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: **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

General File ID or BMP ID: CC026

PIN: 551-05-00-A

Subdivision, Tract, Business or Owner Name (if known): Commonwealth of Virginia

Property Description: Located at the intersetion of Route 199 and John Tyler Lane in the City of Williamsburg

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

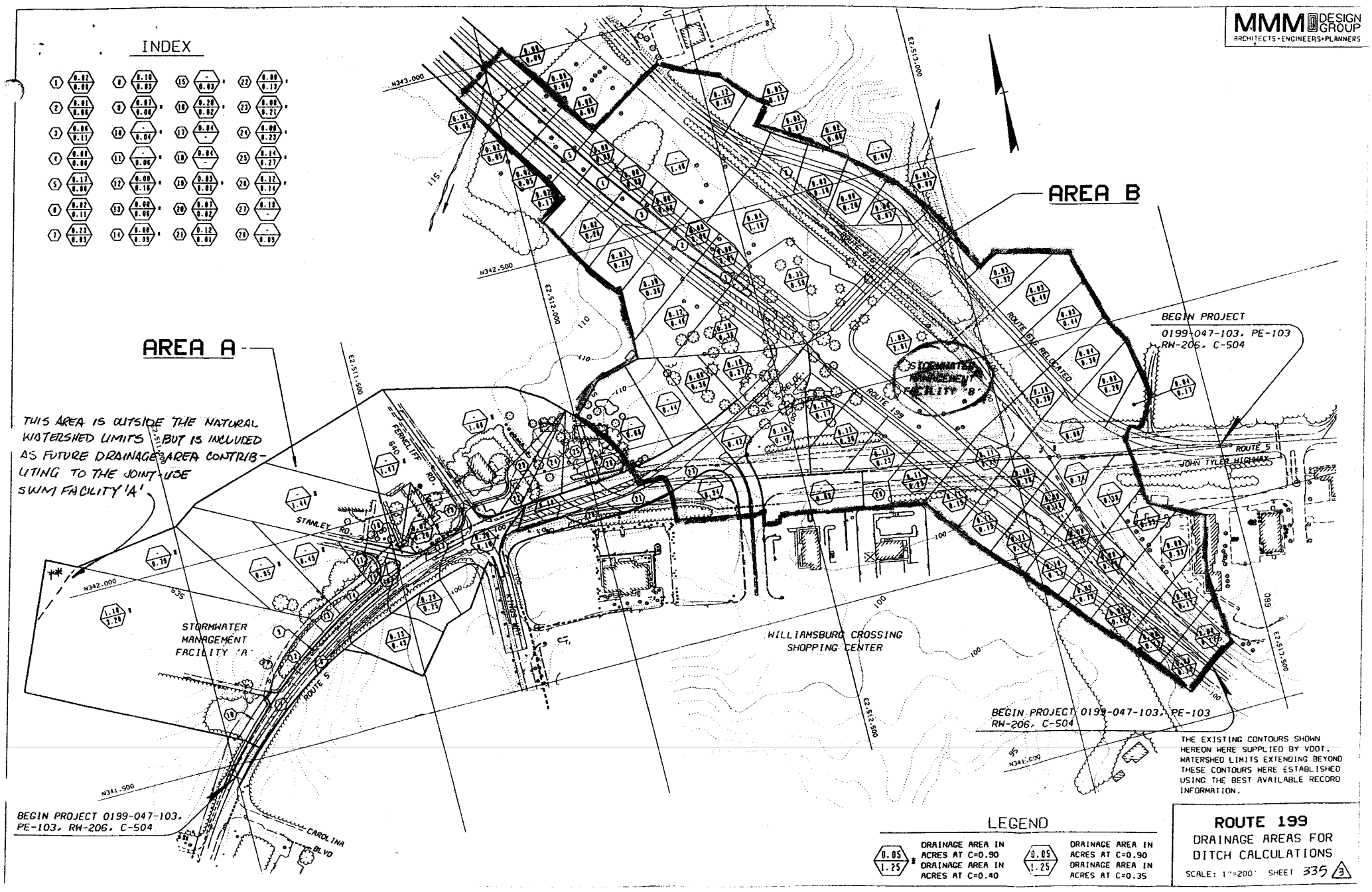
CC026

Contents for Stormwater Management Facilities As-built Files

Each file is to contain:

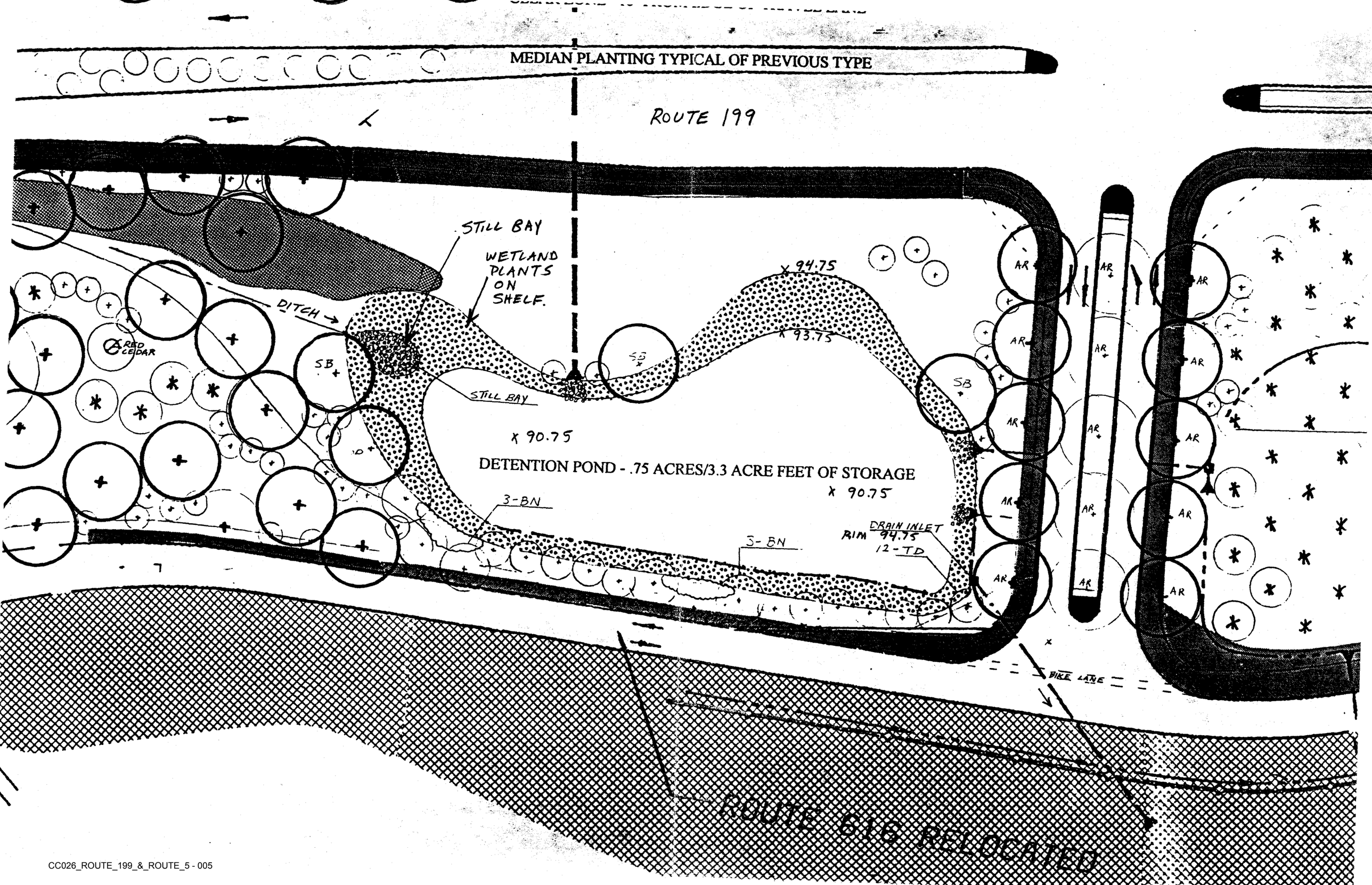
1. As-built plan
2. Completed construction certification
3. Construction Plan
4. Design Calculations
5. Watershed Map
6. Maintenance Agreement
7. Correspondence with owners
8. Inspection Records
9. Enforcement Actions

