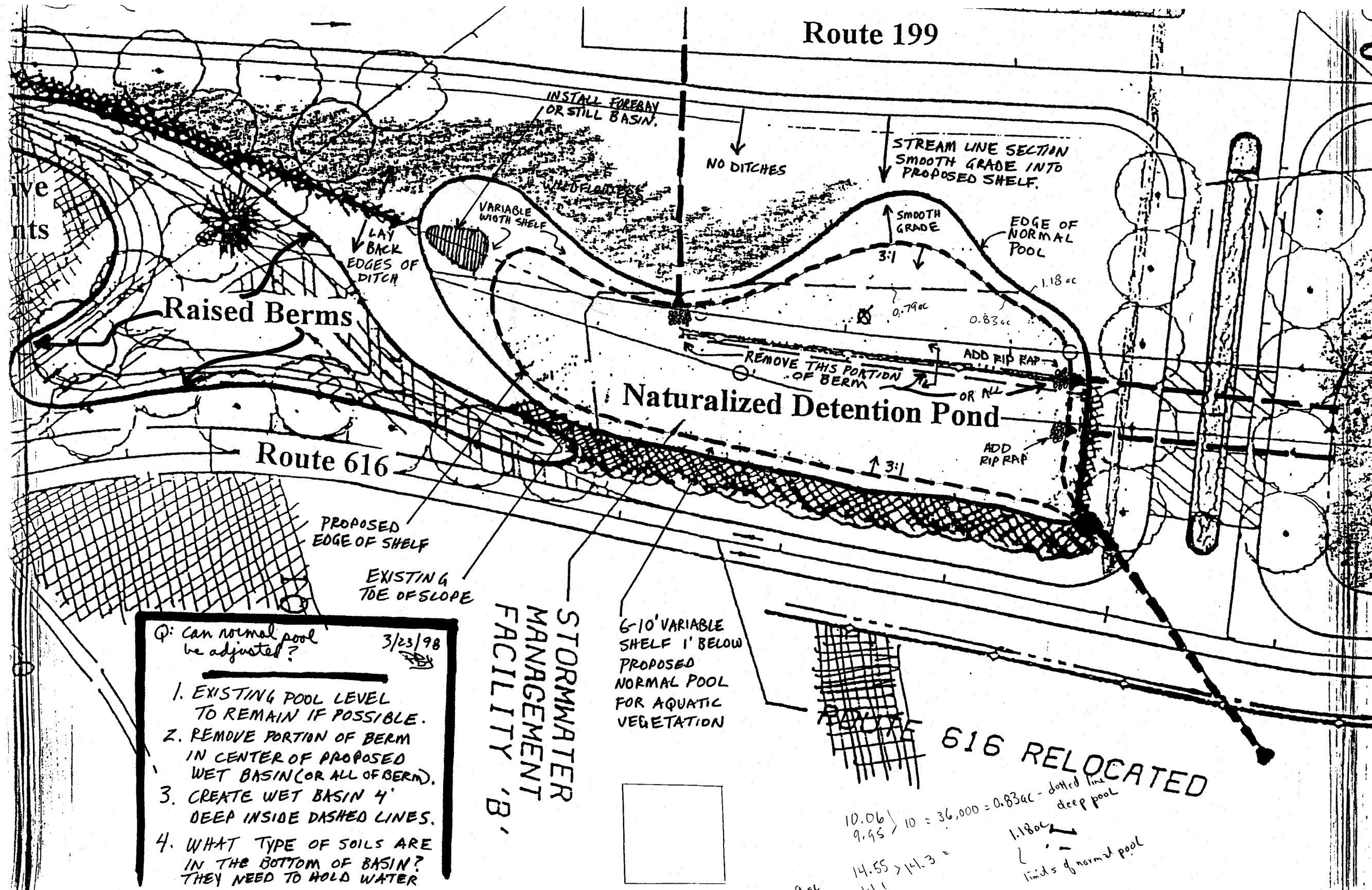
MEDIAN PLANTING TYPICAL OF PREVIOUS TYPE

Back ends  
of rear of still  
basin

SCALE 1"=50'

Scale 1"=50'

ROUTE 610 RELOCATED



- Q: Can normal pool be adjusted? 3/23/98
1. EXISTING POOL LEVEL TO REMAIN IF POSSIBLE.
  2. REMOVE PORTION OF BERM IN CENTER OF PROPOSED WET BASIN (OR ALL OF BERM).
  3. CREATE WET BASIN 4' DEEP INSIDE DASHED LINES.
  4. WHAT TYPE OF SOILS ARE IN THE BOTTOM OF BASIN? THEY NEED TO HOLD WATER

$$\begin{array}{r} 10.06 \\ 9.95 \end{array} \div 10 = 36,000 = 0.83ac - \text{dotted line deep pool}$$

$$14.55 \div 14.3 = 14.1$$

$$9.5 - 0.79ac = 1 \text{ area inside dotted line - original config.}$$

$$\begin{array}{r} 1.2 \\ -0.8 \\ \hline 0.4 \times 1' = 0.4 acft \\ .8 \times 4' = 3.2 acft \\ \hline 3.6 acft \end{array}$$

8 1/3 ac per acft storage



SUPERVISED BY E.M. White

DESIGNED BY M.M. Design Group

REVISED BY

LIMITED ACCESS HIGHWAY

DESIGN FEATURES RELATIVE TO CONSTRUCTION OR  
REGULATION AND CONTROL OF TRAFFIC MAY BE  
SUBJECT TO CHANGE AS DEEMED NECESSARY BY  
THE DEPARTMENT.

PLAN NO.	STATE	FEDERAL AID PROJECT	ROUTE	SHEET NO.
12-27-95	3		199	0199-047-103, RW-206, C-504

ROUTE 5, P.O.C.	ENTRANCE TO PARCEL 126
$\Delta = 34.53' RT$	$\Delta = 20.25' 48' LT$
$D = 47.84' 11''$	$D = 63.86' 19''$
$T = 335.93'$	$T = 16.22'$
$L = 747.83'$	$L = 32.09'$
$R = 12.244'$	$R = 50.00'$
$P.C. = 632+00.00$	$P.C. = 1+85.59$
$P.I. = 635+85.39$	$P.I. = 2+01.80$
$P.O.C. = 639+47.98$	$P.T. = 2+17.68$

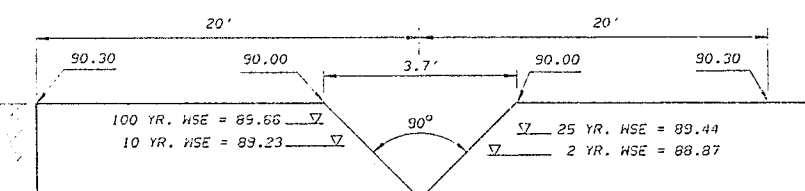
- IP DENOTES DROP INLET  
O.I.S.T. SILT TRAP
- 8 TYPE 'B' DITCH W/  
STO. EC-3. (TYPE 'A')
- 11 TYPE 'O' DITCH
- 23 TYPE 'A' MEDIAN DITCH  
W/STO. EC-3 (TYPE 'A')

REFERENCES (PROFILES, DETAIL & DRAINAGE DESCRIPTION SHEETS, ETC.)	
ROUTE 199	3C
DITCH SECTIONS	2P, 2P(1)
DRAINAGE DATA	2K(1)
SHMF 'A' DETAILS	2W(3)
ENTRANCES	3K

- C --- DENOTES CONST. LIMITS IN CUT
- F --- DENOTES CONST. LIMITS IN FILL

NOTE: FIGURES IN PARENTHESES AND DOT-DASHED LINES DENOTE TEMPORARY EASEMENTS.

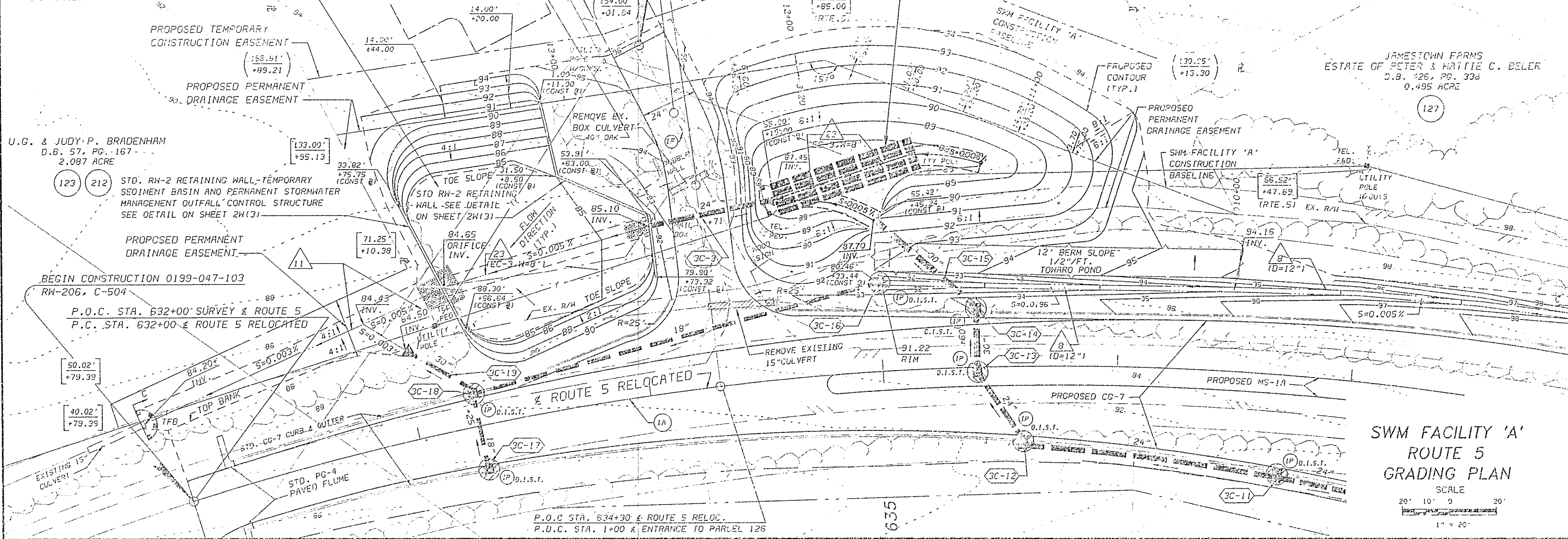
NOTE: FIGURES IN BRACKETS, AND DOT-DASHED LINES DENOTE PERMANENT EASEMENTS.



EMERGENCY SPILLWAY (SEE SHT. 2W(3))  
NOT TO SCALE

PROVIDE TREE PROTECTION MEASURES  
AS NECESSARY TO SAFEGUARD AGAINST  
ANY DAMAGE TO EX. 40" OAK TREE.

PROPOSED STORMWATER MANAGEMENT,  
EROSION, AND SEDIMENT CONTROL  
FACILITY 'A'.



SWM FACILITY 'A'  
ROUTE 5  
GRADING PLAN

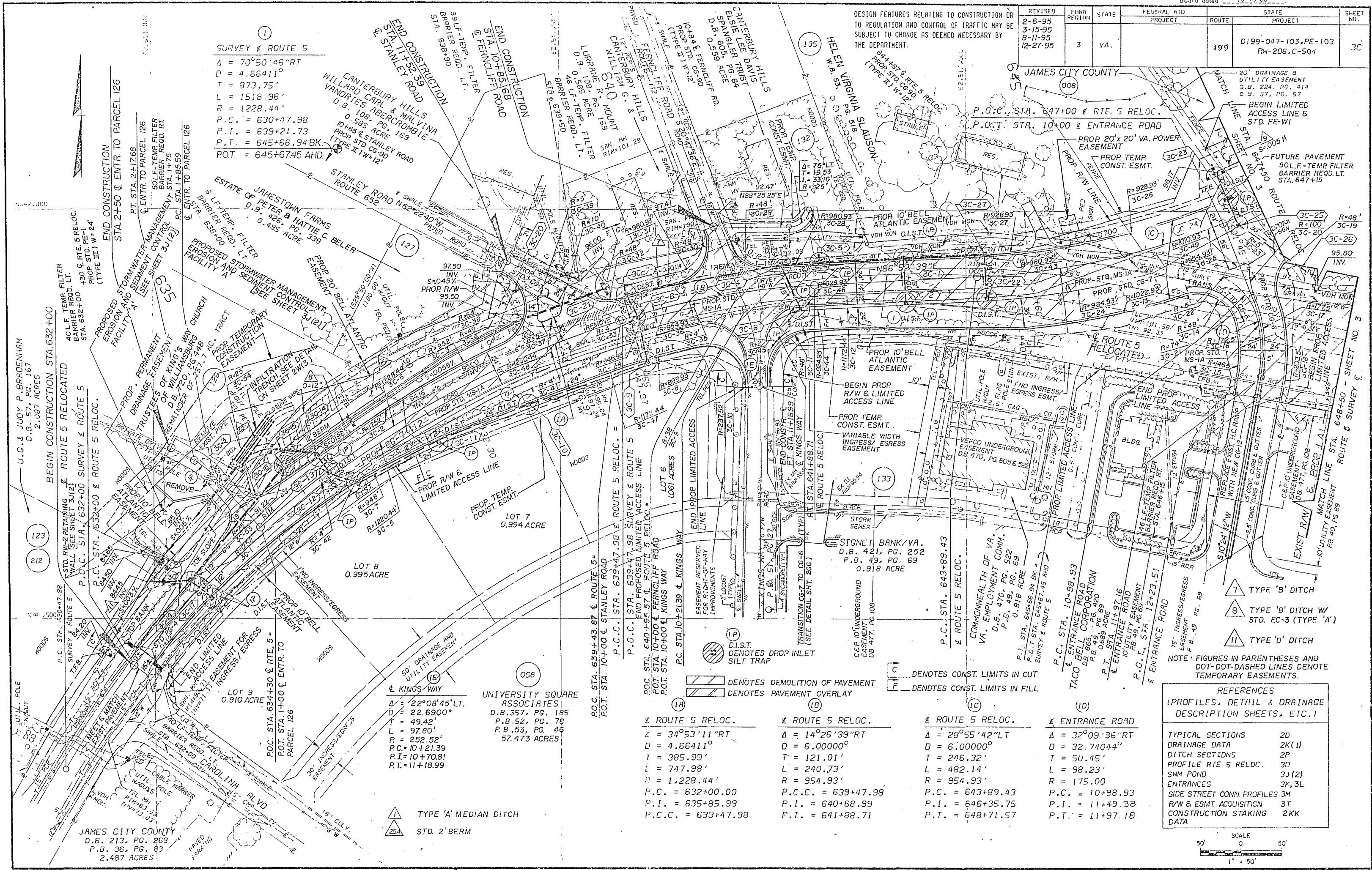
SCALE  
20' 10' 0' 20'  
1" = 20'



3  
51

SUPERVISOR: J. W. WILKS  
DESIGNED BY: MAM D. W. G. 5-20-22  
REVISED BY

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	ROUTE	STATE PROJECT	SHEET NO.
2-6-95 3-15-95 8-11-95 12-27-95	3	VA.		199	D199-047-103, PE-103 RW-206, C-504	3C



SURVEY & ROUTE 5  
Δ = 70°50'46"RT  
D = 4.66411°  
T = 873.75'  
L = 1518.96'  
R = 1228.44'  
P.C. = 630+47.98  
P.I. = 639+21.73  
P.T. = 645+66.94 BK  
P.O.T. = 645+67.45 AHD

ESTATE OF JAMESTOWN FARMS  
WILLARD CARL & MALVINA  
VANDORIE ABERCROMBIE  
D.B. 426, PG. 338  
0.495 ACRE

PROPOSED STORMWATER MANAGEMENT  
FACILITY A  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY B  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY C  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY D  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY E  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY F  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY G  
(SEE SHEET 3J(2))

CANTERBURY HILLS  
WILLARD CARL & MALVINA  
VANDORIE ABERCROMBIE  
D.B. 109, PG. 169  
0.585 ACRE  
10+65 & STANLEY ROAD  
PROP. STD. CG-90  
(TYPE II) W-12

STANLEY ROAD  
ROUTE 652

PROPOSED STORMWATER MANAGEMENT  
FACILITY A  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY B  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY C  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY D  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY E  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY F  
(SEE SHEET 3J(2))

PROPOSED STORMWATER MANAGEMENT  
FACILITY G  
(SEE SHEET 3J(2))

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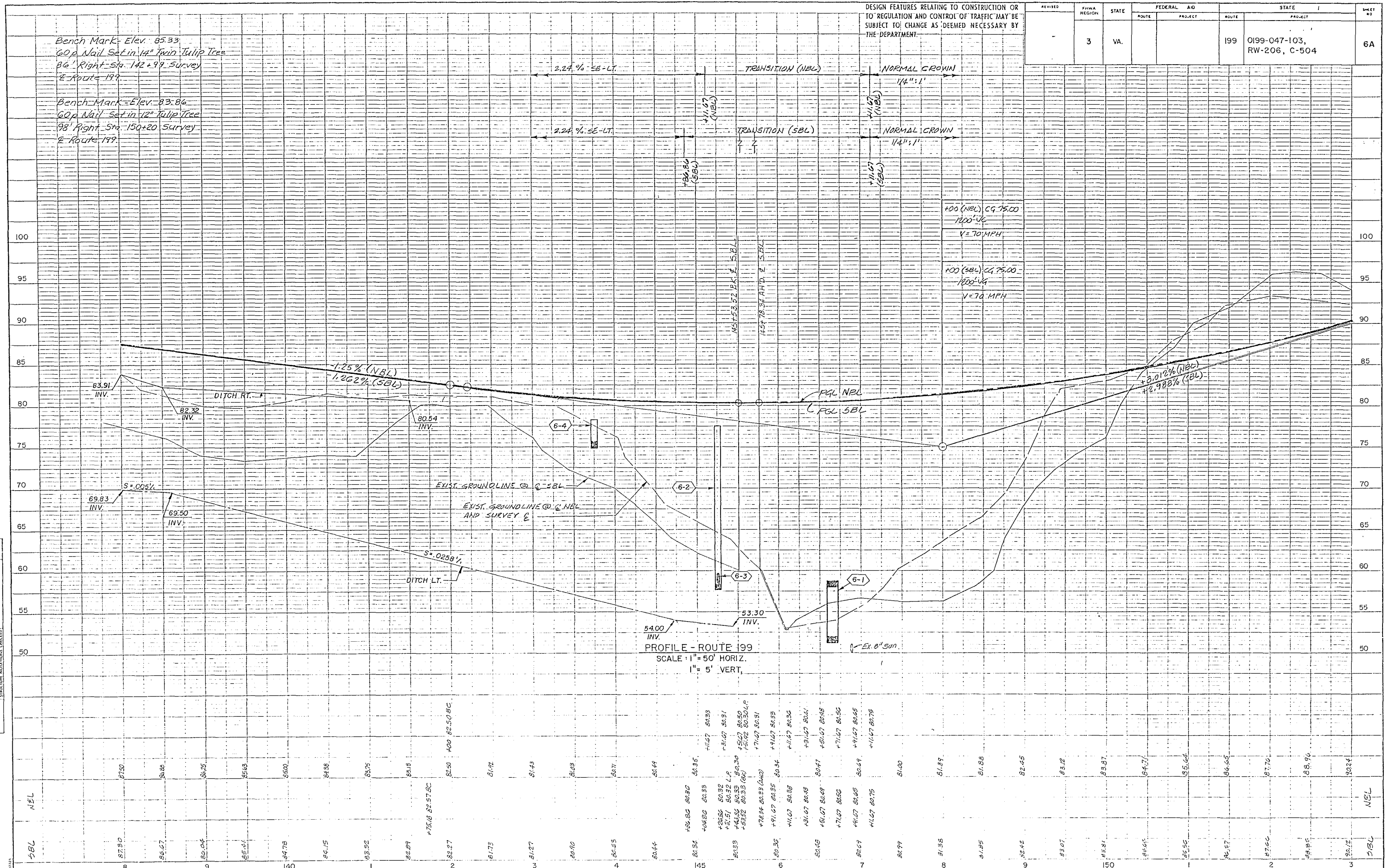


REVISED	FHWA REGION	STATE	FEDERAL AID	ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		199	0199-047-103, RW-206, C-504	6A

Bench Mark Elev. 85.33  
60p Nail Set in 14" Twin Tulip Tree  
86' Right Sta. 142+99 Survey  
E Route 199

Bench Mark Elev. 83.86  
60p Nail Set in 12" Tulip Tree  
98' Right Sta. 150+20 Survey  
E Route 199

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT.



PROFILE - ROUTE 199  
SCALE: 1" = 50' HORIZ.  
1" = 5' VERT.

PROFILE	NOTES
NOTE BOOK, CHECKS	STRUCTURE NOTATIONS CHECKED

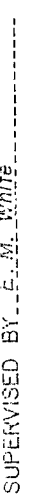
VDOT No. 60M

PLAN NO.	PROJECT	FILE NO.	SHEET NO.
A	0199-047-103	75-14-1	6A



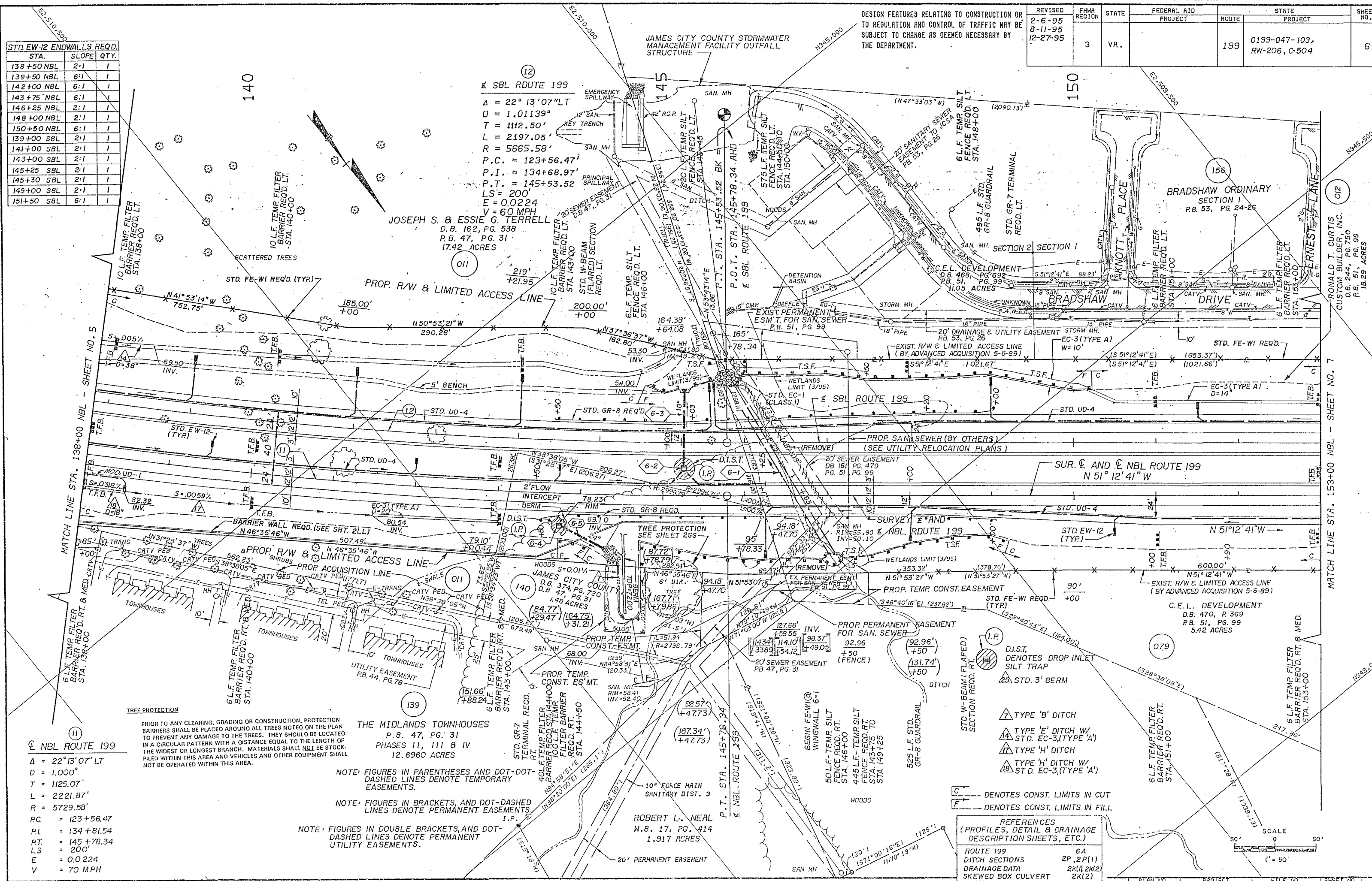
STD. EW-12 ENDWALLS REQD.			
STA.	SLOPE	QTY.	
138+50 NBL	2:1	1	
139+50 NBL	6:1	1	
142+00 NBL	6:1	1	
143+75 NBL	6:1	1	
146+25 NBL	2:1	1	
148+00 NBL	2:1	1	
150+50 NBL	6:1	1	
139+00 SBL	2:1	1	
141+00 SBL	2:1	1	
143+00 SBL	2:1	1	
145+25 SBL	2:1	1	
145+30 SBL	2:1	1	
149+00 SBL	2:1	1	
151+50 SBL	6:1	1	

LIMITED ACCESS HIGHWAY			By Resolution of Congress with Transportation Board dated <u>10/16/80</u>			SHEET NO.
REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	ROUTE	STATE PROJECT	
2-6-95 8-11-95 12-27-95	3	VA.		199	0199-047-103, RW-206, C-504	

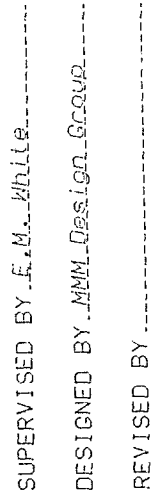


DESIGNED BY MIM Design Group

REVISÉ BY:









10-19-88 0047-103 C-504 2K(1) 22

SUPERVISED BY E.M. White

DESIGNED BY M.M. Design Group

REVISED BY

20

PROJECT NO. 0199-047-103, C-504  
SHEET NO. 1G(1) DRAINAGE NOTES:

- 1G(1)-1 43 LF - 24" TEMPORARY PIPE REQUIRED (2' COVER).  
INV. (IN) 94.77, (OUT) 94.55.
- 1G(1)-2 68 LF - 36" TEMPORARY PIPE REQUIRED (4' COVER).  
INV. (IN) 92.47, (OUT) 91.80
- 1G(1)-3 60 LF - 18" TEMPORARY PIPE REQUIRED (2' COVER).  
INV. (IN) 100.0±, (OUT) 99.7±. (MATCH EXIST. DITCH ELEV.)

SHEET NO. 3 DRAINAGE NOTES:

- 3-1 12 LF - 24" CONC. PIPE REQUIRED (1' COVER).  
INV. (IN) 93.10, (OUT) 93.00.  
1 STD. ES-1 END SECTION REQUIRED.
- 3-2 1 STD. DI-7 DROP INLET REQUIRED.  
H = 4.20', INV. = 92.80.  
1 STD. TYPE III GRATE REQUIRED.
- 3-3 315 LF - 36" CONC. PIPE REQUIRED (8' COVER).  
INV. (IN) 92.80, (OUT) 92.00.  
1 STD. ES-1 END SECTION REQUIRED.  
14 TONS STD. EC-1, CLASS I REQUIRED.  
263 TONS OF BEDDING MAT'L. AGGR. NO.25 OR 26. (1.33'DEPTH).
- 3-4 138 LF - 24" CONC. PIPE REQUIRED (3' COVER).  
INV. (IN) 97.80, (OUT) 97.36.  
2 STD. ES-1 END SECTIONS REQUIRED.
- 3-5 12 LF - 24" CONC. PIPE REQUIRED (1' COVER).  
INV. (IN) 94.65, (OUT) 94.55.  
1 STD. ES-1 END SECTION REQUIRED.
- 3-6 1 STD. DI-7 DROP INLET REQUIRED.  
H = 4.00', INV. = 94.00 (SOUTHWEST), 94.55 (SOUTHEAST).  
1 STD. TYPE I GRATE REQUIRED.
- 3-7 138 LF - 30" CONC. PIPE REQUIRED (5' COVER).  
INV. (IN) 94.00, (OUT) 93.50.  
1 STD. ES-1 END SECTION REQUIRED.
- 3-8 1 SPECIAL DESIGN OUTLET STRUCTURE (SHW-1) REQUIRED.  
H = 8.65', ORIFICE INV. = 90.75, OUTFALL INV. = 87.50.  
STRUCTURE INV. = 84.50.
- 3-9 172 LF - 36" PIPE REQUIRED (13' COVER).  
INV. (IN) 87.50, (OUT) 86.00, 45° SKEW.  
1 STD. ES-1 OR ES-2 END SECTION REQUIRED.  
14 TONS STD. EC-1, CLASS I REQUIRED.  
132 TONS OF BEDDING MAT'L. AGGR. NO.25 OR 26. (1.33'DEPTH).
- 3-10 167 LF - 15" PIPE REQUIRED (4' COVER).  
INV. (IN) 94.80, (OUT) 90.83.
- 3-11 66 LF - 24" CONC. PIPE REQUIRED (4' COVER).  
INV. (IN) 95.80, (OUT) 95.50.  
2 STD. ES-1 END SECTIONS REQUIRED.

SHEET NO. 3C DRAINAGE NOTES:

- 3C-1 1 STD. DI-28 CURB DROP INLET REQUIRED (L = 6').  
H = 5.42', INV. = 96.95.
- 3C-1 TO 3C-5 100 LF - 18" CONC. PIPE REQUIRED (3' COVER).  
INV. (IN) 96.95, (OUT) 96.55.
- 3C-2 1 STD. DI-38 CURB DROP INLET REQUIRED (L = 6').  
H = 4.34', INV. = 98.30. CURB OPENING (SOUTH).
- 3C-2 TO 3C-1 55 LF - 18" CONC. PIPE REQUIRED (3' COVER).  
INV. (IN) 98.30, (OUT) 98.10.
- 3C-3 48 LF - 24" PIPE REQUIRED (4' COVER).  
INV. (IN) 87.45, (OUT) 85.10  
1 STD. ES-1 OR ES-2 END SECTION REQUIRED.  
9 TONS STD. EC-1, CLASS I REQUIRED.
- 3C-4 1 STD. DI-2C CURB DROP INLET REQUIRED (L = 6').  
H = 5.86', INV. = 95.85.
- 3C-4 TO 3C-7 192 LF - 18" CONC. PIPE REQUIRED (4' COVER).  
INV. (IN) 95.85, (OUT) 95.05.
- 3C-5 1 STD. DI-28 CURB DROP INLET REQUIRED (L = 4').  
H = 5.86', INV. = 96.55.
- 3C-5 TO 3C-4 50 LF - 18" CONC. PIPE REQUIRED (4' COVER).  
INV. (IN) 96.55, (OUT) 96.35.
- 3C-6 1 STD. DI-36 CURB DROP INLET REQUIRED (L = 5').  
H = 4.21', INV. = 96.55. CURB OPENING (NORTH).

SHEET NO. 3C DRAINAGE NOTES (CONTINUED):

- 3C-6 TO 3C-4 58 LF - 18" CONC. PIPE REQUIRED (3' COVER).  
INV. (IN) 96.55, (OUT) 96.35, 30° SKEW.
- 3C-7 1 STD. DI-2C CURB DROP INLET REQUIRED (L = 6').  
H = 5.33', INV. = 95.05.
- 3C-7 TO 3C-8 30 LF - 24" CONC. PIPE REQUIRED (3' COVER).  
INV. (IN) 95.05, (OUT) 94.90.
- 3C-8 1 STD. DI-38 CURB DROP INLET REQUIRED (L = 4').  
H = 6.66', INV. = 93.10.
- 3C-8 TO 3C-9 57 LF - 18" CONC. PIPE REQUIRED (4' COVER).  
INV. (IN) 93.10, (OUT) 92.85.
- 3C-9 1 STD. DI-3E CURB DROP INLET REQUIRED (L = 8').  
H = 4.79', INV. = 92.85.
- 3C-9 TO 3C-10 155 LF - 24" CONC. PIPE REQUIRED (2' COVER).  
INV. (IN) 92.85, (OUT) 92.15.
- 3C-10 1 STD. DI-3E CURB DROP INLET REQUIRED (L = 8').  
H = 7.02', INV. = 89.08.
- 3C-10 TO 3C-11 122 LF - 24" CONC. PIPE REQUIRED (4' COVER).  
INV. (IN) 89.08, (OUT) 88.53.
- 3C-11 1 STD. DI-3E CURB DROP INLET REQUIRED (L = 8').  
H = 6.00', INV. = 88.53.
- 3C-11 TO 3C-12 112 LF - 24" CONC. PIPE REQUIRED (4' COVER).  
INV. (IN) 88.53, (OUT) 88.08.
- 3C-12 1 STD. DI-3E CURB DROP INLET REQUIRED (L = 8').  
H = 4.66', INV. = 88.08.
- 3C-12 TO 3C-13 37 LF - 24" CONC. PIPE REQUIRED (4' COVER).  
INV. (IN) 88.08, (OUT) 87.95, 45° SKEW.
- 3C-13 1 STD. DI-38 CURB DROP INLET REQUIRED (L = 14').  
H = 5.53', INV. = 87.95.
- 3C-13 TO 3C-14 22 LF - 30" CONC. PIPE REQUIRED (3' COVER).  
INV. (IN) 87.95, (OUT) 87.87.
- 3C-14 1 STD. DI-28 CURB DROP INLET REQUIRED (L = 4').  
H = 6.13', INV. = 87.87.
- 3C-15 52 LF - 30" CONC. PIPE REQUIRED (2' COVER).  
INV. (IN) 87.87, (OUT) 87.70.  
1 STD. EW-1 ENDWALL REQUIRED.
- 3C-16 1 STD. DI-128 DROP INLET REQUIRED (L=6')  
H = 2.72', INV. = 88.50.  
2 STD. TYPE I GRATES REQUIRED.
- 3C-16 TO 3C-18 180 LF - 18" CONC. PIPE REQUIRED (2' COVER).  
INV. (IN) 88.50, (OUT) 85.21.
- 3C-17 1 STD. DI-28 CURB DROP INLET REQUIRED (L = 6').  
H = 4.12', INV. = 84.65.
- 3C-17 TO 3C-18 32 LF - 18" CONC. PIPE REQUIRED (2' COVER).  
INV. (IN) 94.65, (OUT) 84.57.
- 3C-18 1 STD. DI-28 CURB DROP INLET REQUIRED (L = 4').  
H = 5.14', INV. = 84.57.
- 3C-19 28 LF - 30" CONC. PIPE REQUIRED (2' COVER).  
INV. (IN) 84.57, (OUT) 84.50.  
1 STD. ES-1 END SECTION REQUIRED.
- 3C-20 10 LF - 12" CONC. PIPE REQUIRED.  
EXTENSION OF EXISTING PIPE.
- 3C-21 111 LF - 24" CONC. PIPE REQUIRED (2' COVER).  
INV. (IN) 96.00, (OUT) 95.50.  
2 STD. ES-1 END SECTIONS REQUIRED.
- 3C-22 1 STD. DI-38 DROP CURB INLET REQUIRED (L = 4').  
H = 5.33, INV. = 98.70. CURB OPENING (SOUTH).
- 3C-22 TO 3C-2 54 LF - 18" CONC. PIPE REQUIRED (4' COVER).  
INV. (IN) 98.70, (OUT) 98.50.
- 3C-23 1 STD. DI-38 DROP CURB INLET REQUIRED (L = 8').  
H = 5.02', INV. = 96.10.
- 3C-23 TO 3C-25 34 LF - 30" CONC. PIPE REQUIRED (2' COVER).  
INV. (IN) 96.10, (OUT) 96.03.

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT.

LIMITED ACCESS HIGHWAY By Resolution of Commonwealth Transportation Board dated 10-18-88

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		199	0199-047-103, C-504	2K(1)

SHEET NO. 3C DRAINAGE NOTES (CONTINUED):

- 3C-24 30 LF - 30" CONC. PIPE REQUIRED (2' COVER).  
INV. (IN) 96.17, (OUT) 96.10.  
1 STD. ES-1 END SECTION REQUIRED.
- 3C-25 1 STD. DI-3F CURB DROP INLET REQUIRED (L = 12').  
H = 6.51', INV. = 96.03.
- 3C-26 109 LF - 30" CONC. PIPE REQUIRED (6' COVER).  
INV. (IN) 96.03, (OUT) 95.80.  
1 STD. ES-1 END SECTION REQUIRED.
- 3C-27 1 STD. DI-28 DROP CURB INLET REQUIRED (L = 4').  
H = 4.29, INV. = 98.50.
- 3C-27 TO 3C-1 100 LF - 18" CONC. PIPE REQUIRED (3' COVER).  
INV. (IN) 98.50, (OUT) 98.10.