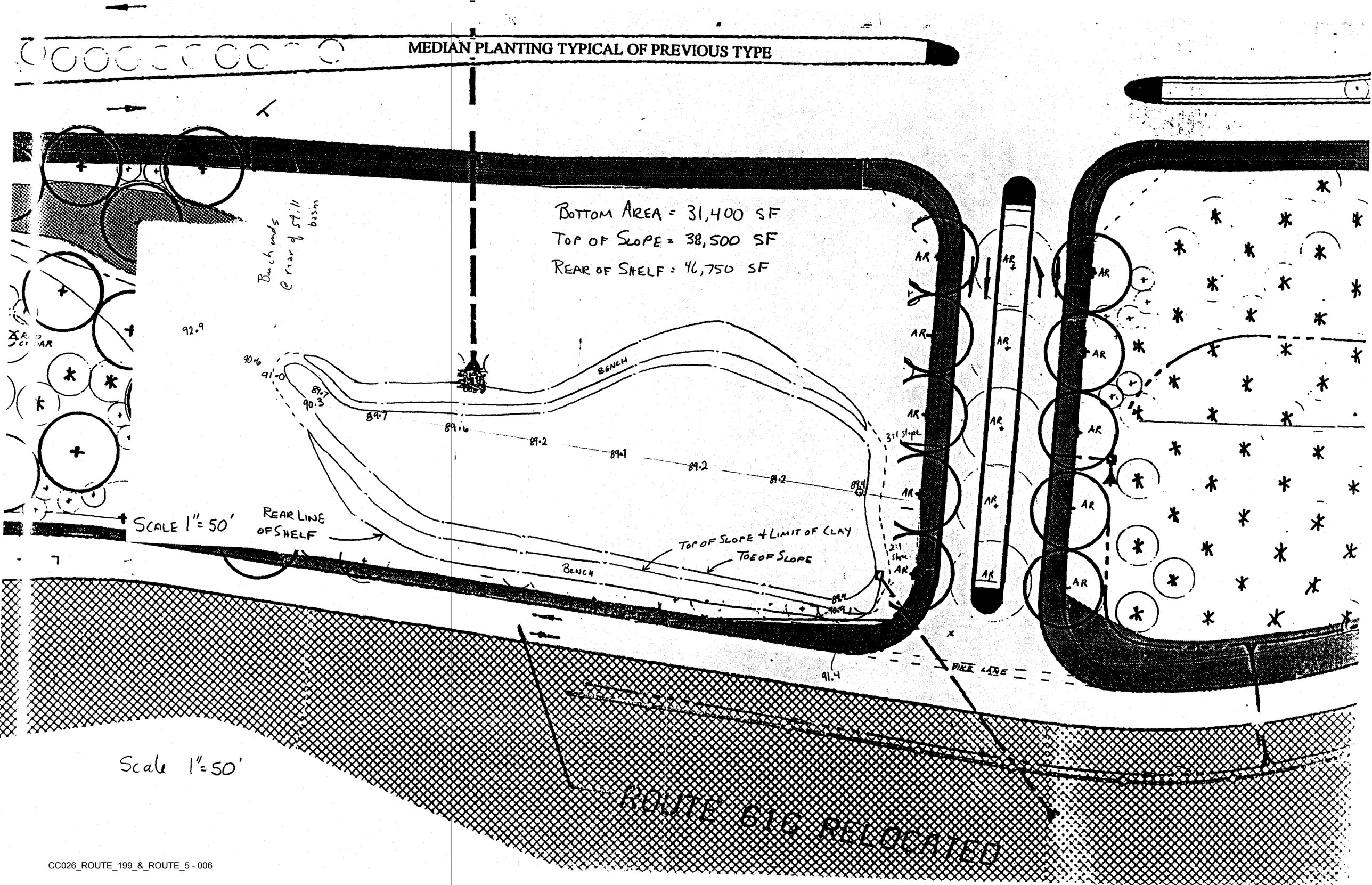
MMM DESIGN GROUP
ARCHITECTS • ENGINEERS • PLANNERS

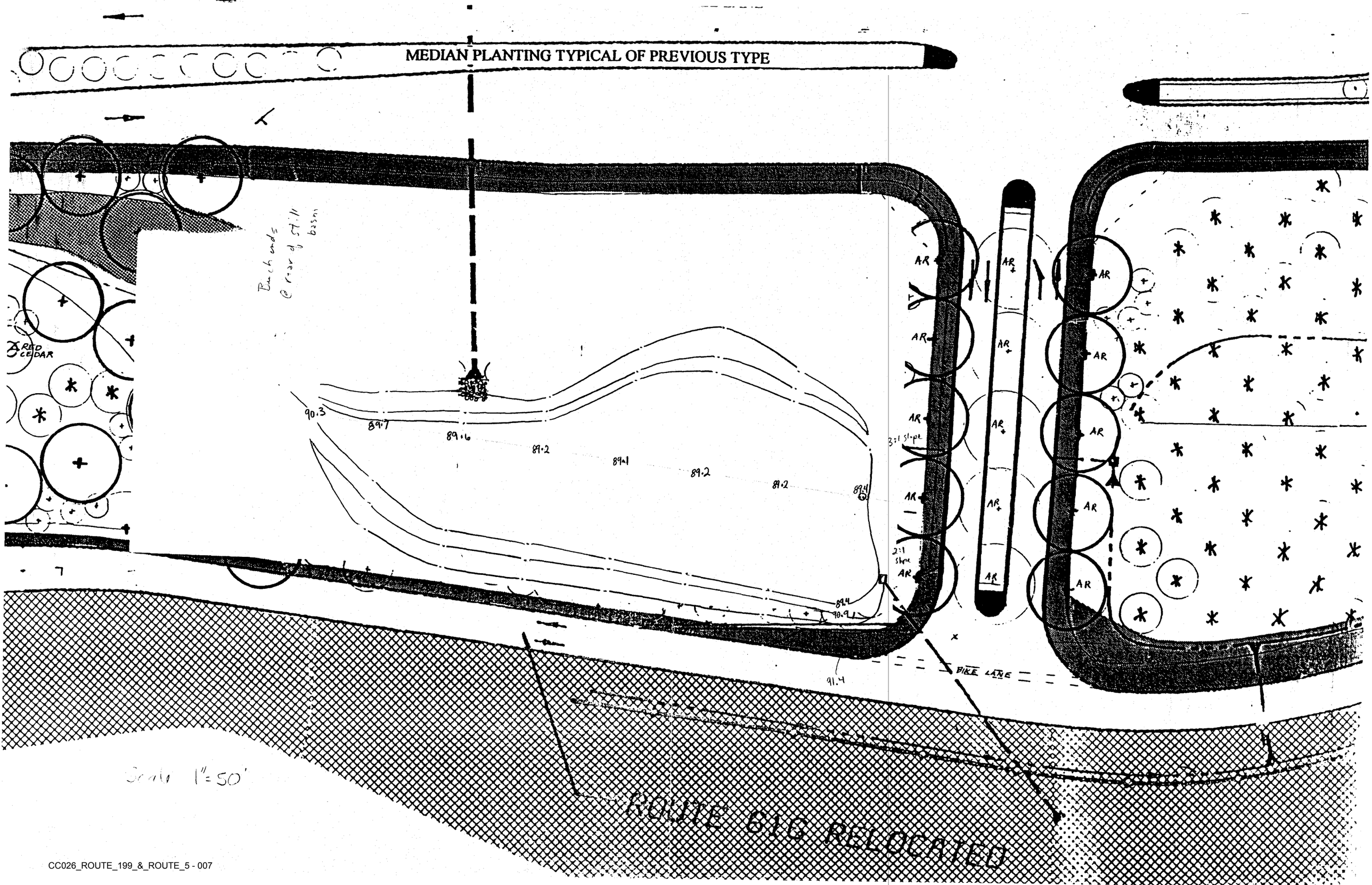


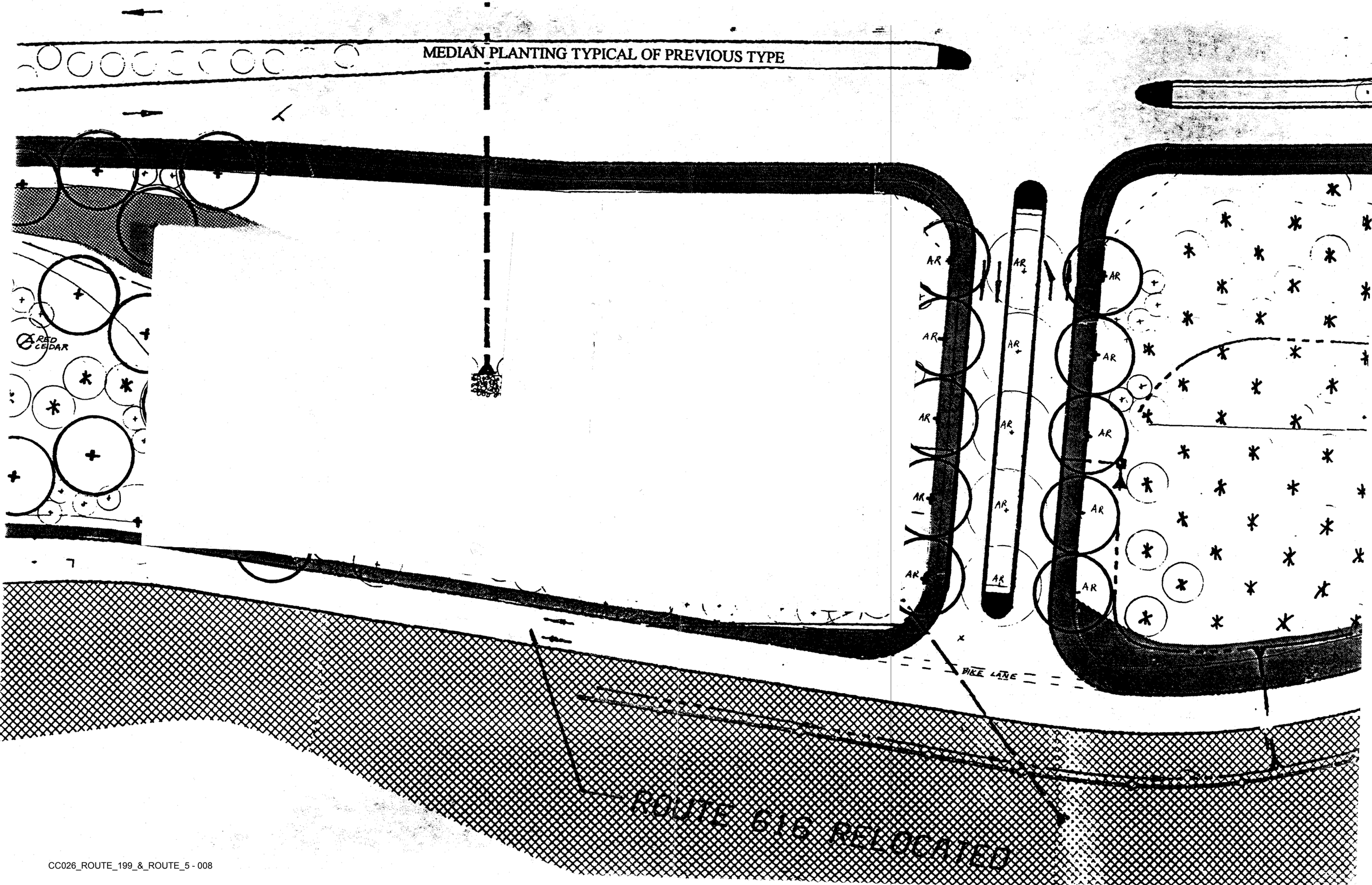
THE EXISTING CONTOURS SHOWN HEREON WERE SUPPLIED BY VDOT. WATERSHED LIMITS EXTENDING BEYOND THESE CONTOURS WERE ESTABLISHED USING THE BEST AVAILABLE RECORD INFORMATION.

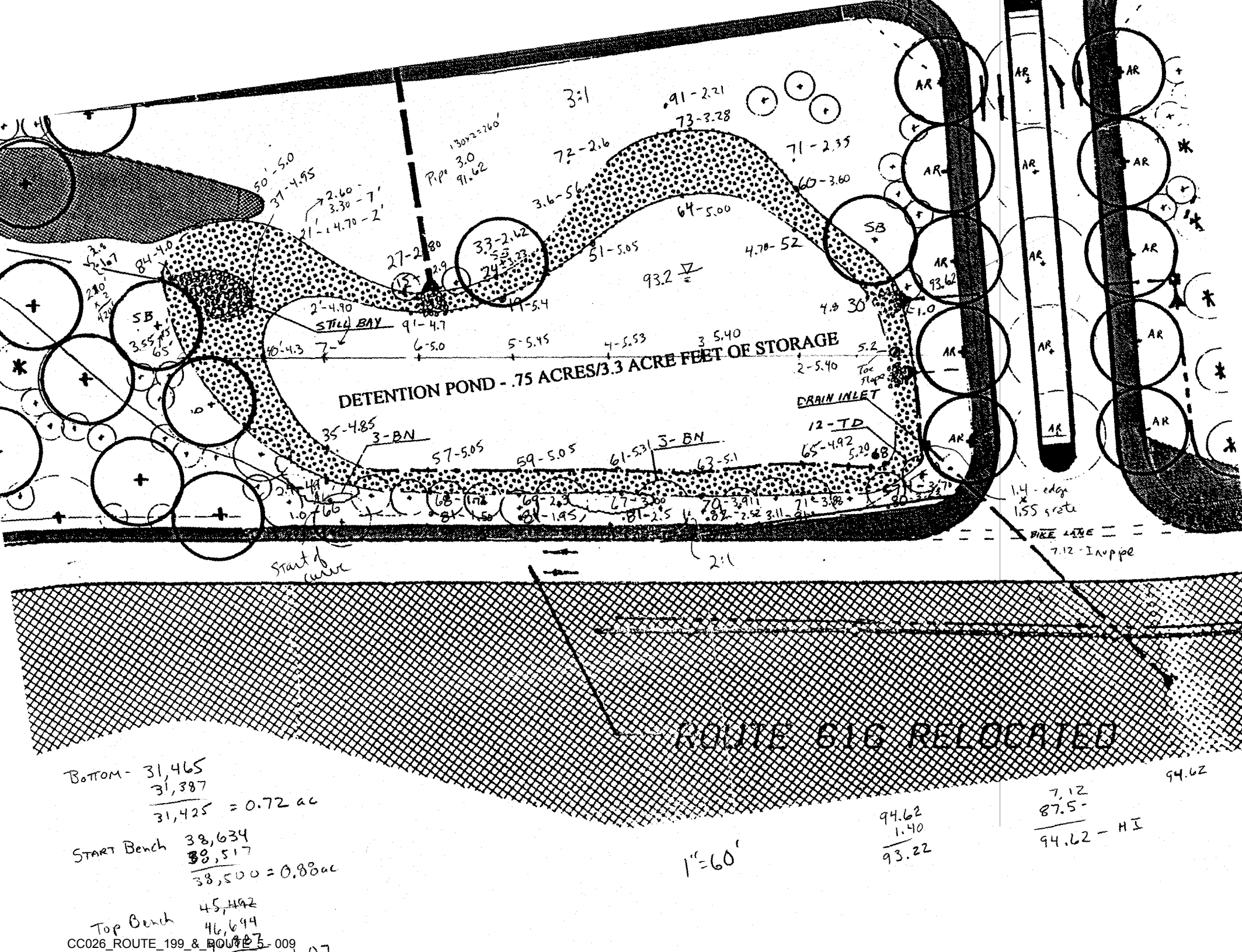
ROUTE 199
DRAINAGE AREAS FOR DITCH CALCULATIONS
SCALE: 1"=200' SHEET 335 3

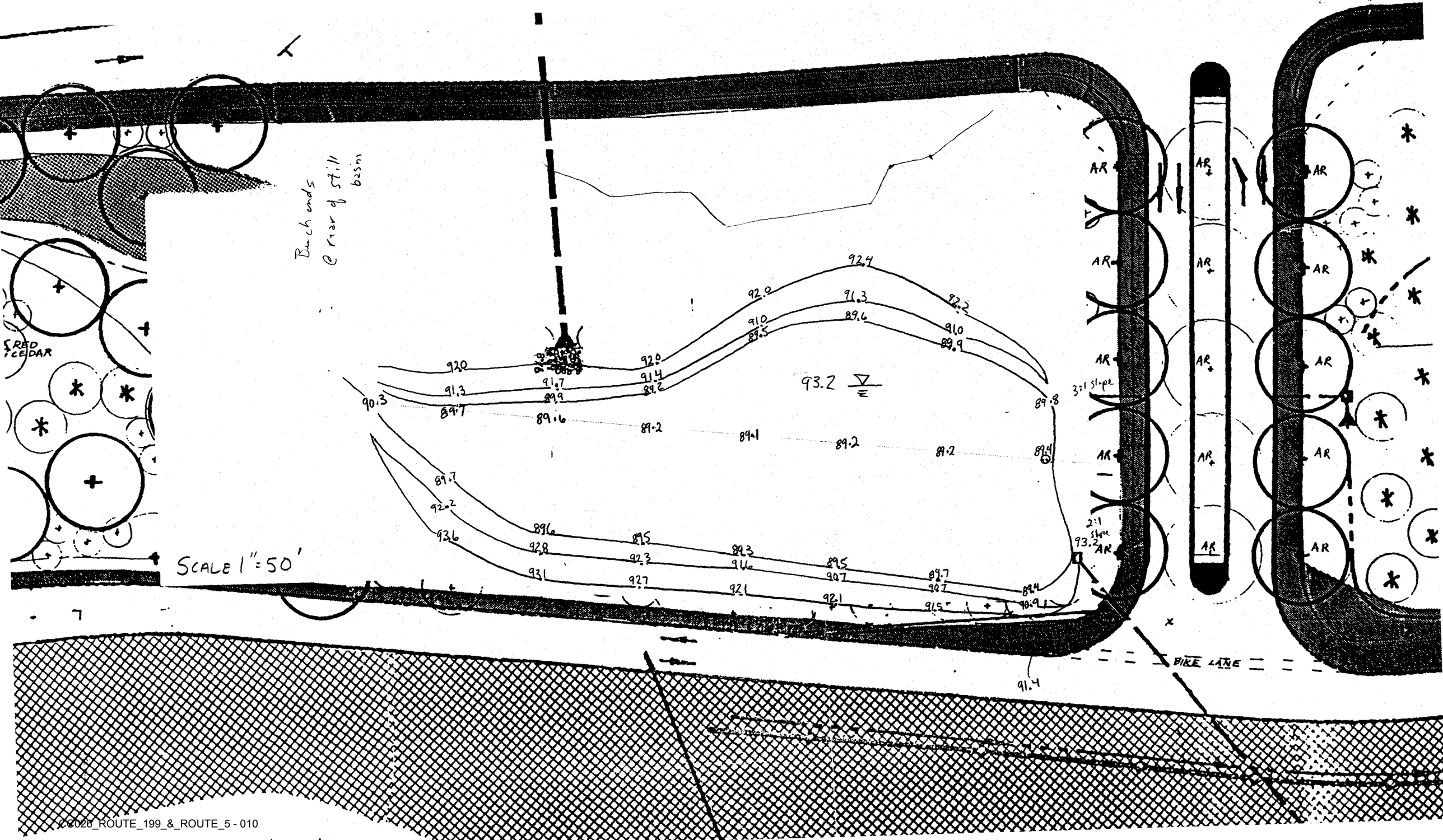

MEDIAN PLANTING TYPICAL OF PREVIOUS TYPE
ROUTE 199
STILL BAY
WETLAND PLANTS ON SHELF.
DITCH
RED CEDAR
SB
STILL BAY
x 94.75
x 93.75
x 90.75
DETENTION POND - .75 ACRES/3.3 ACRE FEET OF STORAGE
x 90.75
3-BN
3-BN
DRAIN INLET
RIM 94.75
12-TD
AR
BIKE LANE
ROUTE 616 RELOCATED

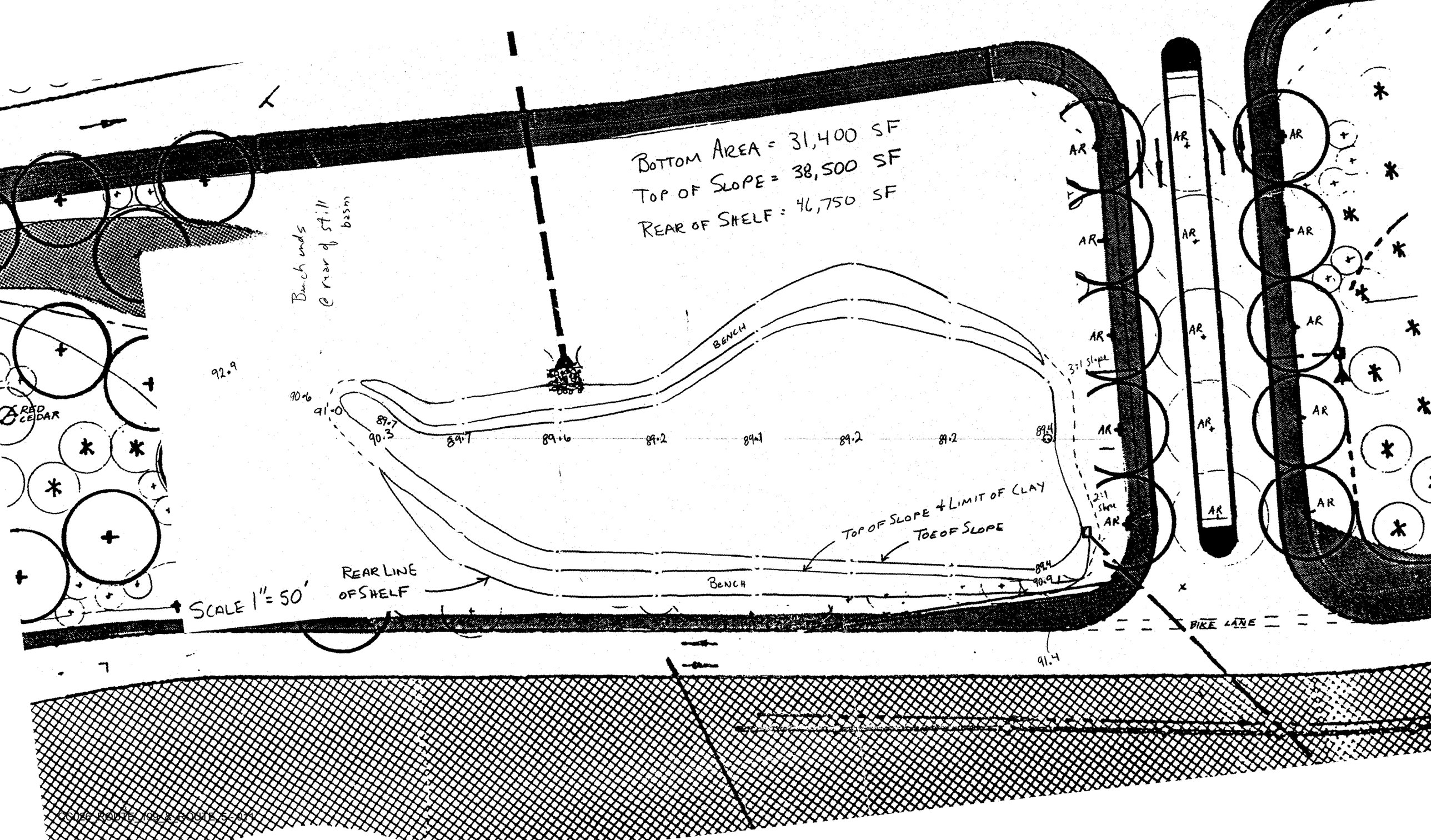

MEDIAN PLANTING TYPICAL OF PREVIOUS TYPE
BOTTOM AREA = 31,400 SF
TOP OF SLOPE = 38,500 SF
REAR OF SHELF = 46,750 SF
Bushands @ rear of still basin
92.9
90.6
91.0
89.7
90.3
89.7
89.6
89.2
89.1
89.2
89.2
89.4
89.4
90.9
91.4
BENCH
BENCH
3:1 Slope
2:1 Slope
AR
SCALE 1"=50'
REAR LINE OF SHELF
TOP OF SLOPE + LIMIT OF CLAY
TOE OF SLOPE
BIKE LANE
Scale 1"=50'
ROUTE 61 RELOCATED