SHEET NO. 4 DRAINAGE NOTES:

- 4-1 213 LF - 24" CONC. PIPE REQUIRED (5' COVER).  
INV. (IN) 101.10, (OUT) 100.35, 35° SKEW.  
2 STD. ES-1 END SECTIONS REQUIRED.  
312 CY TEMP. DIVERSION CHANNEL EXCAVATION.  
630 SY TEMP. DIVERSION CHANNEL LINING, CLASS A.  
600 LF TEMP. SILT FENCE.
- 4-2 1 STD. DI-128 DROP INLET REQUIRED (L = 4').  
H = 2.20', INV. = 101.10.  
2 STD. TYPE I GRATES REQUIRED.
- 4-3 66 LF - 18" CONC. PIPE REQUIRED (4' COVER).  
INV. (IN) 101.10, (OUT) 100.82.  
1 STD. ES-1 END SECTION REQUIRED.

SHEET NO. 5 DRAINAGE NOTES:

- 5-1 137 LF - 60" CONC. PIPE REQUIRED (14' COVER).  
INV. (IN) 75.00, (OUT) 73.50, 45° SKEW.  
1 STD. EW-2S END WALL REQUIRED.  
267 TONS OF BEDDING MAT'L. AGGR. NO. 25 OR 26, (2.33'DEPTH).  
347 CY MINOR STRUCTURE EXCAVATION.
- 5-2 1 STD. T-DI-7 TOP UNIT REQUIRED  
1 STD. B-3 BASE UNIT AND STD. R-1 RISER REQUIRED.  
H = 18.19', INV. = 73.50.  
1 STD. TYPE I GRATE REQUIRED.  
1 STD. SL-1 SAFETY SLAB REQUIRED.
- 5-3 132 LF - 60" CONC. PIPE REQUIRED (14' COVER).  
INV. (IN) 73.50, (OUT) 72.00, 45° SKEW.  
1 STD. EW-2S END WALL REQUIRED.  
80 TONS STD. EC-1, CLASS I REQUIRED.  
257 TONS OF BEDDING MAT'L. AGGR. NO. 25 OR 26, (2.33'DEPTH).  
334 CY MINOR STRUCTURE EXCAVATION.

NOTE: PIPE LENGTHS SHOWN DO NOT INCLUDE LENGTH OF END SECTIONS

PLAN NO.	PROJECT	FILE NO.	SHEET NO.
A	0199-047-103	75-14-1	2K(1)



# Permitting



# COMMONWEALTH of VIRGINIA

## DEPARTMENT OF TRANSPORTATION

P.O. BOX HD  
WILLIAMSBURG, 23187-3608

DAVID R. GEHR  
COMMISSIONER

QUINTIN D. ELLIOTT  
RESIDENT ENGINEER

October 15, 1998

Keith Letchworth  
James City Service Authority  
101E Mounts Bay Rd.  
Williamsburg, VA 23187

Ref: Permit #53521569  
Route 5, County of James City



Dear Keith Letchworth:

This is to inform you that your permit has been approved. Prior to any work being performed under this land use permit, the owner and/or contractor shall notify the Williamsburg Resident Engineer or Permit Specialist in writing 48 hours in advance. Also, state in writing, any lane closure(s) and the estimated time for re-opening of the lane.

Traffic shall, at all times, be properly protected by adequate lights, barricades and signs, as specified in the "VIRGINIA WORK AREA PROTECTION MANUAL" or as directed by the Resident Engineer or his representative. Signs shall be in accordance with specifications of the "Manual On Uniform Traffic Control Devices." Traffic shall not be blocked or re-routed without special written permission of the Department's Engineer.

Prior to ANY CHANGES made of approved plans/attached permit, a revised plan with a letter of explanation concerning the changes shall be submitted to the VDOT Resident Engineer for review and approval.

An accounts receivable number will be assigned to a permit if, before or during construction, it is deemed necessary by the Department to assign inspectors to the work. The permittee is to pay the Department an additional inspection fee in an amount that will cover the salary, expense allowance, mileage allowance, equipment rental, etc., of the inspector assigned by the Department for handling work covered by this permit. Said inspection fee to be paid promptly each month on bills rendered by the Department.

VDOT must receive written notification from the utility owners of sewer or water lines being taken into the utilities system prior to the release of the permit and bond or letter of credit.

WE KEEP VIRGINIA MOVING

-Continued-

Page 2

Ref: 53521569

Route 5

County of James City

A copy of the approved permit will be located on the site during the entire duration of the permit. If it is not located at the site when an inspector reviews the site, the work will be shut down until such time that the VDOT Residency Office is contacted and a copy is at the location of the work.

Upon completion of the work under this permit, the permittee shall notify the Resident Engineer by letter giving the permit number, county, route number and name of the party or parties to whom the permit was issued.

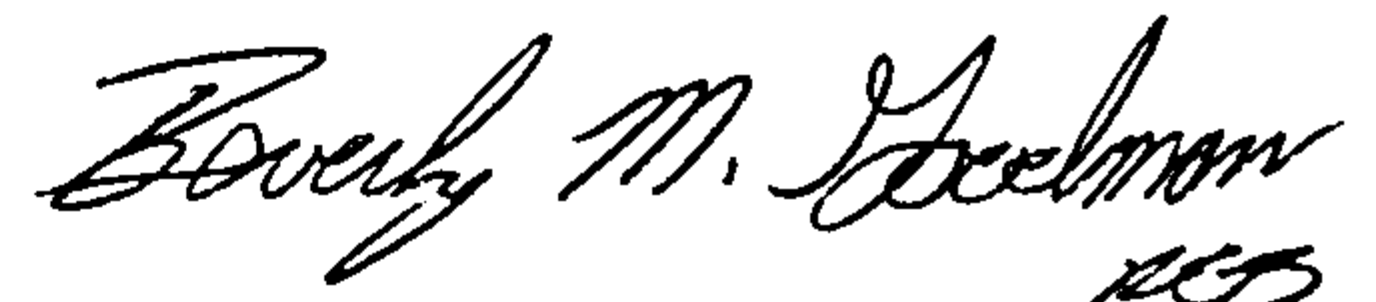
Notification for an inspection for sub-grade, base and/or completion of work will need to be made 48 hours in advance. The Williamsburg Residency phone number is (757) 253-4832.

It is the permittee's responsibility to insure that all items on the attached "VDOT Permit General Provisions" are adhered to and complied with by their contractors and/or sub-contractors.

If we can be of further assistance in this matter, please advise.

Sincerely,

Quintin D. Elliott  
Resident Engineer



By: Beverly M. Goodman  
Asst. Resident

Engineer  
BMG/qfs  
Attachment

MP-232  
LUPS 1-96

LAND USE PERMIT  
PERMITTEE NOTICE TO  
RESIDENCY OF COMPLETION

53521569  
County

James City

5  
Street

JOHN TYLER

Date \_\_\_\_\_  
Permit No.

Route

Quintin D. Elliott  
Resident Engineer  
Williamsburg Residency  
P. O. Box HD  
Williamsburg, Va. 23187

Dear Sir:

The above numbered permit has been satisfactorily completed, and is ready for final inspection. I hereby certify that the installation of the \_\_\_\_\_ was done in accordance with the terms of the permit or as modified and shown on the attached sketch.

Sincerely,

\_\_\_\_\_  
Permittee or Agent

Attachment(s)



SPECIAL PROVISIONS IN CONNECTION WITH PERMIT # 53521569

Any of the following provisions which can apply, shall apply.

1. ALL WORK PERFORMED UNDER THIS PERMIT ON THE RIGHT OF WAY SHALL, IN ALL RESPECTS, INCLUDING LOCATION, ELEVATION AND GRADE; MANNER OF PERFORMING THE WORK, RESTORATION OF CONDITIONS, ETC., BE SUBJECT TO VDOT DIRECTIONS AND SHALL BE PERFORMED TO THE SATISFACTION OF THE DEPARTMENT'S RESIDENT ENGINEER OR HIS/HER REPRESENTATIVE.
2. IT IS THE DUTY OF THE DEPARTMENT'S RESIDENT ENGINEER OR HIS/HER REPRESENTATIVE TO KEEP ALL ROADS IN A SAFE TRAVELABLE CONDITION AT ALL TIMES. THEREFORE, THE PERMIT MAY BE DENIED, REVOKED OR SUSPENDED WHEN IN THE OPINION OF THE RESIDENT ENGINEER, OR HIS/HER REPRESENTATIVE THE SAFETY, USE OR MAINTENANCE OF THE HIGHWAY SO REQUIRES.
3. TRAFFIC SHALL NOT BE BLOCKED OR REROUTED WITHOUT WRITTEN PERMISSION FROM THE DEPARTMENT'S RESIDENT ENGINEER OR HIS/HER REPRESENTATIVE. WHERE ONE WAY TRAFFIC IS PERMITTED TO BE MAINTAINED, IT SHALL BE PROPERLY FLAGGED 24 HOURS PER DAY BY A CERTIFIED FLAG PERSON. TRAFFIC SHALL AT ALL TIMES BE PROPERLY PROTECTED BY ADEQUATE LIGHTS, BARRICADES, SIGNS, AND FLAG PERSONS AS SPECIFIED IN THE CURRENT EDITION OF THE VIRGINIA WORK AREA PROTECTION MANUAL. ALL SIGNS SHALL BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES".
4. VDOT RESERVES THE RIGHT TO STOP WORK ANY TIME DUE TO SAFETY PROBLEMS AND/OR NONCOMPLIANCE WITH THE TERMS OF THE PERMIT. THE DEPARTMENT MAY, AT ITS DISCRETION, COMPLETE ANY OF THE WORK COVERED IN THE PERMIT OR RESTORE THE RIGHT OF WAY TO DEPARTMENT STANDARDS AND BILL THE PERMITTEE ACTUAL COST OF SUCH WORK. THE PERMITTEE MAY BE REQUIRED TO MOVE, ALTER, CHANGE OR REMOVE FROM THE ROAD RIGHT OF WAY, IN A SATISFACTORY MANNER, FOR ANY INSTALLATION MADE ON THE RIGHT OF WAY UNDER THIS PERMIT.
5. LONG, OPEN TRENCHES WILL NOT BE PERMITTED. THE MAXIMUM LENGTH AT ANY TIME, INCLUDING BACKFILLED PORTION WHICH IS NOT SUITABLE FOR TRAFFIC, SHALL NOT EXCEED 500 FEET AND SHALL BE PROPERLY SIGNED AND DELINEATED. TRENCHES ARE NOT TO BE LEFT OPEN OVERNIGHT UNLESS APPROVED BY THE RESIDENT ENGINEER OR HIS/HER REPRESENTATIVE. NO PREBLASTING OR PREBLOWING WILL BE PERMITTED WITHOUT PRIOR APPROVAL FROM THE RESIDENT ENGINEER.
6. ALL BACKFILING AND COMPACTION OF TRENCHES SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS OUTLINED IN VDOT'S ROAD AND BRIDGE SPECIFICATIONS (CURRENT EDITION). THE PERMITTEE WILL BE HELD RESPONSIBLE FOR ANY SINKING OF BACKFILL OR PAVEMENT FOR A PERIOD OF THREE (3) YEARS AFTER COMPLETION OF WORK. ALL TRENCHES SHALL BE MAINTAINED TO THE SATISFACTION OF THE RESIDENT ENGINEER OR HIS/HIS REPRESENTATIVE.
7. WHERE PAVEMENT EXISTS, ALL CROSSINGS SHALL BE BORED, PUSHED OR JACKED FROM BACK OF DITCH LINE TO BACK OF DITCH LINE OR TOW OF FILL TO TOE OF FILL. THE PAVEMENT SHALL NOT BE CUT UNLESS OTHERWISE APPROVED BY THE STATE PERMIT ENGINEER OR RESIDENT ENGINEER AND THEN ONLY IF JUSTIFIABLE CIRCUMSTANCES PREVAIL OR PROOF IS SHOWN THAT A THOROUGH ATTEMPT HAS BEEN MADE TO PUSH, BORE OR JACK.
8. WHENEVER PAVEMENT IS PERMITTED TO BE CUT, NOT OVER ONE-HALF OF THE ROADWAY WIDTH SHALL BE DISTURBED AT ONE TIME; THE FIRST OPENING SHALL BE COMPLETELY RESTORED TO SATISFACTORY TRAVELABLE CONDITION BEFORE THE SECOND HALF CAN BE OPENED. WHERE THE PAVEMENT IS DISTURBED OR DEEMED WEAKENED IT IN ITS ENTIRETY OR SUCH PORTIONS OF IT AS DEEMED DESIRABLE BY THE DEPARTMENT, SHALL BE RESTORED OR REPLACED IN A MANNER WHICH IS SATISFACTORY TO THE DEPARTMENT'S RESIDENT ENGINEER OR HIS/HER REPRESENTATIVE.
9. NO EXCAVATED MATERIAL IS TO BE PLACED OR TRACKED ON THE PAVEMENT, WITHOUT PERMISSION OF THE DEPARTMENT'S RESIDENT ENGINEER OR HIS/HER REPRESENTATIVE. WHEN SO PERMITTED, THE PAVEMENT SHALL BE SATISFACTORILY CLEANED BY AN APPROVED METHOD. NO CLEATED EQUIPMENT IS TO BE USED ON THE PAVEMENT WITHOUT PROPER PROTECTION TO THE PAVEMENT.
10. ROAD DRAINAGE SHALL NOT BE BLOCKED. THE SHOULDERS, DITCHES, ROADSIDE AND DRAINAGE FACILITIES, AS WELL AS THE PAVEMENT, SHALL BE KEPT IN AN OPERABLE CONDITION SATISFACTORY TO THE DEPARTMENT. NECESSARY PRECAUTIONS SHALL BE TAKEN BY THE PERMITTEE TO INSURE AGAINST SILTATION OF ADJACENT PROPERTIES, STREAMS, ETC. IN ACCORDANCE WITH VDOT'S CURRENT STANDARD PRACTICES OR AS PRESCRIBED BY THE DEPARTMENT RESIDENT ENGINEER OR HIS/HER REPRESENTATIVE.

11. ROAD AND STREET CONNECTIONS, PRIVATE ENTRANCES, AND CONSTRUCTION ENTRANCES ARE TO BE KEPT IN SATISFACTORY CONDITION. ENTRANCES SHALL NOT BE BLOCKED. AMPLE PROVISION MUST BE MADE FOR SAFE INGRESS AND EGRESS TO ADJACENT PROPERTY AT ALL TIMES. WHERE ENTRANCES ARE DISTURBED THEY SHALL RESTORED TO THE SATISFACTION OF THE PROPERTY OWNER AND THE DEPARTMENT.
12. IF DURING OF BEFORE CONSTRUCTION IT IS DEEMED NECESSARY FOR VDOT TO ASSIGN AN INSPECTOR TO THE PROJECT, THE PERMITTEE IS TO PAY THE DEPARTMENT AN ADDITIONAL INSPECTION FEE IN AN AMOUNT THAT WILL COVER THE SALARY, EXPENSE ALLOWANCE, AND MILEAGE ALLOWANCE FOR THE INSPECTION(S) ASSIGNED BY THE DEPARTMENT FOR HANDLING WORK COVERED BY THIS PERMIT. SAID INSPECTION FEE TO BE PAID PROMPTLY EACH MONTH ON BILLS RENDERED BY THE DEPARTMENT.
13. THE PERMITTEE SHALL IMMEDIATELY HAVE CORRECTED ANY SITUATION WHICH MAY ARISE AS A RESULT OF THESE INSTALLATIONS THAT THE DEPARTMENT'S RESIDENT ENGINEER OR HIS/HER REPRESENTATIVE DEEMS HAZARDOUS TO THE TRAVELING PUBLIC, EVEN THOUGH IT MAY NOT BE SPECIFICALLY COVERED IN THE PERMIT AND/OR THE LAND USE PERMIT MANUAL.
14. NO TREES OR SHRUBS SHALL BE CUT OR TRIMMED AND NO TREES ROOTS OVER 3" IN DIAMETER ARE TO BE CUT WITHOUT WRITTEN PERMISSION OF THE DEPARTMENT'S RESIDENT ENGINEER OR THE DISTRICT ENVIRONMENTAL MANAGER AND COVERED BY AN APPROPRIATE TREE TRIMMING APPLICATION. ALL ROOTS UNDER 3" IN DIAMETER ARE TO BE CLEAN CUT WITH AN AX OR SAW. PARTICULAR ATTENTION SHALL BE GIVEN NOT TO SPLINTER THE ROOTS NEXT TO THE TREE.
15. NO TREES OR SHRUB ARE TO BE PLANTED WITHOUT PRIOR REVIEW AND APPROVAL OF THE DISTRICT ENVIRONMENTAL MANAGER AND RESIDENT ENGINEER.
16. ANY HIGHWAY SIGNS, RIGHT OF WAY MARKERS, ETC., DISTURBED AS A RESULT OF THIS WORK SHALL BE ACCURATELY RESET BY THE PERMITTEE IMMEDIATELY FOLLOWING THE WORK IN THE VICINITY OF THE DISTURBED FACILITY.
17. THE PERMITTEE ASSUMES FULL RESPONSIBILITY FOR ANY AND ALL DAMAGES THAT MAY OCCUR AS A RESULT OF THE WORK PERFORMED UNDER THIS PERMIT.
18. UPON COMPLETION OF THE WORK COVERED BY THIS PERMIT, ALL DISTURBED AREAS WITHIN THE STATE'S RIGHT OF WAY SHALL BE TOPSOILED, SEEDED, AND RESTORED TO THEIR FORMER CONDITION AS FOUND PRIOR TO STARTING SUCH WORK.
19. THE ABSENCE OF A STATE INSPECTOR DOES NOT IN ANY WAY RELIEVE THE PERMITTEE OF HIS RESPONSIBILITY TO PERFORM THE WORK IN ACCORDANCE WITH THE APPROVED PLANS AND PROVISIONS OF THE PERMIT AND NO CHANGES SHALL BE MADE WITHOUT THE RESIDENT ENGINEER'S APPROVAL.
20. THIS PERMIT DOES NOT GRANT PERMISSION TO GRADE ON THE PROPERTY OF OTHERS OR DISTURB IN ANYWAY UTILITY POLES, PEDESTALS, OR UNDERGROUND FACILITIES.
21. PRIOR TO ANY EXCAVATION, THE PERMITTEE SHALL COMPLY WITH THE TERMS OF UNDERGROUND UTILITY PREVENTION ACT, TITLE 56, CHAPTER 10.3, SECTION 56-265.14 THROUGH 56-265.2 CODE OF VIRGINIA AS AMENDED. ANY CONFLICTS WITH EXISTING UTILITY FACILITIES SHALL BE RESOLVED BETWEEN THE PERMITTEE AND THE UTILITY OWNER(S) INVOLVED.
22. IT SHALL BE THE PERMITTEE'S RESPONSIBILITY TO OBTAIN ANY AND ALL NECESSARY PERMITS THAT MAY BE REQUIRED BY ANY OTHER GOVERNMENT AGENCIES.
23. PRIOR TO ANY EXCAVATION NEAR SIGNALIZED INTERSECTIONS, IT IS THE RESPONSIBILITY OF THE PERMITTEE TO NOTIFY THE RESIDENT ENGINEER.
24. THE PERMITTEE WILL BE HELD RESPONSIBLE FOR CORRECTING ANY SETTLEMENT OF PAVEMENT AND TRENCHES FOR A PERIOD OF THREE YEARS AFTER THE COMPLETION OF THE WORK.
25. THE PERMITTEE AGREES TO MOVE, REMOVE, ALTER, OR CHANGE ANY INSTALLATION THAT INTERFERES WITH THE ULTIMATE CONSTRUCTION OF THE HIGHWAY IN ALIGNMENT OR GRADE WITHOUT COST TO THE DEPARTMENT UNLESS OTHERWISE STIPULATED AND AGREED TO BY THE DEPARTMENT.
26. ALL CROSSING AND PARALLEL INSTALLATIONS ALLOWED IN THE SHOULDERS OR DITCH LINES SHALL HAVE A MINIMUM COVER OF 36 INCHES. CABLE TV AND TELEPHONE CABLES PLACED ADJACENT TO THE RIGHT OF WAY AND BACK DITCH LINE SHALL HAVE A MINIMUM OF 30 INCHES COVER. ALL OTHER FACILITIES SHALL HAVE A MINIMUM OF 36 INCHES OF COVER.

27. ALL OVERHEAD CROSSING SHALL CONFORM TO THE LATEST REQUIREMENTS OF THE NATIONAL ELECTRICAL SAFETY CODE AND THE VERTICAL CLEARANCE OF THE LOWEST WIRE OF CABLE CROSSING THE ROADWAY SHALL NOT BE LESS THAN 21 FEET FOR INTERSTATE AND 18 FEET MINIMUM FOR ALL PRIMARY AND SECONDARY ROADS.
28. WHERE FEASIBLE, ALL ABOVE GROUND INSTALLATIONS (SUCH AS FIRE HYDRANTS, TELEPHONE PEDESTALS, MARKERS ETC.) SHALL BE LOCATED ADJACENT TO THE RIGHT OF WAY LINE. ALL MANHOLE COVERS, VALVE BOX, ETC., SHALL BE INSTALLED TWO INCHES BELOW EXISTING GROUND LINE AND SHALL CONFORM TO EXISTING CONTOURS.





## COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION

### - SPECIAL NOTICE OF PERMITTEE LIABILITY -

The following liability provisions are applicable by attachment to **ALL** VDOT Land Use, Tree Trimming, and/or Spraying Permits issued.

- (1) Permittee acceptance and use of a VDOT permit is *prima facie* evidence that the permittee has read and is fully cognizant of all required permit provisions, applicable traffic control plans and associated construction standards to be employed. All applicants to whom permits are issued shall at all times indemnify and save harmless the Commonwealth Transportation Board, members of the Board, the Commonwealth, and all Commonwealth employees, agents, and officers, from responsibility, damage, or liability arising from the exercise of the privileges granted in such permit to the extent allowed by law.
- (2) Safety - permittee shall at all times give strict attention to the safety and rights of the traveling public, his employees and himself. Failure to employ proper traffic control and construction standards mandated by permit shall be cause for the Resident Engineer or his representative to order the permittee off the right of way and/or be cause for revocation of permit.
- (3) Permittee agrees to secure and carry insurance against liability for personal injury and property damage that may arise from the work performed under permit and/or from the operation of permitted activity—up to one million dollars (\$1,000,000) each occurrence to protect the Board Members and Department's agents or employees; seventy-five thousand dollars (\$75,000) each occurrence to protect the Board, Department, or the Commonwealth in event of suit.
- (4) The permittee is required to notify "Miss Utility" or each operator of underground utility where no notification center exists of any planned excavation. This notification must be provided at least **72 hours** - excluding weekends and holidays - before the start of planned excavation. Failure to carry out this requirement may result in this permit being revoked.
- (5) The permittee is required to notify the local VDOT Residency Office or Traffic Engineering Section when planned excavation is in the vicinity of a signalized intersection. Failure to carry out this requirement may result in the permit being revoked.

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VDOT does not participate in the "Miss Utility" notification center. The number to contact regarding VDOT underground utilities, such as traffic signal detector wiring, etc. in the Williamsburg Residency area is

(757) 925-2566

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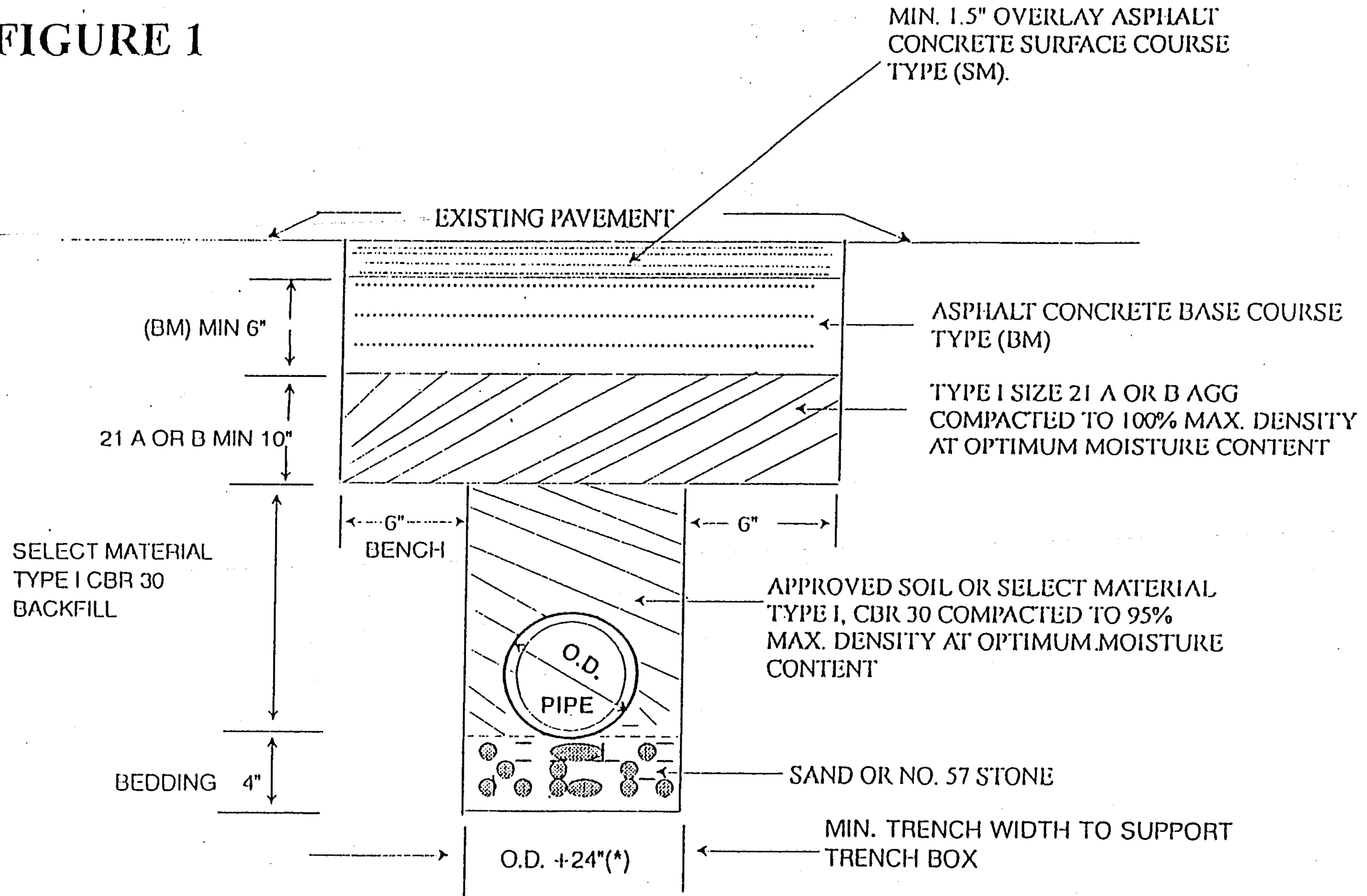
### SUBSEQUENT SPECIAL PROVISIONS

1. All patches are to be replaced in accordance with the following regulations and as shown on Figure 1.
2. The permittee will be required to replace the surface and base of the roads included under this permit in accordance with the Roads and Bridge Specifications and this Special Provision.
3. Backfill material shall include a minimum of four (4") inches bedding materials (sand or #57 stone). The balance of the backfill shall be approved soil compacted to the bottom of subbase layer (Type I, Size 21A or 21B). The entire backfill shall be free from wood, decaying material, asphalt, concrete, ice, frost, large clods, stones and debris.
4. Backfill material shall be compacted to a minimum of 95% of the theoretical maximum density at optimum moisture content, as determined by VDOT testing procedures, use mechanical tamping throughout the depth of the trench in six (6") inch layers to insure that adequate support is provided for the subbase layer (Type I, Size 21A or 21B).
5. It shall be the option of the Resident Engineer to request and review the backfill compaction test results and/or authorize an inspector to monitor the compaction.
6. Cuts in roads with Surface Course (SM) and Asphalt Concrete Base (BM) shall be replaced with ten (10") inches of Type I, Size 21A or 21B aggregate compacted to 100 percent of the theoretical maximum density at optimum moisture content covering the entire trench width in addition to a bench of six (6") inches from all sides, this layer shall serve as subbase. An Asphalt Concrete base course (BM) of a six (6") inch minimum thickness or match the existing base thickness, shall be placed over the subbase. A surface asphalt concrete course of a minimum of 1.5" (SM) shall be placed on top of the base (BM) covering the trench width. The asphalt concrete surface course

shall be slightly higher (1/8"-1/4") than the existing surface to provide a smooth grade into the existing pavement surface.

7. Cuts in surface treated roads with aggregate base course shall be replaced with the same layers as roads with asphalt base (BM) except the subbase layer (Type I, Size 21A) is reduced to six (6") inches and the (BM) layer to four (4") inches but still keeping a six inch bench. The surface course shall be a surface treatment matching the existing surface.
8. The cut to be backfilled shall be made as dry as practicable at the time of backfilling by pumping, bailing, draining, or other approved dewatering methods.
9. All cuts sides shall be trimmed to neat straight lines and a tack coat shall be applied at a rate of 0.05 - 0.15 gallon per square yard of RC-250 or CAE-2 before placing the plant mix.
10. Replacement of pavement shall be from edge of pavement to edge of pavement except when individual cuts are made and not covering the entire width of the pavement.
11. Placement of all Asphalt Concrete and surface treated courses shall be rolled where possible with a unit having a manufacturer's rating of ten (10) tons, and rolled until the aggregate is keyed into the bitumen. Where rolling is not possible, a mechanical tamp will be used. In all cuts stone is to be placed in the trench daily up to a maximum length of 500 feet, at which time the pavement shall be covered with a temporary or permanent asphalt patch. If the application of the bituminous layer is delayed for adverse weather conditions, the contractor shall provide and maintain a base course that is acceptable to the VDOT until such time as the appropriate pavement patch can be applied and completion of the installation of the gas, sewer, and water lines, contractor shall restore pavement in the manner prescribed on the VDOT permit within (10) days.
12. Contractor will be responsible for any depression greater than 1/4" that occurs within three years of completion of patching. Correction shall consist of milling and replacing 1.5" of surface course mix (SM).

# FIGURE 1



\* FOR PIPE LESS THAN 12" THE TRENCH WIDTH MAY BE 36" MAXIMUM.  
SEE UB-1 (ROAD AND BRIDGE STANDARDS VOLUME II)

CUT REPLACEMENT IN ROADS WITH ASPHALT CONCRETE BASE AND SURFACE



When installation is made in the shoulder or other traveled portions of roadway which are not hard-surfaced, the top ten inches of the trench must be replaced with good bank gravel or two-inch capping of crusher run stone or crusher run material over the entire shoulder.

#### BACKFILL AND COMPACTION

All backfilling of trenches shall be in layers or not greater thickness than six inches, and shall be made to a minimum of 95% theoretical density, at optimum moisture content, in accordance with the Department's "Road and Bridge Specifications" (current edition).

#### BORING, ETC., UNDER ROADWAY CROSSING, MINIMUM COVER

Bore shall be from ditch line to ditch line with all work being performed behind the ditch line. Should any pavement be damaged, the permittee will be required to put back four inches of bituminous asphalt (concrete).

All underground crossings shall be bored, pushed, or jacked and shall have a minimum cover of 36 inches below finished grade, including 36 inches below the ditch line and lower where other underground facilities exist, unless conditions dictate otherwise. All roadway crossings shall be made as nearly as possible at right angles to the center of the road.

#### LOCATION OF PARALLEL FACILITIES

All parallel installations placed within the highway right of way shall be placed on the outer three to five feet of shoulder to right of way unless conditions dictate otherwise.

#### MINIMUM COVER (PARALLEL)

All parallel underground installations placed within the highway right of way shall have a minimum of 36 inches cover below finished grade unless conditions dictate otherwise.

#### ABOVE GROUND MOUNTED INSTALLATIONS

All above ground mounted installations (such as poles, guys, fire hydrants, telephone pedestals, etc.) shall be located adjacent to the right of way line. All manhole covers, valve boxes, etc. shall be installed in the shoulders or embankment two inches below the existing contours.

## OVERHEAD INSTALLATION

All overhead installations shall not be placed with less than 18 feet vertical clearance of all primary and secondary roads: a minimum of 21 feet vertical clearance shall be required on interstate highways at any point at any time. In all cases, vertical clearances shall comply with the standards as required by the National Electric Code (current edition).

## LOCATION OF OVERHEAD PARALLEL FACILITIES

No above ground installations (poles, anchors, guys, etc.) shall be placed between the ditch line and the traveled roadway.

## COMMERCIAL ENTRANCE PROVISIONS

### ENTRANCE TO BE CONSTRUCTED TO DEPARTMENT STANDARDS

The commercial entrance granted by this permit shall be constructed exactly as shown on the permit and/or the accompanying sketch. The entrance shall be constructed in accordance with the Department's "Commercial Entrance Design Standards"; the "Manual of Minimum Entrance Standards to State Highways"; and the Department's "Road and Bridge Specifications" (current editions).

### BASE MATERIALS

The entrance is to be constructed with base material and surface material meeting Department Specifications to depth and width indicated on the permit and/or the accompanying sketch. Base materials are subject to inspection for proper grade and depth by the Resident Engineer prior to paving.

### INSTALLATION OF DRAINAGE PIPE

Shall be of sufficient length to allow a three to one slope from top of curb to ends of pipe, and shall be installed exactly as shown on the permit and/or the accompanying sketch. Entrance is to be constructed to as not impair drainage within the right of way, with any and all drainage pipe being supplied by the permittee and approved by the Department.

### FAILURE TO COMPLETE WORK

If the permittee fails to complete the work, the Department shall do whatever is necessary to restore the area within the right of way to its original conditions, or have the work completed, or whichever is applicable. The actual cost for same shall be the responsibility of the permittee.

## ENTRANCE WILL NOT BE PERMITTED TO BE OPENED FOR BUSINESS

Permittee shall complete the entrance to the total satisfaction of the Department before the entrance can be opened for business. Should the work not be completed to the satisfaction of the Department, the Department shall take whatever steps necessary to hold certificate of occupancy.

## PLANTING OF SHRUBBERY

Prior to any planting of shrubbery on the right of way, a permit outlining the proposed planting must be received and approved by the Department.

## NO SIGNS ON RIGHT OF WAY

No signs or advertising of any nature shall be placed on highway right of way or overhang the right of way.

## PLACING OF GUARDRAIL

Guardrail, if specified, shall be installed as shown on the permit and/or on the accompanying sketch and shall comply with Department Standards.

## OPEN CUT BACK FILL REQUIREMENTS

The maximum length of the ditch or the trench to be opened at one time shall not exceed 500 feet, including back filled portion of any trench which is not in condition for traffic, except by special permission by the engineer.

Whenever a line is permitted to be placed within the pavement, the trench and the roadway shall be repaired as follows:

- A. The trench is to be back filled with crushed stone to within six inches of the finished grade. The remaining six inches is to be back filled with BM-3 and the entire roadway shall be paved with two inches of SM-2A across the entire roadway and 25 feet on each side of the trench.
- B. All surface-treated streets shall be resurfaced as follows:
  1. Overlay two inches of bituminous concrete type SM-2A.
  2. Open cut, if allowed, will be repaved with SM-2A, 25 feet on both sides and the entire width of the roadway.
  3. In areas where the edge of pavement is damaged, the damaged area is to be restored and the entire roadway width is to receive an overlay of bituminous concrete type SM-2A.

## OPEN CUT PAVEMENT RESTORATION

All streets shall be re-surfaced as follows:

1. Bituminous Asphalt - The roadway is to be tacked and overlay of bituminous concrete type SM-2A, or sand mix shall be applied to the entire roadway surface.
2. Surface Treatment - The roadway is to be re-surfaced with a seal coat consisting of CAE-2, at the rate of .30 gallons per square yard and covered with number 78 or 8 stone at the rate of 25 pounds per square yard will be required.

In the event that any roadway is damaged or marred in any respect due to equipment working or hauling material for the installation of the proposed work, the permittee will be required to restore the surface of the road in a manner suitable to VDOT. Where the existing roadway is bituminous concrete, the disturbed area will be patched, if necessary, with bituminous concrete BM-2 and an overlay of bituminous concrete type SM-2A shall be applied to the entire roadway surface through the disturbed area at the rate of 165 pounds per square yard and to such length that a smooth riding surface is achieved. In the event that the roadway surface is bituminous surface treatment, the area, is necessary, will be patched with bituminous concrete SM-2A and the entire roadway sealed using CAE-2 asphalt applied at the rate of .35 gallons per square yard and covered with number 8 stone at the rate of 25 pounds per square yard.