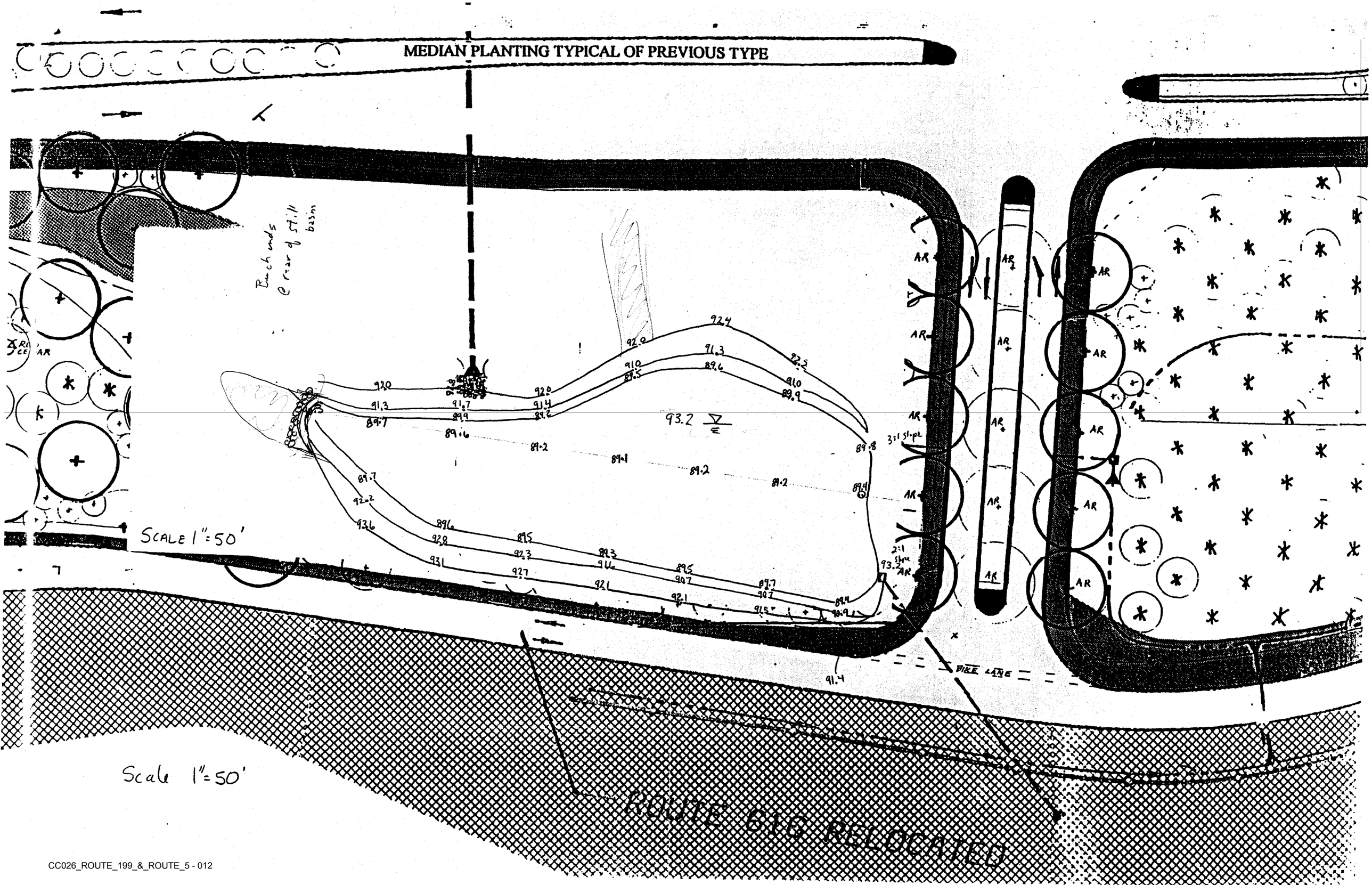

MEDIAN PLANTING TYPICAL OF PREVIOUS TYPE
Bushands
@ rear of ST. 11
basin
RED CEDAR
90.3
89.7
89.6
89.2
89.1
89.2
89.2
89.4
89.4
90.9
91.4
3:1 slope
2:1 slope
AR
BIKE LANE
Scale 1"=50'
ROUTE 61C RELOCATED

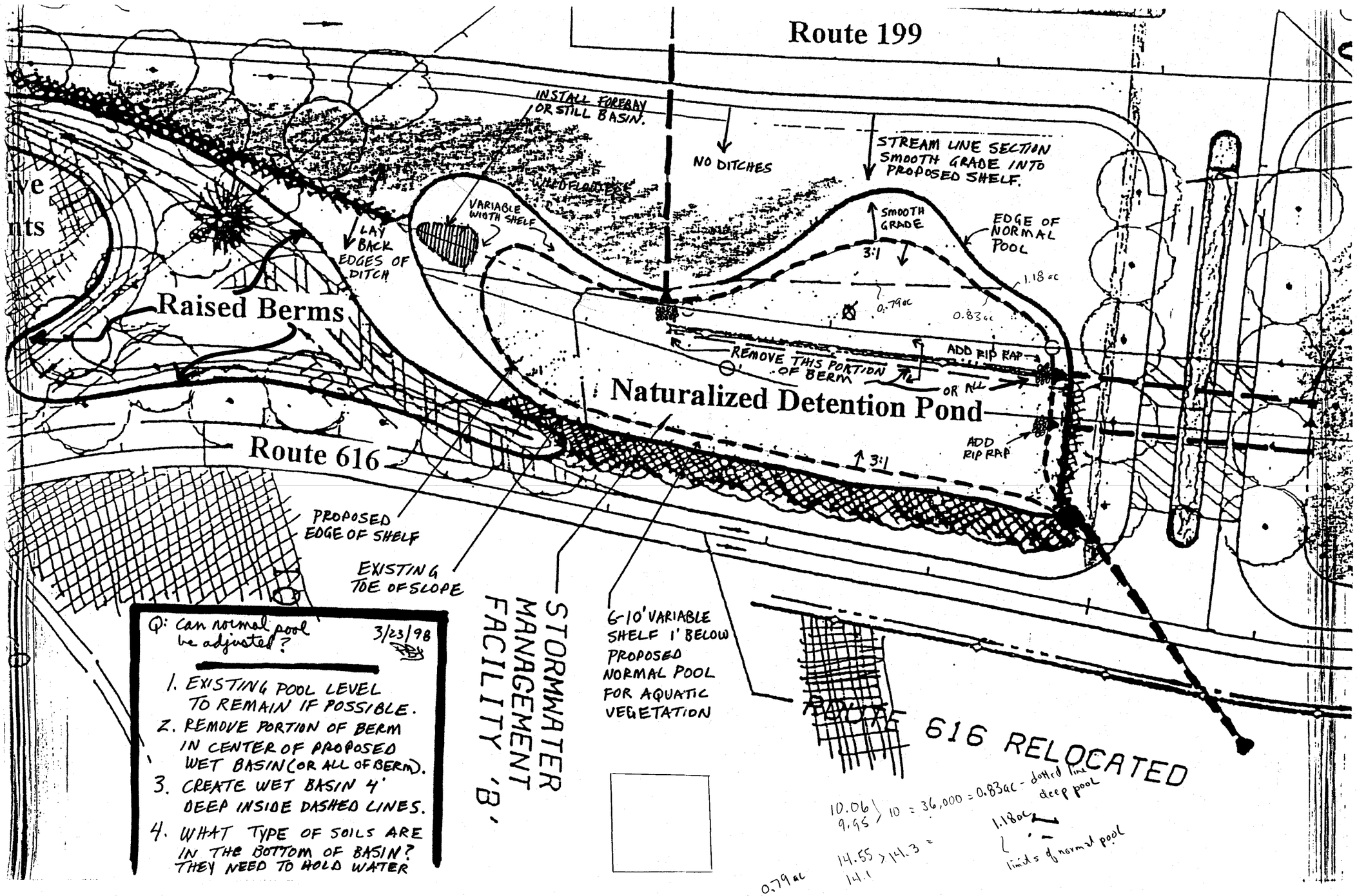

MEDIAN PLANTING TYPICAL OF PREVIOUS TYPE
RED CEDAR
AR
BIKE LANE
ROUTE 616 RELOCATED


DETENTION POND - .75 ACRES/3.3 ACRE FEET OF STORAGE
STILL BAY
DRAIN INLET
12-TD
3-BN
3-BN
SB
SB
AR
3:1
2:1
93.2
94.62
Pipe 3.0
91.62
Toe Flags
BIKE LANE
7.12 - Inupe
1.4 - edge
1.55 grate
Start of curve
ROUTE 610 RELOCATED
1"=60'
Bottom - 31,465
31,387
31,425 = 0.72 ac
Start Bench 38,634
38,517
38,500 = 0.88ac
Top Bench 46,694
46,750 = 1.07
94.62
1.40
93.22
7.12
87.5-
94.62 - HI


Bench ends @ rear of settling basin
RED CEDAR
SCALE 1" = 50'
AR
3:1 slope
2:1 slope
93.2
BIKE LANE
92.0
91.3
90.3
89.7
91.7
89.9
89.6
91.4
89.2
92.4
91.0
89.5
89.6
92.5
89.9
89.8
89.1
89.4
92.2
93.6
89.6
92.8
93.1
89.5
92.3
92.7
89.3
91.6
92.1
89.5
90.7
91.5
89.7
90.7
90.9
91.4


BOTTOM AREA = 31,400 SF
TOP OF SLOPE = 38,500 SF
REAR OF SHELF = 46,750 SF
Bench ends @ rear of still basin
BENCH
3:1 slope
2:1 slope
TOP OF SLOPE + LIMIT OF CLAY
TOE OF SLOPE
REAR LINE OF SHELF
BENCH
SCALE 1" = 50'
BIKE LANE
RED CEDAR
AR
92.9
90.6
91.0
89.7
90.3
89.7
89.6
89.2
89.1
89.2
89.2
89.4
89.4
90.9
91.4


MEDIAN PLANTING TYPICAL OF PREVIOUS TYPE
Bench marks @ rear of still basin
SCALE 1"=50'
Scale 1"=50'
3:1 slope
2:1 slope
BIKE LANE
AR
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

10.06 / 9.95 > 10 = 36,000 = 0.83ac - dotted line deep pool

1.18ac limits of normal pool

14.55 > 14.3 = 14.1

9.5 - 0.79 ac area inside dotted line - original config.

1.2 - 0.8

0.4 x 1' = 0.4 acft

.8 x 4' = 3.2 acft

3.6 acft

4 acft

8 1/3 ac per acft storage

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
   Material Cost = $0.20/SF
   Surface Area = 43,560 × 1.15 = 50,094 SF
   Placement = $5000
   EARTHWORK = 50,000 CF / 27 = 1855 SY × $5/SY = $9276
   SHIPPING - $400

   TOTAL COST = 0.2 × 50,000 + 5000 + 9300 + 400 = $24,700
   [revise earthwork to $2100 ⇒ price = $17,500

   b) Bentomat - ST

   Surface Area = 45,000 SF
   Delivered + Installed - $1/SF
   EARTHWORK - 45,000 SF/27 = 1667 SY × $5/SY = $8330
   COST = $1 × 45,000 + 8330 = $53,330

3. Clay Material
   line 38,500 ft³ w/ 6 inches of clay ($10^{-6} - 10^{-7}$) material
   say 800 cyds of material -
   800 cy × $5/cyd = $4000
   Remove 800 cyd sand - $4000
   EARTHWORK - 3 day × 10 hr/day × $70/hr = $2100
   TOTAL = $10,100

4. Bentonite -
   $413.64/3000 lb Super Sack
   3 lb/SF × 38,500 sf × $\frac{413.64}{3000}$ = $15,925 PLACEMENT - Disking, Spreading

FLOW ANALYSIS FOR PRE-DEVELOPMENT AND POST-DEVELOPMENT CONDITIONS

MMM DESIGN GROUP
ARCHITECTS + ENGINEERS + PLANNERS

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+sqr(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 = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

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

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*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

MMM DESIGN GROUP ARCHITECTS + ENGINEERS + PLANNERS	DESIGN ANALYSIS ☐ BUDGET ☐ PRELIMINARY ■ FINAL ☐ OTHER	SHEET NO: ____ OF: ____ JOB NO: 06429.00
PROJECT NAME: ROUTE 199 0199-047-F03, RW-206, C-504		DEPARTMENT: CIVIL SHEET NO: OF:
PROJECT PART: DRAINAGE DESIGN		COMPUTED BY: KWH DATE: 11-3-95
SPEC. DIVISION: EMERGENCY OVERFLOW DESIGN		CHECKED BY: DATE:

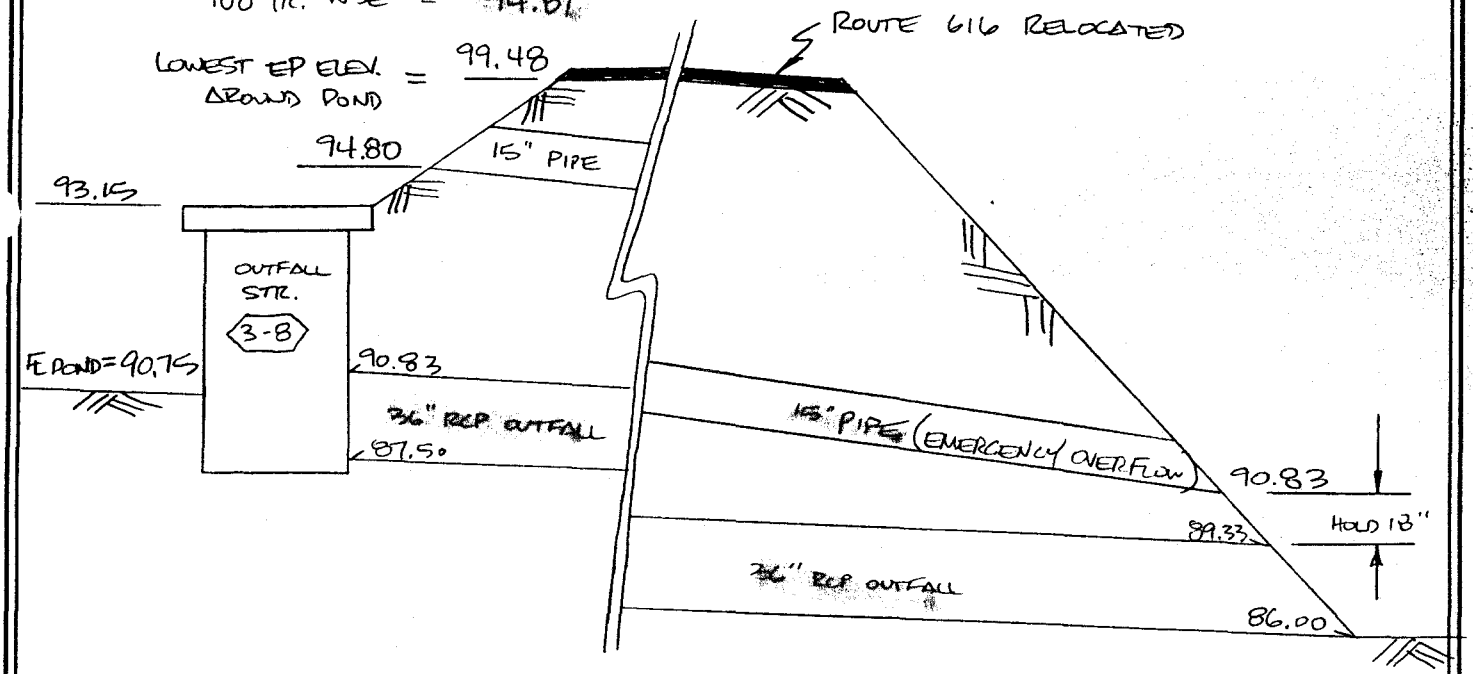
RELEVANT ELEVATIONS:

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



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

APPROXIMATE VOLUME @ ELEV. 99.48 = 404,500 CF
15" RCP Q_{MAX} ≈ 10.2 cfs ∴ APPROXIMATE DRAWDOWN = 11 HOURS
15" CMP Q_{MAX} ≈ 7.5 cfs ∴ APPROXIMATE DRAWDOWN = 15 HOURS
(ASSUMING SWM OUTFALL STRUCTURE 100% PLUGGED)

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

FRM054.DE

MMM Design Group

STORMWATER MANAGEMENT OUTFALL STRUCTURE CALCULATIONS

WATER SURFACE ELEVATION	ORIFICE-CIRCULAR DIA.(in) 3.00 INV. EL.(ft) 90.75		NO OPENING			DI-7 3' X 3.5' RIM EL. (ft) 93.15		TOTAL Q W/ NON CLOGGED ORIFICE	TOTAL Q WITH CLOGGED ORIFICE	REMARKS
FEET	HEAD (ft)	Q(CFS)	HEAD (ft)	Q(CFS)		HEAD (ft)	Q(CFS)	CFS	CFS	
90.75										
91.00	0.25	0.12						0.12		
91.50	0.75	0.21						0.21		
92.00	1.25	0.27						0.27		
92.50	1.75	0.32						0.32		
93.00	2.25	0.36						0.36		
93.15	2.40	0.37						0.37		
93.50	2.75	0.40				0.35	5.37	5.77	5.37	2 YR (93.57)
94.00	3.25	0.43				0.85	29.99	30.42	29.99	10 YR (93.89)
94.50	3.75	0.47				1.35	37.59	38.05	37.59	25 YR (94.16)
95.00	4.25	0.50				1.85	43.86	44.36	43.86	100 YR (94.81)
95.50	4.75	0.52				2.35	49.32	49.84	49.32	
96.00	5.25	0.55				2.85	54.21	54.76	54.21	
96.50	5.75	0.58				3.35	58.68	59.25	58.68	
97.00	6.25	0.60				3.85	62.82	63.42	62.82	
97.50	6.75	0.62				4.35	66.69	67.31	66.69	
98.00	7.25	0.65				4.85	70.34	70.99	70.34	

* Indicates ORIFICE flow condition

H.B. INC.

Jimmy Thompson (229-2504)

1165 C. YRDS OUT

1750 C YRDS IN

$51,625.00

CC026

DRAINS TO COLLEGE CREEK

MMM DESIGN GROUP
ARCHITECTS + ENGINEERS + PLANNERS

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 & EXCERPT 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.

JAMES CITY COUNTY FAX FORM

Name: JIMMY THOMPSON
Firm or Company: HSB INC
Facsimile Number: 220-0390
Number of pages including this transmittal: 3
From: PAT MENICHINO

James City County
P.O. Box 8784
Williamsburg, Virginia 23187-8784
Office Phone: 757-253-6675
Fax Number: 757-253-6850

Comments: JIM,
ANY QUESTIONS? PLEASE CALL ME OR DARRYL COOK

THANKS,
PAT

Date:

Time:

If you do not receive all pages, call 757-253-6671 as soon as possible

TRANSACTION REPORT

Transmission
Transaction(s) completed

NO.	TX DATE/TIME	DESTINATION	DURATION	PGS.	RESULT	MODE
945	NOV. 30 9:40	95668874	0° 01' 19"	003	OK	N ECM

JAMES CITY COUNTY FAX FORM

Name: Billy Taylor
Firm or Company: Tomes Contractors
Facsimile Number:
Number of pages including this transmittal: 3
From: Darryl Cook

James City County
P.O. Box 8784
Williamsburg, Virginia 23187-8784
Office Phone: 757-253-
Fax Number: 757-253-6850

Comments: Please sign + return - I need to get your schedule for beginning work as soon as I can.

Date:

If you do not receive all pages, call 757-253-6671 as soon as possible

ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical • Construction Materials • Environmental

OCT 1998
RECEIVED
ENVIRONMENTAL DIVISION

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 ±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

COMMONWEALTH OF VIRGINIA
MARK L. JENKINS
NO. 26153
PROFESSIONAL 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

OCT 1998
RECEIVED
ENVIRONMENTAL DIVISION

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.