## TRAFFIC PROTECTION

Traffic shall not be blocked or re-routed without special written permission of the Department's Engineer. Traffic shall at all times be properly protected by adequate lights, barricades and signs, as specified in the Department's "Typical Traffic Control for Work Area Protection Manual" or as directed by the Resident Engineer or his representative. Signs shall be in accordance with specifications of the "Manual on Uniform Traffic Control Devices."

## COMMERCIAL ENTRANCES

Tenure of all commercial entrances to highways is not infinite nor is it meant to be transferred from one owner to another. If it is determined by Department representatives that an entrance is substandard and safety, use, or maintenance of the entrance has changed significantly to require correction then necessary changes shall be made or the entrance may be closed at the direction of the Commissioner or his representative. It should also be noted that once an entrance has been constructed, regardless of when, the permittee, or his successors or assignees, shall be responsible for the maintenance and upkeep of said entrance as stated above.



## UNDERGROUND PARALLEL INSTALLATION WITH CROSSING

1. Applicants to whom permits are issued shall at all times indemnify and save harmless the State Transportation Commission and the Commonwealth of Virginia from responsibility for damages to, or liability arising from, the exercise of the privileges granted in such permit either during construction or at any time in the future.
2. A permit may be denied any applicant and all permits issued by the State Transportation Commission may be revoked, whenever in the opinion of the State Transportation Commission, the safety, use or maintenance of the highway so requires.
3. The permittee agrees that, if the work authorized by this permit, including any work necessary to restore shoulders, ditches and drainage structures to their original condition, is not completed by the applicant to the satisfaction of the engineer, the Department of Transportation will do whatever is necessary to restore the area within the right of way to its original condition and the permittee will pay to the state the actual cost of completing the work. The permittee is to be responsible for all work performed.
4. The permittee further agrees to move, remove or alter any installation installed under this permit that interferes with the future construction, reconstruction or improvements of the highway without cost to the Commonwealth.
5. Minimum cover to be not less than 36 inches below the point of the original ground on parallel installation and crossing.
6. The Williamsburg Residency Office in Williamsburg, Virginia is to be notified 48 hours prior to any work. The phone number is (804) 253-4832.
7. The residency office in Williamsburg is to be notified within 48 hours of the completion of the work.
8. All provisions set forth in the manual of permits are to be followed without exceptions, except as outlined in the attached special provisions.
9. All work done under this permit on the road right of way shall in all respects, including location, alignment, elevation and grade, manner of performing the work, restoration of conditions, etc., be subject to transportation department directions and shall be done to the satisfaction of the department.

- Continued -



Underground Parallel Installation with Crossing  
Page 2

10. The applicant for a permit must submit plans of his proposed installations in sufficient time to permit the department to review them and make any necessary studies.
11. It is the duty of the district and resident engineers to keep and maintain all roads in a safe, traversable condition at all times and for them to be able to do this, they must have the cooperation of the permittee and all concerned. It must be understood with the permittee that in case it is found practicable and necessary to do so, the district and resident engineers, or their representatives, have the authority to suspend the work, and discontinue issuing of permits for the installation of all underground utilities during the period of November 1 to April 1.
12. If during the construction it is deemed necessary by the department to assign an inspector or inspectors to the project, the permittee is to pay the department an additional inspection fee in an amount that will cover the salary, expense allowance and mileage allowance of the inspector or inspectors assigned by the department for handling work covered by this permit, plus 10% for handling. Said inspection fee to be paid promptly each month on bills rendered by the department.
13. The absence of a state inspector does not in any way relieve the permittee of his responsibility to perform the work in accordance with the provision of this permit.
14. Road drainage is not to be blocked. The shoulders, roadside, ditches and drainage facilities, as well as the pavement, shall be kept in a condition satisfactory to the department at the completion of each day's work.
15. Mailbox turnouts are to be kept in a condition satisfactory to the engineer. Crusher run stone will be required for a minimum distance of 25 feet each side of the mailbox.
16. Where road and street connections and private entrances are disturbed, they are to be kept in a satisfactory condition during construction by grading and placing an adequate amount of stone on them as necessary. The backfill in driveways and walkways shall be tamped with a mechanical tamper from the trench bottom to the existing ground surface. Entrances are not to be blocked except when an agreement between the permittee and the property owner has been worked out for the temporary closing of the entrance. Ample provision must be made for the safe ingress and egress to adjacent property owners at all times. When the final clean up is in process, all entrances are to be restored to their original condition and to the satisfactory condition of the engineer and to the property owner.

- Continued -



17. No excavated material is to be placed on the pavement without written permission of the department's engineer. When so permitted, a minimum of 1 inch of sand, sawdust or another approved protective coating is to be spread on the roadway surface for the protection of the pavement. This material is to be cleaned from the pavement at the end of each day to the satisfaction of the engineer by the use of a power broom. No cleated equipment is to be allowed on the pavement at any time.
18. Signs shall be in accordance with the specifications of the Virginia Manual of Uniform Traffic Control Devices. The signs are to be located as directed by the resident engineer or his representative. Traffic is to be located as directed by adequate lights, barricades and construction signs at all times.
19. Traffic is not to be blocked or rerouted without special written permission of the department's engineer. Where one-way traffic is permitted to be maintained, it shall be flagged 24 hours per day. Traffic shall at all times be properly protected by adequate lights, barricades and signs, and also flagmen when needed as indicated in no. 18.
20. The permittee shall immediately have corrected any situation which may arise as a result of these installations that the inspector or engineers deem hazardous to the traveling public, even though it may not be specifically covered in the permit or the manual.
21. No trees are to be cut or trimmed unless a tree trimming permit has been obtained in advance.
22. No tree roots over three inches in diameter are to be cut without special permission of the landscape engineer. All roots under three inches in diameter are to be clean cut with an axe or saw. Particular attention should be given not to splinter the roots next to the tree. Wherever possible, tunneling through or under roots should prevail instead of cutting anchor roots.
23. No pits are to be located closer to the pavement than the shoulder break. If a shoulder is less than four feet in width, sheeting will be required. If work is being performed with a curb and gutter section, a minimum of four feet is to be maintained from the back of the curb to the face of the pit. Sheeting may be used in the event that the line has to be placed closer than the required four feet. All pits are to be closed as soon as the jacking or boring operation is completed.
24. Casing will be required on all major secondary surface-treated roads where the proposed installation exceeds 1 1/4 inches in diameter. If the permittee agrees to abandon a line that is less than 1 1/4 inches in

diameter should a problem arise, then the casing will not be required. Casing will be required on all concrete asphalt roads. Casing will be required on interstate and primary routes. Casing will extend from the center line of the ditch on one side of the road to the center line of the ditch on the opposite side of the road. Casing will be of sufficient strength to withstand the traffic load on the roadway and to withstand the pressure of a line should it break.

25. All roadway crossings are to be made as nearly as possible at right angles to the center of the road.
26. The maximum length of the ditch or the trench to be opened at one time shall not exceed 500 feet, including back filled portion of any trench which is not in condition for traffic, except by special permission by the engineer.
27. Whenever a line is permitted to be placed within the pavement, the trench and the roadway shall be repaired as follows:
  - A. The trench is to be back filled with crushed stone to within six inches of the finished grade. The remaining six inches is to be back filled with BM-3 and the entire roadway shall be paved with two inches of SM-2A across the entire roadway and 25 feet on each side of the trench.
  - B. All surface-treated streets shall be resurfaced as follows:
    1. Overlay two inches of bituminous concrete type SM-2A.
    2. Open cut, if allowed, will be repaved with SM-2A, 25 feet on both sides and the entire width of the roadway.
    3. In areas where the edge of pavement is damaged, the damaged area is to be restored and the entire roadway width is to receive an overlay of bituminous concrete type SM-2A.
28. In the event that any roadway is damaged or marred in any respect due to equipment working or hauling of material for the installation of the proposed work, the permittee will be required to restore the surface of the road in a manner suitable to VDOT. Where the existing roadway is bituminous concrete, the disturbed area will be patched, if necessary, with bituminous concrete BM-3 and an overlay of bituminous type SM-2A shall be applied to the entire roadway surface through the disturbed area at the rate of 110 pounds per square yard.



In the event that the roadway surface is bituminous surface treatment, the area, if necessary, will be patched with bituminous concrete SM-2A and the entire roadway sealed using CAE-2 asphalt applied at the rate of 0.35 gallons per square yard and covered with no. 78 stone at the rate of 25 pounds per square yard.

29. All back filling of trenches within the shoulders shall be in layers of no greater thickness than six inches and shall be compacted to a minimum of 95% density. Where base material is encountered, this will be replaced at 1 1/2 times the amount encountered or to a minimum of six inches, whichever is greater. From the edge of pavement to the shoulder break, the material used must conform with the Virginia Department of Transportation's Road and Bridge Specifications. Compaction by water will not be permitted. In shoulders where topsoil and grass are encountered, a minimum of three inches of topsoil will be placed and the areas reseeded until such time as the vegetation is re-established. Each street involved in this permit is to be completely restored as described in the special provisions with the exception of the final surface-treatment seal, prior to any work being started on additional streets.
30. The contractor, throughout the life of the project, will control erosion and siltation of rivers, streams and impoundments, lakes, reservoirs, etc. Such measures shall include, but not be limited to the use of berms, dikes, dams, settlement basins, fiber mats, brush silt barriers, netting, gravel or crushed stone, mulch, grasses, slope drains and other methods. The temporary erosion and siltation control measures, as described herein, shall be applied to erosion material exposed by any activity associated with the construction of this project including local material sources and waste areas and all haul roads.
31. Should vents and manholes be allowed to be placed on the shoulder of the roadway, they must be placed on the same grade and slope as the roadway, and shall be enclosed with a concrete or bituminous concrete collar.
32. The issuance of this permit does not relieve the permittee or developer from compliance with any federal, state and local laws, ordinances, or regulations which affect in any manner those engaged or employed in the performance of this work. The permittee, or developer, shall at all times observe and comply with such laws, ordinances, regulations, orders or decrees and shall protect and indemnify the state and its representative against any claim for liability arising from or based on the violations of any such laws, ordinances, regulations, orders or decrees whether by himself or his employees.

Underground Parallel Installation with Crossing  
Page 6

33. The permittee, or developer, shall procure all additional permits and licenses, pay all charges, fees and taxes, give all notices necessary and incidental to the lawful prosecution of this work. Specific attention is directed to the 1972 "Amendments to the Federal Water Pollution Control Act" which may be applicable for work to be performed under this permit. The permittee, or developer, shall determine for himself the applicability of a Corps of Engineers' or other permit in the performance of this work, and shall secure such permits as may be required and submit the permit for examination upon request by the department.
34. The use of 10-20-10 fertilizer is required instead of 10-10-10.
35. Class A-3 concrete should have compressive strength of 4,000 psi.
36. Concrete form removal from members not supporting load should be 48 hours.
37. Utilities should be kept on the outer three to five feet of the right of way.
38. All clean outs, manholes, vent boxes and metering systems should be kept out of the ditch line.
39. All laterals under the roadway must be encased or material meet requirements for no encasement.
40. Where construction limits run off highway right of way, the permittee should obtain prior easements from adjoining property owners. This will prevent a situation whereby the contractor cannot obtain an easement and then request the department to make changes after issuing the permit.
41. All underground crossings of the roadway will be jacked, bored or pushed. Open cuttings of pavement will not be allowed except on an individual basis, provided they meet the criteria as noted in section III, pg. 3-33 of the Land Use Permit manual, current edition.
42. When redesign of the utilities to the back edge of right of way is possible, this should be done. However, if conflicts exist after a field review by the designer and the county, we will be glad to meet with the permittee and the designer prior to any redesign to resolve those conflict points.
43. Contractor(s) need to obtain a highway performance bond for each area of work.

- Continued -



Underground Parallel Installation with Crossing  
Page 7

44. Should the permittee have trouble fitting the utilities within the highway right of way as required by the department, the county shall obtain an easement from adjacent landowners prior to beginning that phase of work.
45. Any damage to the pavement, that is caused by the placement of the utilities, shall be replaced to department standards using a minimum of six inches of bituminous asphalt.
46. Any entrance pipes that are disturbed will be replaced to departmental standards. If the pipes become distorted or broken, they shall be replaced with equal or better.
47. When installation is made in the shoulder or other traveled portions of the roadway which are not hard surfaced, the top 10 inches of trench must be replaced with good bank gravel or crusher run stone with a capping of crusher run material over the entire shoulder.

VDOT PERMIT  
GENERAL PROVISIONS

The following general provisions shall apply to all permits, unless otherwise noted, and shall be made a part of all permits where applicable. This does not preclude the possibility of additional provisions when deemed necessary, or when modification of these provisions are required to meet the needs of a specific permit application. A copy of the approved permit shall be kept on the job site at all times by the permittee.

ENGINEERING DESIGN REQUIREMENTS

The proposed installation granted by this permit must be constructed exactly as shown on the permit or accompanying sketch.

RESPONSIBILITY OF APPLICANT

Applicants to whom permits are issued shall at all times indemnify and save harmless the State Highway Commission and the Commonwealth of Virginia from responsibility, damages, or liability arising from the exercise of the privilege granted in such permit.

NOTIFICATION PRIOR TO WORK COMMENCING

The Williamsburg Residency Office in Williamsburg, Virginia is to be notified 48 hours prior to any work. The phone number is (804) 253-4832.

RESPONSIBILITY FOR FUTURE MAINTENANCE AND PROTECTION

The permittee assumes full responsibility for any and all damages that may occur as a result of the work performed under this permit. Furthermore, the Department will in no way be responsible for any damage to the facility being placed as a result of future maintenance or construction activities performed by the Department. Permittee is responsible for the continuing maintenance of those facilities placed within highway rights of way.

FUTURE ADJUSTMENT'S PERMITTEES' RESPONSIBILITY

The permittee agrees to move, remove, alter, or change any installation that interferes with the ultimate construction of the highway in alignment or grade without cost to the Virginia Department of Transportation.



## REVOCABLE PERMITS

A permit may be denied any applicant, and all permits issued by the State Highway and Transportation Commission may be revoked whenever, in the opinion of the State Highway Commissioner, the safety, use or maintenance of the highway so requires.

## DEPARTMENT'S RIGHT TO STOP WORK

The Department reserves the right to stop the work at any time the terms of the permit are not satisfactorily complied with, and the Department may, at its discretion, complete any of the work covered in the permit at the expense of the permittee. If it is in the best interest of traffic safety, the Department may complete or have completed at the expense of the permittee any of the work that must be done to properly protect the traveling public.

## WORK TO BE PERFORMED TO SATISFACTION OF DEPARTMENT

All work done under this permit on the right of way shall in all respects, including location, alignment, elevation and grade, manner of performing the work, restoration of conditions, etc., be subject to Department directions and shall be done to the satisfaction of the Department's Resident Engineer or his representative.

## CORRECTION OF HAZARDOUS CONDITIONS

The permittee shall immediately have corrected any condition which may arise as a result of these installations that the inspector or engineer deem hazardous to the traveling public or state maintenance forces even though such conditions may not be specifically covered these special provisions or in the Land Use Permit Manual.

## EXCAVATION

No excavated material is to be placed on the pavement without written permission of the Department's Engineer, and then only for a limited period of time. When so permitted, the pavement shall be satisfactorily cleared by an approved method. No cleated equipment is to be used on the pavement without proper protection to the pavement. The work shall be constructed in such a manner that no water, mud, or debris will drain or be traced onto the roadway. Erosion and siltation control shall be provided in accordance with VDOT Road and Bridge Specifications (current edition). Where extended work prevails, the permittee will be required to cleanup as the work progresses. The permittee shall see that dusty conditions are kept to a minimum, either by addition of water or calcium chloride at all times.

#### UNSATISFACTORY PERFORMANCE OF WORK

The permittee agrees that if the work authorized by this permit, including and work necessary to restore shoulders, ditches and drainage structures to their original condition, is not completed by the applicant to the satisfaction of the engineer, the Department will do whatever is required to restore the area within the right of way to Departmental Standards, and the permittee will pay to the state the actual cost of completing the work.

#### CONDITION OF CONNECTIONS AND ENTRANCES

Where road and street connections are disturbed, they are to be kept in a satisfactory condition during construction. Traffic volume and locations may require the disturbed area be patched with cold mix on a temporary basis. Otherwise grading and placing an adequate amount of stone on them will be required until the right of way is restored. The backfill in driveways and walkways shall be tamped with mechanical tampers, from the trench bottom to the existing ground surface. Entrances are not to be blocked except when an agreement between the permittee and the property owner has been worked out for the temporary closing of the entrance. Ample provision must be made for the safe ingress and egress to adjacent property owners at all times. When the final clean up is processed all entrances are to be restored to their original condition and to the satisfactory condition of the Engineer and to the property owner.

#### NECESSITY TO ASSIGN INSPECTORS

If, during or before construction, it is deemed necessary by the Department to assign inspectors to the work, the permittee is to pay the Department an additional inspection fee in an amount that will cover the salary, expense allowance, and mileage allowance, equipment rental, etc., of the inspector or inspectors assigned by the Department for handling work covered by this permit. Said inspection fee to be paid promptly each month on bills rendered by the Department.

#### ABSENCE OF INSPECTOR

The absence of a state inspector does not in any way relieve the permittee of his responsibility to perform the work in accordance with provisions of this permit, and no changes shall be made without the Resident Engineer's approval.

#### TREE ROOTS

No trees or shrubs shall be cut or trimmed, and no tree roots over three inches in diameter are to be cut without special permission of the Environmental Section or the Department and covered by a properly executed "Tree Trimming



Permit." All roots under three inches in diameter are to be clean cut with an axe or saw. Particular attention should be given not to splinter the roots next to the tree. Wherever possible, tunneling through or under root should prevail instead of cutting anchor roots.

#### ROAD DRAINAGE

Road drainage shall not be blocked. The shoulders, ditches, roadside and drainage facilities, as well as the pavement, shall be kept in an operable condition satisfactory to the Department. Necessary precaution shall be taken by the permittee to ensure against siltation of adjacent properties, streams, etc., in accordance with the Department's standard practices.

#### PROTECTION OF EXISTING UTILITY FACILITIES

The permittee shall comply with the terms of the "Underground Utility Damage Prevention Act," Title 56, Chapter 10.3. Sections 56-265.14 through 56-265.29 of the Code of Virginia, as amended, prior to doing any excavation to ensure that no damage will be done to existing underground facilities. Where underground facilities are encountered, they shall be protected even to the extent that hand excavation shall be performed. The Department cannot emphasize strongly enough that the existing utility facilities shall be protected and that extreme caution shall be exercised.

#### CONFLICT WITH EXISTING UTILITIES

Any conflicts with existing utility facilities shall be resolved between the permittee and the utility owners involved.

#### RESPONSIBILITY TO PROCURE ALL NECESSARY PERMITS, ETC.

The permittee, or developer, shall procure all additional governmental permits and licenses, pay all charges, fees and taxes, give all notices necessary and incidental to the due and lawful prosecution of this work. The permittee, or developer, shall determine the applicability of other permits in performance of this work, and shall secure such permits as may be required and submit the permit for examination upon request by the Department.

#### NOTIFICATION WORK STARTING

Prior to starting work covered under this permit, the permittee shall notify the Williamsburg Resident Engineer or Permit Specialist 48 hours in advance. Williamsburg Residency phone number is (804) 253-4832.

## NOTIFICATION WORK COMPLETED

Upon completion of the work under this permit, the permittee shall notify the Resident Engineer by letter giving the permit number, county, route and name of the party or parties to whom the permit was issued.

## COMPLYING WITH DEPARTMENT'S REQUIREMENTS

Any additional provisions or Department Standards for entrances, traffic control, construction techniques, material requirements, etc., shall be applicable to this permit and the permittee shall make himself aware of these requirements and comply with same when performing the work covered under permit, including but not limited to the Department's "Minimum Standards of Entrances to State Highways," "Road Designs and Standards," and "Road and Bridge Specifications" (current edition).

## TREE TRIMMING AND/OR TREE REMOVAL

No tree trimming or tree removal shall be permitted in connection with the permit unless a tree trimming application (Form TT) is completed and is attached to and made a part of the permit application.

## RESPONSIBILITY OF DISTRICT AND RESIDENT ENGINEERS

It is the duty of the District and Resident Engineers to keep and maintain all roads in a safe traversable condition at all times and, therefore, must have the full cooperation of the permittee and all concerned. It must be understood with the permittee that in case it is found practicable and necessary to do so, the District and Resident Engineers have the authority to suspend the work and discontinue issuance of permits.

## ADJUSTING EXISTING PROPERTY PINS AND RIGHT OF WAY MONUMENTS, HIGHWAY SIGNS, ETC.

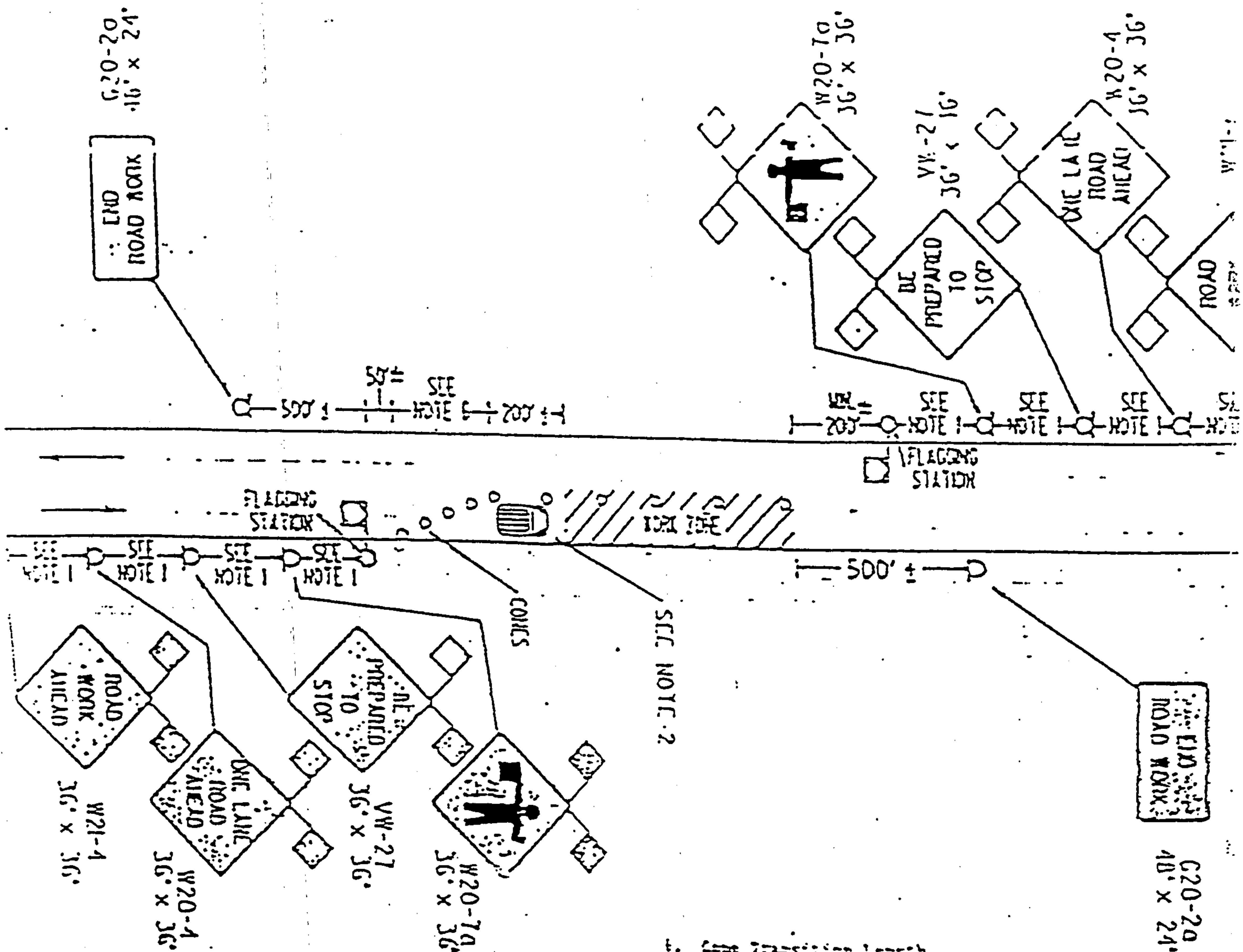
The permittee is responsible for identifying, locating, adjusting and/or relocating property pins and right of way monuments, including making all arrangements therefor. Any highway signs right of way markers, etc., disturbed as a result of this work shall be accurately reset by the permittee immediately following the work in the vicinity of the disturbed facility.

## OPEN TRENCHES

Long open trenches will not be permitted. The maximum length trench at all times, including backfilled portion which is not suitable for traffic, shall not exceed 500 feet. Trenches are not to be left open over night unless otherwise directed by the Resident Engineer.



TYPICAL TRAFFIC CONTROL  
FOR WORK ON TRAVELWAY  
ON TWO-LANE SECONDARY HIGHWAYS  
(Figure S-3)

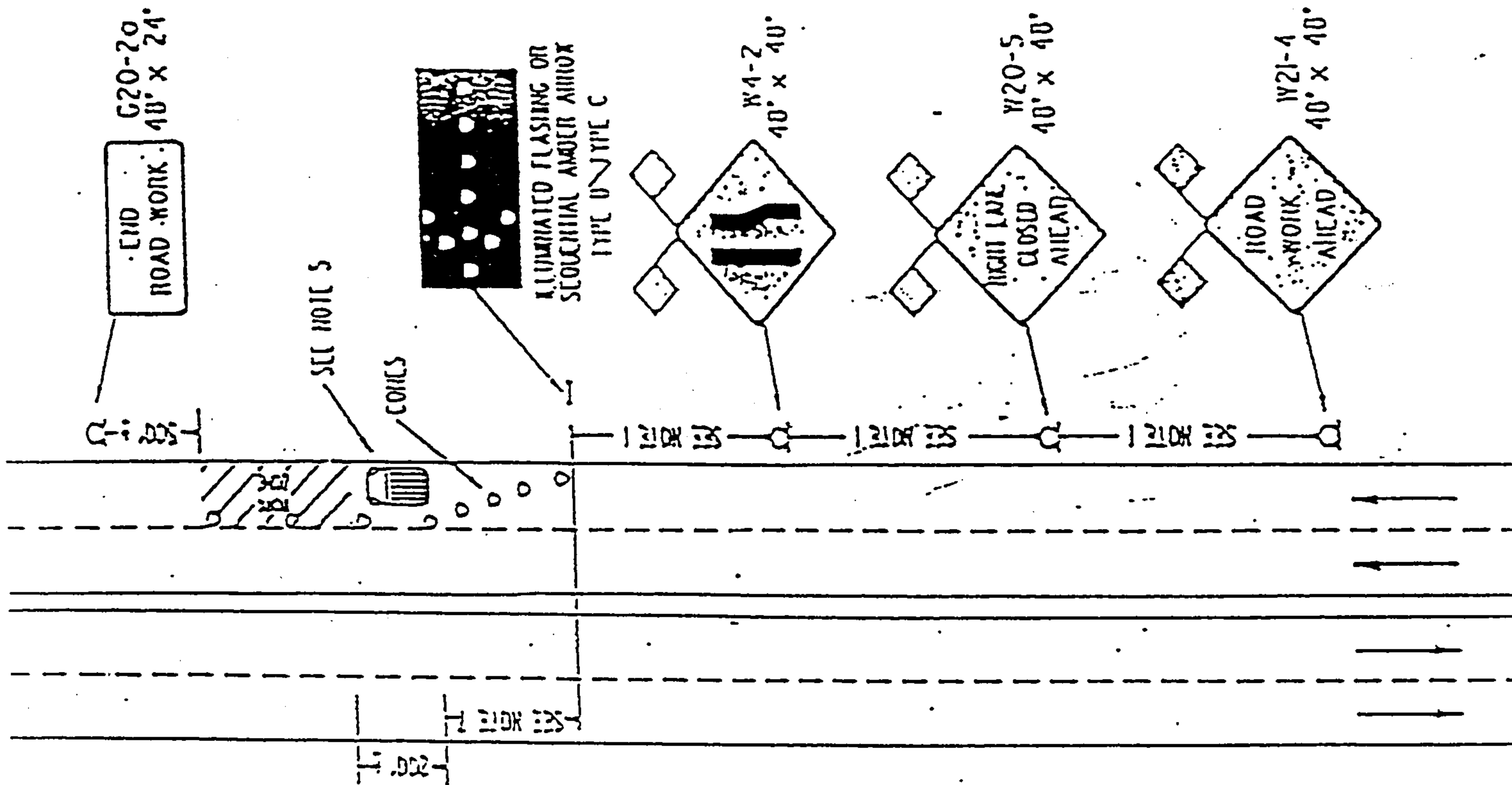


3. Distance between advance warning signs and between "advance flagger" sign and flagging station should be 300'-500' where posted speed limit is 45 mph or less and 500'-600' where posted speed limit is greater than 45 mph.
4. A truck or trailer with at least one rotating or two alternating light intensity amber flashers shall be parked 30'-50' in advance of the first work crew.
5. Care should be exercised when establishing the limits of the work zone to ensure a minimum sight distance is obtained in advance of the transition based on the posted speed limit and curve to be greater than the values associated on page 6-127.
6. Flagging stations shall be located far enough in advance of the work zone to permit approaching traffic to reduce speed and/or stop before passing the work zone and allow sufficient distance for departing traffic in the left lane to return to the right lane before reaching opposing traffic.
7. Where right-of-way and/or geometric conditions permit, 48" x 48" signs should be used in lieu of

Year	1900	1901	1902
1900	100	100	100
1901	105	105	105
1902	110	110	110
1903	115	115	115
1904	120	120	120
1905	125	125	125
1906	130	130	130
1907	135	135	135
1908	140	140	140
1909	145	145	145
1910	150	150	150

7. Lane Spacing Guide - 20 feet for speeds 0-25 MPH  
30 feet for speeds 26 MPH or greater. Spacing transitions and on curves of 6 degrees or greater locations determined by the District Traffic Engineer shall be no more than 20 feet for speeds 0-25 MPH and no more than 30 feet for speeds 26 MPH or greater.
8. Secondary highways with a travelway of 16' or less do not require the following: (a) cones, (b) 20 ft trailer, (c) "One Lane Road Ahead" sign, specific flagging station. However, note - all activities of work being performed interfere with

TYPICAL TRAFFIC CONTROL  
FOR WORK IN OUTSIDE LANE  
ON FOUR-LANE SECONDARY HIGHWAYS  
(Figure S-4)



NOTES

Distance between advance warning signs and between "advance flagger" sign and flagging station should be 350'-500' where posted speed limit is 45 mph or less and 500'-600' where posted speed limit or unposted statutory maximum speed limit is greater than 45 mph.

A truck or trailer with at least one rotating or two alternating high intensity amber flashers shall be parked 30'-50' in advance of the first work area. When the posted speed limit is 45 mph or greater, a truck with a TMC shall be used.

Care should be exercised when establishing the limits of the work zone to ensure a minimum sight distance is obtained in advance of the transition based on the posted speed limit and equal to or greater than the values indicated on page S-127.

Where right-of-way and/or geometric conditions permit, 36" x 48" signs should be used in lieu of 36" x 36" signs.

On four-lane, divided secondary highways having a median wider than 5', left and right side sign assemblies shall be required.

6. Lane Spacing: Guide = 40 feet for speeds 0-35 MPH and 60 feet for speeds 36 MPH or greater. Spacing on transitions and on curves of 6 degrees or greater or locations determined by the District Traffic Engineer shall be no more than 20 feet for speeds of 0-35 MPH and no more than 40 feet for speeds of 36 MPH or greater.

7. Lane Transition Length

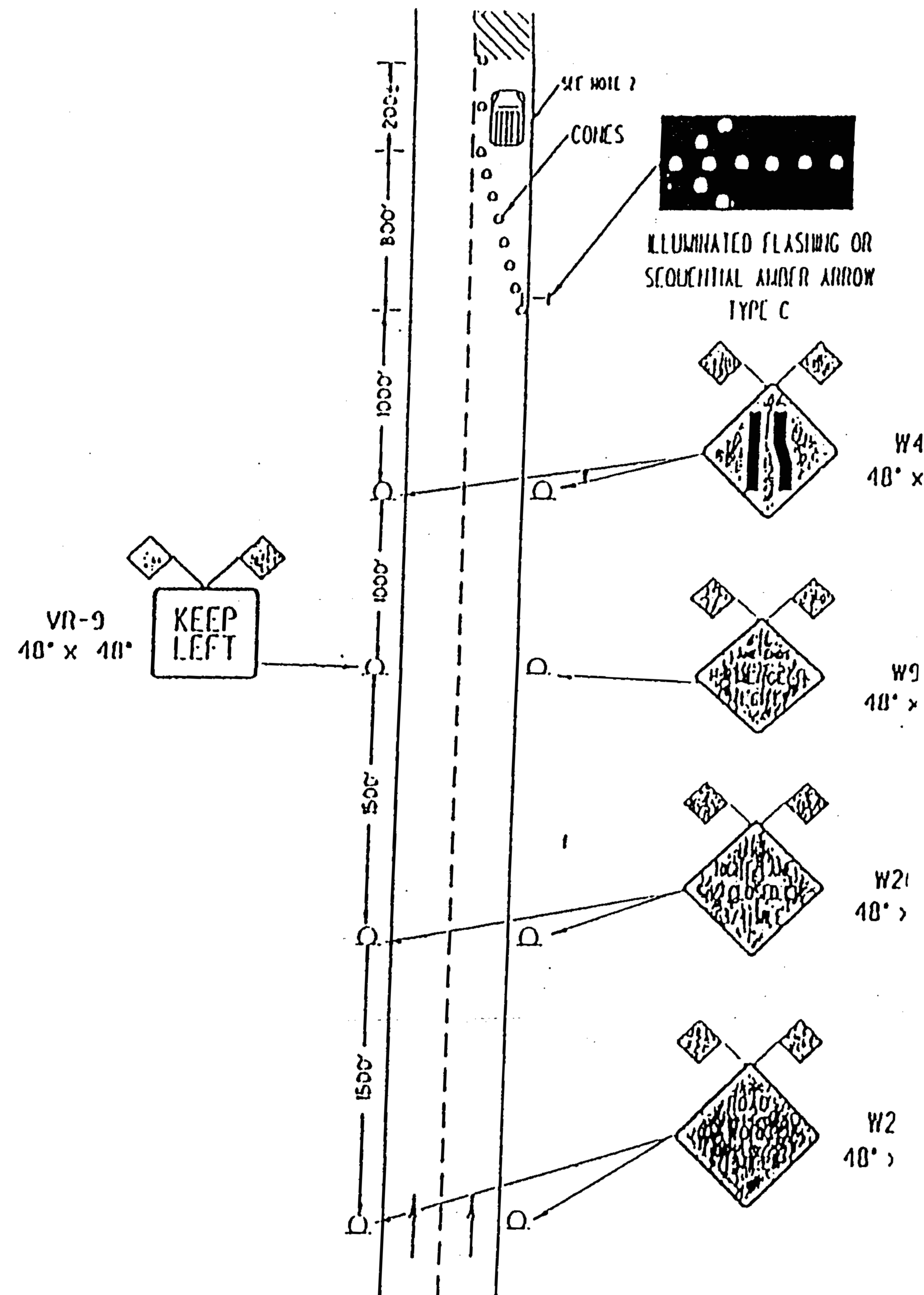
Speed Limit M.P.H.	Taper Length Lane Width in Feet		
	10	11	12
20	70	75	80
25	105	115	125
30	150	165	180
35	205	225	245
40	270	295	320
45	350	395	440
50	500	550	600
55	650	705	760
60	800	860	920
65	950	1015	1080

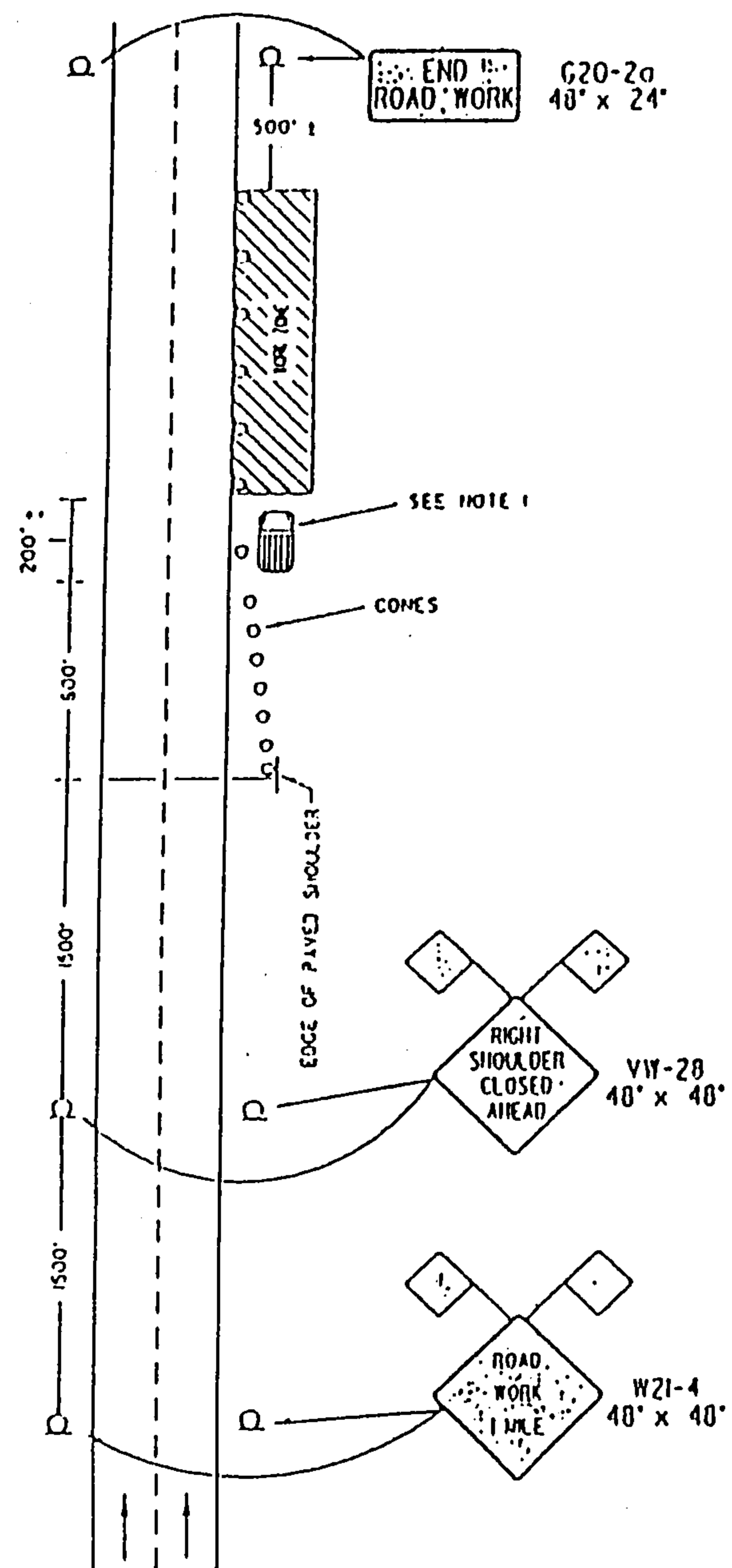


# TYPICAL TRAFFIC CONTROL FOR WORK IN OUTSIDE LANE ON LIMITED ACCESS HIGHWAYS (Figure L-4)

## NOTES

1. Care should be exercised when establishing the limits of the work zone to insure a minimum sight distance of 1000 feet in advance of the transition.
2. A truck with illuminated flashing or sequential amber arrow and truck mounted crash cushion shall be parked at beginning of work zone in advance of work crew.
3. For spacing of cones, see page 6-126.
4. For two-way operations on limited access highways, use traffic control as shown on Figure P-3.





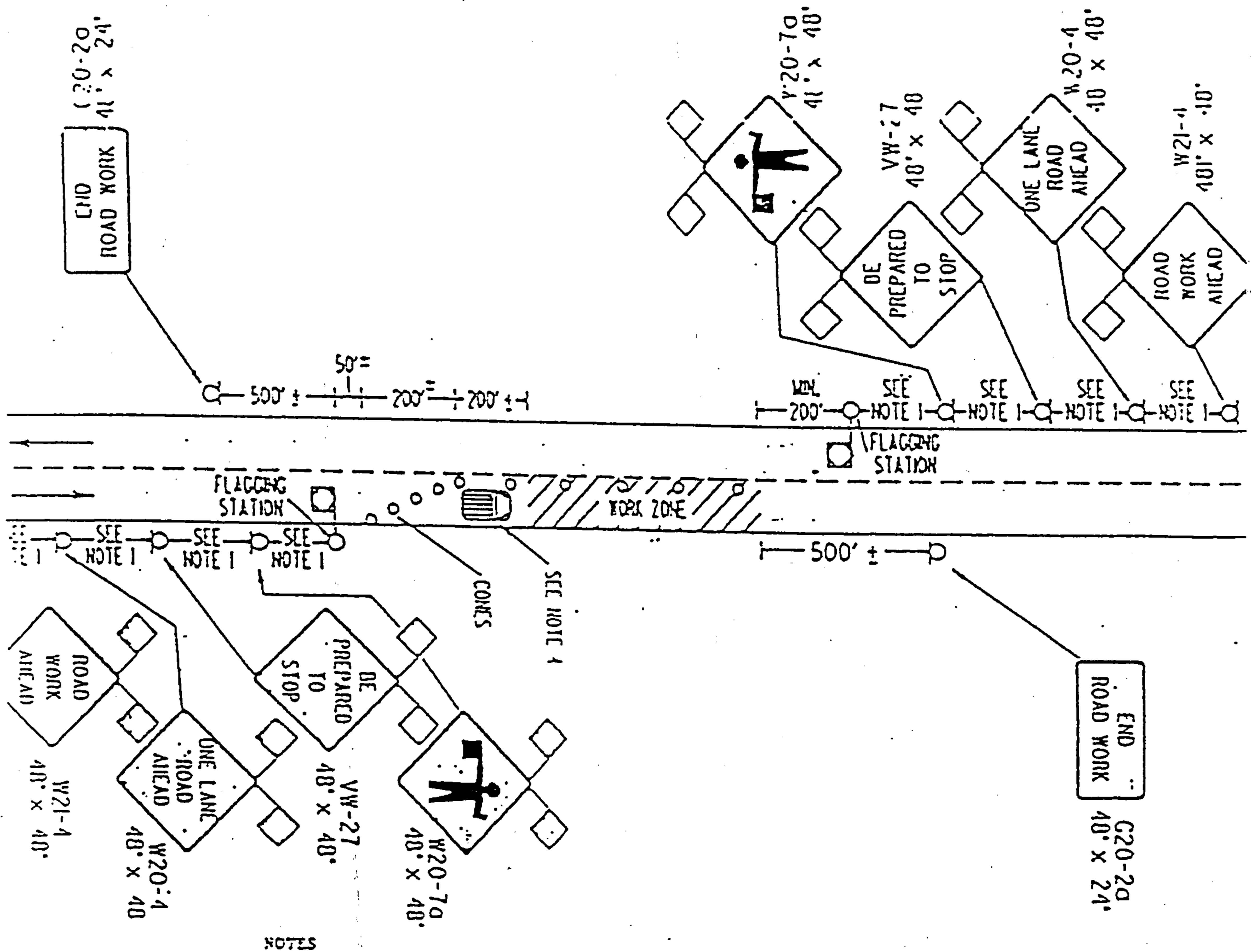
TYPICAL TRAFFIC CONTROL  
FOR WORK BETWEEN TRAVELWAY AND DITCH LINE  
ON LIMITED ACCESS HIGHWAYS  
(Figure L-1)

NOTES

1. A truck or trailer with at least one rotating or two alternating high intensity amber flashers shall be parked at beginning of work zone in advance of work crew.
2. For spacing of cones, see page 6-126.



TYPICAL TRAFFIC CONTROL  
FOR WORK ON TRAVELWAY  
ON TWO-LANE PRIMARY HIGHWAYS  
(NON-LIMITED ACCESS)  
(Figure P-3)



NOTES

1. Distance between advance warning signs and between "advance flagger" sign and flagging station should be 350'-500' where posted speed limit is 45 mph or less and 500'-800' where posted speed limit or unposted statutory maximum speed limit is greater than 45 mph.

2. A truck or trailer with at least one rotating or two alternating high intensity amber flashers shall be parked 30'-50' in advance of the first work crew. When the posted speed limit is 45 mph or greater, a truck with a TMCC shall be used.

3. Care should be exercised when establishing the limits of the work zone to insure a minimum sight distance is obtained in advance of the transition based on the posted speed limit and equal to or greater than the values indicated on page 6-127.

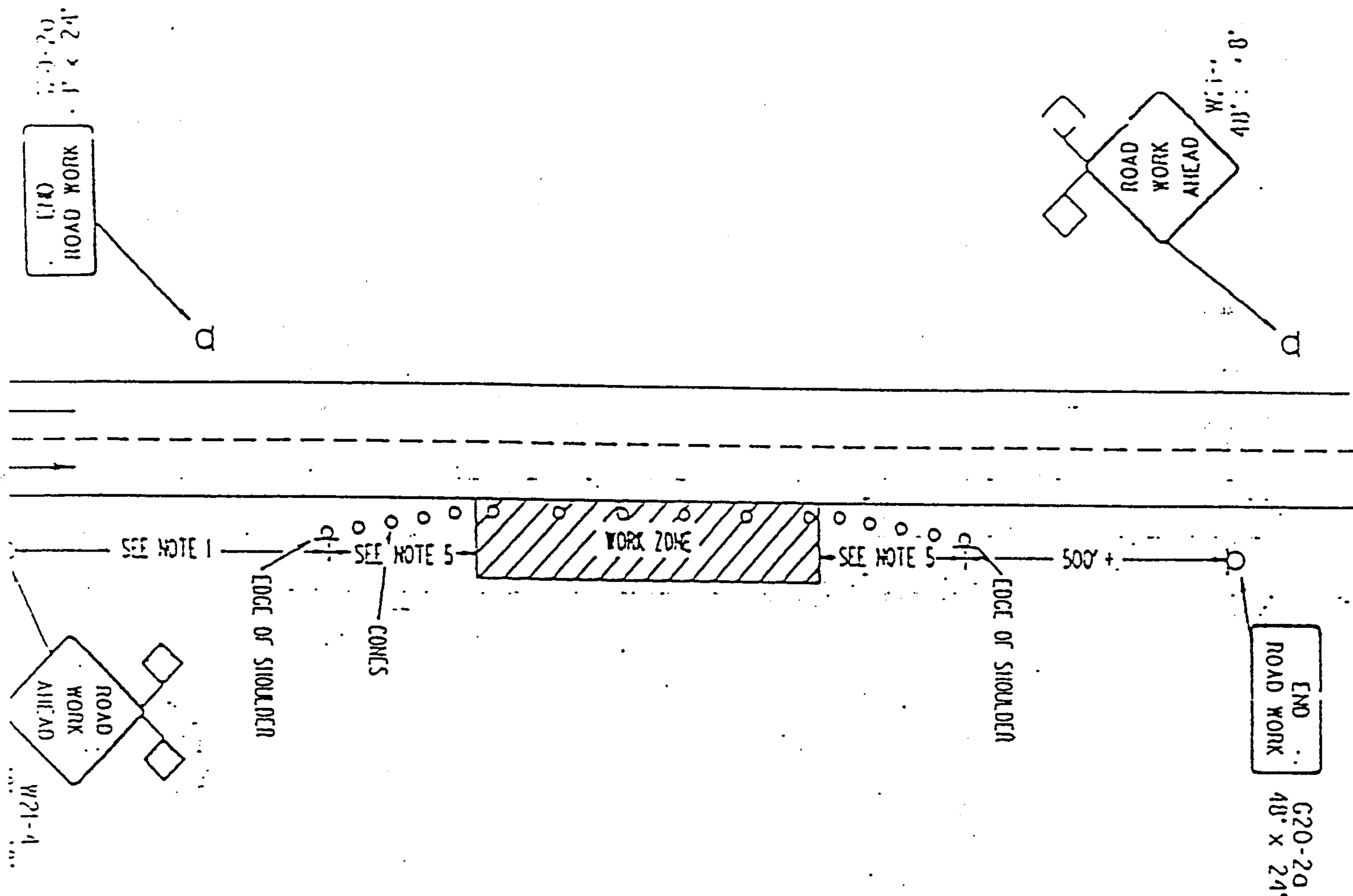
4. Flagging stations shall be located far enough in advance of the work zone to permit approaching traffic to reduce speed and/or stop before passing the work zone and allow sufficient distance for departing traffic in the left lane to return to the

5. Cone Spacing Guide - 40 feet for speeds 0-35 MPH  
80 feet for speeds 36 MPH or greater. Spacing on transitions and on curves of 6 degrees or greater or locations determined by the District Traffic Engineer shall be no more than 20 feet for speeds of 0-35 MPH and no more than 40 feet for speeds of 36 MPH or greater.

6. Cone Transition Length

Speed Limit M.P.H.	Taper Length Lane Width in Feet		
	10	11	12
20	70	75	80
25	105	115	125
30	150	165	180
35	205	225	245
40	270	295	320
45	430	495	540
50	500	550	600
55	550	605	660
60	600	660	720
65	650	715	750

TYPICAL TRAFFIC CONTROL  
FOR WORK BETWEEN TRAVELWAY AND DITCH LINE  
ON PRIMARY HIGHWAYS  
(NON-LIMITED ACCESS)  
(Figure P-1)



NOTES

1. Distance between advance warning signs and between "advance flagger" sign and flagging station should be 350'-500' where posted speed limit is 45 mph or less and 500'-800' where posted speed limit or unposted statutory maximum speed limit is greater than 45 mph.
2. Traffic cones are not required on the departure end of the work zone on four-lane undivided and divided primary highways.
3. On primary highways having a median wider than 8', left and right side sign assemblies shall be required.
4. Cone Spacing Guide - 40 feet for speeds 0-35 MPH  
60 feet for speeds 36 MPH or greater. Spacing on transitions and on curves of 6 degrees or greater or locations determined by the District Traffic Engineer shall be no more than 20 feet for speeds of 0-35 mph and no more than 40 feet for speeds of 36 MPH or greater.

5. Cone Transition Length

Speed Limit M.P.H.	Taper Length Lane Width in Feet		
	10	11	12
20	70	75	80
25	105	115	125
30	150	165	180
35	205	225	245
40	270	295	320
45	450	495	540
50	500	550	600
55	550	605	660
60	600	660	720
65	650	715	780



# Inspections

# ENGINEERING CONSULTING SERVICES, LTD.

## HAND AUGER PROBE LOG

HA-1

CLIENT: James City County  
PROJECT: SWM Pond at Routes 199 and 5  
James City County, Virginia

ECS JOB NO. N3036  
DATE: 9/23/98

EXIST. SURF. GRADE: Unknown  
PROPOSED FINISHED GRADE: Existing

ECS PROJ. ENG.: Mark L. Jenkins

MATERIAL DESCRIPTION	DEPTH (FT)
Brown, Moist, Fine to Medium SAND (SP-SM), Trace Silt	0.25
	0.5
	0.75
	1
White, Moist, Fine SAND (SP-SM), Trace Silt	1.25
	1.5
	1.75
	2
	2.25
	2.5
	2.75
	3
	3.25
	3.5
	3.75
	4
End of Hand Auger at 4 Feet	4.25
	4.5
	4.75
	5
	5.25
	5.5
	5.75
	6

814 Greenbrier Circle  
Suite A  
Chesapeake, Virginia  
Ph. (757) 366-5100 Fax. (757) 366-5203



# ENGINEERING CONSULTING SERVICES, LTD.

## HAND AUGER PROBE LOG

HA-2

CLIENT: James City County  
PROJECT: SWM Pond at Routes 199 and 5  
James City County, Virginia

ECS JOB NO. N3036  
DATE: 9/23/98

EXIST. SURF. GRADE: Unknown  
PROPOSED FINISHED GRADE: Existing

ECS PROJ. ENG.: Mark L. Jenkins

MATERIAL DESCRIPTION	DEPTH (FT)
Brown and Gray, Moist, Silty Fine to Medium SAND (SM)	0.25
	0.5
	0.75
	1
	1.25
	1.5
	1.75
	2
	2.25
	2.5
	2.75
	3
	3.25
	3.5
	3.75
	4
	4.25
	4.5
	4.75
	5
End of Hand Auger at 1.5 Feet	5.25
	5.5
	5.75
	6

814 Greenbrier Circle  
Suite A  
Chesapeake, Virginia  
Ph. (757) 366-5100 Fax. (757) 366-5203

# ENGINEERING CONSULTING SERVICES, LTD.

## HAND AUGER PROBE LOG

HA-3

CLIENT: James City County  
PROJECT: SWM Pond at Routes 199 and 5  
James City County, Virginia

ECS JOB NO. N3036  
DATE: 9/23/98

EXIST. SURF. GRADE: Unknown  
PROPOSED FINISHED GRADE: Existing

ECS PROJ. ENG.: Mark L. Jenkins

MATERIAL DESCRIPTION	DEPTH (FT)
Brown and Gray, Moist, Silty Fine to Medium SAND (SM), Trace Clay	0.25
	0.5
	0.75
	1
End of Hand Auger at 1.5 Feet	1.25
	1.5
	1.75
	2
	2.25
	2.5
	2.75
	3
	3.25
	3.5
	3.75
	4
	4.25
	4.5
	4.75
	5
	5.25
	5.5
	5.75
	6

814 Greenbrier Circle  
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# ENGINEERING CONSULTING SERVICES, LTD.

## HAND AUGER PROBE LOG

HA-4

CLIENT: James City County  
PROJECT: SWM Pond at Routes 199 and 5  
James City County, Virginia

ECS JOB NO. N3036  
DATE: 9/23/98

EXIST. SURF. GRADE: Unknown  
PROPOSED FINISHED GRADE: Existing

ECS PROJ. ENG.: Mark L. Jenkins

MATERIAL DESCRIPTION	DEPTH (FT)
Brown, Moist, Fine to Medium SAND (SP-SM), Trace Silt	0.25
	0.5
	0.75
	1
White, Moist, Fine to Medium SAND (SP-SM), Trace Silt	1.25
	1.5
	1.75
	2
	2.25
	2.5
	2.75
White, Moist, Fine to Medium SAND (SP-SM), Trace Coarse Sand and Fine to Medium Gravel	3
	3.25
	3.5
	3.75
End of Hand Auger at 4 Feet	4
	4.25
	4.5
	4.75
	5
	5.25
	5.5
	5.75
	6

814 Greenbrier Circle  
Suite A  
Chesapeake, Virginia  
Ph. (757) 366-5100 Fax. (757) 366-5203



## LABORATORY TEST SUMMARY

**PROJECT:** SWM Pond at Routes 199 and 5  
**LOCATION:** Williamsburg, Virginia

**ECS Job No.:** N3036  
**DATE:** 9-29-98

Boring Number	Sample Number	Depth (feet)	Percent Passing #200 Sieve	Atterberg Limits LL/PL/PI	USCS Symbol
HA-1	S-1	1-2	5.2	Non-Plastic	SP-SM
HA-2	S-1	1-2	14.6	Non-Plastic	SM
HA-3	S-1	1-2	14.5	Non-Plastic	SM
HA-4	S-1	1-2	9.9	Non-Plastic	SP-SM

N:\SUMMARY\3036BSM.DOC



# UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

Table Unified System of Classification

Major divisions			Group symbols	Typical names
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils 50% or more passes No. 200 sieve	Sils and Clays Liquid limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		OL	Organic silts and organic silty clays of low plasticity	
	Sils and Clays Liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
		CH	Inorganic clays of high plasticity, fat clays	
		OH	Organic clays of medium to high plasticity	
	Highly Organic Soils			PT

Table (Continued)

Classification criteria	
Classification on basis of percentage of fines Less than 5% pass No. 200 sieve GW, GP, SW, SP More than 12% pass No. 200 sieve GM, GC, SM, SC 5% to 12% pass No. 200 sieve Borderline classification requiring use of dual symbols	$C_u = D_{60}/D_{10}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
	Not meeting both criteria for GW
	Atterberg limits plot below "A" line or plasticity index less than 4
	Atterberg limits plot above "A" line and plasticity index greater than 7
	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
	$C_u = D_{60}/D_{10}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
	Not meeting both criteria for SW
	Atterberg limits plot below "A" line or plasticity index less than 4
	Atterberg limits plot above "A" line and plasticity index greater than 7
	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
<p>Plasticity Chart For classification of fine-grained soils and fine fraction of coarse-grained soils. Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols. Equation of A line: <math>PI = 0.73(LL - 20)</math></p>	
Visual-manual identification, see ASTM Designation D2488.	

# FIELD DENSITY TEST - NUCLEAR METHOD

## ASTM D - 2922

PROJECT: BMP @ 199+5

JOB NO.: N3036

SUBJECT: NUCLEAR FIELD DENSITY TESTS

DATE: 12-5-98

STANDARD COUNTY DENSITY \_\_\_\_\_

STANDARD COUNT MOISTURE \_\_\_\_\_

CONTRACTOR: Tomo

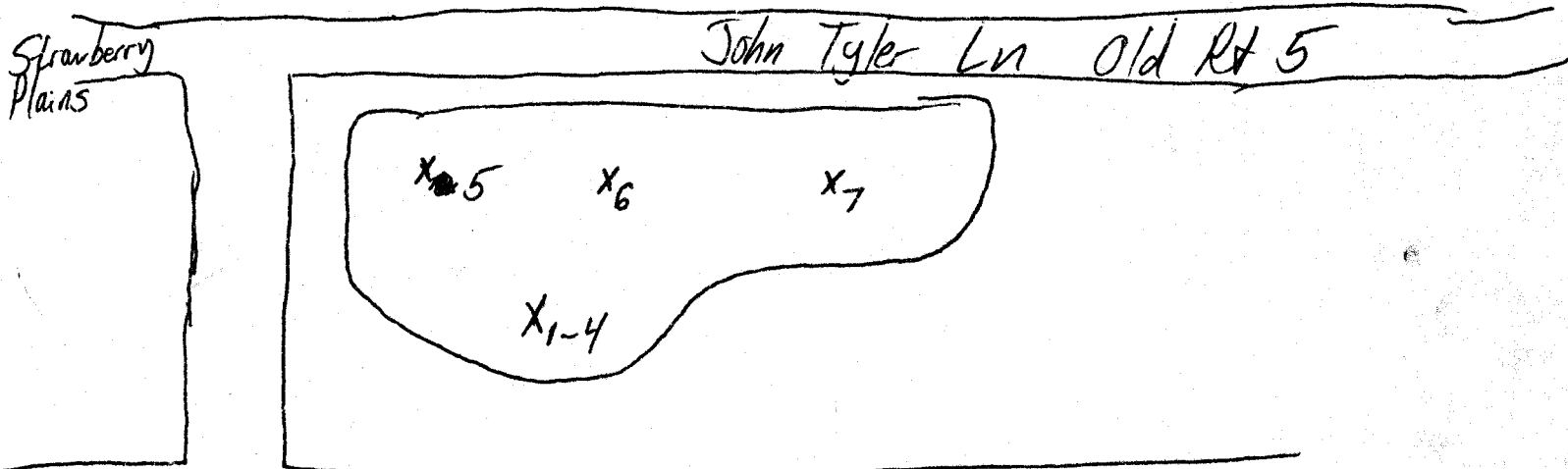
CLIENT: JCC

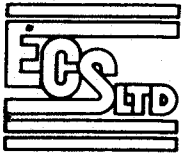
TECH: Bane

TEST NO.	①	②	③	④	⑤	⑥	⑦
MOISTURE CONTENT (PCF)	11.9	10.8	10.6	10.7	9.2	12.0	11.4
WET DENSITY (PCF)	119.9	118.6	120.5	120.4	115.7	121.3	119.6
DRY DENSITY (PCF)	108.0	107.8	109.9	109.7	106.4	109.4	108.2
MOISTURE CONTENT (%)	11.04	9.98	10.6	9.76	8.66	10.95	10.50
STANDARD PROCTOR MODIFIED PROCTOR							
OPT. WATER CONTENT							
LIFT, ELEVATION OR SOIL MARK	Finished Grade →						
PROBE DEPTH (INCH)	10"	8"	6"	4"	10"	10"	10"
PERCENT COMPACTION							
REQUIRED COMPACTION	90%	→					
* AR (TEST NO.)							

\* AR = Area Rerolled-Retest

Location Diagram/Remarks:





ENGINEERING  
CONSULTING  
SERVICES, LTD.  
2119-D  
North Hamilton Street  
Richmond, Virginia 23230  
(804) 353-6333

# FIELD REPORT

Project No.

N3036

Permit No.

Project

BMP @ 199+5

Day/Date

Sat 12-5-98

Location

James City County

Weather/Temp

Sun 70's

Contractor

Toano

Client

Soils

8

Arrive Job

2:15 PM

Depart Job

2:45 PM

Concrete

Total Hours on Job

0.5

Reinf. Steel

Laboratory Time

0.5

Special Services

Travel Time

0.25

TOTAL CHARGEABLE HOURS

1.25

Mileage

4

Expenses \$

Summary of Services Performed. Field Test Data, Locations, Elevations and Depths are Estimated.

The undersigned engineering technician arrived on site, as requested, to observe the compaction of Engineered Fill at finished grade for retaining pond. See attached Field Density Tests.

The Nuclear Method was used to test the compaction of the soils. Test results indicated that the areas tested on this date are indeterminant until reviewed by STASS geologist and P.E.

☐ Deficiency Needing Correction

(INDICATE NORTH ON ALL SKETCHES)

Copy Received By:  
Site Representative

Mark Enos  
James City County

By

JC Bant  
ENGINEERING CONSULTING SERVICES, LTD.

Title/Company

CC026\_ROUTE\_199\_&\_ROUTE\_5 - 037



\* 2:00 PM SAT 12/5/98 ECS TESTING

POND AT 199 + ROUTE 5

DATE	TRUCKS IN	TRUCKS OUT
12-2-98	1 - T-4 1:58 1 - T-5 1 - T-4 1 - T-5 1 - T-6 1 - T-4 1 - T-5	1 - T-4 1 - T-5 1 - T-6 1 - T-4 1 - T-5 1 - T-6 1 - T-4 3:45 1 - T-6 1 - T-4 4:05 1 - T-6 4:20 1 - T-4 4:28 1 - T-6 4:47 1 - T-4 4:52
	TOTAL IN - 7	TOTAL OUT 13
12-3-98	<div> <div>WADE'S T-4 T-5 T-6</div> <div>H&amp;A HAULING HUDNALL'S HAUL C &amp; K E. PRYOR</div> </div> 1 - T-4 1 - WADE'S 1 - E. PRYOR 1 - C & K 1 - HUDNALL'S 1 - H&A 1 - T-5	<div>7:40 AM</div> 1 - H&A 1 - T-4 1 - WADE'S 1 - E. PRYOR 1 - C & K 1 - HUDNALL'S 1 - T-5 1 - T-4 1 - WADE'S 1 - E. PRYOR 1 - C & K 1 - HUDNALL'S 1 - H&A 1 - T-5

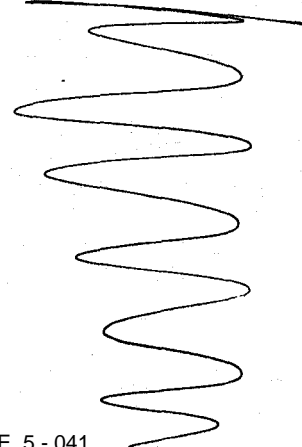
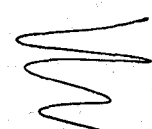
DATE	TRUCKS IN	TRUCKS OUT
12/3/98	1 - T-4 1 - WADE'S 1 - E. PRYOR 1 - C & K 1 - HUDNALL'S 1 - H & A 1 - T-5 1 - T-4 1 - T-6 16 1 - T-5 1 - T-4 1 - T-6 1 - T-5 20 1 - E. PRYOR 1 - C & K 1 - HUDNALL 1 - T-4 1 - T-6 25	1 - T-4 1 - WADE'S 1 - E. PRYOR 1 - C & K 1 - HUDNALL'S 1 - H & A 1 - T-5 1 - WADE'S 1 - E. PRYOR 1 - C & K 1 - T-4 1 - T-6 26 1 - HUDNALL 1 - H & A 1 - WADE'S 1 - T-5 1 - E. PRYOR 30 1 - C & K 1 - HUDNALL 1 - T-4 1 - T-6 1 - WADE 35 1 - H & A 1 - T-5 1 - C & K 1 - HUDNALL 1 - T-4 40

11:27 AM

5 miles  
3 colors

BROUGHT  
FORWARD

BROUGHT  
FORWARD  
40

DATE	TRUCKS IN	25	TRUCKS OUT	
12-3	1 - WADES		1 - T-6	
	1 - H & A		1 - H & A	
	1 - T-5		1 - T-5	
	1 - <del>E. PRYOR</del>		1 - E. PRYOR	P-1
	1 - C & K	30	1 - C & K	45
	1 - HUDNALLS		1 - HUDNALLS	
	1 - T-4		1 - H-A	
	1 - WADES		<del>1 - C &amp; K</del>	
	1 - T-4		1 - HUDNALLS	
	1 - T-5	35	1 - T-6	50
	1 - T-4		1 - H & A	
	1 - HUDNALLS		1 - Pryor	
	1 - T-6		1 - WADES 1:00	
	1 - H & A		1 - T-5	
	1 - Pryor	40	1 - T-4	55
	1 - WADES 1:40		1 - C & K	
	1 - T-5 1:43		1 - HUDNALLS	
	1 - T-4 1:45		1 - T-6	
	1 - T-6 2:00		1 - C & K 1:40	
	1 - C & K 2:15	45	1 - H & A	60
			1 - Pryor	
			1 - WADES 1:54	
			1 - T-5	
			1 - HUDNALLS 2:00	
			1 - T-4	65
				

12:00 NOON  
ROUND TRIP 47  
MIN



DATE	TRUCKS IN	45	TRUCKS OUT	65
12-3-58	1 - H+A 2:17		1 - T-6 2:08	
	1 - Pryor 2:24		1 - C+K 2:44	
	1 - T-5 2:25		1 - T-5 2:48	
	1 - T-4 2:34		1 - Hudnall	
	1 - T-6 2:49	50	1 - Pryor	70
	1 - C+K 3:20		1 - T-4	
	1 - T-5		1 - H+A 3:00	
	1 - Hudnall		1 - T-6	
	1 - T-4 <del>4:00</del>		1 - C+K	
	1 - T-6 -	55	1 - T-5	75
	1 - E. Pryor		1 - T-4	
	1 - H+A		1 - Hudnall	
	1 - C+K 4:06		1 - T-6	
	1 - T-5		1 - Pryor	
	1 - T-4	60	1 - H+A 3:55	80
	1 - Hudnall		1 - C+K	
	1 - T-6		1 - T-5	
	1 - H+A		1 - T-4	
	1 - Pryor		1 - Hudnall	
	1 - C+K	65	1 - T-6	85
	1 - T-5		1 - H+A	
	1 - T-4		1 - Pryor	
	1 - Hudnall		1 - T-5	
	1 - T-6		1 - T-4	
	1 - Pryor	70		
	1 - H+A 5:17			
	TOTAL 71			

TOTAL 89

DATE	TRUCKS IN	TRUCKS OUT
12/4/98 FRIDAY	1 - T-4	1 - HUDNALL 7:42
	1 - T-6	1 - C&K
	1 - T-5	1 - H&A
	1 - T-5	1 - WADE'S
	1 - T-4	1 - T-4 } ON TOP OF BANK FOR TUBOCH 5
	1 - WADE'S	1 - T-4
	1 - T-5	1 - HUDNALLS
	1 - T-5	1 - C&K
		1 - H&A
		1 - WADE'S
		1 - T-5
		1 - T-4 8:40
		1 - HUDNALL
		1 - C&K
		1 - H&A 9:00
		1 - WADE'S
		1 - T-5
		1 - HUDNALL
		1 - T-4
		1 - C&K
		1 - H&A
		1 - T-4
		1 - T-4
		1 - HUDNALL
		1 - T-4
		1 - WADE'S
		1 - T-4

# LOOPS TO UPPER END OF BMP

DATE	TRUCKS IN	BROUGHT FORWARD 8	TRUCKS OUT	BROUGHT FORWARD 27
12-4-98	1-H&A 1-WADES 1-T-5 1-C&K 1-H&A 1-WADES 1-T-5 1-C&K 1-H&A 1-T-4 1-T-6 1-T-5 1-H&A 1-C&K 1-T-4	10      15      20      25	1-T-5 1-C&K 1-H&A 1-T-4 B.K. 1-HUDNALLS 1-T-4 B.K. 1-T-6 B.K. 1-WADES 1-T-5 1-T-4 B.K. 1-T-6 B.K. 1-C&K 1-T-4 B.K. BK <del>1-T-6</del> 1-H&A 1-T-4 1-WADES 1-T-5 1-C&K 1-H&A 1-T-4 1-WADE 1-T-6 (top of bank) 1-T-5 1-T-6 (top of bank) 1-H&A 1-C&K	30      35      40      45      50



5 TO UPPER FEND  
OF BMP  
CARRIES  
FORWARD

DATE

TRUCKS IN

(23)

TRUCKS OUT

(54)

12-4-98

1- WADES

1- T-5

25

1- C+K

1- H+A

1- T-4

1- T-5 (1:48) 30

1- T-6 (1:54)

1- WADES (1:58)

1- H+A (2:06)

1- C+K (2:06)

1- T-4 (2:08) 35

1- T-5 (2:12)

1- T-6 (2:17)

1- H+A (2:29)

1- C+K 2:33

1- T-4 2:33 40

1- T-5 2:38

1 T-6

1 H+A 2:54

1 T-4

1 C+K 45

1 T-5 3:03

1 T-6 3:12

1 H+A 3:18

1 T-4

1 C+K 3:20 50

- 126 TOTAL

1- T-4

55

1- T-6 TO TOP OF BANK

1- WADES

1- T-6 TOP OF BANK

1- T-6 TOP OF BANK

TOTAL  
TODAY 59

12/2/98 13

12/3/98 89

12/4/98 40

19 (HORNE/TUBOCH)

TOTAL 161  
TOTAL

Total

1212

70

TDD 144

DATE

TRUCKS IN

TRUCKS OUT

12/5/98<sup>145</sup>

1 T-5 7:50

1 T-4

1 T-6

1 T-5 8:14

1 T-4 8:15

150

1 T-6 8:18

1 T-5 8:33

1 T-4

1 T-6 8:39

1 T-5

155

1 T-4 8:59

1 T-6 9:00

1 T-5

1 T-6 9:26

1 T-4

160

1 T-5 9:42

1 T-6 9:51

1 T-4 9:56

1 T-5 10:00

1 T-6 10:15

165

1 T-4 10:15

1 T-5 10:28

1 T-6 10:33

1 T-4

1 T-5 10:49

170

1 T-6 11:00

12/2 13

12/3 89

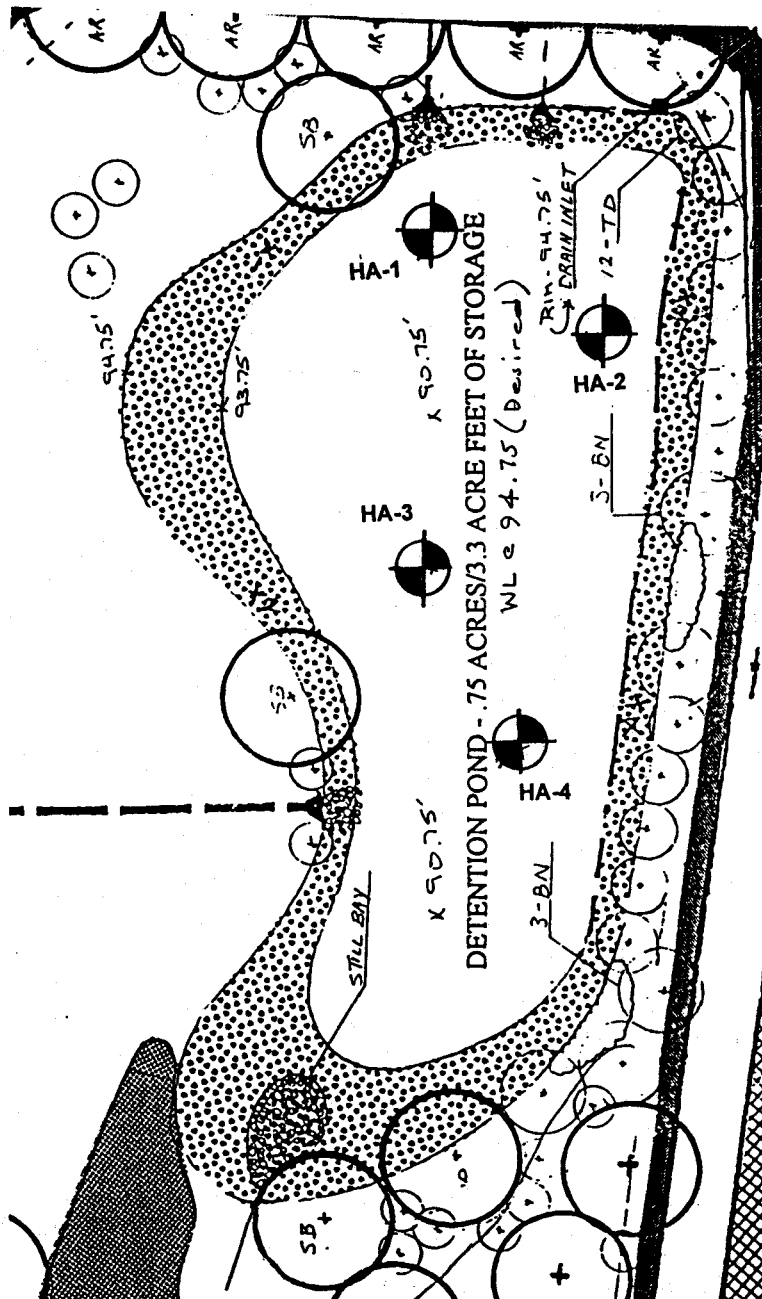
12/4 40

12/4 19 - HORNE/TUBOCH

161

2 Loads  
Top 5 mi





ENGINEERING CONSULTING  
SERVICES, LTD.