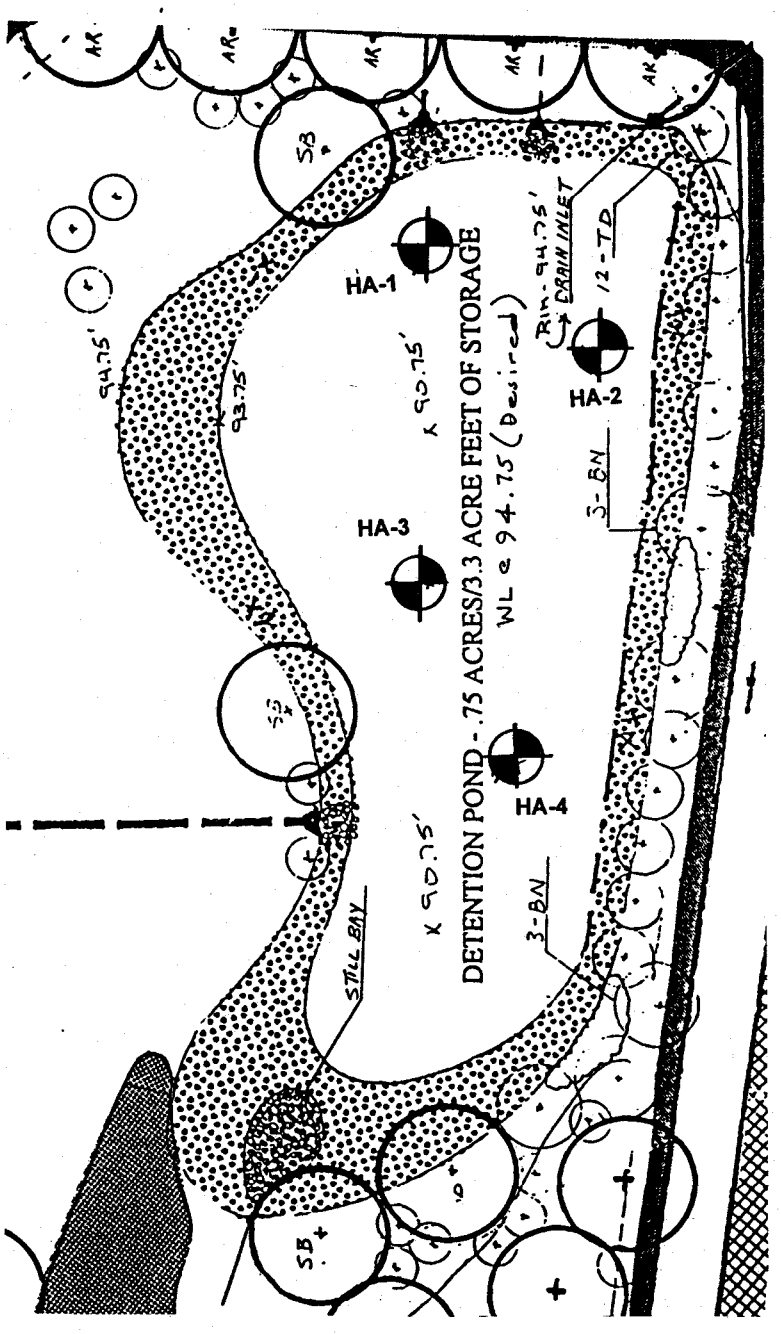
Mark L. Jenkins

COMMONWEALTH OF VIRGINIA
MARK L. JENKINS
NO. 26153
PROFESSIONAL ENGINEER

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



ECS LTD

ENGINEERING CONSULTING SERVICES, LTD.

814 Greenbrier Circle
Suite A
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
	4.25
	4.5
	4.75
	5
	5.25
	5.5
	5.75
End of Hand Auger at 4 Feet	**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
	5.25
	5.5
	5.75
End of Hand Auger at 1.5 Feet	**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**
	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**
End of Hand Auger at 1.5 Feet	

814 Greenbrier Circle
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 3
White, Moist, Fine to Medium SAND (SP-SM), Trace Coarse Sand and Fine to Medium Gravel	3.25 3.5 3.75 4
	4.25 4.5 4.75 5
	5.25 5.5 5.75 6
End of Hand Auger at 4 Feet	

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

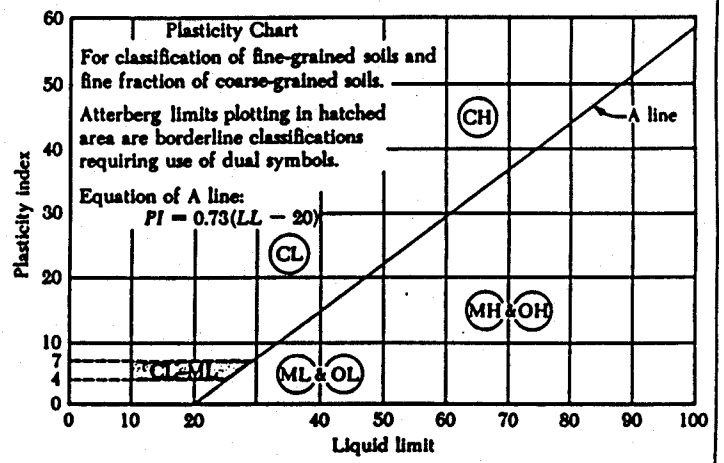
UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

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	Silts 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
	Silts 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	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 $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ 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 $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ 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.

Reprinted from the Annual Book of ASTM Standards

Engineering Consulting Services, Ltd.

FIELD DENSITY TEST - NUCLEAR METHOD
ASTM D - 2922

PROJECT: BMP @ 199+5 JOB NO.: N3036

SUBJECT: NUCLEAR FIELD DENSITY TESTS DATE: 12-5-98

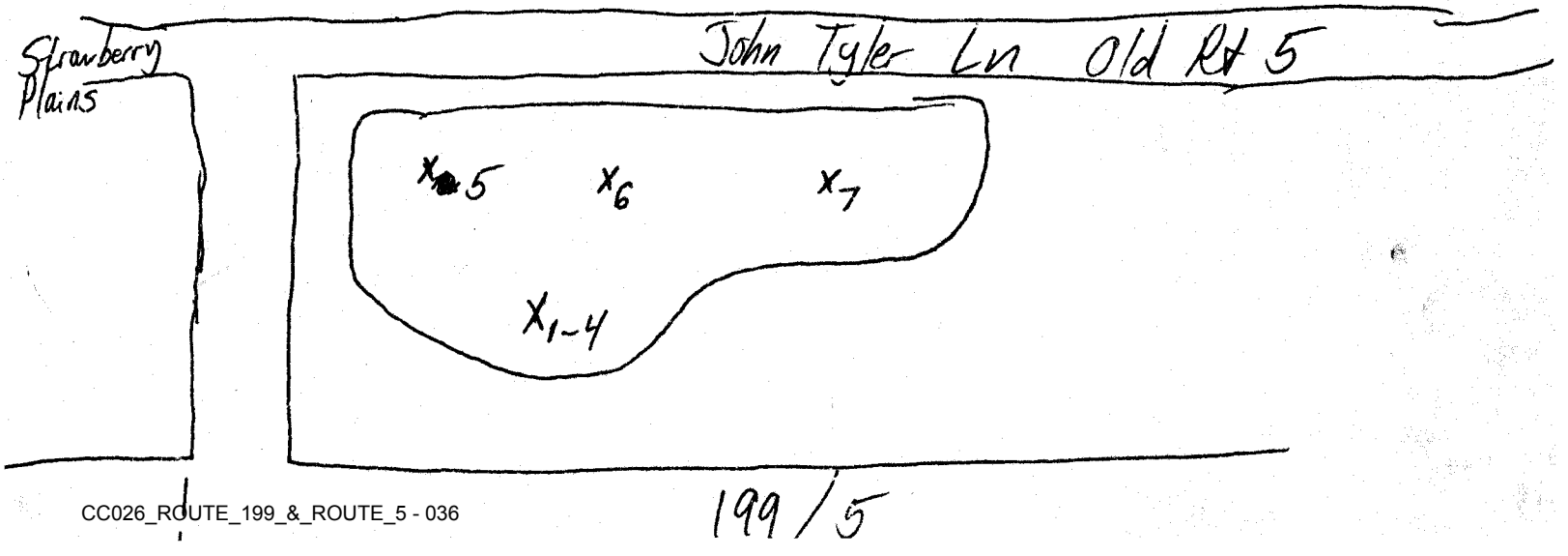
STANDARD COUNTY DENSITY _____ STANDARD COUNT MOISTURE _____

CONTRACTOR: Tomo CLIENT: JCC TECH: Baker

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 X

Arrive Job 2:15PM

Depart Job 2:45PM

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 staff geologist and P.E.

☐ Deficiency Needing Correction

(INDICATE NORTH ON ALL SKETCHES)

Copy Received By: Site Representative Mark Emerson
James City County

Title/Company

By JC Barnett III, EIT
ENGINEERING CONSULTING SERVICES, LTD.