814 Greenbrier Circle  
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Chesapeake, VA 23320  
PH: (757) 366-5100  
FAX: (757) 366-5203

# Hand Auger Boring Location Diagram

SWM Pond  
Routes 199 and 5  
Williamsburg, Virginia  
for  
James City County

MLJ

not to scale

N3036

10-13-98

1 of 1

# ENGINEERING CONSULTING SERVICES, LTD.

## HAND AUGER PROBE LOG

HA-1

CLIENT: James City County  
PROJECT: SWM Pond at Routes 199 and 5  
James City County, Virginia

ECS JOB NO. N3036  
DATE: 9/23/98

EXIST. SURF. GRADE: Unknown  
PROPOSED FINISHED GRADE: Existing

ECS PROJ. ENG.: Mark L. Jenkins

MATERIAL DESCRIPTION	DEPTH (FT)
Brown, Moist, Fine to Medium SAND (SP-SM), Trace Silt	0.25
	0.5
	0.75
	1
White, Moist, Fine SAND (SP-SM), Trace Silt	1.25
	1.5
	1.75
	2
	2.25
	2.5
	2.75
	3
	3.25
	3.5
	3.75
	4
End of Hand Auger at 4 Feet	4.25
	4.5
	4.75
	5
	5.25
	5.5
	5.75
	6

814 Greenbrier Circle  
Suite A  
Chesapeake, Virginia  
Ph. (757) 366-5100 Fax. (757) 366-5203

# ENGINEERING CONSULTING SERVICES, LTD.

## HAND AUGER PROBE LOG

HA-2

CLIENT: James City County  
PROJECT: SWM Pond at Routes 199 and 5  
James City County, Virginia

ECS JOB NO. N3036  
DATE: 9/23/98

EXIST. SURF. GRADE: Unknown  
PROPOSED FINISHED GRADE: Existing

ECS PROJ. ENG.: Mark L. Jenkins

MATERIAL DESCRIPTION	DEPTH (FT)
Brown and Gray, Moist, Silty Fine to Medium SAND (SM)	0.25
	0.5
	0.75
	1
	1.25
	1.5
	1.75
	2
	2.25
	2.5
	2.75
	3
	3.25
	3.5
	3.75
	4
	4.25
	4.5
	4.75
	5
End of Hand Auger at 1.5 Feet	5.25
	5.5
	5.75
	6

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Suite A  
Chesapeake, Virginia  
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# ENGINEERING CONSULTING SERVICES, LTD.

## HAND AUGER PROBE LOG

HA-3

CLIENT: James City County  
PROJECT: SWM Pond at Routes 199 and 5  
James City County, Virginia

ECS JOB NO. N3036  
DATE: 9/23/98

EXIST. SURF. GRADE: Unknown  
PROPOSED FINISHED GRADE: Existing

ECS PROJ. ENG.: Mark L. Jenkins

MATERIAL DESCRIPTION	DEPTH (FT)
Brown and Gray, Moist, Silty Fine to Medium SAND (SM), Trace Clay	0.25
	0.5
	0.75
	1
End of Hand Auger at 1.5 Feet	1.25
	1.5
	1.75
	2
	2.25
	2.5
	2.75
	3
	3.25
	3.5
	3.75
	4
	4.25
	4.5
	4.75
	5
	5.25
	5.5
	5.75
	6

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Suite A  
Chesapeake, Virginia  
Ph. (757) 366-5100 Fax. (757) 366-5203

# ENGINEERING CONSULTING SERVICES, LTD.

## HAND AUGER PROBE LOG

HA-4

CLIENT: James City County  
PROJECT: SWM Pond at Routes 199 and 5  
James City County, Virginia

ECS JOB NO. N3036  
DATE: 9/23/98

EXIST. SURF. GRADE: Unknown  
PROPOSED FINISHED GRADE: Existing

ECS PROJ. ENG.: Mark L. Jenkins

MATERIAL DESCRIPTION	DEPTH (FT)
Brown, Moist, Fine to Medium SAND (SP-SM), Trace Silt	0.25
	0.5
	0.75
	1
White, Moist, Fine to Medium SAND (SP-SM), Trace Silt	1.25
	1.5
	1.75
	2
	2.25
	2.5
	2.75
White, Moist, Fine to Medium SAND (SP-SM), Trace Coarse Sand and Fine to Medium Gravel	3
	3.25
	3.5
	3.75
End of Hand Auger at 4 Feet	4
	4.25
	4.5
	4.75
	5
	5.25
	5.5
	5.75
	6

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Suite A  
Chesapeake, Virginia  
Ph. (757) 366-5100 Fax. (757) 366-5203



## LABORATORY TEST SUMMARY

**PROJECT:** SWM Pond at Routes 199 and 5  
**LOCATION:** Williamsburg, Virginia

**ECS Job No.:** N3036  
**DATE:** 9-29-98

Boring Number	Sample Number	Depth (feet)	Percent Passing #200 Sieve	Atterberg Limits LL/PL/PI	USCS Symbol
HA-1	S-1	1-2	5.2	Non-Plastic	SP-SM
HA-2	S-1	1-2	14.6	Non-Plastic	SM
HA-3	S-1	1-2	14.5	Non-Plastic	SM
HA-4	S-1	1-2	9.9	Non-Plastic	SP-SM

N:\SUMMARY\3036BSM.DOC

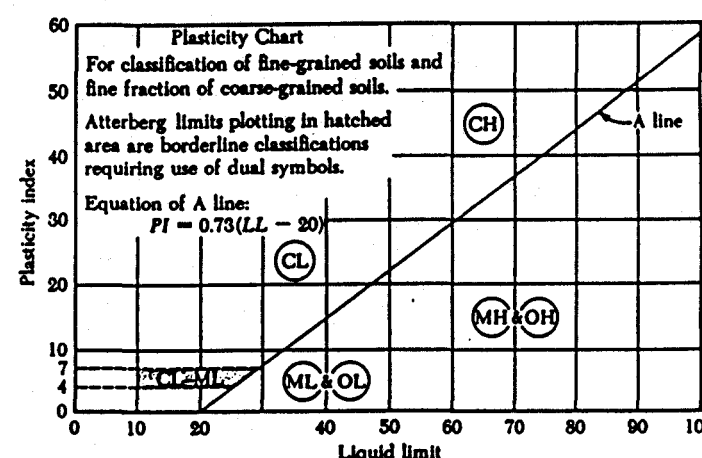


# UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

Table Unified System of Classification

Major divisions			Group symbols	Typical names
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils 50% or more passes No. 200 sieve	Sils and Clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Sils and Clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
			PT	Peat, muck, and other highly organic soils

Table (Continued)

Classification criteria			
Classification on basis of percentage of fines Less than 5% pass No. 200 sieve GW, GP, SW, SP More than 12% pass No. 200 sieve GM, GC, SM, SC 5% to 12% pass No. 200 sieve Borderline classification requiring use of dual symbols	$C_u = D_{60}/D_{10}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3		
	Not meeting both criteria for GW		
	Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols	
	Atterberg limits plot above "A" line and plasticity index greater than 7		
	$C_u = D_{60}/D_{10}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3		
	Not meeting both criteria for SW		
	Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols	
	Atterberg limits plot above "A" line and plasticity index greater than 7		
			
	Visual-manual identification, see ASTM Designation D2488.		

# Specifications and Engineering Calculations

## ROUTE 199/5 BMP POND

1. BOTTOM AREA = 31,400 sf = 0.72 ac = 2917 SM  
FRONT SHELF = 38,500 sf = 0.88 ac = 3576 SM  
REAR SHELF = 46,750 sf = 1.07 ac = 4343 SM

### 2. Synthetic Liner

#### a) 20 MIL PVC

$$\text{Material Cost} = \$0.20/\text{SF}$$

$$\text{Surface Area} = 43,560 \times 1.15 = 50,094 \text{ SF}$$

$$\text{Placement} = \$5000$$

$$\text{EARTHWORK} = 50,000 \text{ CF} / 27 = 1855 \text{ SY} \times \$5/\text{SY} = \$9276$$

$$\text{SHIPPING} = \$400$$

$$\text{TOTAL COST} = 0.2 \times 50,000 + 5000 + 9300 + 400 = \underline{\$24,700}$$

$$\text{[revise earthwork to } \$2100 \Rightarrow \text{price} = \$17,500]$$

#### b) Bentomat - ST

$$\text{Surface Area} = 45,000 \text{ SF}$$

$$\text{Delivered + Installed} = \$1/\text{SF}$$

$$\text{EARTHWORK} = 45,000 \text{ SF} / 27 = 1667 \text{ SY} \times \$5/\text{SY} = \$8330$$

$$\text{Cost} = \$1 \times 45,000 + 8330 = \underline{\$53,330}$$

### 3. Clay Material

line 38,500 ft<sup>3</sup> w/ 6 inches of clay (10<sup>-6</sup> - 10<sup>-7</sup>) material

say 800 cyds of material -

$$800 \text{ cy} \times \$5/\text{cyd} = \$4000$$

$$\text{Remove 800 cyd sand} = \$4000$$

$$\text{EARTHWORK} = 3 \text{ day} \times 10 \text{ hr/day} \times \$70/\text{hr} = \$2100$$

$$\text{TOTAL} = \underline{\$10,100}$$

### 4. Bentonite -

$$\$413.64/3000 \text{ lb Super Sack}$$

$$3 \text{ lb/SF} \times 38,500 \text{ SF} \times \frac{413.64}{3000} = \$15,925 \quad \text{PLACEMENT -}$$

Disking, Spreading



FLOW ANALYSIS FOR  
PRE-DEVELOPMENT AND  
POST-DEVELOPMENT CONDITIONS

STORMWATER MANAGEMENT FACILITY - ROUTE 199 AREA B

PRE-DEVELOPMENT CONDITION

	Subarea Surface	Area (Ac.)	C Factor	C * A
1.	Average Grass	18.94	0.35	6.63
2.	Paved	4.20	0.90	3.78
3.				
Total Area:		23.14	Total C*A:	10.41

Composite C Factor = 0.45

Time of Concentration

200 '	Overland Flow @	5.00	%	=	4.1	min
1840 '	Channel Flow @	2.00	fps	=	15.3	min

Peak Q for multi-year storm

Year	Area Ac.	Cf	C	Tc min	i in/hr	Q cfs
2	23.14	1.00	0.45	19	3.43	35.7
10	23.14	1.00	0.45	19	4.66	48.5
25	23.14	1.10	0.45	19	5.43	62.2
100	23.14	1.25	0.45	19	6.61	86.1

POST-DEVELOPMENT CONDITION

	Subarea Surface	Area (Ac.)	C Factor	C * A
1.	Average Grass	21.21	0.35	7.42
2.	Paved	7.81	0.90	7.03
3.				
Total Area:		29.02	Total C*A:	14.45

Composite C Factor = 0.50

Time of Concentration

20 '	Overland Flow @	5.00	%	=	1.0	min
2790 '	Channel Flow @	2.00	fps	=	23.3	min

Peak Q for multi-year storm

Year	Area Ac.	Cf	C	Tc min	i in/hr	Q cfs
2	29.02	1.00	0.50	24	3.02	43.7
10	29.02	1.00	0.50	24	4.16	60.1
25	29.02	1.10	0.50	24	4.86	77.3
100	29.02	1.25	0.50	24	5.93	107.2

POND-2 Version: 5.17  
S/N:

0199-047-F03-C504-RW206  
AREA B  
S.W.M. FACILITY  
RTE 199 - NBL STA. 102

CALCULATED 02-03-1994 14:49:57  
DISK FILE: D:\199\B-199 .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sq <sup>2</sup> (A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
90.75	0.00	0	0	0	0
91.00	825.00	825	825	69	69
91.50	9,432.00	9,432	13,047	2,174	2,243
92.00	18,795.00	18,795	41,541	6,924	9,167
92.50	24,785.00	24,785	65,163	10,861	20,027
93.00	30,775.00	30,775	83,178	13,863	33,890
93.50	36,765.00	36,765	101,177	16,863	50,753
94.00	42,755.00	42,755	119,167	19,861	70,614
94.50	43,837.00	43,837	129,885	21,647	92,262
95.00	44,918.00	44,918	133,129	22,188	114,450
95.50	46,000.00	46,000	136,374	22,729	137,179
96.00	47,080.00	47,080	139,617	23,269	160,448
96.50	48,118.00	48,118	142,794	23,799	184,247
97.00	49,155.00	49,155	145,907	24,318	208,565
97.50	50,193.00	50,193	149,019	24,837	233,402
98.00	51,230.00	51,230	152,132	25,355	258,757

$$IA = (\text{sq. rt}(\text{Area1}) + ((E_i - E_1) / (E_2 - E_1)) * (\text{sq. rt}(\text{Area2}) - \text{sq. rt}(\text{Area1})))^2$$

where: E1, E2 = Closest two elevations with planimeter data  
E<sub>i</sub> = Elevation at which to interpolate area  
Area1, Area2 = Areas computed for E1, E2, respectively  
IA = Interpolated area for E<sub>i</sub>

\* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$\text{Volume} = (1/3) * (\text{EL2} - \text{EL1}) * (\text{Area1} + \text{Area2} + \text{sq. rt.}(\text{Area1} * \text{Area2}))$$

where: EL1, EL2 = Lower and upper elevations of the increment  
Area1, Area2 = Areas computed for EL1, EL2, respectively  
Volume = Incremental volume between EL1 and EL2

PROJECT NAME:

ROUTE 199 0199-047-F03, RW-206, C-504

DEPARTMENT: CIVIL

PROJECT PART:

DRAINAGE DESIGN

SHEET NO: \_\_\_\_\_ OF: \_\_\_\_\_

COMPUTED BY: KMH DATE: 11-3-95

SPEC. DIVISION:

EMERGENCY OVERFLOW DESIGN

CHECKED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

RELEVANT ELEVATIONS :

PERMANENT S.W. M. ELEVATIONS

2 YR. WSE = 93.57

10 YR. WSE = 93.89

25 YR. WSE = 94.16

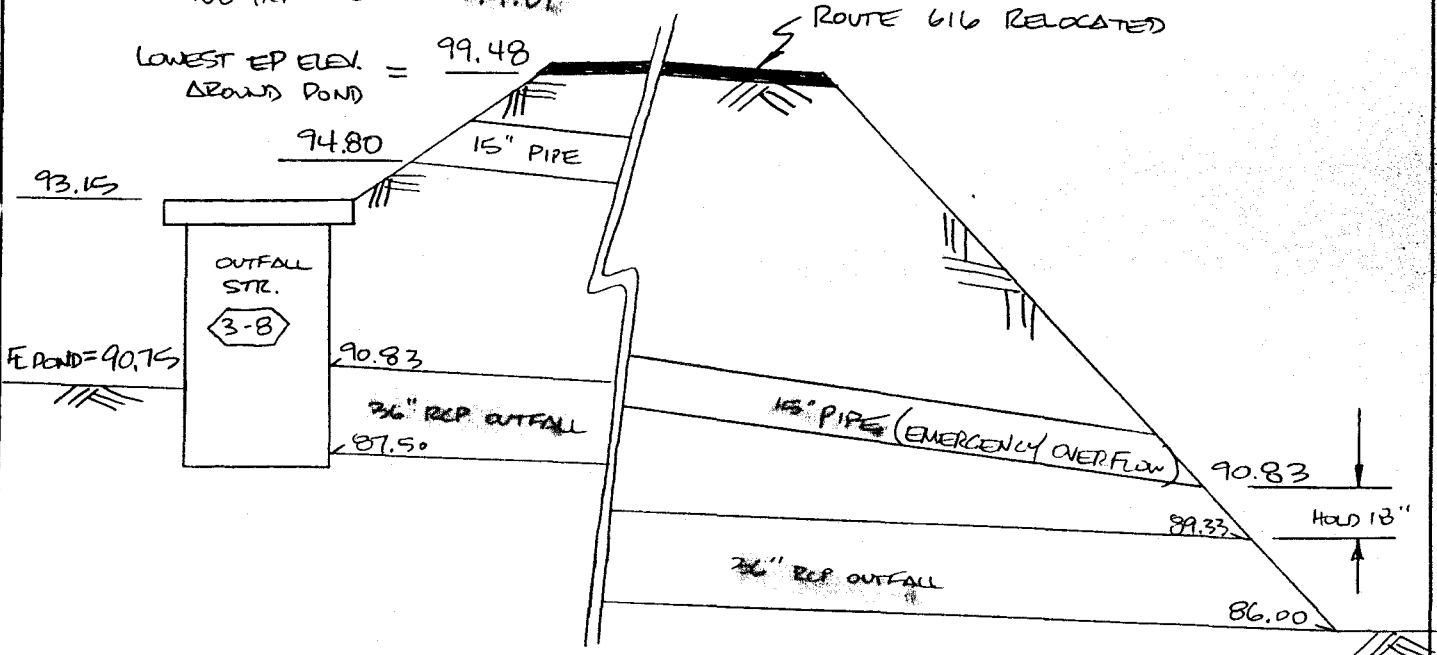
100 YR. WSE = 94.81

TEMPORARY SEDIMENT BASIN ELEV.

WET STORAGE = 93.55

TOTAL STORAGE = 94.80

LOWEST EP ELEV. = 99.48  
ABOVE POND



SET INV(IN) @ 94.80 & HOLD INV(OUT) TO 18" ABOVE TOP OF 36" OUTFALL  
 $\therefore$  SET INV(OUT) @ 90.83 LENGTH = 160' S = 0.0248 %

APPROXIMATE VOLUME @ ELEV. 99.48 = 404,500 CF

15" RCP  $Q_{MAX} \approx 10.2$  cfs  $\therefore$  APPROXIMATE DRAWDOWN = 11 HOURS

15" CMP  $Q_{MAX} \approx 7.5$  cfs  $\therefore$  APPROXIMATE DRAWDOWN = 15 HOURS

(ASSUMING SWM OUTFALL STRUCTURE 100% PLUGGED)

CONCLUSION :

15" PIPE REQUIRED INV(IN) = 94.80  
 160 LF INV(OUT) = 90.83



MMM Design Group

## STORMWATER MANAGEMENT OUTFALL STRUCTURE CALCULATIONS

[illegible]

\* Indicates ORIFICE flow condition

H.B. INC.

Jimmy Thompson (229-2504)

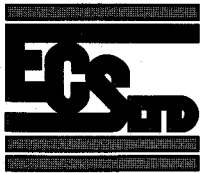
1165 C. YARDS OUT

1750 C YARDS IN

\$ 51,625.00

# Correspondence





**ENGINEERING CONSULTING SERVICES, LTD.**

Geotechnical • Construction Materials • Environmental

September 28, 1998

Mr. Darryl Cook  
James City County  
Environmental Division  
101-E Mounts Bay Road  
Williamsburg, Virginia 23187-8784



ECS Proposal N1725-P (revised)

Reference: Proposal for Geotechnical Exploration Services and Engineering Services  
SWM Facility "B"  
Route 199 at Route 5  
Williamsburg, Virginia

Dear Mr. Cook:

As requested, Engineering Consulting Services, Ltd., is pleased to present the following unit price and estimated total cost proposal for providing subsurface exploration services, laboratory testing and engineering services for the above referenced project.

**Scope of Services - Subsurface Exploration**

Our services will include drilling of hand auger probes, performing sieve analysis testing of representative samples and preparation of a geotechnical engineering report. The engineering report will include the following items:

- a. Information on site conditions including special site features and drainage characteristics.
- b. Description of the field exploration, field tests and laboratory tests performed.
- c. Final logs of the hand auger probes and records of the field exploration in accordance with the standard practice of geotechnical engineers. A site location plan will be included, and the results of the laboratory tests will be included on a separate test report sheet.

814 Greenbrier Circle, Suite A, • Chesapeake, Virginia 23320-2643 • (757) 366-5100 • Fax (757) 366-5203

Offices: Washington, DC • Baltimore, MD • Frederick, MD • Richmond, VA • Chesapeake, VA • Fredericksburg, VA  
Danville, VA • Raleigh/Durham, NC • Wilmington, NC • Charlotte, NC • Greensboro, NC

## MEMORANDUM

**DATE:** September 17, 1998

**TO:** John Horne, Wayland Bass, Darryl Cook, Craig Nordeman, Al Brennick

**FROM:** Paul Tubach, Jr.

**SUBJECT:** 199/Rt5 Williamsburg Crossing: tasks and timelines

### Invitation to Bid

Rose submitted the bid notification which will appear in Sunday's paper. Individual nurseries will be mailed information on Friday, September 18. Bid opening is Oct. 7. It will take the nurseries at least 3 weeks to transplant and get the trees ready for delivery in early November. Depending on the number of suppliers, we will try to unload trees one section at a time. Craig Nordeman and I visited the site and designated staging areas in each quadrant. One drainage ditch will need to be crossed using fill or timbers.

### Mowing

In order for planting to occur, all turf areas will need to be mowed... especially the horse farm quadrant. A maintenance contract needs to be authorized.

### Mulch and tree staking

Al Brennick, with the City, will provide all the mulch necessary to complete the job. Delivering it to the site has yet to be worked out.

### Equipment

Both the County and the City are providing tractors with augers to prepare planting holes. The City will donate an additional two days of equipment and operator beyond the scope of their tree planting. I've called Larry Foster to see about "borrowing" a back hoe and operator for a day to get those 'hard to reach' spots.

### Retention basin

Darryl Cook and I are evaluating what materials and methods are available for installing a liner in the bottom 3' of the basin. The top 1' including the shelf will have a fluctuating water depth depending upon storm events. Costs have not been determined. The timeline to make a decision on the manner of installation is Friday, September 25.

### Old road bed

Wayland Bass is determining what options are available to scarify and break up the compacted ground under the old Route 5 road bed. Some test holes with a back hoe are needed to assess what the soils are like and whether the gravel was removed. Additional topsoil or organic matter will need to be worked into the area in front of the shopping center.

- d. Our opinion as to the probable cause(s) of the non-retention of water in the SWM pond, and recommendations on how to modify the basin to hold a permanent pool of water.
- e. Upon request, we will provide additional consultation and engineering analysis for you on other problems related to performance of the structure and subsurface conditions.

### **Subsurface Exploration Services**

We propose to perform a total of four (4) hand auger probes extending to a depth of about 2 to 4 feet below the existing SWM pond basin. Representative samples collected from the hand auger probes will be returned to our laboratory in Williamsburg, Virginia for further identification, classification and testing, followed by the preparation of a written engineering report. The estimated cost of our services is as noted below:

#### **A. Field Exploration:**

- 1. Field Engineer to perform Hand Augers and collect soil samples for laboratory testing, estimate 3 hours @ \$65.00/field engineer hour \$ 195.00
- Field Exploration Subtotal:** **\$ 195.00**

#### **B. Laboratory Testing:**

- 1. 4 Gradation Analyses @ \$30.00 each \$ 120.00
- Laboratory Subtotal:** **\$ 120.00**



**C. Engineering Services:**

2.	Project Engineer - Report Preparation estimate 3 hours @ \$65.00/hour	\$ <u>195.00</u>
	<b>Engineering Services Subtotal:</b>	<b>\$ 195.00</b>

**ESTIMATED TOTAL COST, ALL SERVICES: \$ 510.00**

If other items are required because of unexpected field conditions encountered in our field exploration program, or because of a request for additional services, they would be invoiced in accordance with our current Fee Schedule. Before modifying or expanding the extent of our exploration program, you would be informed of our intentions for both your review and authorization.

Attached to this letter, and an integral part of our proposal, are our "General Conditions of Service." These conditions represent the current recommendations of the Association of Soil and Foundation Engineers, the Consulting Engineers' Council, and the Geotechnical Division of the American Society of Civil Engineers.

This letter is the agreement for our services. Your acceptance of this proposal may be indicated by signing and returning the proposal acceptance sheet to us. We are pleased to have this opportunity to offer our services and look forward to working with you on this project.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.



Mark L. Jenkins, P.E.  
Project Engineer

MLJ/N1725pr.doc

Enclosures:      General Conditions of Service

## **Engineering Consulting Services, Ltd.**

### **PROPOSAL ACCEPTANCE**

Proposal No.: N1725-P (revised)  
Scope of Work: Geotechnical Exploration and Engineering Services  
Location: SWM Facility "B"  
Route 199 at Route 5  
Williamsburg, Virginia

Client Signature: \_\_\_\_\_

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

Please complete and return this page to ECS, Ltd. To indicate acceptance of this proposal and to initiate work on the above-referenced project. The Client's signature above also indicates that he/she has read or has had the opportunity to read the accompanying General Conditions of Service and agrees to be bound by such General Conditions of Service.

### **BILLING INFORMATION**

(Please Print or Type)

Name of Client: \_\_\_\_\_  
Name of Contact Person: \_\_\_\_\_  
Telephone No. Of Contact Person: \_\_\_\_\_  
  
Party Responsible for Payment: \_\_\_\_\_  
Company Name: \_\_\_\_\_  
Person/Title: \_\_\_\_\_  
Department: \_\_\_\_\_  
Billing Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
  
Telephone Number: \_\_\_\_\_  
Fax Number: \_\_\_\_\_  
  
Client Project/Account Number: \_\_\_\_\_  
Special Conditions for Invoice: \_\_\_\_\_  
Submittal and Approval: \_\_\_\_\_

ECS GENERAL CONDITIONS

ENGINEERING CONSULTING SERVICES, LTD.  
GENERAL CONDITIONS OF SERVICE

These General Conditions of Service, including any Supplemental Conditions of Service which are or may become applicable to the services to be provided in the Proposal, are incorporated by reference into the foregoing Proposal and shall be part of the Agreement under which services are to be performed by ECS for Client. For the purposes of these General Conditions, "Agreement" shall mean the Proposal, these General Conditions, Supplemental Conditions (if any) and Fee Schedule.

SECTION 1: SCOPE OF WORK

- a. The scope of work shall include all services provided by ECS, in its discretion, which are reasonably necessary and appropriate for the effective and prompt fulfillment of ECS's obligations under the Agreement, including these General Conditions and any supplemental conditions incorporated herein; it being expressly provided that all such services provided shall be invoiced and paid for in accordance with Section 3 below.
- b. It is understood that the scope of work and time schedule defined in the Proposal are based on the information provided by Client. If this information is incomplete or inaccurate, or if unexpected conditions are discovered, the scope of work may change, even as the work is in progress. If the Client requests additional services or when a change in the scope of work or time schedule is necessary, a written amendment to the Agreement shall be executed by the Client and ECS as soon as is practicable and consent to such amendments shall not be unreasonably withheld.

SECTION 2: CLIENT DISCLOSURES

- a. The Client shall notify ECS of any known or suspected hazardous substances which are or may be related to the services to be provided. Such hazardous substances shall include but not be limited to any substance which poses or may pose a present or potential hazard to human health or the environment whether contained in a product, material, by-product, waste or sample and whether it exists in a solid, liquid, semi-solid or gaseous form. This duty to notify ECS of any such hazardous substances shall also apply to any of the foregoing substances which ECS may be provided or obtain or which exist or may exist on or near any premises upon which services are to be performed by employees, agents or contractors of ECS. The Client shall notify ECS of all such hazardous substances of which it has knowledge or which it reasonably suspects exist upon entering into this Agreement. Thereafter, disclosure and notification to ECS shall be required immediately upon discovery of any other hazardous substances or upon discovery of increased concentrations of previously disclosed substances where the increased concentration makes them hazardous.
- b. Following any disclosure as set forth in the preceding paragraph, or if any hazardous substances are discovered or reasonably suspected by ECS after its services are undertaken, ECS may, at its discretion, discontinue its services. Whether or not ECS discontinues its services in whole or in part, the Client and ECS agree that the scope of services, schedule and the estimated fee or budget shall be adjusted in accordance with the disclosed information or condition, and ECS may, at its discretion, terminate the Agreement. In the event that the Agreement is terminated pursuant to this Section, the Client shall pay ECS for services and all termination expenses as set forth in Section 11 of this Agreement.
- c. If all or any part of the scope of work is to be performed in the general vicinity of a facility or in an area where dust, fumes, gas, noise, vibrations or other particulate or nonparticulate matter is in the atmosphere where it raises a potential health hazard or nuisance to those working in the area of such conditions, Client shall notify ECS of such condition, potential health hazard or nuisance and thereafter ECS shall take all necessary and reasonable measures to protect its employees against such possible health hazards or nuisances. The reasonable direct cost of such measures shall be born by the Client.

SECTION 3: BILLINGS AND PAYMENTS



- a. Unless otherwise specifically provided in the Proposal or Agreement, billings will be based on actual units used at the standard rates shown on the attached fee schedules, travel cost and other expenses. Such billings shall not be limited by the estimates of total, incremental or phase project costs provided for information purposes in the Proposal. Client recognizes that time is of the essence with respect of payment of ECS's invoices, and that timely payment is a material part of the consideration of this Agreement. Client shall pay ECS for services performed in U.S. funds drawn upon U.S. banks and in accordance with the rates and charges set forth herein. Invoices will be submitted by ECS from time to time, but no more frequently than every two weeks, and shall be due and payable upon receipt. If Client objects to all or any portion of an invoice, Client shall nevertheless timely pay the full amount of such invoice and Client shall notify ECS within fourteen (14) calendar days of the invoice date of the cause of disagreement and the portion of the invoice in dispute. Thereafter, ECS and the Client shall make good faith effort to resolve such dispute.
- b. Client shall pay an additional charge of one-and-one-half (1.5) percent (or the maximum percentage allowed by law, whichever is lower) of the invoiced amount per month for any payment received by ECS more than thirty (30) calendar days from the date of the invoice, excepting any portion of the invoiced amount in dispute and resolved in favor of Client. Payment thereafter shall first be applied to accrued interest and then to the principal unpaid amount. Payment of invoices is in no case subject to unilateral discounting or set-offs by Client.
- c. Application of the percentage rate indicated above as a consequence of Client's late payments does not constitute any willingness on ECS's part to finance Client's operation, and no such willingness should be inferred. If Client fails to pay invoiced amounts within thirty (30) calendar days of the date of the invoice, ECS may at any time, without waiving any other claim against Client and without thereby incurring any liability to Client, suspend or terminate this Agreement. Termination shall not relieve Client of its obligation to pay amounts incurred up to termination.
- d. The Client's obligation to pay for the services performed under this Agreement is in no way contingent upon Client's ability to obtain financing, zoning, approval of governmental or regulatory agencies, final adjudication of a lawsuit in which ECS is not involved, or upon Client's successful completion of the project. No deduction shall be made from any invoice on account of penalty, liquidated damages or other sums withheld from payments to ECS. It is agreed that all expenses incurred by ECS in enforcing the Agreement or in obtaining liens, obtaining judgments or collecting any delinquent amounts due, including reasonable attorney's fees shall be recoverable from the Client.
- e. The fees quoted in this contract shall remain valid for a period of twelve (12) months from the date of contract. Thereafter, they shall be adjusted in accordance with the Average Consumer Price Index (CPI) for the last twelve (12) months.

#### SECTION 4: RIGHT OF ENTRY

- a. Client hereby grants ECS and its subcontractors or agents the right to enter from time to time property owned by Client and/or other(s) in order for ECS to fulfill the scope of services included hereunder. Client understands that use of exploration equipment may cause some damage, the correction of which is not part of this Agreement. Client also understands that the discovery of certain hazardous conditions and/or taking preventive measures relative to these conditions may result in a reduction of the Property's value. Accordingly, Client waives any claim against ECS and its subcontractors or agents, and agrees to defend, indemnify and hold ECS harmless from any claim or liability for injury or loss allegedly arising from procedures associated with subsurface exploration activities or discovery of hazardous materials or suspected hazardous materials. In addition, Client agrees to compensate ECS for any time spent or expenses incurred by ECS in defense of any such claim with compensation to be based upon ECS's prevailing fee schedule and expense reimbursement policy.
- b. ECS shall not be liable for damage or injury from damage to subterranean structures (pipes, tanks, cables, or other utilities, etc.) which are not called to ECS's attention in writing and correctly shown on the diagram(s) furnished by Client to ECS.

#### SECTION 5: SAMPLES

- a. Soil, rock, water and/or other samples obtained from the Project site are the property of Client. ECS shall preserve such samples for no longer than sixty (60) calendar days after the issuance of any document that includes the data obtained from them, unless other arrangements are mutually agreed upon in writing. Should any of these samples be contaminated by hazardous substances or suspected hazardous substances, it is Client's responsibility to select and arrange for lawful disposal procedures, that is, procedures which encompass removing the contaminated samples from ECS's custody and transporting them to a disposal site. Client is advised that, in all cases, prudence and good judgment should be applied in selecting and arranging for lawful disposal procedures.
- b. Due to the risks to which ECS is exposed, Client agrees to waive any claim against ECS, and to defend, indemnify and hold ECS harmless from any claim or liability for injury or loss arising from containing, labelling, transporting, testing, storing, or other handling of contaminated samples. Client also agrees to compensate ECS for any time spent and expenses incurred by ECS in defense of any such claim, with such compensation to be based upon ECS's prevailing fee schedule and expense reimbursement policy.

#### SECTION 6: REPORTS AND OWNERSHIP OF DOCUMENTS

- a. ECS shall furnish six (6) copies of each report to Client. Additional copies shall be furnished at the rates specified in the fee schedule. With the exception of ECS Reports to Client, all documents, including original boring logs, field data, field notes, laboratory test data, calculations and estimates are and remain the property of ECS. Client agrees that all reports and other work furnished to the Client not paid for in full will be returned to ECS upon demand and will not be used for design, construction, permits or licensing.

#### SECTION 7: STANDARD OF CARE

- a. Services performed by ECS under this Agreement will be conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the Engineering profession currently practicing in the same locality under similar conditions. No other representation, express or implied, and no warranty or guarantee is included or intended in this Agreement, or in any report, opinion, document or otherwise.
- b. Any exploration, testing, surveys and analysis associated with the work will be performed by ECS for the Client's sole use to fulfill the purpose of this Agreement and ECS is not responsible for interpretation by others of the information developed. The Client recognizes that subsurface conditions beneath the Project site may vary from those encountered in borings, surveys or explorations and the information and recommendations developed by ECS are based solely on the information available from such borings, surveys and explorations.

#### SECTION 8: LIMITATION OF PROFESSIONAL LIABILITY

- a. Client agrees to limit ECS's liability to Client and all construction contractors arising from ECS's professional acts, errors or omissions in performing this Agreement, such that the total aggregate liability of ECS to all those named shall not exceed \$50,000 or total fee for the services rendered on this project, whichever is greater. Client further agrees to require of the Client's General Contractor and its subcontractors an identical limitation of ECS's liability for damages that may be suffered by the contractor or the subcontractors arising from professional acts, errors or omissions of ECS.
- b. Documents, including but not limited to, technical reports, original boring logs, field data, field notes, laboratory test data, calculations, and estimates furnished to the Client or its agents pursuant to this Agreement are not intended or represented to be suitable for reuse by the Client or others on extensions of the Project or on any other project. Any reuse without ECS's written consent will be at Client's sole risk and without liability to ECS or to ECS's contractor(s) and Client shall indemnify and hold harmless ECS and ECS's contractor(s) from all claims, damages, losses and expenses including attorney's fees arising out of or resulting therefrom.

- c. Under no circumstances shall ECS be liable for extra work or other consequences due to changed conditions or for costs related to failure of the construction contractor or materialmen or service providers to install work in accordance with the plans and specifications.

#### SECTION 9: LIABILITY INSURANCE

- a. ECS represents that it and its agents, and consultants employed by it, is and are protected by Workers Compensation insurance and that ECS has coverage under liability insurance policies which ECS deems reasonable and adequate. ECS shall furnish certificates of insurance upon request. ECS shall not be responsible for bodily injury and property damage or losses arising directly or indirectly, in whole or in part, from acts by the Client, its employees, agents, staff, consultants or subcontractors employed by it or by any other person or combination of persons. The Client agrees to limit the liability of ECS to the limits of ECS's insurance. The Client is responsible for requesting specific inclusions or limits of coverage that are not present in ECS insurance, the cost of such inclusions or coverage increases, if available, to be at the expense of the Client.

#### SECTION 10: ARBITRATION OF DISPUTES

- a. All claims, disputes or controversies arising out of, or in relation to the interpretation, application or enforcement of this Agreement shall be decided through arbitration, as adopted and described by the then most current rules of the American Arbitration Association. The parties further agree that Client will require, as a condition for participation in the project and their Agreement to perform labor or services, that all Contractors, Subcontractors, Subsubcontractors and Materialmen, whose portion of the work amounts to five thousand dollars (\$5,000) or more, and their insurers and sureties, shall agree to this procedure.

#### SECTION 11: TERMINATION

- a. Client or ECS may terminate this Agreement for breach of this Agreement, or for any other reasons which may arise. In the event of termination, the party effecting termination shall so notify the other party, and termination will become effective fourteen (14) calendar days after receipt of the termination notice. Irrespective of which party shall effect termination or the cause therefore, ECS shall promptly render to Client a final invoice and Client shall immediately remunerate ECS for services rendered and costs incurred, in accordance with ECS's prevailing fee schedule and expense reimbursement policy. Services shall include those rendered up to the time of termination, as well as those associated with termination itself, such as demobilizing, modifying schedules and reassigning personnel. Upon such termination, Client and ECS shall deliver to each other all reports and documents pertaining to services performed up to termination.

#### SECTION 12: SEVERABILITY

- a. Any provision of this Agreement later held to violate a law or regulation shall be deemed void, and all remaining provisions shall continue in force.

#### SECTION 13: TITLES

- a. The titles used in this Agreement are for general reference only and are not part of the Agreement. Parties to this Agreement are advised to read each provision and rely on the guidance of legal counsel as necessary to help assure a complete understanding of all provisions and the obligations imposed through acceptance.

#### SECTION 14: SURVIVAL

- a. All obligations arising prior to the termination of this Agreement and all provisions of this Agreement allocating responsibility or liability between the Client and ECS shall survive the completion of services and the termination of this Agreement.

**SECTION 15: ASSIGNS**

- a. Neither the Client nor ECS may delegate, assign, sublet or transfer its duties, responsibilities or interests in this Agreement without the written consent of the other party.

**SECTION 16: CHOICE OF LAW**

- a. This Agreement shall be interpreted according to the laws of the State in which the Project is located (but not including its choice of law rules.

**END OF GENERAL CONDITIONS**



**PROPOSAL FOR  
GEOTECHNICAL EXPLORATION  
AND ENGINEERING SERVICES**

**PROJECT NAME  
PROJECT LOCATION (CITY AND STATE)**

**FOR**

**CLIENT'S NAME**

**DATE**



## DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784  
(757) 253-6671 Fax: (757) 253-6850 E-MAIL: devtman@james-city.va.us

CODE COMPLIANCE  
(757) 253-6626  
codecomp@james-city.va.us

ENVIRONMENTAL DIVISION  
(757) 253-6670  
environ@james-city.va.us

PLANNING  
(757) 253-6685  
planning@james-city.va.us

COUNTY ENGINEER  
(757) 253-6678  
INTEGRATED PEST MANAGEMENT  
(757) 253-2620

December 15, 1998

Mr. Lewis McMurran  
McCale Development Corporation  
729 Thimble Shoals Blvd., Suite 4A  
Newport News, VA 23606

RE: Soil from Retention Pond at Routes 5 and 199

Dear Mr. McMurran:

In accordance with our letter agreement dated November 30, 1998, soil material was delivered to Landfall at Jamestown from the retention pond at Routes 5 and 199 beginning on December 2nd and continuing through December 4th. Our agreement was that the County would receive \$2.00/cubic yard of delivered material.

A total of 142 tandem dump truck loads were delivered to Landfall. Each truck load carried approximately 10 cubic yards so the County needs to be reimbursed \$2840 for the material. The amount of fill material is less than the 1600 yards stated in the agreement as the County diverted about 25 loads of material for our own use.

The check needs to be made out to "Treasurer, James City County." Please send the check to my attention at the address on this letter. Please contact me at 253-6673 if you have any questions.

Sincerely,

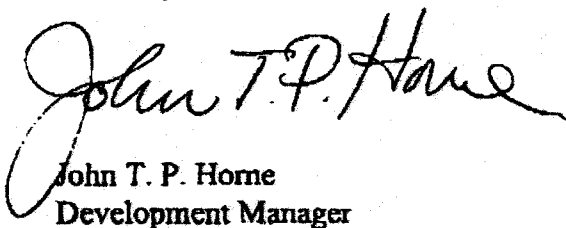
Darryl E. Cook, P.E.  
Environmental Director

Mr. Taylor  
November 30, 1998  
Page 2

immediately notify the Environmental Division so that adjustments can be made to the project in order to still completely line the entire pond with clay.

If you agree to this arrangement, please sign and return this letter as soon as possible. If you have any questions, please contact Darryl Cook at 253-6673.

Sincerely,

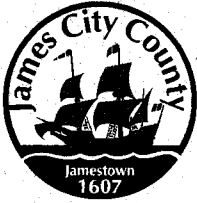


John T. P. Horne  
Development Manager

I understand and accept the conditions of this letter.



William Taylor



## DEVELOPMENT MANAGEMENT

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(757) 253-6678

INTEGRATED PEST MANAGEMENT  
(757) 253-2620

November 30, 1998

Mr. William Taylor  
Toano Contractors, Inc.  
P.O. Box 712  
Toano, VA 23168

RE: Soil From Retention Pond at Routes 5 and 199

Dear Mr. Taylor:

This is to confirm our agreement for your company to remove up to 1600 cubic yards of sandy soil material from the retention pond at Routes 5 and 199 and replace it with clay material. The clay material is to be obtained from the area of Settlers Mill, Section 6, that was tested by ECS Ltd., a geotechnical engineering firm, and found to meet our requirements for retaining water. If there is not sufficient suitable clay material available from the Settlers Mill site, Toano Contractors will not be obligated to complete the excavation and filling operation under the terms of this letter. The excavated material is to be placed in the Landfall at Jamestown subdivision on Jamestown Road in an area designated by the developer.

The terms of the agreement are that the County will reimburse Toano Contractors \$70 per truck load of material delivered to or removed from the project site. Each truck load will carry a minimum of 10 cubic yards. The material will be excavated from the bottom and sides of the pond up to the inward edge of the shelf that is located about three feet above the bottom of the pond. The excavation of the soil is to be at a uniform 12 inches of depth. The excavation will be backfilled with the clay material in a 12-inch lift and compacted by a sheeps foot roller to 90% of its maximum dry density as determined by the Standard Proctor method. Areas will be identified where the underlying material appears too soft to achieve 90% compaction of the clay material without undercutting. If the County declines to perform undercutting, those areas will not be tested for compaction. The price includes all costs associated with the placement and compaction of the fill material. The County shall be responsible for conducting compaction tests. An additional \$1000 shall be paid for the installation and removal of a minimum 70-foot long stone construction entrance as well as stabilization of any areas disturbed by your activities outside of the pond bottom. The work is scheduled to begin during the week of November 30, 1998.

The maximum expenditure for this work is to be \$23,500. As the work is progressing, if it appears that the project cannot be completed for this amount, Toano Contractors shall

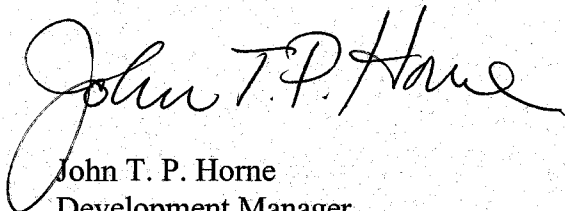


Mr. Taylor  
November 30, 1998  
Page 2

immediately notify the Environmental Division so that adjustments can be made to the project in order to still completely line the entire pond with clay.

If you agree to this arrangement, please sign and return this letter as soon as possible. If you have any questions, please contact Darryl Cook at 253-6673.

Sincerely,

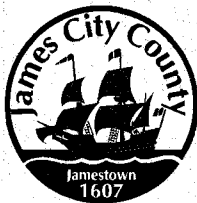


John T. P. Horne  
Development Manager

I understand and accept the conditions of this letter.

---

William Taylor



## DEVELOPMENT MANAGEMENT

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INTEGRATED PEST MANAGEMENT  
(757) 253-2620

November 30, 1998

Mr. Lewis McMurran  
McCale Development Corporation  
729 Thimble Shoals Blvd., Suite 4A  
Newport News, VA 23606

RE: Soil From Retention Pond at Routes 5 and 199

Dear Mr. McMurran:

This is to confirm our agreement for McCale Development to accept delivery of approximately 1600 cubic yards of soil material from the excavation of the retention pond at Routes 5 and 199. The material is as described in the soil boring reports sent to you earlier. In a conversation with Mr. Forest Miller on November 25, 1998, it was agreed that McCale Development would reimburse James City County \$2.00/cubic yard for this material. The material should be delivered during the week of November 30, 1998.

If you agree to this arrangement, please sign and return this letter as soon as possible. If you have any questions, please contact Darryl Cook at 253-6673.

Sincerely,

John T. P. Horne  
Development Manager

I understand and accept the conditions of this letter.

---

Lewis McMurran



## DEVELOPMENT MANAGEMENT

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**COUNTY ENGINEER**

(757) 253-6678

**INTEGRATED PEST MANAGEMENT**

(757) 253-2620

November 30, 1998

Mr. Lewis McMurrin  
 McCale Development Corporation  
 729 Thimble Shoals Blvd., Suite 4A  
 Newport News, VA 23606

RE: Soil From Retention Pond at Routes 5 and 199

Dear Mr. McMurrin:

This is to confirm our agreement for McCale Development to accept delivery of approximately 1600 cubic yards of soil material from the excavation of the retention pond at Routes 5 and 199. The material is as described in the soil boring reports sent to you earlier. In a conversation with Mr. Forest Miller on November 25, 1998, it was agreed that McCale Development would reimburse James City County \$2.00/cubic yard for this material. The material should be delivered during the week of November 30, 1998.

If you agree to this arrangement, please sign and return this letter as soon as possible. If you have any questions, please contact Darryl Cook at 253-6673.

Sincerely,

John T. P. Horne  
 Development Manager

I understand and accept the conditions of this letter.

Lewis McMurrin  
*President*

To	DARRYL COOK
From	FOREST MILLER
Co/Dept	JCC
Phone #	
Fax #	253-6850



## DEVELOPMENT MANAGEMENT

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November 30, 1998

Mr. William Taylor  
Toano Contractors, Inc.  
P.O. Box 712  
Toano, VA 23168

RE: Soil From Retention Pond at Routes 5 and 199

Dear Mr. Taylor:

This is to confirm our agreement for your company to remove up to 1600 cubic yards of sandy soil material from the retention pond at Routes 5 and 199 and replace it with clay material. The clay material is to be obtained from the area of Settlers Mill, Section 6, that was tested by ECS Ltd., a geotechnical engineering firm, and found to meet our requirements for retaining water. If there is not sufficient suitable clay material available from the Settlers Mill site, Toano Contractors will not be obligated to complete the excavation and filling operation under the terms of this letter. The excavated material is to be placed in the Landfall at Jamestown subdivision on Jamestown Road in an area designated by the developer.

The terms of the agreement are that the County will reimburse Toano Contractors \$70 per truck load of material delivered to or removed from the project site. Each truck load will carry a minimum of 10 cubic yards. The material will be excavated from the bottom and sides of the pond up to the inward edge of the shelf that is located about three feet above the bottom of the pond. The excavation of the soil is to be at a uniform 12 inches of depth. The excavation will be backfilled with the clay material in a 12-inch lift and compacted by a sheeps foot roller to 90% of its maximum dry density as determined by the Standard Proctor method. Areas will be identified where the underlying material appears too soft to achieve 90% compaction of the clay material without undercutting. If the County declines to perform undercutting, those areas will not be tested for compaction. The price includes all costs associated with the placement and compaction of the fill material. The County shall be responsible for conducting compaction tests. An additional \$1000 shall be paid for the installation and removal of a minimum 70-foot long stone construction entrance as well as stabilization of any areas disturbed by your activities outside of the pond bottom. The work is scheduled to begin during the week of November 30, 1998.

The maximum expenditure for this work is to be \$23,500. As the work is progressing, if it appears that the project cannot be completed for this amount, Toano Contractors shall

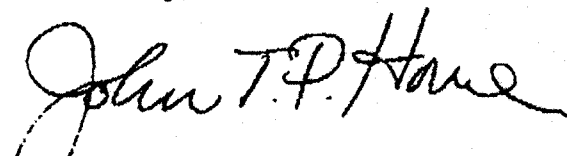


Mr. Taylor  
November 30, 1998  
Page 2

immediately notify the Environmental Division so that adjustments can be made to the project in order to still completely line the entire pond with clay.

If you agree to this arrangement, please sign and return this letter as soon as possible. If you have any questions, please contact Darryl Cook at 253-6673.

Sincerely,



John T. P. Home  
Development Manager

I understand and accept the conditions of this letter.



William Taylor

**FAX****Date** 11/16/98**Number of pages including cover sheet** 1

**TO:** Darryl E. Cook  
James City County/Envir. Services  
101-E Mounts Bay Road  
Williamsburg, Virginia 23185  
**Phone** (757) 253-6673  
**Fax Phone** (757) 253-6850

**FROM:** Lewis A. McMurrin, III  
McCale Development Corporation  
729 Thimble Shoals Blvd., Suite 4A  
Newport News, Virginia 23606  
**Phone** (757) 873-0011  
**Fax Phone** (757) 873-0651

**CC:**

**REMARKS:** ☐ Urgent ☒ For your review ☐ Reply ASAP ☐ Please Comment

Re: Soil from Retention Pond at Rt. 5 and Rt. 199

Darryl,

Per your fax of November 10<sup>th</sup>, McCale accepts your offer to dispose of 1500-2000 cubic yards of spoils from the excavation of retention pond at Route 5 and 199 at our Landfall at Jamestown subdivision.

Kindly advise when the material will be available so we may coordinate the selection of an area to receive the material.

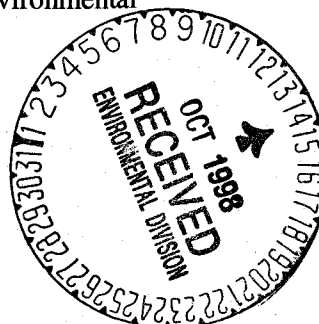
I sincerely appreciate your consideration of McCale in your determination of a site to dispose of this material.

  
Lewis



**ENGINEERING CONSULTING SERVICES, LTD.**

Geotechnical • Construction Materials • Environmental



October 13, 1998

Mr. Darryl Cook  
James City County  
101-A Mounts Bay Road  
Williamsburg, Virginia 23185

ECS Project No. N3036

Reference: Subsurface Exploration and Geotechnical Engineering Evaluation  
Stormwater Management Pond at Routes 199 and 5  
Williamsburg, Virginia

Dear Mr. Cook:

Engineering Consulting Services, Ltd. has completed a subsurface exploration and engineering evaluation of the above referenced project. The field exploration was conducted on September 25, 1998, by performing four (4) hand auger borings to depths of 1.5 to 4 feet below the existing surface within the basin of the pond as shown on the attached hand auger location diagram. The purposes of this exploration were to explore the soil and groundwater conditions at the site and to develop soils related engineering recommendations to guide remedial construction within the pond that will facilitate maintaining a water level of approximately 4 feet. We accomplished these purposes by drilling hand auger borings and performing sieve analyses on representative samples from the borings to evaluate pertinent engineering properties, in order to develop appropriate geotechnical engineering recommendations.

The soil deposits encountered in the hand auger probes were classified in the field in general accordance with ASTM D-2488 (Description and Identification of Soils - Visual/Manual Procedures). Field classification indicated that the subsurface soils generally consisted of clean to relatively clean silty sands (SP-SM and SM) to depths of 4 feet below existing basin grades as shown on the attached hand auger boring logs.

229-6677

814 Greenbrier Circle, Suite A, • Chesapeake, Virginia 23320-2643 • (757) 366-5100 • Fax (757) 366-5203

Offices: Washington, DC • Baltimore, MD • Frederick, MD • Richmond, VA • Chesapeake, VA • Fredericksburg, VA

Danville, VA • Raleigh/Durham, NC • Wilmington, NC • Charlotte, NC • Greensboro, NC

CC026\_ROUTE\_199\_&\_ROUTE\_5-023

Based on the hand auger borings and laboratory test data, it appears that the pond will not maintain the desired water elevation due to the high infiltration rate and estimated coefficients of permeability of the sand materials that comprise the ponds basin to a depth of at least 4 feet. We recommend the following two alternatives to minimize infiltration and help maintain the desired water level:

- **Bentonite**

If bentonite is utilized for remediation of the pond's basin, we recommend using a minimum of 3 pounds of bentonite per square foot. The bentonite should be in powdered form and should be well mixed into the soil matrix to a depth of at least 8 inches. If mixing is not performed well, small areas may allow water through the base of the pond. If this were to occur, broadcasting additional bentonite over the surface, as required, should substantially lower the infiltration.

- **Clay Liner**

If a natural clay liner is to be utilized, the clay and silt content of the material should constitute at least 70% by weight. The Atterberg Limits of the clay are not particularly important; however, it noted that highly plastic clays will be much more difficult to work with. The clay should be free of debris and heavy organic material (large roots and stumps). The clay should be placed in horizontal lifts with a maximum loose thickness of 12 inches which is the recommended minimum liner thickness. The clay should moisture conditioned to within  $\pm 5\%$  of its optimum moisture content and compacted to at least 90% of its maximum dry density, as determined by the Standard Proctor method, ASTM D-698. The clay liner should be benched into existing side slopes (horizontal lifts) and placed to an elevation that is at least as high as the desired water level. If material is to be removed from the pond base in order to maintain the existing basin elevation, this material would meet specifications for select, engineered fill that could be used to raise site grades under new pavements and structures.



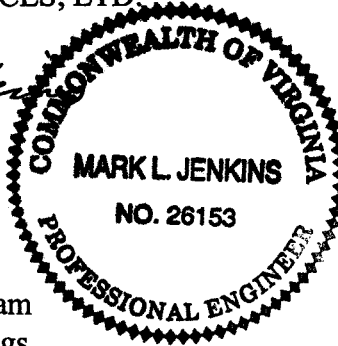
We have appreciated being of service to James City County during the exploration and remedial construction phases of this SWM pond and look forward to its successful completion. If you should have any questions regarding the information and recommendations contained in this report or if we can be of any further assistance, please do not hesitate to contact us.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.



Mark L. Jenkins, P.E.  
Project Engineer



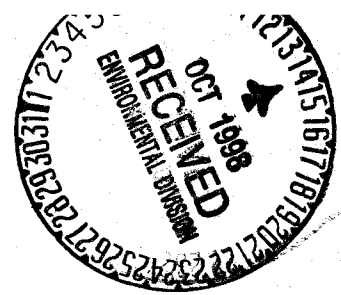
- Enclosures:
1. Boring Location Diagram
  2. Hand Auger Boring Logs
  3. Laboratory Test Summary
  4. Unified Soil Classification System

MLJ/cd/N3036rpt.doc



**ENGINEERING CONSULTING SERVICES, LTD.**

Geotechnical • Construction Materials • Environmental



October 13, 1998

Mr. Darryl Cook  
James City County  
101-A Mounts Bay Road  
Williamsburg, Virginia 23185

ECS Project No. N3036

Reference: Subsurface Exploration and Geotechnical Engineering Evaluation  
Stormwater Management Pond at Routes 199 and 5  
Williamsburg, Virginia

Dear Mr. Cook:

Engineering Consulting Services, Ltd. has completed a subsurface exploration and engineering evaluation of the above referenced project. The field exploration was conducted on September 25, 1998, by performing four (4) hand auger borings to depths of 1.5 to 4 feet below the existing surface within the basin of the pond as shown on the attached hand auger location diagram. The purposes of this exploration were to explore the soil and groundwater conditions at the site and to develop soils related engineering recommendations to guide remedial construction within the pond that will facilitate maintaining a water level of approximately 4 feet. We accomplished these purposes by drilling hand auger borings and performing sieve analyses on representative samples from the borings to evaluate pertinent engineering properties, in order to develop appropriate geotechnical engineering recommendations.

The soil deposits encountered in the hand auger probes were classified in the field in general accordance with ASTM D-2488 (Description and Identification of Soils - Visual/Manual Procedures). Field classification indicated that the subsurface soils generally consisted of clean to relatively clean silty sands (SP-SM and SM) to depths of 4 feet below existing basin grades as shown on the attached hand auger boring logs.

814 Greenbrier Circle, Suite A, • Chesapeake, Virginia 23320-2643 • (757) 366-5100 • Fax (757) 366-5203

Offices: Washington, DC • Baltimore, MD • Frederick, MD • Richmond, VA • Chesapeake, VA • Fredericksburg, VA  
Danville, VA • Raleigh/Durham, NC • Wilmington, NC • Charlotte, NC • Greensboro, NC

Based on the hand auger borings and laboratory test data, it appears that the pond will not maintain the desired water elevation due to the high infiltration rate and estimated coefficients of permeability of the sand materials that comprise the ponds basin to a depth of at least 4 feet. We recommend the following two alternatives to minimize infiltration and help maintain the desired water level:

- **Bentonite**

If bentonite is utilized for remediation of the pond's basin, we recommend using a minimum of 3 pounds of bentonite per square foot. The bentonite should be in powdered form and should be well mixed into the soil matrix to a depth of at least 8 inches. If mixing is not performed well, small areas may allow water through the base of the pond. If this were to occur, broadcasting additional bentonite over the surface, as required, should substantially lower the infiltration.


- **Clay Liner**

If a natural clay liner is to be utilized, the clay and silt content of the material should constitute at least 70% by weight. The Atterberg Limits of the clay are not particularly important; however, it noted that highly plastic clays will be much more difficult to work with. The clay should be free of debris and heavy organic material (large roots and stumps). The clay should be placed in horizontal lifts with a maximum loose thickness of 12 inches which is the recommended minimum liner thickness. The clay should moisture conditioned to within  $\pm 5\%$  of its optimum moisture content and compacted to at least 90% of its maximum dry density, as determined by the Standard Proctor method, ASTM D-698. The clay liner should be benched into existing side slopes (horizontal lifts) and placed to an elevation that is at least as high as the desired water level. If material is to be removed from the pond base in order to maintain the existing basin elevation, this material would meet specifications for select, engineered fill that could be used to raise site grades under new pavements and structures.

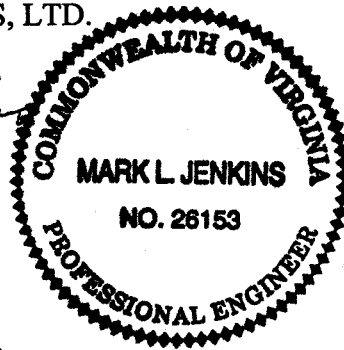
We have appreciated being of service to James City County during the exploration and remedial construction phases of this SWM pond and look forward to its successful completion. If you should have any questions regarding the information and recommendations contained in this report or if we can be of any further assistance, please do not hesitate to contact us.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.



Mark L. Jenkins, P.E.  
Project Engineer



- Enclosures:
1. Boring Location Diagram
  2. Hand Auger Boring Logs
  3. Laboratory Test Summary
  4. Unified Soil Classification System

MLJ/cd/N3036rpt.doc



CC026  
DRAINS TO  
COLLEGE  
CREEK

FACSIMILE TRANSMITTAL

MMM Design Group • 229 West Bute Street • Norfolk, Virginia 23510  
Phone: (757) 623-1641 • Fax: (757) 623-5809 • email: mmm@norfolk.infi.net

TO: DARRYL COOK PE  
FROM: STEVE LOWRY  
RE: ROUTE 199 SWM FACILITY "B"  
DATE: 3/12/98 PAGE 1 OF 7 FAX NO. (757) 253-6850

MESSAGE:

DARRYL - PURSUANT TO YOUR REQUEST BY TELEPHONE  
YESTERDAY, FIND ATTACHED DRAINAGE AREA MAP & EXCEPT  
COMPUTATIONS FOR ROUTE 199'S STORMWATER MGMT  
FACILITY "B" LOCATED AT ROUTE 199 & ROUTE 5.

I WILL BRING A COPY OF THE ORIGINAL SHEETS WITH ME  
TOMORROW WHEN WE MEET REGARDING ALT. ROUTE 5.

PLEASE DO NOT HESITATE TO CALL IF WE CAN BE OF ANY  
FURTHER ASSISTANCE.

S

This facsimile transmittal is from MMM Design Group, and contains information which is confidential and/or legally privileged. The information is intended only for the use of the individual(s) named on this transmittal sheet. If you are not the intended recipient, any disclosure, copying, or use of the information on this transmittal is strictly prohibited. Please call us at (757) 623-1641 (collect), and we will make arrangements for the immediate return of the documents at no cost to you.

# Miscellaneous

**CETCO**

Sezn Simapietri  
1-800-588-9223

# Geosynthetic Clay Liners



**BENTOMAT®**

**CLAYMAX®**





# **Experience, Innovation, and Value in Geosynthetic Clay Liners.**

CETCO is the leading supplier of sodium bentonite for a broad variety of specialty environmental applications. As a subsidiary of the world's largest bentonite company, CETCO has exceptional technical resources and manufacturing expertise. With geosynthetic clay liners (GCLs) as a core capability, CETCO is firmly committed to the development and advancement of technologies that integrate sodium bentonite and geosynthetics. This commitment to innovation is the foundation for CETCO's GCL product line.

CETCO Geosynthetic Clay Liners (GCLs) are high performance environmental liners comprised of geosynthetic carrier components integrated with a layer of low-permeability Volclay® sodium bentonite.

CETCO GCLs provide better engineered hydraulic performance than several feet of compacted clay with a total composite thickness of less than one inch. The Volclay® sodium bentonite also provides high performance self-sealing properties and freeze-thaw resistance. CETCO GCLs are manufactured in large rolls that require just a simple overlapped seam. Simple, cost-effective installation makes CETCO GCLs the logical choice over traditional compacted clay liner methods for a wide range of environmental applications including; landfill liners and caps, impoundments, secondary containment and mining applications.



CETCO GCLs are made in large rolls for easy installation.



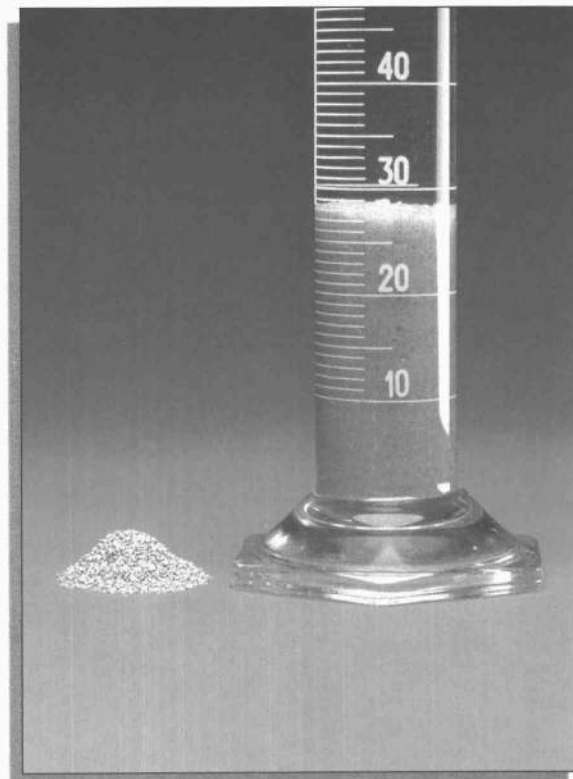
Bentomat installation in a landfill liner system with a 3H:1V slope.



# SODIUM BENTONITE – NATURE'S BEST LINER

Sodium bentonite is a naturally occurring clay with hundreds of commercial and industrial uses. Sodium bentonite is an ore comprised mainly of montmorillonite, a layered clay mineral with broad, flat platelets that are ideally shaped to provide a hydraulic barrier. Sodium ions located between these platelets allow water to hydrate the bentonite in a remarkable absorption reaction that results in bentonite's high swelling characteristics. This swelling provides the ability to seal around penetrations, giving the GCL self-healing characteristics. During hydration, a confined layer of dry sodium bentonite changes into a dense, monolithic mass with no observable individual particles. A fully hydrated sodium bentonite layer can have a hydraulic conductivity of less than  $5 \times 10^{-9}$  cm/sec, approximately one hundred times lower than a typical compacted clay layer.

If high concentrations of salts are present, such as in seawater, CETCO may recommend Volclay CRC®. Volclay CRC is a contaminant-resistant sodium bentonite treated with special additives designed for use in high saline environments. Volclay CRC also performs well in a broad range of harsh chemical environments found in some leachate and industrial applications where untreated bentonites cannot be utilized.



Just two grams of dry sodium bentonite can swell to many times its original volume when exposed to water.

## GCLs SUPERIOR HYDRAULIC CONDUCTIVITY

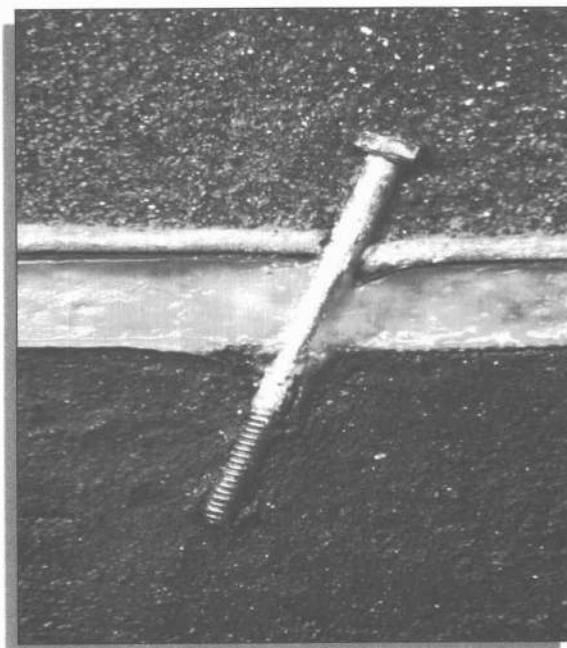


2-3 Feet  
(60-90 cm)

**CETCO GCL** – Hydraulic Conductivity  $5 \times 10^{-9}$

**Compacted Clay Liner** – Hydraulic Conductivity  $1 \times 10^{-7}$

CETCO GCLs superior hydraulic conductivity is achieved with a product thickness less than one inch, thus allowing for 2-3 feet of additional waste disposal depth.



Sodium bentonite's swelling ability allows it to seal around accidental punctures.

# CETCO GCLs – MAXIMUM PERFORMANCE, MAXIMUM CHOICE

Regardless of the application, most lining projects have large, relatively flat central sections surrounded by steeper perimeter slopes. Each of these areas has the same stringent hydraulic performance requirements but very different shear strength requirements. To meet these varied demands in the most cost-efficient means possible, CETCO offers both reinforced and non-reinforced GCLs. Additionally CETCO manufactures two GCLs that incorporate a composite lamination CL, both providing a permeability 10 to 1,000 times lower than compacted clay liners.

## CLAYMAX® 200R

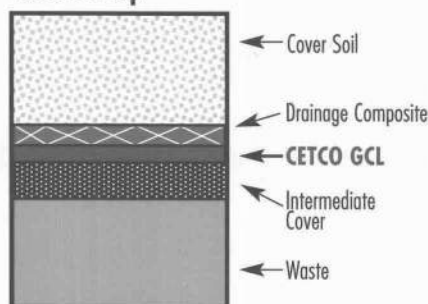
CLAYMAX 200R is a non-reinforced GCL with two lightweight geotextiles encapsulating a layer of Volclay sodium bentonite. Ideally suited for mild slopes, CLAYMAX 200R maximizes both performance and value in one product. A completely self-seaming GCL, CLAYMAX 200R is ideal for lining the flat areas of a landfill.

## CLAYMAX® 600CL

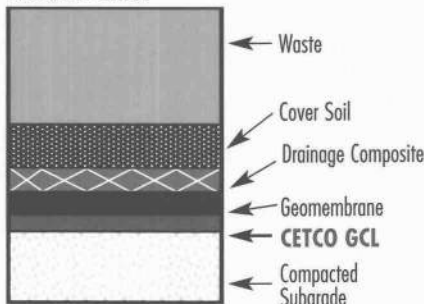
CLAYMAX 600CL is a non-reinforced GCL consisting of two lightweight geotextiles encapsulating a layer of Volclay sodium bentonite with a composite laminate applied to one of the geotextiles. CLAYMAX 600CL is the ideal solution for flat areas of landfill caps and high hydraulic head conditions in bottom liner applications.

## CETCO GCL APPLICATION DETAILS

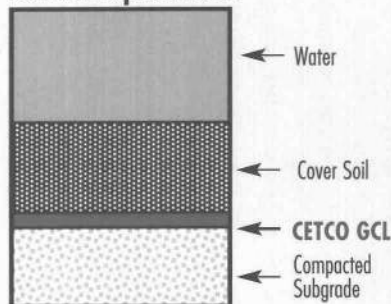
**Landfill Cap**



**Landfill Liner**



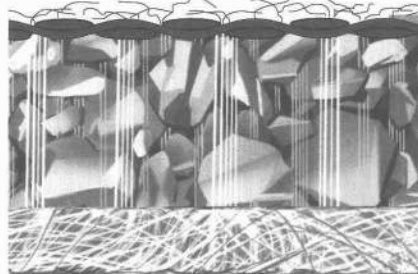
**Surface Impoundment**





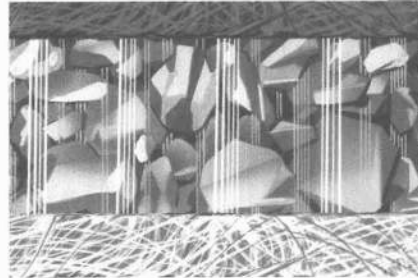
## BENTOMAT® ST

BENTOMAT ST is a reinforced GCL consisting of a layer of pure Volclay sodium bentonite encapsulated between two geotextiles, needlepunched together. BENTOMAT ST provides maximum performance under a wide variety of field conditions. This integrated matrix of bentonite and needlepunched fibers provides high internal shear strength and low permeability. BENTOMAT ST has a thin upper geotextile for maximizing intimate contact in composite liner systems.



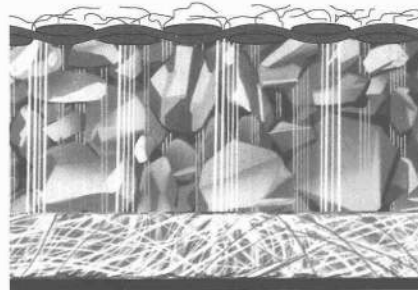
## BENTOMAT® DN

BENTOMAT DN is a reinforced, needlepunched GCL that not only has high internal shear strength but also provides additional interface friction on both sides of the GCL. BENTOMAT DN is ideally suited for steep-slope liner/cover systems where overall liner system stability is critical.



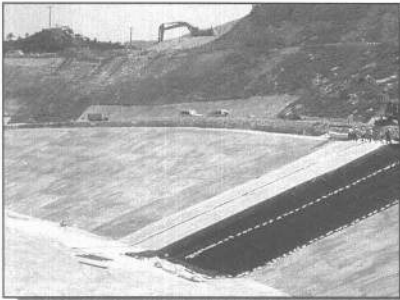
## BENTOMAT® CL

Bentomat CL is a reinforced GCL composed of two carrier geotextiles needlepunched together to encapsulate a layer of Volclay sodium bentonite. A composite lamination gives the GCL excellent hydraulic performance and provides puncture and tensile strengths beyond conventional plastic membranes. Bentomat CL is ideal for landfills, ponds, surface impoundments and other containment projects



**CUSTOM PRODUCTS.** With a variety of manufacturing processes and materials available, CETCO can manufacture enhanced GCLs that provide high tensile strength, added drainage or gas venting capacity, or other physical properties that may be required. Additionally, CETCO's lamination process can provide composite liner systems capable of meeting stringent regulations.