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	WADE'S T-4 T-5 T-6 H & A HAULING HUDNALL'S HAUL C & K E. PRYOR 1 - T-4 1 - WADE'S 1 - E. PRYOR 1 - C & K 1 - HUDNALL'S 1 - H & A 1 - T-5 7	1 - H & A 7:40 AM 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 14

DATE	TRUCKS IN	TRUCKS OUT
12/3/98	1 - T-4	1 - T-4
	1 - WADE'S	1 - WADE'S
	1 - E. PRYOR	1 - E. PRYOR
	1 - C & K	1 - C & K
	1 - HUDNALL'S	1 - HUDNALL'S
	1 - H & A	1 - H & A
	1 - T-5	1 - T-5
	1 - T-4	1 - WADE'S
	1 - T-6 16	1 - E. PRYOR
	1 - T.S	1 - C & K
	1 - T-4	1 - T-4
	1 - T-6	1 - T-6 26
	1 - T-5 20	1 - HUDNALL
	1 - E.PRYOR	1 - H & A
	1 - C & K	1 - WADES
	1 - HUDNALL	1 - T-5
	1 - T-4	1 - E-PRYOR 30
	1 - T-6 25	1 - C & K
		1 - HUDNALL
		1 - T-4
		1 - T-6
		1 - WADE 35
		1 - H & A
		1 - T-5
		1 - C & K
	11:27 AM	1 - HUDNALL
		1 - T-4 40

UPDATE

WALTRIPS MACHINE
WILL BE AT LANDFILL
TO PUSH UP STOCKPILE
RIGHT AFTER LUNCH
TODAY. 12/3/98
CALL FROM TIMMY
WALTRIP

5 mpdlg
3 cutters

DATE	TRUCKS IN (BROUGHT FORWARD 25)		TRUCKS OUT (BROUGHT FORWARD 40)	
12-3	1 - WADES		1 - T-6	
	1 - H & A		1 - H & A	
	1 - T-5		1 - T-5	
	1 - E. PRYOR		12:00 NOON ROUND TRIP 47 MIN 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		[redacted] 1 C & K	
	1 - T-4		1 - HUNNALLS	
	1 - T-5	35	1 - T-6	50
	1 - T-4		1 H + A	
	1 - Hudnalls		1 Pryor	
	1 - T6		1 WADE 1:00	
	1 - H+A		1 - T-5	
	1 - Pryor	40	1 - T-4	55
	1 - WADE 1:40		1 - C+K	
	1 - T-5 1:43		1 - Hudnalls	
	1 - T-4 1:45		1 - T6	
	1 - T-6 2:00		1 - C+K 1:40	
	1 - C+K 2:15	45	1 - H+A	60
			1 - Pryor	
			1 - WADE 1:54	
			1 - T-5	
			1 - Hudnalls 2:00	
			1 - T-4	65

DATE	TRUCKS IN		45	TRUCKS OUT		65
12-3-98	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 Hudnalls		
	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			1 - C+K		
	1 - T-6		55	1 - T-5		75
	1 - E. Pryor			1 - T-4		
	1 - H & A			1 - Hudnalls		
	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	1 - HUDNALL	7:42	1
	1 - T-6		1 - C & K		
	1 - T-5		1 - H & A		
	1 - T-5		1 - WADE'S		
	1 - T-4	5	1 - T-4	ON TOP OF BANK FOR TUBOCH	5
	1 - WADES		1 - T-4		
	1 - T-5		1 - HUDNALLS		
	1 - T-5		1 - C & K		
			1 - H & A		
		10	1 - WADE'S		10
			1 - T-5		
			1 - T-4	8:40	
			1 - HUDNALL		
			1 - C & K		
		15	1 - H & A	9:00	15
			1 - WADES		
			1 - T-5		
			1 - HUDNALL		
			1 - T-4	BURGER KING	
		20	1 C & K		20
			1 - H & A		
			1 - T-4	BURGER KING	
			1 - T-4	BURGER KING	
			1 - HUDNALL		
		25	1 - T-4	B.K.	25
			1 - WADES		
			1 - T-4	B.K.	

LOADS TO UPPER END OF BMP

DATE	TRUCKS IN (78 + ↓)	BROUGHT FORWARD 8	TRUCKS OUT (102 + ↓)	BROUGHT FORWARD 27
12-4-98	1-H&A		1 T-5	
	1-WADES	10	1 C&K	
	1-T-5		1-H&A	30
	1-C&K		1-T-4 B.K.	
	1-H&A		1-HUDNALLS	
	1-WADES		1-T-4 B.K	
	1-T-5	15	1-T-6 B.K.	
	1 C&K		1-WADES	35
	1 H&A		1-T-5	
	1 T-4		1-T-4 B.K.	
	1 T-6		1-T-6 B.K.	
	1-T-5	20	1-C&K	
	1-H+A		1-T-4 B.K	40
	1 C&K		BK [redacted] 1-T-6	
	1 T-4		1-H&A	
			1-T-4	
		25	1-WADES	
			1-T-5	45
			1-C&K	
			1-H&A	
			1-T-4	
			1-WADE	
			1-T-6 (top of bank)	50
			1-T-5	
			1-T-6 (top of bank)	
			1-H&A	
			1 C&K	

[redacted]

78

102

5 TO UPPER FENT OF BMP CARRIED ROKWARD

DATE	TRUCKS IN (23)		TRUCKS OUT (54)	
12-4-98	1- WADES		1- T-4	55
	1- T-5	25	1- T6- TO TOP OF BANK	
	1- C+K		1- WADES	
	1- H+A		1- T-6 TOP OF BANK	
	1- T4		1- T6 TOP OF BANK	
	1- T5 (1:48)	30		
	1- T6 (1:54)		TOTAL TODAY 59	
	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)		12/2/98 13	
	1- T-6 (2:17)		12/3/98 89	
	1- H+A (2:29)		12/4/98 40	
	1- C+K 2:33		19 (HORNE/TOBOCH)	
	1- T-4 2:33	40		
	1- T-5 2:38		TOTAL 161	
	1 T-6		TOTAL	
	1 H&A 2:54			
	1 T-4			
	1 C&K	45		
	1 T-5 3:03			
	1 T-6 3:12			
- 126 TOTAL TOT.	1 H&A 3:18			
	1 T-4			
	1 C+K 3:20	50		

[redacted] 66
78
144

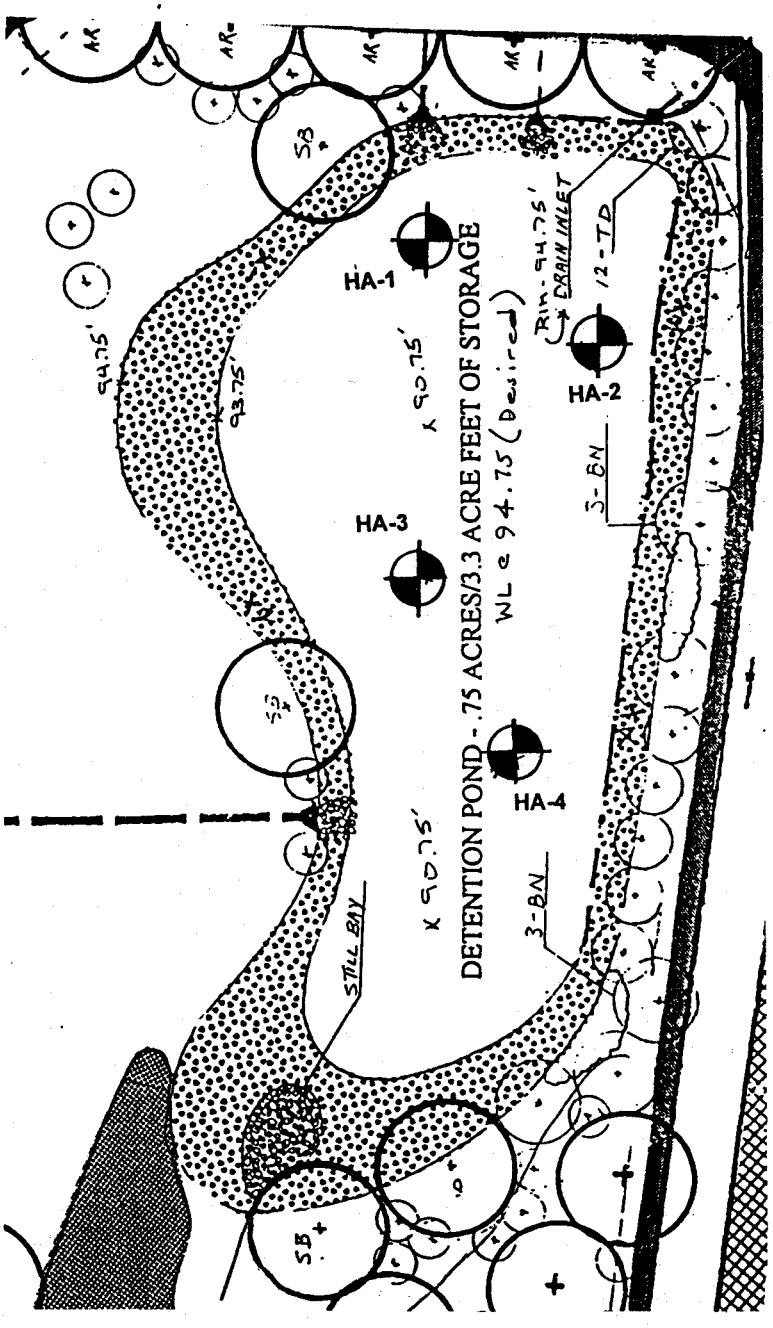
DATE		TRUCKS IN			TRUCKS OUT
12-4	129	1 T-5	3:31		
		1 T-6	3:38		
		1 H & A			
		1 T-4			
Total Total	133	1 - C & K		55	TOTAL OUT
	134	1 - T-6	4:02		12/2 13
		1 - H + A	4:08		12/3 89
		1 T-4	4:12		12/4 40
	137	1 - C+K	4:26		12/4 19 - Hauled Tubcals
		1 - T-6	4:30	60	
		1 H + A	4:36		161
	140	1 T-4	4:36		
		1 C + K	4:58		
		1 T-6	4:58		
	143	1 H + A	5:00	65	
	144	1 T-4	5:02		
				70	

WE STILL NEED
2 LOADS Topsoil
at Burger King

TDD 144

DATE	TRUCKS IN		TRUCKS OUT	
12/5/98 145	1 T-5	7:50		
	1 T-4			
	1 T-6			
	1 T-5	8:14	12/2	13
	1 T-4	8:15	12/3	89
150	1 T-6	8:18	12/4	40
	1 T-5	8:33	12/4	19 - HORNE/TUBOCH
	1 T-4			
	1 T-6	8:39	161	
	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	10:06		
	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		

2 Loads Topsoil



ENGINEERING CONSULTING SERVICES, LTD.