# CETCO GCLs For Every LINING APPLICATION



## LANDFILL LINERS

Within a landfill composite liner system, GCLs are an equivalent replacement for all or part of the traditional compacted clay component. GCLs effectively minimize system leakage by providing "intimate contact" with the overlying geomembrane, outperforming a compacted clay-based composite liner system. CETCO GCLs provide simple, cost-effective installation, with superior hydraulic performance.



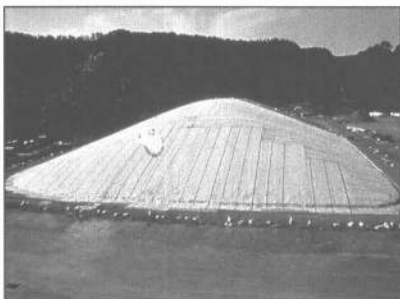
## SECONDARY CONTAINMENT

Because of the ease of installation, flexibility, and reasonable cost, CETCO GCLs are excellent for secondary containment of above-grade fuel storage tanks. The details and penetrations typically found at such sites are easily and cost effectively constructed using GCLs and accessory bentonite or bentonite mastic.



## SURFACE IMPOUNDMENTS

CETCO GCLs are widely used in decorative lakes, aeration lagoons, fly ash lagoons, and other surface impoundments. Because they do not require specialized equipment or labor, GCLs can be installed with minimal instruction and supervision.



## LANDFILL COVERS

GCLs are ideal for landfill cover systems, both as the sole hydraulic barrier component and as part of a composite system underlying a geomembrane. GCLs resist damage due to freeze-thaw, desiccation cycling, and differential settlement, all of which can damage traditional compacted clay liners.

**Other Applications.** GCLs are used in the liner systems of heap leach mining facilities, constructed wetlands, and for other lining and sealing projects where traditional options are technically or financially infeasible. Call CETCO to discuss your specific GCL project and application requirements.



Drainage Swales



Mining Applications



Wetland Creation and Conservation

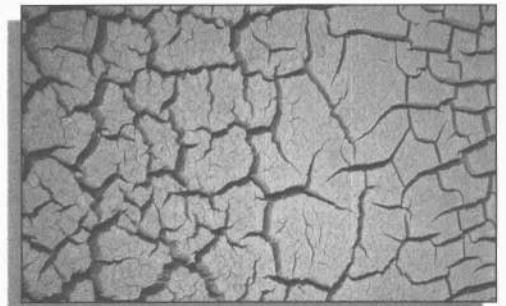


# CETCO GCLs vs. COMPACTED CLAY LINERS

CETCO GCLs have several important advantages over traditional compacted clay liners (CCLs), especially in terms of hydraulic performance, ease of installation and air space requirements.

## LONG-TERM PERFORMANCE

Climatic forces and differential settlement can increase CCL leakage dramatically over time. CETCO's GCLs eliminate these problems, because natural environmental stresses such as freeze/thaw and desiccation/rewetting cycles have no affect on sodium bentonite's performance. Differential settlement, common in landfill cover applications, can be handled by bentonite's high plasticity and self-healing capabilities. CCLs can crack under these conditions, leading to significant increases in leakage.



Freeze/thaw or wet/dry cracking in a CCL can diminish its effective depth and long-term performance.

## EASE OF CONSTRUCTION

It's not uncommon for thousands of tons of clay to be hauled long distances to the job site, resulting in added construction time, traffic, noise and cost. CETCO's GCLs can be delivered and installed with far greater efficiency. In fact, it takes about 150 truckloads of clay to equal the coverage of just one truckload of GCL!



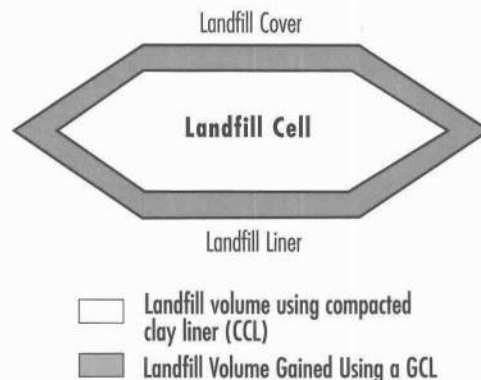
One truckload of GCLs covers the same area as approximately 150 truckloads of compacted clay.

## MINIMUM AIR SPACE REQUIREMENTS

The most valuable asset in any landfill is its air space. A compacted clay liner needlessly devours this precious resource and robs a landfill of its future revenue. But a GCL provides the same, if not better, level of performance and occupies virtually no air space.

## LANDFILL AIR SPACE ILLUSTRATION

The red band in the illustration represents the increased air space (landfill volume) in a typical landfill project when a GCL is substituted for a CCL. Note that air space is gained on both the bottom liner and cover systems. In fact, an average-sized landfill can obtain over 10 percent more air space when a GCL is used.



## GCLs vs. CCLs

### GCL Advantages

- Better resistance to freeze/thaw cycling
- Better resistance to differential settlement
- Installations are less sensitive to inclement weather conditions
- Factory controlled quality

# DESIGN BY FUNCTION. SELECT YOUR NEXT GCL...LOGICALLY.

	FLUX (Permeability)	INTERNAL SHEAR	INTERFACE SHEAR	OVERLAP SEAMS	
CLAYMAX 200R	●	○	●	●	Most landfill applications with slopes <10H:1V
CLAYMAX 600CL	●	○	●	●	Landfill caps & ponds with slopes <10H:1V
BENTOMAT ST	●	●	●	●	Most lining applications with slopes >10H:1V
BENTOMAT DN	●	●	●	●	Most lining applications with slopes >3H:1V
BENTOMAT CL	●	●	●	●	Landfill caps & ponds with slopes >10H:1V

● Strongly recommended    ● Exceeds minimum requirements    ○ Not recommended

Technical information and specifications may be obtained from CETCO's Internet web site at <http://www.cetco.com>.



World Wide Distribution and Service

## CETCO

COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY  
A wholly owned subsidiary of HMCOL International Corporation

### Lining Technologies Group

1350 West Shure Drive  
Arlington Heights, IL 60004 USA  
Tel: (800) 527-9948 Fax: (847) 577-5571  
<http://www.cetco.com>

## BENTONITE

- APPLY (TILL IN) AT  
4 POUNDS/SQ. FT. FOR SANDY  
SOIL.
- SHIPPED IN 50 POUND BAGS
- SMALLER QUANTITIES  
COST \$8/BAG

HOWARD GAMMON

(804) 966-2615

VAMAC - Richmond - <sup>Kenny</sup> McDowell

804-353-7811 or

Benseal - 50# bags

2 lb/SF - clay

4 lb/SF - foundation

\$8-9/bag ⇒

Joe Crystal



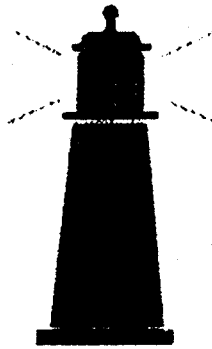
PVC LINERS

8/18/93

Daryl; THIS LINING MATERIAL  
WAS USED TO LINE THE  
EX. 1 AC SEWERAGE LAGOON

@ FORT UNION MILITARY ACADEMY  
AND WE ALSO USED IT TO  
LINE A NEW SEWERAGE 1 AC.  
LAGOON ON A PROJECT  
IN THE PHILIPPINES.

DELIVERED IN 1 PIECE  
NO ON-SITE "WELDING" (SEAMS)



FAX COVER SHEET

*Daryl*

DATE: 10/3/97

NUMBER OF PAGES, INCLUDING THIS COVER SHEET: 2

TO: DARRELL RICKMAN COMPANY: RICKMAN EGR.

PROJECT: PHILIPPINES FAX NO: 804-229-4683

Thank You for considering EPI for this work ; Please, if you  
have any questions about this fax , or our products , call me.

Best Regards



KEN TIGARD

800-655-4637



# Environmental Protection, Inc.

PO Box 333, Mancelona, MI 49659

800-OK-LINER Fax 616-587-8020

## Quotation - Proposal

October 31, 1997

Richmond Engineering, Inc  
1643 A Merrimac Trail  
Williamsburg, VA 23185-3624

Attn: Darrell Richmond

Fax: 1-804-229-4683

Phone: 804-229-1776

Re: 20 Mil PVC Geomembrane Liner for Philippines

### Liner Material

EPI proposes to provide the following geomembrane liner material for the above project:

1,267 Square Meters of 20 Mil PVC Geomembrane Liner in One(1) panel 28.6m x 44.3m @ \$2.48/\$M **\$3,142.**  
This is a delivered price to Richmond (23201) Virginia

package weight of 1,911# 36" x 42" x 30"H

40 mil X 45% more than 20 mil  
30 mil X 25% more than 20 mil

### Specifications

Fabrication per EPI Quality Control Manual dated January 1, 1997

Material will meet or exceed PGI Specification 1197, minimum material physical properties which replaces NSF Standard 54.

Project Plans: By Owner

Project Specifications: By Owner

### Not Included

Off loading and storage of materials at the project site.

Any taxes not mentioned above are the responsibility of the purchaser.

Installation of liner materials

### Terms and Conditions

See "Terms and Conditions of Sale" attached.

All above materials are F.O.B. Mancelona, Michigan

Approved accounts: Full payment NET 30 days from delivery. Retention is not allowed.

This proposal is effective for 30 days.

Both parties agree to be bound by a faxed acceptance copy of this proposal.

Respectfully submitted,

Ken Tigard  
Sales Representative

Accepted by:

Name: \_\_\_\_\_

Company: \_\_\_\_\_

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

Fred Rowe -

12" covered w/soil

20 mil PVC

Line under shelf

\* 0.20/SF - material

Add 15% to Surface Area

2 to 3 Panels

Inct. - \$5000 thin crew

or - \$2000 - supervise only

Liner plaid in 1 day

Shipping - \$300-400

Work to 10 days - once ordered

Warranty - 1 year

Longevity - 30 yrs +

30 mil - \$0.05/SF more

Exxon Chemical Co., Polymers Group Americas  
13501 Katy Freeway, Houston, TX 77079  
Tel 713 870-6329

F. Blake Rivas Co.  
P.O. Box 67, Tuckerton, NJ 08087-0067  
Tel 800 233-7176

Fluid Systems  
1245 Corporate Blvd., Aurora, IL 60504  
Tel 800 346-9107

GSE Lining Technology, Inc.  
19103 Gundie Rd., Houston, TX 77078  
Tel 800 435-2008

Hinspergers Poly Industries  
645 Needham Lane, Mississauga, Ontario, Canada  
L5A 1T9  
Tel 800 388-7871

JPS Elastomerics Corp., Environmental Products Div.  
9 Sullivan Rd., Holyoke, MA 01040-2800  
Tel 800 621-2281

MPC Containment Systems Ltd.  
4834 S. Oakley, Chicago, IL 60609  
Tel 773 927-4120

National Seal Co.  
Farnsworth Center, 1245 Corporate Blvd., Ste. 300,  
Aurora, IL 60504  
Tel 630 898-1161

Occidental Chemical Corp., Marketing Support-PW  
P.O. Box 809050, Dallas, TX 75380  
Tel 214 404-3800

Palco Linings, Inc.  
7571 Santa Rita Circle, Stanton, CA 90680  
Tel 714 898-0867

Phillips Fibers Corp.  
P.O. Box 66, Greenville, SC 29602  
Tel 803 242-6600

Plastic Fusion Fabricators, Inc.  
3455 Stanwood Blvd., Huntsville, AL 35811  
Tel 205 852-0378

### Poly-Flex, Inc.

2000 W. Marshall Dr., Grand Prairie, TX 75051  
Tel 972 337-7425  
Fax 972 337-7233  
www.poly-flex.com  
See our ad on **Page H-189** and  
**Circle Number 232** for details

Reef Industries Inc.  
Box 750250, Houston, TX 77275-0250  
Tel 713 507-4200

Serrot Corp.  
125 Cassia Way, Henderson, NV 89015  
Tel 800 237-1777

Thor Div. of Odin Int'l. Inc.  
P.O. Box 203428, Austin, TX 78720-3428  
Tel 800 223-8467

Union Carbide  
39 Old Ridgebury Rd., Danbury, CT 06817  
Tel 800 335-8550

### Liners, Wastewater Pond

#### C.I.M. Industries Inc.

94 Grove St., Peterborough, NH 03458  
Tel 800 543-3458  
Fax 603 924-9482  
cimind.com  
See our ad on **Page C-7** and  
**Circle Number 17** for details

CETCO (Colloid Environmental Technologies Co.)  
1350 W. Shure Dr., Arlington Heights, IL 60004  
Tel 847 392-5800

Colloid Environmental Technologies Co.  
1500 W. Shure Dr., Arlington Heights, IL 60004  
Tel 800 527-9948

### Construction Techniques

15910 Pearl Rd., P.O. Box 360007, Cleveland, OH  
44136  
Tel 800 563-5047  
Fax 216 572-5533  
E-mail: contech@bright.net

www.fabriform1.com  
See our ad on **Page H-162** and  
**Circle Number 205** for details

EnviroNetics, Inc.  
1201 Commerce St., Lockport, IL 60441  
Tel 815 838-8331

Exxon Chemical Co., Polymers Group Americas  
13501 Katy Freeway, Houston, TX 77079  
Tel 713 870-6329

F. Blake Rivas Co.  
P.O. Box 67, Tuckerton, NJ 08087-0067  
Tel 800 233-7176

Fluid Systems  
1245 Corporate Blvd., Aurora, IL 60504  
Tel 800 346-9107

GSE Lining Technology, Inc.  
19103 Gundie Rd., Houston, TX 77073  
Tel 800 435-2008

JPS Elastomerics Corp., Environmental Products Div.  
9 Sullivan Rd., Holyoke, MA 01040-2800  
Tel 800 621-2281

MPC Containment Systems Ltd.  
4834 S. Oakley, Chicago, IL 60609  
Tel 773 927-4120

National Seal Co.  
Farnsworth Center, 1245 Corporate Blvd., Ste. 300,  
Aurora, IL 60504  
Tel 630 898-1161

Occidental Chemical Corp., Marketing Support-PW  
P.O. Box 809050, Dallas, TX 75380  
Tel 214 404-3800

Palco Linings, Inc.  
7571 Santa Rita Circle, Stanton, CA 90680  
Tel 714 898-0867

Plastic Fusion Fabricators, Inc.  
3455 Stanwood Blvd., Huntsville, AL 35811  
Tel 205 852-0378

### Poly-Flex, Inc.

2000 W. Marshall Dr., Grand Prairie, TX 75051  
Tel 972 337-7425  
Fax 972 337-7233  
www.poly-flex.com  
See our ad on **Page H-189** and  
**Circle Number 232** for details

Reef Industries Inc.  
Box 750250, Houston, TX 77275-0250  
Tel 713 507-4200

Seaman Corp., Ind. Fabric Div.  
1000 Venture Blvd., Wooster, OH 44691  
Tel 423-691-9476

Serrot Corp.  
125 Cassia Way, Henderson, NV 89015  
Tel 800 237-1777

### Reservoirs & Standpipes, Steel

Brown Steel Contractors, Inc.  
P.O. Box 549, Newnan, GA 30264  
Tel 404 253-3232

Brown-Minneapolis Tank  
P.O. Box 64670, St. Paul, MN 55164  
Tel 612 454-6750

Chicago Bridge & Iron Co.  
1501 N. Division St., Plainfield, IL 60544  
Tel 815 439-6000

Columbian Steel Tank Co.  
P.O. Box 2907, Kansas City, KS 66110-9982  
Tel 913 621-3700

Peabody TecTank  
P.O. Box 996, Parsons, KS 67357  
Tel 316 421-0200

Pitt-Des Moines, Inc.  
9719 Lincoln Village Dr., Sacramento, CA 95827  
Tel 916 366-6663

Pitt-Des Moines, Inc.  
9550 Hickman Rd., Clive, IA 50325  
Tel 515 254-9228

### Pitt-Des Moines, Inc.

3400 Grand Ave., Neville Island, Pittsburgh, PA  
15225  
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Fax 412 331-7751  
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### Smith, A. O., Engineered Storage Products Co., Municipal/Industrial Dept.

345 Harvestore Dr., Dekalb, IL 60115  
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Fax 815 756-7821  
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### Soil Sealants

CETCO (Colloid Environmental Technologies Co.)  
1350 W. Shure Dr., Arlington Heights, IL 60004  
Tel 847 392-5800

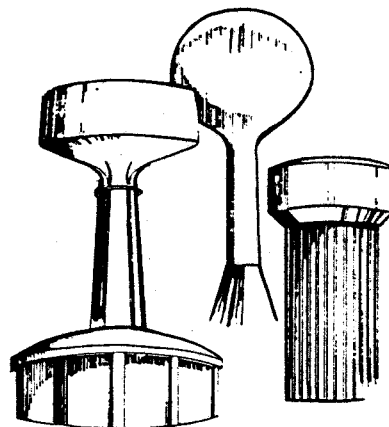
### Tank Coatings & Painting

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Tel 616 374-3221

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# Environmental Protection, Inc.

PO Box 333, Mancelona, MI 49659  
800-OK-LINER Fax 616-587-8020

## *Quotation - Proposal*

March 20, 1996

HB Hankins Co, Inc.  
739 Thimble Shoals Blvd Ste 704  
Newport News, VA 23606

Attn: Hank Mullins

Fax: 1-804-873-0943  
Phone: 804-873-2196

Re: Mill Creek Landing Subdivision

### Material

EPI proposes to provide the following geomembrane liner material for the above project :

174240 Square Feet of 20 Mil PVC Geomembrane Liner Material. Panel size & number to be determined from final plans. Unit Cost of \$ 0.145 per sq. ft. \$ 25,265.

NOTE: Quantities are subject to revision, after reviewing final plans.

Estimated Freight Charge to Job Site: \$ 1378.

### Specifications

Project plans: By Owner

Project specifications: EPI-QCM-030196

Fabrication per EPI Quality Control Manual dated March 1, 1996.

Material will meet or exceed NSF Standard 54 minimum material physical properties.

### Not Included

Off loading and storage of materials at the project site.

Any taxes not mentioned above are the responsibility of the purchaser.

### Terms and Conditions

See "Terms and Conditions of Sale" attached.

All above materials are F.O.B. Mancelona, Michigan

Approved accounts: Full payment NET 30 days from delivery. Retention is not allowed.

This proposal is effective for 10 days.

Both parties agree to be bound by a faxed acceptance copy of this proposal.

Respectfully submitted,

Accepted by:

Name: \_\_\_\_\_

Company: \_\_\_\_\_

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

Ken Tigard  
Sales Representative

**FAXED**

# Environmental Protection, Inc.

PO Box 333, Mancelona, MI 49659

800-OK-LINER Fax 616-587-8020

## *Quotation - Proposal*

March 20, 1996

HB Hankins Co, Inc.  
739 Thimble Shoals Blvd Ste 704  
Newport News, VA 23606

Attn: Hank Mullins

Fax: 1-804-873-0943

Re: Mill Creek Landing Subdivision

### Services

EPI offers to provide the following services for the above project :

Installation of 174240 Square Feet of 20 Mil PVC Liner (final quantity & panel size & number to be determined from final plans) For a unit cost of \$ 0.055 per sq. ft. \$ 9,338.  
including all necessary supervision, labor, and welding equipment required to completely install the liner on a fully prepared, dry, and maintained surface, per EPI Quality Control Manual dated March 1, 1996, including air lance testing and destructive testing of all field seams.

### Specifications

Project plans: By Owner  
Project specification: EPI-QCM-030196

### Not Included

Off loading and storage of materials at the job site.  
Any permits or performance bonds.  
Surface preparation, trenching, backfilling, dewatering, or soil sterilization  
Operated forklift for transporting and deployment of liner.

### Terms and Conditions

See "Terms and Conditions of Sale" attached.  
Installation price is based on one (1) mobilization and performing the installation when the ambient daytime temperature is consistently above 60° Fahrenheit.  
Installation price includes any required use tax.  
Approved accounts: 3% discount for payment received within 10 days of installation, Full payment NET 30 days from completion of installation. Retention is not allowed.  
This proposal is effective for 10 days.  
Both parties agree to be bound by a faxed acceptance copy of this proposal.

Respectfully submitted,

Ken Tigard  
Sales Representative

Accepted

Company: \_\_\_\_\_

Name: \_\_\_\_\_

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

**FAXED**



## Terms and Conditions of Sale

1. **Acceptance:** This proposal shall constitute a binding contract upon Seller's written executed acceptance. The date of such acceptance shall be the date Seller executes its acceptance and transmits same to Buyer via United States Mail or other delivery service. If the date of signature of acceptance is different to the date of mailing, acceptance shall become final on the date of mailing.

2. **Prices and Payment:** 1/2% Discount allowed on payments received within 10 days from date of invoice. Net 30 days. Retention is not allowed. It is agreed that the terms and conditions of payment will not be subordinated to any provision of the project specifications, contract or other document which sets forth the terms and conditions under which Buyer will be paid for performance of work by him in connection with any project on which the materials herein quoted shall be installed. Interest will be charged on past due accounts. INTEREST CHARGE WILL BE CALCULATED ON THE UNPAID BALANCE AT 1.5% PER MONTH. (18% PER ANNUM), OR THE MAXIMUM RATE ALLOWED BY LAW, WHICHEVER IS LESS. Unless specifically included as a separate item prices quoted do not include any bonds or any city, county, state or federal taxes imposed upon the sale, transfer or transportation of Seller's material or service.

3. **Default and Venue:** In the event Buyer cancels all or any portion of this contract following the date of acceptance by Seller, Buyer shall be obligated to pay for all fabricated and/or purchased components pertaining to the project and all other non-recoverable costs pertaining to the project. In the event suit is necessary to enforce payment by Buyer, whether as a result of cancellation or as a result of nonpayment, Buyer herewith agrees to pay all actual attorney's fees, out-of-pocket costs and actual Court costs incurred by Seller including all out-of-pocket costs and actual attorney's fees in enforcing any judgment. In such event, Seller shall have the exclusive right to institute legal proceedings in either any Court having jurisdiction where the Buyer's materials are installed, the place of residence of the Buyer, or in any Court of competent jurisdiction in the County of Kalkaska, State of Michigan. In the event Buyer institutes legal proceedings against Seller for whatever reason, any Court of competent jurisdiction in the County of Kalkaska shall have exclusive jurisdiction.

4. **Warranties:** Environmental Protection, Inc. (EPI), warrants that the factory seams of the liner material shown on the reverse of this proposal, if installed in accordance with the manufacturer's specifications and recommendations, shall be free from defects for a period of one (1) year.

The material is warranted by the manufacturer. The manufacturer's warranty shall be the only warranty applying to the material. The warranty of EPI of the seams shall be limited to confinement of an aqueous effluent rated as "excellent" or "A" as set forth in the chemical compatibility list published by the liner material manufacturer.

This warranty is subject to the following:

1. During the period of the one (1) year of which this warranty applies, an earthen cover shall be maintained on top of the liner at all times. The maximum effluent temperature shall not exceed 100°F and the Ph of the effluent shall be maintained between 5 and 9.
2. This warranty shall not cover damage caused by mechanical, physical or other external forces caused by persons or entities other than EPI or damage caused by solutions of greater concentrations than the chemicals as defined above, excessive pressure or stress from any sources or acts of God, casualty or catastrophe, such as, but not limited to, floating debris, insects and animals.
3. This warranty is conditioned upon (a) normal use and service of the liner for the purpose and in the manner for which it is designed and manufactured; (b) installation of the liner on preconsolidated soil free of sharp protrusions, (c) proper field seaming, and installation of the liner material, and (d) payment in full for all materials and service.

Deviation from any of these conditions shall void this warranty.

EPI guarantees to replace or repair, at its option, defective factory seams caused by poor workmanship for up to one (1) year after the date of the invoice. This warranty is limited to the repair or replacement of the affected membrane area and does not include the cost of earthwork or other activities not originally performed by EPI. IN NO EVENT SHALL EPI'S LIABILITY EXCEED THE ORIGINAL SELLING PRICE OF THE DEFECTIVE AREA OF THE LINER.

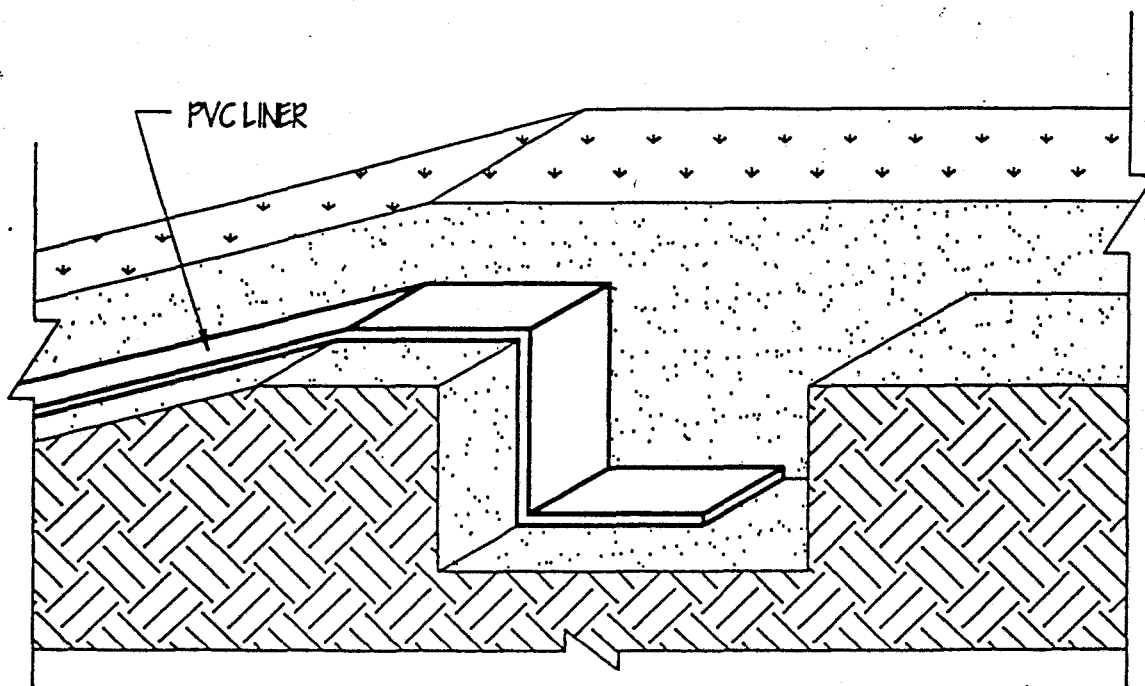
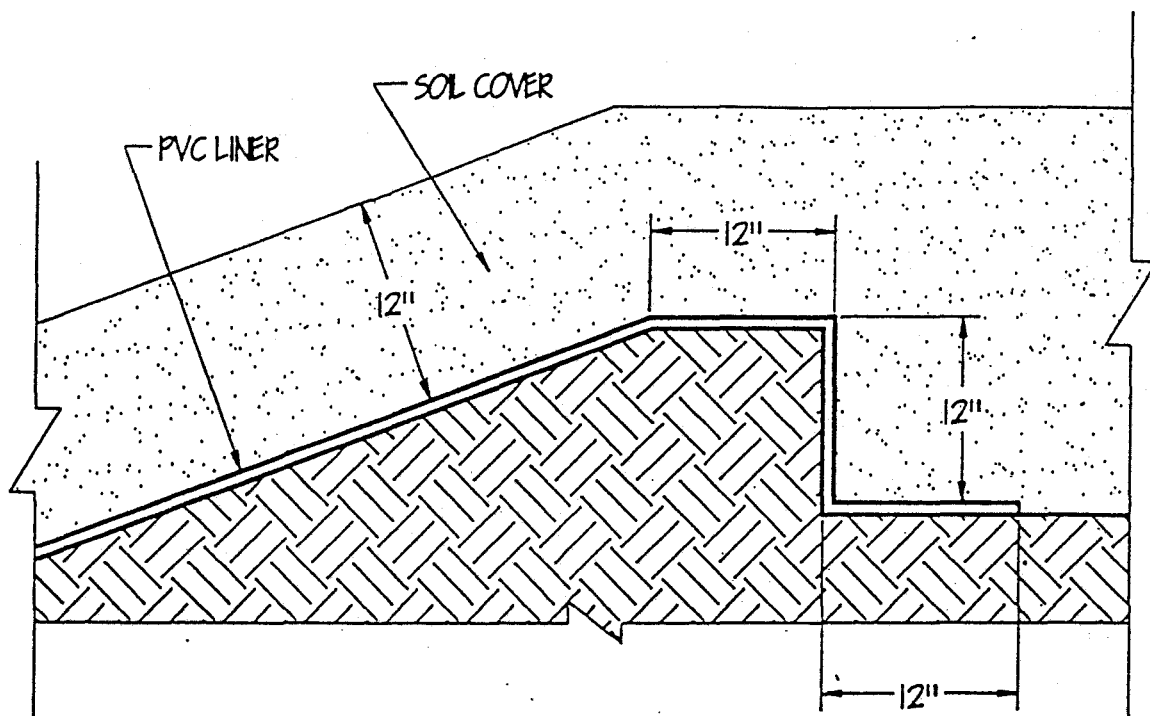
To enable EPI's technical staff to properly determine the cause of any alleged defect and to take appropriate steps to effect timely corrective measures if such defect is within the warranty, any claim for alleged breach of warranty must be made and presented to EPI within thirty (30) days after the alleged defect was first noticed or all warranties will be deemed to have been waived by the buyer.

During the warranty period, EPI reserves the right to have one or more of its representatives visit (with or without giving prior notice) the site at which its material(s) are being utilized to observe the site preparation, liner installation, emplacement of cover material(s) and/or factory and field seams.

THERE ARE NO WARRANTIES GIVEN BY EPI WITH RESPECT TO THE MATERIAL OR INSTALLATION COVERED HEREBY, OTHER THAN THOSE SPECIFICALLY DESCRIBED HEREIN. THOSE WARRANTIES ARE IN THE PLACE AND STEAD OF THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE. IN NO EVENT SHALL EPI BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR, RESULTING FROM, OR IN CONNECTION WITH, ANY BREACH OF WARRANTY OR ANY LOSS RESULTING FROM USE OF THE LINER BY BUYER. EPI DOES NOT ASSUME NOR AUTHORIZE ANY PERSON TO ASSUME FOR IT ANY OTHER OR ADDITIONAL LIABILITY OF ANY KIND IN CONNECTION WITH THE SALE OF THE LINER TO THE BUYER OR BUYER'S USE OF THE LINER.

5. **Prevailing Terms and Conditions:** These terms and conditions may be superseded by specific provisions typed on this proposal. However, should any of these terms and conditions be contrary to or inconsistent with any terms and conditions contained in any purchase order form or other document between Seller and Buyer which is prepared by Buyer and when ever executed, the provisions hereof shall be controlling and shall supersede the conflicting terms and conditions which are contained in such other document.

**FAXED**



## Conventional Anchor Trench

ENVIRONMENTAL  
PROTECTION  
INCORPORATED

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Fx #: 616-587-8020

File Name:  
anvtrench

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# PVC: Polyvinyl Chloride Flexible Membrane Liners

PVC liners fabricated by EPI are a single-ply construction with Polyvinyl Chloride as the principle polymer. Only first quality virgin resins are used and all materials meet or exceed National Sanitation Foundation Standard 54 for flexible membrane liners.

PVC Liners are fabricated by EPI in panel sizes up to 40,000 square feet, accordion-folded in both directions, and packaged for shipment to your site for quick, easy installation to save you time and money.

EPI utilizes statistical process control (SPC) to ensure the integrity of each panel produced. Samples from actual factory seams are removed during the welding process for a rigorous, proven testing procedure that assures you of the highest quality factory-fabricated PVC geomembranes available.

## TYPICAL INSTALLATIONS:

Sewage Lagoons	Canals
Landfills	Decorative Ponds
Reservoirs	Golf Course Ponds
Industrial Waste Ponds	Recreation Ponds
Secondary Containment	Tailings Ponds
Cooling Ponds	Farm Ponds

*Applications suggested are not intended to be all inclusive. EPI does not warrant or guarantee the suitability, merchantability, fitness for a particular purpose, or longevity of this material for the uses listed. You may wish to consult your project engineer or installer/contractor to determine what physical properties are required for a synthetic liner. In some cases a chemical compatibility test may be required.*

MINIMUM PHYSICAL PROPERTIES:							
PROPERTY	TEST METHOD	REQUIREMENTS					
		10 MIL	20 MIL	30 MIL	40 MIL	50 MIL	60 MIL
Thickness	ASTM D-1593	± 5%	± 5%	± 5%	± 5%	± 5%	± 5%
Specific Gravity (min.)	ASTM D-792	1.20	1.20	1.20	1.20	1.20	1.20
100% Modulus (psi, min.)	ASTM D-882	1000	1000	1000	900	900	900
(lb. force/in. width, min.)		10	20	30	36	45	54
Tensile (psi, min.)	ASTM D-882	2300	2300	2300	2300	2300	2300
(lb. force/in. width, min.)		23	46	69	92	115	138
Elongation at Break (% min.)	ASTM D-882	325	325	325	350	400	450
Graves Tear (lb./in., min.)	ASTM D-1004	300	325	325	325	325	325
(lb. force/in. width, min.)		3	6	8	10	12	14
Resistance to Soil Burial (% change max.)	ASTM D-3083 (NSF Modified)						
1. Breaking Factor		5	5	5	5	5	5
2. Elongation At Break		20	20	20	20	20	20
3. Modulus at 100% Elongation		20	20	20	20	20	20
Impact Cold Crack (°F)	ASTM D-1790	-10	-15	-20	-20	-20	-20
Dimensional Stability (% change/max.)	ASTM D-1204 (212°F/15 min.)	5	5	5	5	5	5
Water Extraction (% max.)	ASTM D-3083	-0.25	-0.25	-0.25	-0.35	-0.35	-0.35
Volatile Loss (% max.)	ASTM D-1203	1.5	0.90	0.70	0.50	0.50	0.50
Hydrostatic Resistance (psi, min.)	ASTM D-751	37	60	82	92	110	150

*These data are based on tests believed to be reliable. However, these are laboratory tests that may not simulate actual use conditions. They are provided for your informational purposes only. No warranty, express or implied, including any other further warranty of fitness for a particular purpose or merchantability, is made by this promotional literature.*



# EPI Liner Installation Guide

## 1. GENERAL

EPI's PVC flexible geomembranes are all purpose, tough, durable linings that can be fabricated into panels up to 40,000 square feet each. These in turn can be easily assembled for lining all possible sized containments, ponds, reservoirs, canals, and lagoons.

## 2. TYPICAL INSTALLATION MATERIALS

Listed below are the materials and equipment that are typically required on the job site before installation can be accomplished:

- A means of handling large pallets of material: Forklift, Front-end Loader, Crane or Boom truck with 6,000 lb. lift capacity.
- 2" or 3" wide hand rollers (Steel, Nylon or Wood):
- 16' or 20' long, slip sheets.
- Sand bags or other ballast.
- Clean rags.
- Squeeze bottles for chemical fusion agent.
- Chains, heavy rope, or slings.
- Necessary safety equipment.

## 3. SITE PREPARATION

The pond should be designed by a Professional Engineer.

Inspect and verify that the pond geometry and surface conditions meet or exceed specifications. The pond must be free of all standing water or mud. The entire surface to be lined must be free from all rocks, roots, debris, or other sharp objects that may damage the liner. The pond bottom must be above the potential groundwater elevation unless a properly designed underdrain is installed below the liner.

The area to be lined may need to have the soil sterilized. This is especially true in areas having nut or quack grasses. If required, the type of soil sterilant used must be compatible with the liner material.

Installation of PVC lining may only take place when the ambient temperature is above 60°F. For temperatures below 60°F, refer to EPI's Installation and Quality Control Manual.

## 4. MATERIAL PLACEMENT

The panels may weigh up to 5,500 pounds each. A large front-end loader, forklift, or crane is required to spot the pallets of material. Slinging of pallets is suggested over uneven terrain.

The material is accordion-folded in both directions. Each panel is marked in the direction to be unfolded for proper positioning. Remove the packaging from the pallet(s). Find the identification letter and the arrow on top of each panel. Place the pallet(s) in the position shown on the Pallet Placement Diagram. **Important:** *Make sure the arrow on the top of each panel is pointing in the same direction as the arrow on the diagram.*

Unfold the material in the direction of the arrow on the panel using a bulldozer or front-end loader. Be certain to unfold the panel so that the end of the material will be in the proper position when unfolded.

Station workers every 10 to 15 feet along the folded material. With each person grasping the top layer, the material is ready to be pulled into the pond.

After the material is 50 to 100 feet into the pond, place a worker on each side of the panel and have them flip air under it. The cushion of air underneath the material makes moving a panel 200 feet long relatively easy.

When the first panel is in position, temporarily anchor it in the trench leaving the edges free to be seamed. The panel should be positioned so that it is lying as straight and as smooth as possible. The liner should be installed in a relaxed condition and be free of tension or stress.

Position the next panel in the same manner and allow a 6" overlap of material onto the first panel. After this panel is in position, ballast the panel edges as required. Repeat this process until all of the panels that can be seamed together in one day are in place.

## 5. FIELD SEAMING USING CHEMICAL FUSION WELD

Both liner surfaces at the overlap must be free of dirt or mud. If not, clean both surfaces with water and dry.

Start at the center of the two panels to be seamed. Do



not fold back the overlapping material. Apply chemical fusion agent into the overlap area with a squeeze bottle. The material should be pressed together immediately while the chemical fusion agent is still liquid. (A slip sheet may be required over irregular or damp sub-grades.) Pay particular attention to any area that consists of more than one layer of material. Excess chemical fusion agent must be wiped up immediately after the seam is made. Two crews may now start seaming toward each end of the panel.

**Caution:** Avoid contact of chemicals or adhesive with the skin or eyes. Avoid prolonged exposure to vapors. Prolonged breathing of adhesive or chemical vapors may be harmful. Consult EPI-20S-SOL Material Safety Data Sheet.

## **6. PATCHING**

All joints upon completion of the work should be tightly bonded. Any liner damage should be replaced or covered and sealed with an additional layer of PVC lining of the proper size. Any repairs to the PVC lining should be patched with lining material meeting the same specification of the material being repaired. The patch material should have rounded corners and extend a minimum of 6 inches in each direction from the damaged area.

## **7. INSPECTION AND TESTING**

Upon completion of the liner installation and prior to placement of the earth cover, fully inspect every lineal foot of field seam and all seals around penetrations. All field seams should be tested with an air lance. The air lance test consists of directing 50 pounds per square inch of air through a 3/16 inch diameter nozzle held no more than 2 inches from the seam.

## **8. EARTH COVER BY OTHERS**

A minimum of 12 inches of earth cover should be placed over the PVC lining. The material used to cover the liner must be free of sticks, stones, rubbish, or any other material which may damage the liner. The cover material should be placed over the lining as soon as

practical after the liner is installed. The contractor responsible for placing the cover material should take great care so that the liner will not be damaged.

## **9. LINER PENETRATION**

We recommend all penetrations through the liner be constructed in accordance with the EPI Penetration Details (Document #D-9211).



# Straight Answers About EPI's PVC

**Q: What geomembrane has the longest historical performance?**

**A:** PVC by far! PVC has been used successfully on a wide scale in containment applications since the 1950's. In fact, studies by a United States Government agency on PVC, including one on canal liners installed in 1968, show physical property retention is in excess of current National Sanitation Foundation Standard 54 requirements.

**Q: What quality control standards are in place for EPI's PVC Liners?**

**A:** EPI is committed to using only the very best raw materials which meet or exceed all standards set forth by the NSF. Considered the industry leader in developing testing methods involving actual factory seam samples, EPI has recently published the "Installation and Quality Control Manual for PVC", acclaimed for its well-researched, detailed, straightforward technical approach to PVC liners.

**Q: Does EPI test actual factory seams?**

**A:** While many companies verify only the accuracy of their equipment settings, we at EPI perform destructive seam tests from each and every liner that ships from our facility. In order to achieve the absolute highest performance from this program, EPI employs an in-house quality control program based on an independently designed statistical process control sampling method which guarantees the industry's tightest standards.

**Q: Does EPI engage in any performance testing?**

**A:** As important as index testing and fabrication consistency are, actual field performance is the ultimate test of a liner. For years EPI has conducted systematic analysis of liners in the industry's only on-site test ponds. Various seaming techniques in both exposed and buried test plots are subject to a variety of technical performance criteria. In addition, EPI's in-house lab maintains on-going tests in many areas including loading, UV stability, friction characteristics, and aquatic research.

**Q: Can EPI air channel test its PVC field seams?**

**A:** EPI has refined double wedge welding technology to apply to PVC geomembranes. This state-of-the-art process allows EPI to employ exacting and precise air channel field seam testing. Wedge welding also allows EPI to complete PVC installations in more extreme weather conditions than are practical with traditional chemical fusion methods.

**Q: What size are EPI's PVC panels?**

**A:** At EPI, our liners are often 200 feet wide and we have fabricated one-piece PVC panels of more than one acre in size. In fact, size is generally limited only by what panel weight can be efficiently handled in the field. Regardless of size, at EPI there is *never* a wide panel "up charge". And, our unique manufacturing process enables us to fabricate irregular shaped panels, reducing overall costs for irregular shaped containments. Our factory fabrication process also reduces field seaming requirements by as much as 80% over some types of liner materials, resulting in significant dollar savings.

**Q: How does installation of EPI's PVC compare with clay or polyethylene liners?**

**A:** Installation is faster and more economical with EPI's PVC.

Installation Comparison			
100,000 Sq. Ft. Pond	Installation Time In Days	Material Needed	Amount Of Field Seaming
PVC From EPI	1	4 Pieces (125' X 200')	650 Lineal Ft.
Polyethylene	8 - 15	11 - 22' X 420' Rolls	4620 Lineal Ft.
Natural Clay	14 - 28	200,000 Cu. Ft. (22,222 Cu. Yds.)	NA

**Q: What thickness does the EPA recommend for PVC?**

**A:** PVC is designed to provide strength and three-dimensional elongation without requiring the added thickness necessary to accommodate the grinding and welding procedures associated with polyethylene. In fact, recent federal landfill guidelines show that 30 mil PVC, 36 mil CSPE, and 60 mil HDPE are functional equivalents.

**Q: Will EPI's PVC stress crack?**

**A:** EPI's PVC has an amorphous structure as opposed to the crystalline structure of polyethylene liners. Therefore, EPI's PVC is not subject to crazing or stress cracking from heating, high thermal expansion, or localized stress concentration geometries which adversely affect polyethylene liners.

**Q: How can I order EPI's PVC?**

**A:** Call us today, toll-free, at 1-800-34-LINER (or 616-587-9108 outside of the U.S.), for the name of the EPI dealer nearest you.



**Environmental Protection, Inc.**

9939 US-131 South NE, PO Box 333

Mancelona, MI 49659-0333

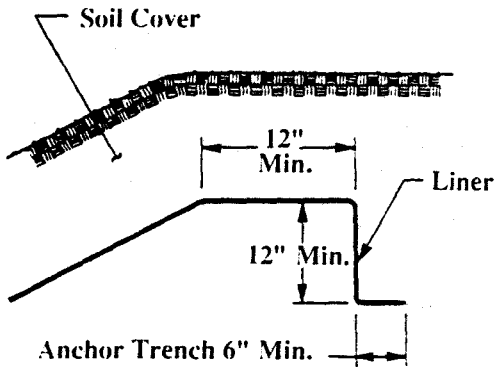
Phone: 1-800-34-LINER Outside the U.S.: 616-587-9108 Fax: 616-587-8020



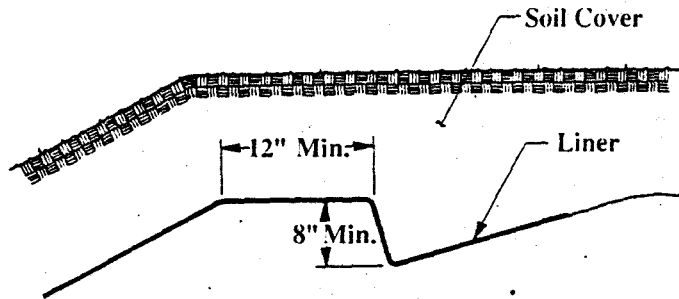
A-9211



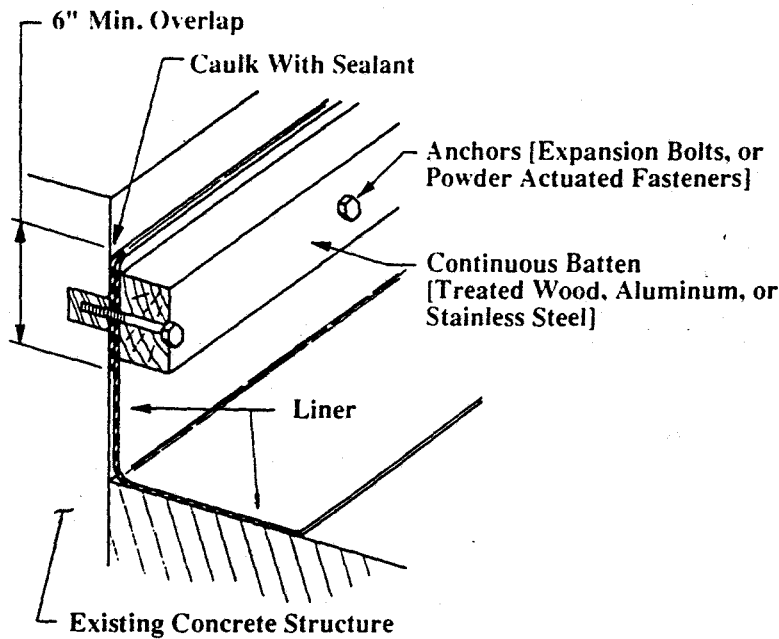
## Anchoring Details



**Conventional Trench**



**Dozer Trench**



**Bolting to Concrete**



**Environmental Protection, Inc.**

9939 US-131 South NE, PO Box 333

Mancelona, MI 49659-0333

Phone: 1-800-34-LINER Outside the U.S.: 616-587-9108 Fax: 616-587-8020



# UltraTech<sup>®</sup> Flexible Membrane Liners

The UltraTech flexible membrane liner is a single-ply membrane compounded for hydraulic containment and possessing proven physical characteristics. By virtue of its unique composition, UltraTech offers excellent weatherability, resistance to chemicals, oils, and grease. It is noted for its high tensile strength and elongation properties, as well as its flexibility over a broad temperature range.

In general, UltraTech liners do not require earthen or other cover materials. They are ideally suited for a variety of applications, particularly where resistance to biodegradation and to a wide range of chemicals is advantageous.

UltraTech can be welded directly to a PVC liner, allowing the use of PVC on the pond bottom and UltraTech on the slopes, with no loss of integrity at the connection of the two liners.

## CHEMICAL RESISTANCE:

Oils – Excellent	Acids – Fair/very good
Brine – Excellent	Hydrocarbons – Good/Excellent
Solvents – Poor/Fair	Bases – Excellent

## TYPICAL INSTALLATIONS:

Canals	Secondary Containments
Brine Pits	Landfill Linings/Covers
Oil Holding Pits	Wastewater Lagoons
Tailing Ponds	Heap Leach Pads
Solar Ponds	Industrial Waste Impoundments

*Applications suggested are not intended to be all inclusive. EPI does not warrant or guarantee the suitability, merchantability, fitness for a particular purpose, or longevity of this material for the uses listed. You may wish to consult your project engineer or installer/contractor to determine what physical properties are required for a synthetic liner. In some cases a chemical compatibility test may be required.*

*UltraTech<sup>®</sup> is a registered trademark of Environmental Protection, Inc.*

MINIMUM PHYSICAL PROPERTIES:				
PROPERTY	TEST METHOD	REQUIREMENTS		
		20 MIL	30 MIL	40 MIL
Thickness	ASTM D-2083	±5%	±5%	±5%
Specific Gravity (min.)	ASTM D-792	1.20	1.20	1.20
100% Modulus (psi, min.)	ASTM D-882	900	900	900
Tensile (psi, min.)	ASTM D-882	2300	2300	2300
Elongation at Break (% min.)	ASTM D-882	290	290	290
Graves Tear (lbs./in., min.)	ASTM D-1004	280	280	280
Resistance to Soil Burial (% change, max.)	ASTM D-3083 (NSF modified)	5	5	5
1. Breaking Factor				
2. Elongation at Break		20	20	20
Impact Cold Crack (°F)	ASTM D-1790	- 25	- 25	- 25
Dimensional Stability (% change/max.)	ASTM D-1204 (212°F/15 min.)	5	5	5
Water Extraction (% loss, max.)	ASTM D-1239	0.35	0.35	0.35
Volatile Loss (% loss, max.)	ASTM D-1203	1.0	0.8	0.8
Hydrostatic Resistance (psi, min.)	ASTM D-751	55	75	110

*These data are based on tests believed to be reliable. However, these are laboratory tests that may not simulate actual use conditions. They are provided for your informational purposes only. No warranty, express or implied, including any other further warranty of fitness for a particular purpose or merchantability, is made by this promotional literature.*





# EPI Liner Installation Guide

## 1. GENERAL

EPI's UltraTech geomembranes are all-purpose, tough, durable linings that can be fabricated into panels up to 40,000 square feet each. These in turn can be easily assembled for lining all possible sized containments, ponds, reservoirs, canals, and lagoons.

## 2. TYPICAL INSTALLATION MATERIALS

Listed below are the materials and equipment that are typically required on the job site before installation can be accomplished:

- A means of handling large pallets of material: Forklift, Front-end Loader, Crane or Boom truck with 6,000 lb. lift capacity.
- 2" or 3" wide hand rollers (Steel, Nylon or Wood).
- 16' or 20' long, slip sheets.
- Sand bags or other ballast.
- Clean rags.
- Squeeze bottles for chemical fusion agent.
- Chains, heavy rope, or slings.
- Necessary safety equipment.

## 3. SITE PREPARATION

The pond should be designed by a Professional Engineer.

Inspect and verify that the pond geometry and surface conditions meet or exceed specifications. The pond must be free of all standing water or mud. The entire surface to be lined must be free from all rocks, roots, debris, or other sharp objects that may damage the liner. The pond bottom must be above the potential groundwater elevation unless a properly designed underdrain is installed below the liner.

The area to be lined may need to have the soil sterilized. This is especially true in areas having nut or quack grasses. If required, the type of soil sterilant used must be compatible with the liner material.

Installation of UltraTech lining may only take place when the ambient temperature is above 60°F. For temperatures below 60°F, refer to EPI's Installation and Quality Control Manual.

## 4. MATERIAL PLACEMENT

The panels may weigh up to 5,500 pounds each. A large front-end loader, forklift, or crane is required to spot the pallets of material. Slinging of pallets is suggested over uneven terrain.

The material is accordion-folded in both directions. Each panel is marked in the direction to be unfolded for proper positioning. Remove the packaging from the pallet(s). Find the identification letter and the arrow on top of each panel. Place the pallet(s) in the position shown on the Pallet Placement Diagram. **Important:** *Make sure the arrow on the top of each panel is pointing in the same direction as the arrow on the diagram.*

Unfold the material in the direction of the arrow on the panel using a bulldozer or front-end loader. Be certain to unfold the panel so that the end of the material will be in the proper position when unfolded.

Station workers every 10 to 15 feet along the folded material. With each person grasping the top layer, the material is ready to be pulled into the pond.

After the material is 50 to 100 feet into the pond, place a worker on each side of the panel and have them flip air under it. The cushion of air underneath the material makes moving a panel 200 feet long relatively easy.

When the first panel is in position, temporarily anchor it in the trench leaving the edges free to be seamed. The panel should be positioned so that it is lying as straight and as smooth as possible. The liner should be installed in a relaxed condition and be free of tension or stress.

Position the next panel in the same manner and allow a 6" overlap of material onto the first panel. After this panel is in position, ballast the panel edges as required. Repeat this process until all of the panels that can be seamed together in one day are in place.

## 5. FIELD SEAMING USING CHEMICAL FUSION WELD

Both liner surfaces at the overlap must be free of dirt or mud. If not, clean both surfaces with water and dry.

Start at the center of the two panels to be seamed. Do

not fold back the overlapping material. Apply chemical fusion agent into the overlap area with a squeeze bottle. The material should be pressed together immediately while the chemical fusion agent is still liquid. (A slip sheet may be required over irregular or damp sub-grades.) Pay particular attention to any area that consists of more than one layer of material. Excess chemical fusion agent must be wiped up immediately after the seam is made. Two crews may now start seaming toward each end of the panel.

**Caution:** Avoid contact of chemicals or adhesive with the skin or eyes. Avoid prolonged exposure to vapors. Prolonged breathing of adhesive or chemical vapors may be harmful. Consult EPI-20S-SOL Material Safety Data Sheet.

## **6. PATCHING**

All joints upon completion of the work should be tightly bonded. Any liner damage should be replaced or covered and sealed with an additional layer of UltraTech lining of the proper size. Any repairs to the UltraTech lining should be patched with lining material meeting the same specification of the material being repaired. The patch material should have rounded corners and extend a minimum of 6 inches in each direction from the damaged area.

## **7. INSPECTION AND TESTING**

Upon completion of the liner installation and prior to placement of the earth cover, fully inspect every lineal foot of field seam and all seals around penetrations. All field seams should be tested with an air lance. The air lance test consists of directing 50 pounds per square inch of air through a 3/16 inch diameter nozzle held no more than 2 inches from the seam.

## **8. EARTH COVER BY OTHERS**

A minimum of 12 inches of earth cover should be placed over the UltraTech lining. The material used to cover the liner must be free of sticks, stones, rubbish, or any other material which may damage the liner. The cover material should be placed over the lining as soon

as practical after the liner is installed. The contractor responsible for placing the cover material should take great care so that the liner will not be damaged.

## **9. LINER PENETRATION**

We recommend all penetrations through the liner be constructed in accordance with the EPI Penetration Details (Document #D-9211).



# Straight Answers About UltraTech®

**Q. What is UltraTech?**

A. UltraTech is a polymeric flexible membrane liner formulated using state-of-the-art polymers, resin modifiers, and stabilizers forming a geomembrane with the best combination of physical properties available today.

**Q. Can UltraTech be left exposed to the sun and elements?**

A. UltraTech has been specifically designed for exposed applications. Its combination of ingredients has been compounded for applications requiring exposed conditions. UltraTech has been subjected to accelerated testing up to 10,000 hours, assuring retention of physical properties after years of exposure and weathering.

**Q. Is UltraTech resistant to petroleum products?**

A. UltraTech has been tested with many different petroleum products, including diesel fuel, kerosene, naphtha, crude oil, etc., and proven to be very resistant to the migration of these products through the liner.

**Q. Why isn't UltraTech 60 mils thick?**

A. Unlike polyethylene, which is made thicker because of its physical property restrictions, UltraTech is designed to provide strength and elongation without requiring added thickness to accommodate the grinding and welding procedure. Field performance of UltraTech is comparable to polyethylene liners of twice the thickness.

**Q. Will UltraTech stress crack?**

A. UltraTech has an amorphous structure, as opposed to the crystalline structure of polyethylene liners. Therefore, UltraTech is not subject to crazing or stress cracking from heating, high thermal expansion, or localized stress concentration geometries which adversely affect polyethylene liners.

**Q. Can UltraTech be used for aquaculture?**

A. The UltraTech formulation is suitable for aquaculture applications. Colors other than black are also available on a special order basis.

**Q. What size are UltraTech panels?**

A. UltraTech can be custom fabricated to your specific job size requirements. Panel sizes are only limited by the weight

that can be efficiently handled at the job site. Panels up to 40,000 square feet are available, thereby eliminating up to 70% of field seams. Custom fabricated, irregular shaped panels also save you time and money.

**Q. How is UltraTech welded?**

A. UltraTech can be heat welded or chemically welded to form a homogeneous bond between adjacent sheets of material.

**Q. Is it necessary to grind the surface of UltraTech to weld seams?**

A. Unlike polyethylene, which must be abraded on the surface prior to welding, UltraTech only needs to be wiped clean of any dust or moisture prior to welding. Since grinding is not required, you are assured of having full thickness of the liner in all areas, and need not be concerned about the loss of thickness along each seam.

**Q. Is UltraTech reinforced?**

A. UltraTech is available in 20, 30, and 40 mil thickness as an unsupported membrane. It is also available in a 35 mil thick fabric-reinforced liner (See EPI Document #C-9211).

**Q. Can UltraTech be used as a methane barrier?**

A. Tests in accordance with ASTM D-1434 conclude that the permeability coefficient of UltraTech is one of the lowest available on the market – making it superior to polyethylene as a methane barrier.

**Q. Can reinforced UltraTech be combined with unsupported UltraTech?**

A. Since the two materials are identical compounds, reinforced and unsupported UltraTech can be heat or chemically welded together to provide the best combination of materials for your containment application. The unsupported UltraTech provides high elongation with high tensile strength, while the reinforced UltraTech provides high dimensional stability. No complicated joining procedures are required.

**Q. Where is UltraTech available?**

A. Call us today, toll-free, at 1-800-34-LINER (or 616-587-9108 outside of the U.S.), for the name of the EPI dealer nearest you.



**Environmental Protection, Inc.**

9939 US-131 South NE, PO Box 333

Mancelona, MI 49659-0333

Phone: 1-800-OK-LINER Outside the U.S.: 616-587-9108 Fax: 616-587-8020

E-Mail: [pvcliner@aol.com](mailto:pvcliner@aol.com)



B-9211



# Aquatic Services

Lake & Pond Management • Algae & Weed Control • Water Features

**Ephraim "Efy" Seidman**  
*President*

P.O. Box 4264 Richmond, VA 23220  
Phone & Fax 804-359-0430 E-mail: [AquaticSVS@aol.com](mailto:AquaticSVS@aol.com)





Lake & Pond Management • Algae & Weed Control • Fish Stocking



23 March 1999

Mr. Darryl Cook  
James City County  
Environmental Division  
P.O. Box 8784  
Williamsburg, VA 23187

Dear Mr. Cook:

Thank you for stopping by our booth last week at the Virginia Lakes and Watersheds Association Annual Meeting. At that time, you requested information on a small aerator unit that could be used in a ~4' deep, one-quarter acre pond. I have enclosed information on the Little Titan unit, the smallest in the Otterbine line. Let me take a moment to re-introduce you to Aquatic Services.

Aquatic Services, Inc. (ASI) is the leading provider of lake and pond management services in Virginia. Our clients include municipalities, private pond owners, lake owner associations, business parks, and golf courses. ASI specializes in lake and pond management and helps clients retain, or increase, the value of their lakes and ponds. Services offered are varied- water quality evaluation; weed and algae control; aeration sales and installation; fish stocking and population assessment; and aquascaping.

While we're primarily consultants dealing with lake/pond management and maintenance, as you already know, ASI is a regional distributor for Otterbine Barebo's line of quality aeration equipment. We are also the Otterbine factory authorized service and installation center for all of Central Virginia. Therefore, if ever necessary, we can handle *all* service and repair needs (including parts).

Please give me a call if you have any questions or need additional information. I know you will get many years of trouble-free operation from any Otterbine equipment you select.

Sincerely,

Ephraim "Efy" Seidman  
Aquatic Services, Inc.



Lake & Pond Management • Algae & Weed Control • Fish Stocking

**OTTERBINE® AERATION EQUIPMENT  
PURCHASE AND INSTALLATION**

***Proposal for:***

**Mr. Darryl Cook  
James City County Environmental Division  
Williamsburg, VA**

**23 March 1999**

**P.O. Box 4264 • Richmond, VA 23220-8264 • (804) 359-0430 • [AquaticSVS@aol.com](mailto:AquaticSVS@aol.com)**

## **OTTERBINE® AERATION EQUIPMENT PURCHASE PROPOSAL**

Thank you for your interest in Aquatic Services and Otterbine aerators. Otterbine has been in business for over 40 years and has well over 120,000 units in the field. Two years ago, Otterbine extended its Concept<sub>2</sub> warranty to THREE YEARS on moving parts and FIVE YEARS on non-moving parts. This warranty is the best in the industry and is a testament to the quality and durability of their units.

In addition, only Otterbine aeration systems are safety tested and ETL approved. All 115 volt and 208-230 volt Otterbine Concept<sub>2</sub> equipment come standard with Class A (Human) Ground Fault Circuit Interrupt protection.

Aeration is a cost effective method of enhancing water quality. It stimulates natural clean up processes in a pond and heightens both the quality of the water and the aesthetic setting. Aeration is an ongoing management tool that helps create an environment which is less conducive to algae and odors. Even though aeration is essentially a water quality management tool, it should be aesthetically pleasing as well.

The general rule of thumb is to provide 1.5 HP per surface acre of water. More power is required if there is a history of severe water quality problems. Less horsepower can be beneficial too, but obviously will provide less water circulation and oxygen input into the system. After certain logistical parameters (availability and location of electricity, pond shape and water depth) are met, placement is usually a matter of personal choice.

There are two general methods of aeration: sub-surface and surface. Sub-surface systems inject air below the water's surface. Surface aeration models float and throw water into the air. This action increases the water to air surface ratio and adds oxygen to the water. In addition, water circulation breaks up stratification in a lake or pond. In Virginia, Concept<sub>2</sub> units do not need to be removed from the water in the winter.

Five spray patterns are available in the Otterbine Concept<sub>2</sub> line- Tri-Star, Sunburst, Rocket, Phoenix, and High Volume. In general, the higher the water pumping rate, the more oxygen added to the water. Spray patterns in order of decreasing water pumping rates are High Volume, Sunburst, Tri-Star, Phoenix, and Rocket. The Little Titan unit is essentially a 1/6 HP Sunburst spray pattern.

The Little Titan model is available in 115 and 230 volt configurations. This small but efficient aerator pumps almost 100 gallons per minute and draws only 1.8 amp at 230 volt. The Little Titan requires only 13 inches of water making it


suitable for very shallow areas. A 1/4" mesh inlet screen keeps debris out of the impeller. The unit comes with 50 feet of underwater power cable (additional cable is available in 25' increments) and a one year limited warranty. Otterbine suggests yearly maintenance, including oil change and periodic seal replacement.

I recommend that you also consider an Electric Control Box. The box is a NEMA 3R enclosure and includes a 24-hour timer, fuse, and Ground Fault Circuit Interrupt (GFCI).

I am pleased to offer you the following prices on the 1/6 HP Little Titan.

<u>Item</u>	<u>Price</u>
Little Titan, 1/6 HP (115/230 volt, 1 phase)	\$450
Additional SOWA Cable (12/3)	\$1.31/ft
1/6 HP Electric Control Panel, 115 volt	\$232
or	
1/6 HP Electric Control Panel, 230 volt	\$469

Thank you for this opportunity to quote you 1999 prices on Otterbine equipment. Please call if you have any additional questions or need information for other sites. We look forward to working with you in the future.

Ephraim "Efy" Seidman  
Aquatic Services, Inc. 

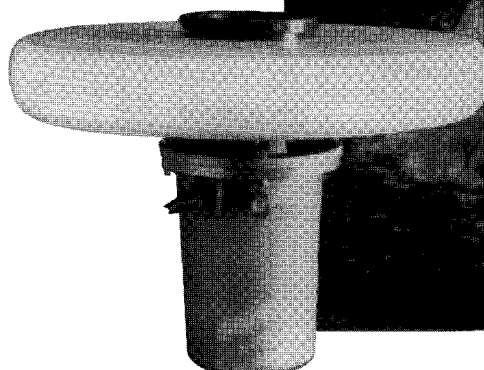


# THE LITTLE TITAN

**Otterbine® Aerators**

Advanced water management technology at  
an affordable price

## 1/6 HP Aerator



### Description:

The LITTLE TITAN aerator offers an easier, more efficient and cost effective way to improve water quality and to provide fish with oxygen enriched water. Unlike old-fashioned agitators, which only recirculate water, the LITTLE TITAN supplies the water with fresh oxygen. Nearly five times as powerful as the average agitator, it delivers for just pennies a day. Ruggedly designed, this aerator can withstand years of hard use. This compact unit features a cast aluminum housing, motor, and impeller supported by a one piece high density polystyrene float. The LITTLE TITAN can operate in just 13"/.32m of water. It's portable. Move it wherever you want to, whenever you want. A 1/4" mesh inlet screen protects fingerlings and keeps debris out of the impeller.

### Performance Characteristics:

The LITTLE TITAN maintains a primary pumping rate of 99GPM/374LPM of oxygen enriched water and circulates over 990GPM/3740LPM. A maximum spray diameter of 3ft/.91m can be obtained.

The LITTLE TITAN comes with 50ft/15m of underwater power cable. Its energy efficient 1/6 HP electric motor operates at 115, 208, or 230 volts and includes thermal overload protection for longer motor life. The motor runs in an oil bath to insure proper lubrication and cooling.

### Applications:

Because of its size, durability, and efficiency, this little "big" aerator is ideal for small ponds. The LITTLE TITAN is also ideal for aquaculture applications in raceways and vats, or it can be suspended in holding tanks (without float).

### Service:

The LITTLE TITAN is designed to insure years of trouble free service. Spare parts are always available through our local service centers, and all repairs are performed by factory trained personnel. The unit also comes with a limited 1 year warranty. The LITTLE TITAN by Otterbine® could very well be the last aerator you may ever have to buy.

### Technical Data:

Model	HP	Voltage	Motor RPM	Running Amp Draw	Spray Height	Spray Diam.	Pumping Rate	Induced Circ. Rate	Min. Oper. Depth	Shipping Weight*
Little Titan	1/6	115, 208, 230	1725 @60Hz	1.8	2 ft	3 ft	99 GPM	990 GPM	13"	28 lbs.
Little Titan	1/6	220	1425 @ 50Hz	1.0	.60m	.91m	374 LPM	3740 LPM	.3m	13 kilos

Shipping weight includes unit and 50'/15m of cable. Additional cable available. Pumping rates may vary due to voltage, elevation, and relative humidity. These units are not intended for use in brackish or salt water.

**Otterbine®/Barebo, Inc.**  
3840 Main Road East  
Emmaus, PA 18049 USA  
610/965-6018  
FAX 610/965-6050



**Distributed in your area by:**

**AQUATIC SERVICES, INC.**  
1723 Arlington Road  
Richmond, VA 23230  
804.359.0430 AquaticSVS@aol.com

## BILL TAYLOR'S PROPOSAL -

IN

$$170 \text{ loads clay} \times 70 = \$11,900$$

$$2 \text{ load topsoil} \times 70 = \$140$$

OUT

$$142 \text{ loads sand to Landfill} \times 70 = \$9,940$$

$$19 \text{ loads sand to Pond/BK} \times 70 = 1,330$$

CONST ENTRANCE -

$$\frac{\$1,000}{\$24,310}$$

No Add'l Charge

- 5 loads sand to upper pond area
- Grading of upper pond area
- Seed, mulch upper pond
- Install rock check dam - upper pond

\* 24,000 \*

Add'l Charge - 2 hrs dozen time -  $\$70/\text{hr} = \$140$   
creation of berms

\$24,450
24,460

24,215

## COUNTY PROPOSAL

IN

$$170 \text{ loads Clay} \times 70 = 11,900$$

$$2 \text{ loads topsoil} \times 70 = 140$$

OUT

$$142 \text{ loads to Landfill} \times 70 = \$9,940 \leftarrow \$2,840$$

$$24 \text{ loads delivered local} \times \$20 = \$480$$

$$1,000$$

CONST ENTR.

Upper Pond Work

$$1 \text{ hr dozen to shape pond area} \times 70 = \$70$$

$$1 \text{ hr dozen to construct rock check} \times 70 = \$70$$

Seed, mulch

$$= \$50$$
$$\$190$$

\$23,800
\$23,650

Creation of berms near  
Burger King - \$150

172 x 70

172 x 70 = 12040

142 x 70

12 x 40

14 x 20

12 loads - 40

7 - 20

3 hrs - 1 hr @ 75

rock - 200

seeding - 50

24,215

> 24,000 even

23,800

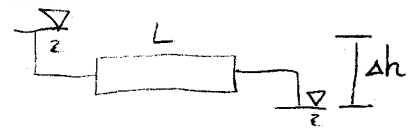
### Tercentennial Grove

The Williamsburg Land Conservancy, via Deanna Sampson, expressed interest in assuming a managerial role in the grove and will forward this idea to their full board. The 300th Commission would then appoint a sub-committee of the Civic Beautification Committee to do all fund raising. Additional money would be put into an escrow account so the Conservancy can administer maintenance contracts, plant replacements and perform other duties as necessary. Trist McConnell and Karen Jamison were excited about the possibility. After I talk with Martha Hamilton-Phillips, I will set up a group meeting to include John Horne, Don Davis, and those mentioned above. They were hoping to do this within a 60 day window (by Dec. 1). We could advance the fundraising visibility of this project with our 428 trees being installed this fall. We may also want to publicize the 40,000 trees.

More later.....



# SOIL PERMEABILITY



$$q = k i A$$

$$i = \frac{\Delta h}{L} = \frac{4'}{1'} = 4$$

$$A = 1 \text{ ft}^2$$

a) assume  $K = 1 \times 10^{-6}$

$$q = 1 \times 10^{-6} \frac{\text{cm}}{\text{sec}} \times 4 \times 1 \text{ ft}^2 \times \frac{1 \text{ ft}}{30.48 \text{ cm}} = .13 \times 10^{-6} \frac{\text{ft}^3}{\text{sec}} \times \frac{3600 \text{ sec}}{\text{hr}} \times \frac{24 \text{ hr}}{\text{day}} = .011 \text{ cf/day}$$

$$\frac{.011 \text{ ft}^3}{1 \text{ ft}^2} = .011 \text{ ft/day}$$

over 30 days - lose 0.33' or 4"

b)  $K = 1 \times 10^{-7}$

lose 0.03' or 0.4" over 30 days

c)  $K = 1 \times 10^{-6}$ ; 6" thick

lose 0.66' or 8" over 30 days

d)  $K = 1 \times 10^{-7}$ ; 6" thick

lose 0.067' or 0.8" over 30 days

e) Current condition -

assume  $K = 1 \times 10^{-3}$

$$q = 1 \times 10^{-3} \frac{\text{cm}}{\text{sec}} \times \frac{4'}{1'} \times 1 \text{ ft}^2 \times \frac{1 \text{ ft}}{30.48 \text{ cm}} \times \frac{3600 \text{ sec}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{1 \text{ day}} = 11.3 \text{ cf/day}$$

lose 11  $\frac{\text{ft}^3}{\text{ft}^2} = 11 \text{ ft/day}$  - no

assume  $K = 1 \times 10^{-4}$

lose 1.1  $\frac{\text{ft}^3}{\text{ft}^2} = 1.1 \text{ ft/day}$  - no

$K = 1 \times 10^{-5}$  - lose 0.1  $\frac{\text{ft}^3}{\text{ft}^2} = 0.1 \text{ ft/day}$  -

$$\text{if } L = 4' - 2.83 \text{ ft/day} - 1 \times 10^{-3}$$

$$= .283 \text{ ft/day} - 1 \times 10^{-4}$$

$$= .03 \text{ ft/day or } .33 \text{ ft/day } 1 \times 10^{-5}$$

f) if  $K = 1 \times 10^{-4}$  .0001

$$i = \frac{\Delta h}{L} = \frac{1'}{1'} = 1$$

$$q = 1 \times 10^{-4} \frac{\text{cm}}{\text{sec}} \times 1 \times 1 \text{ ft}^2 \times \frac{1 \text{ ft}}{30.48 \text{ cm}} \times \frac{3600 \text{ sec}}{\text{hr}} \times \frac{24 \text{ hr}}{\text{day}} = 0.28 \frac{\text{ft}^3}{\text{day}} = 0.28 \text{ ft/day}$$

Hank Gerhart Bach. Horn -

PVC Liners - easily ripped

Clay easily disturbed also

1' cover over all liners - inc. clay

Clay -  $10^{-7}$  cm/sec

speced bentonite in conjunction w/ in situ clay

check w/ Soil Scientists, NRCS

Bentonite - Richmond

Wajo - Wayne Britt - directional drill

ACF - Sean Simonpietri - will be back 9/1/98  
\* Andy - Project Manager

CLAYMAX - GCL -

- need to be covered by 12"

→ HDPE - could be exposed or covered w/ small amt of material

60 mil HDPE - \$0.90/SF - supplied + installed - No earthwork

40 mil " - 0.80/SF

- black -

→ GCL - ~~same as~~ \$1.00/SF supplied + inst.

- \$0.75/SF - material only - Bentomat ST

PVC - \$ 20% cheaper than HDPE

- 30 mil - \$0.70/SF

Reinforced vs Nonreinforced GCL -

Time delivery - 7-10 days

- \$1500/truck - need 1-1½ truck loads

ask for delivered price - FOB jobsite