814 Greenbrier Circle
Suite A
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**
	4.25 4.5 4.75 **5**
	5.25 5.5 5.75 **6**
End of Hand Auger at 4 Feet	

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**
	5.25 5.5 5.75 **6**
End of Hand Auger at 1.5 Feet	

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**
	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**
End of Hand Auger at 1.5 Feet	

814 Greenbrier Circle
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 **3**
White, Moist, Fine to Medium SAND (SP-SM), Trace Coarse Sand and Fine to Medium Gravel	3.25 3.5 3.75 **4**
	4.25 4.5 4.75 **5**
	5.25 5.5 5.75 **6**
End of Hand Auger at 4 Feet	

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

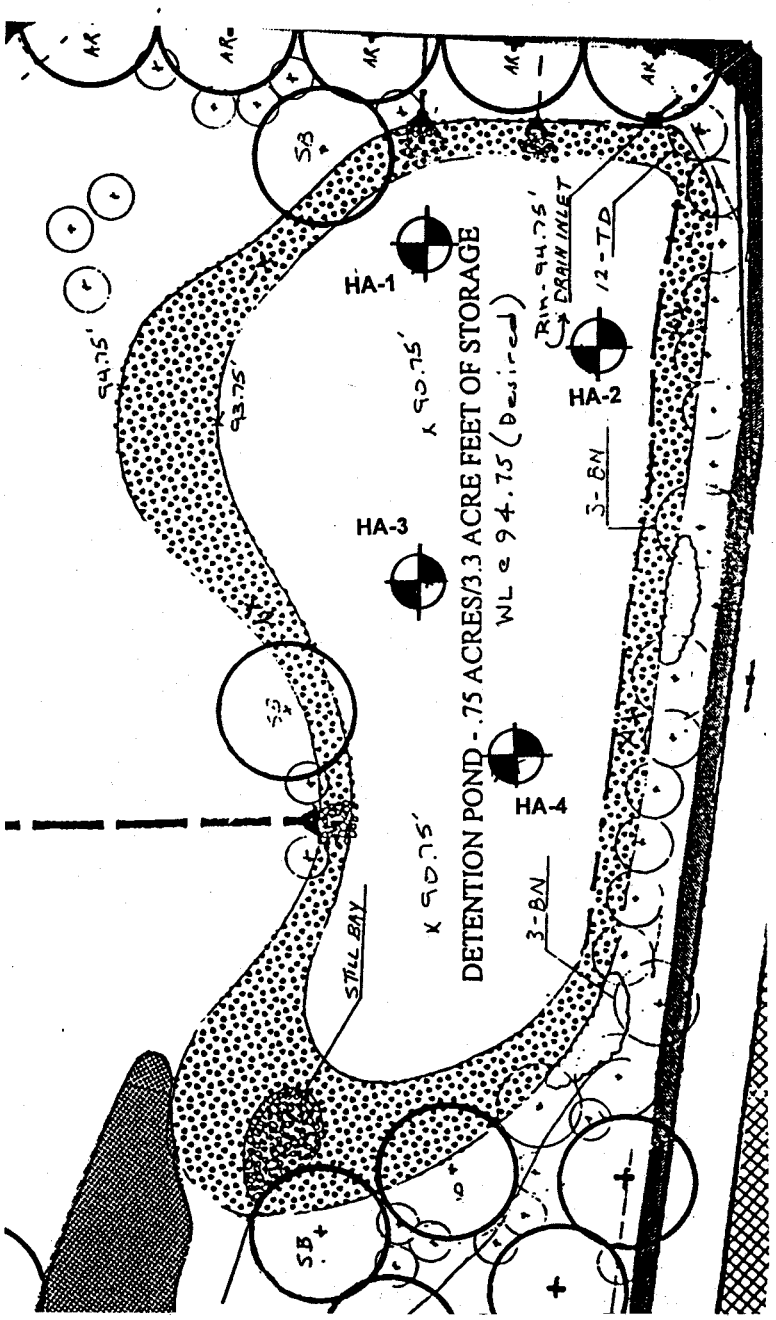
LABORATORY TEST SUMMARY

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



ENGINEERING CONSULTING SERVICES, LTD.

814 Greenbrier Circle
Suite A
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

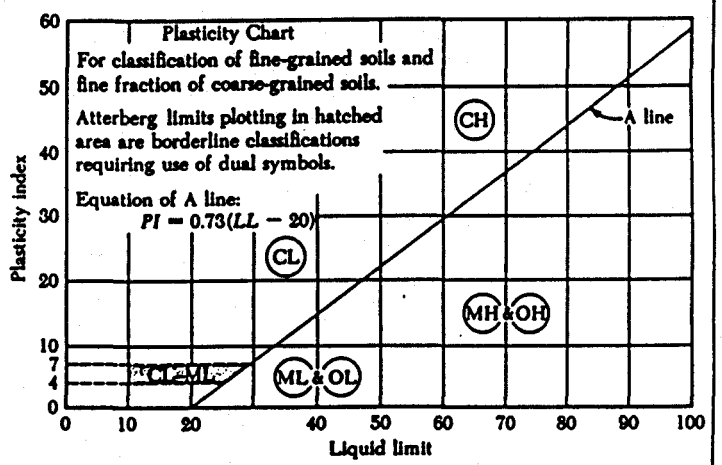
UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

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	Silts 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
	Silts 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	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.

Reprinted from the Annual Book of ASTM Standards

Engineering Consulting Services, Ltd.

ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical • Construction Materials • Environmental

September 28, 1998

OCT 1998
RECEIVED
ENVIRONMENTAL DIVISION

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 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	$	195.00
	Engineering Services Subtotal:	**$**	**195.00**
	ESTIMATED TOTAL COST, ALL SERVICES:	**$**	**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

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

LIMITED ACCESS HIGHWAY By Resolution of Commonwealth Transportation Board dated _____

CERTAIN FEATURES PERTINENT TO CONSTRUCTION OR TO POPULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT.

DATE	FHWA REGION	STATE	FEDERAL AID PROJECT	ROUTE	STATE PROJECT	SHEET NO.
10-27-95	3	VA.		199	0199-047-103, RW-206, C-504	3J(2)

℄ ROUTE 5 RELOC.	℄ ENTRANCE TO PARCEL 126
Δ = 3°53'11" RT	Δ = 29°26'48" LT
D = 4.78411°	D = 63.66193°
T = 335.94'	T = 16.22'
L = 747.03'	L = 32.09'
R = 1202.44'	R = 90.00'
P.C. = 630+00.00	P.C. = 1+85.59
P.I. = 635+85.99	P.I. = 2+01.80
P.C.C. = 639+47.98	P.T. = 2+17.68

DENOTES CURB INLET SILT TRAP (D.I.S.T.)

TYPE 'B' DITCH W/ STD. EC-3, (TYPE 'A')

TYPE 'D' DITCH

TYPE 'A' MEDIAN DITCH W/STD. EC-3 (TYPE 'A')

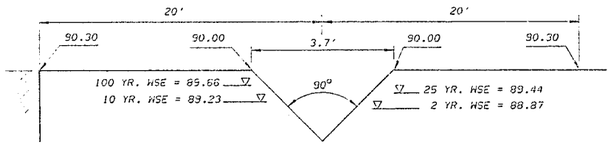
REFERENCES (PROFILES, DETAIL & DRAINAGE DESCRIPTION SHEETS, ETC.)	
ROUTE 199	3C
DITCH SECTIONS	2P,2P(1)
DRAINAGE DATA	2K(1)
SWMF 'A' DETAILS	2W(3)
ENTRANCES	3K

C — — DENOTES CONST. LIMITS IN CUT

F — — DENOTES CONST. LIMITS IN FILL

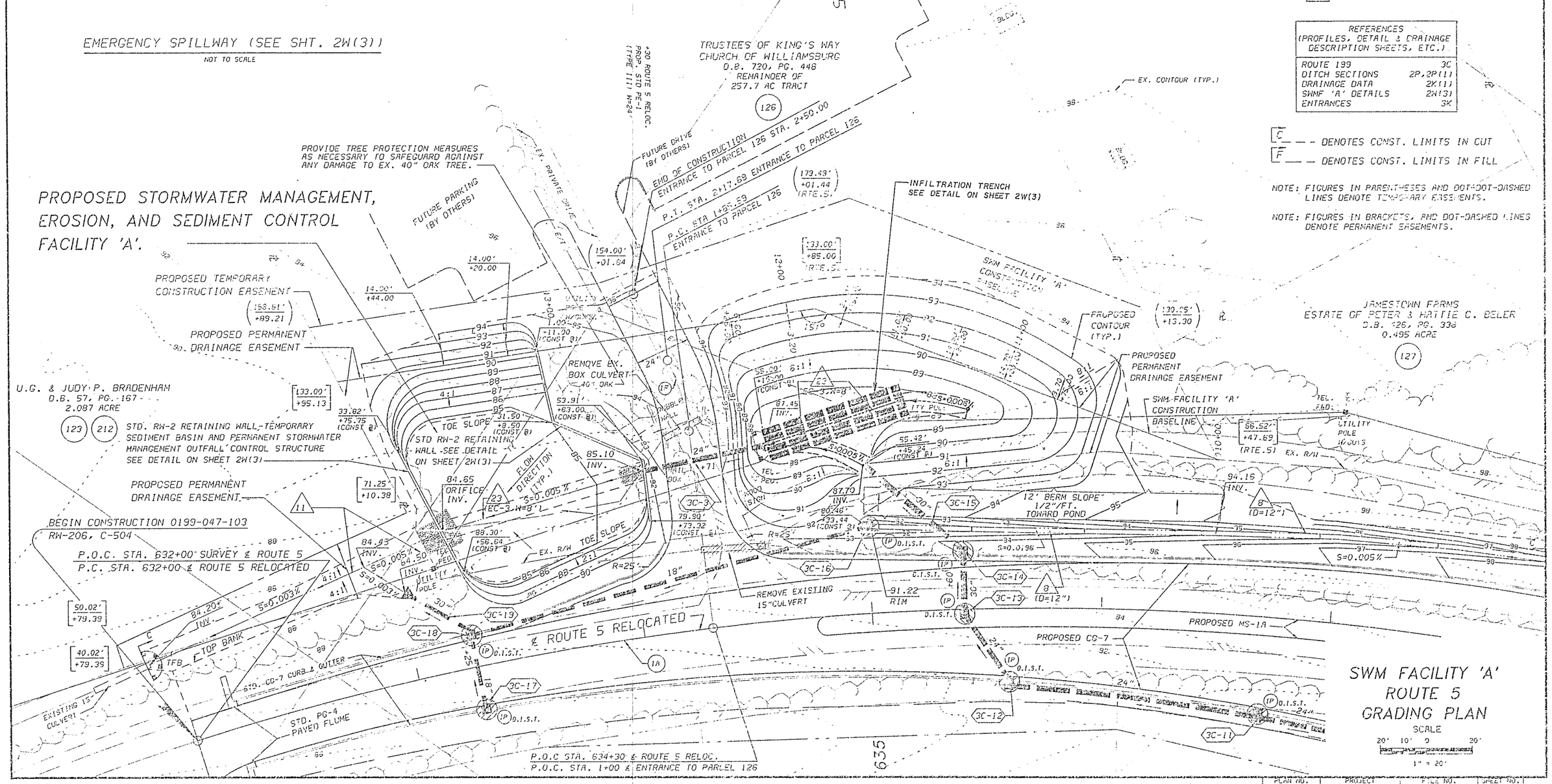
NOTE: FIGURES IN PARENTHESES AND DOT-DOT-DASHED LINES DENOTE TEMPORARY EASEMENTS.

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



EMERGENCY SPILLWAY (SEE SHT. 2W(3))

NOT TO SCALE



SUPERVISED BY E.M. White

DESIGNED BY MMM Design Group

REVISED BY

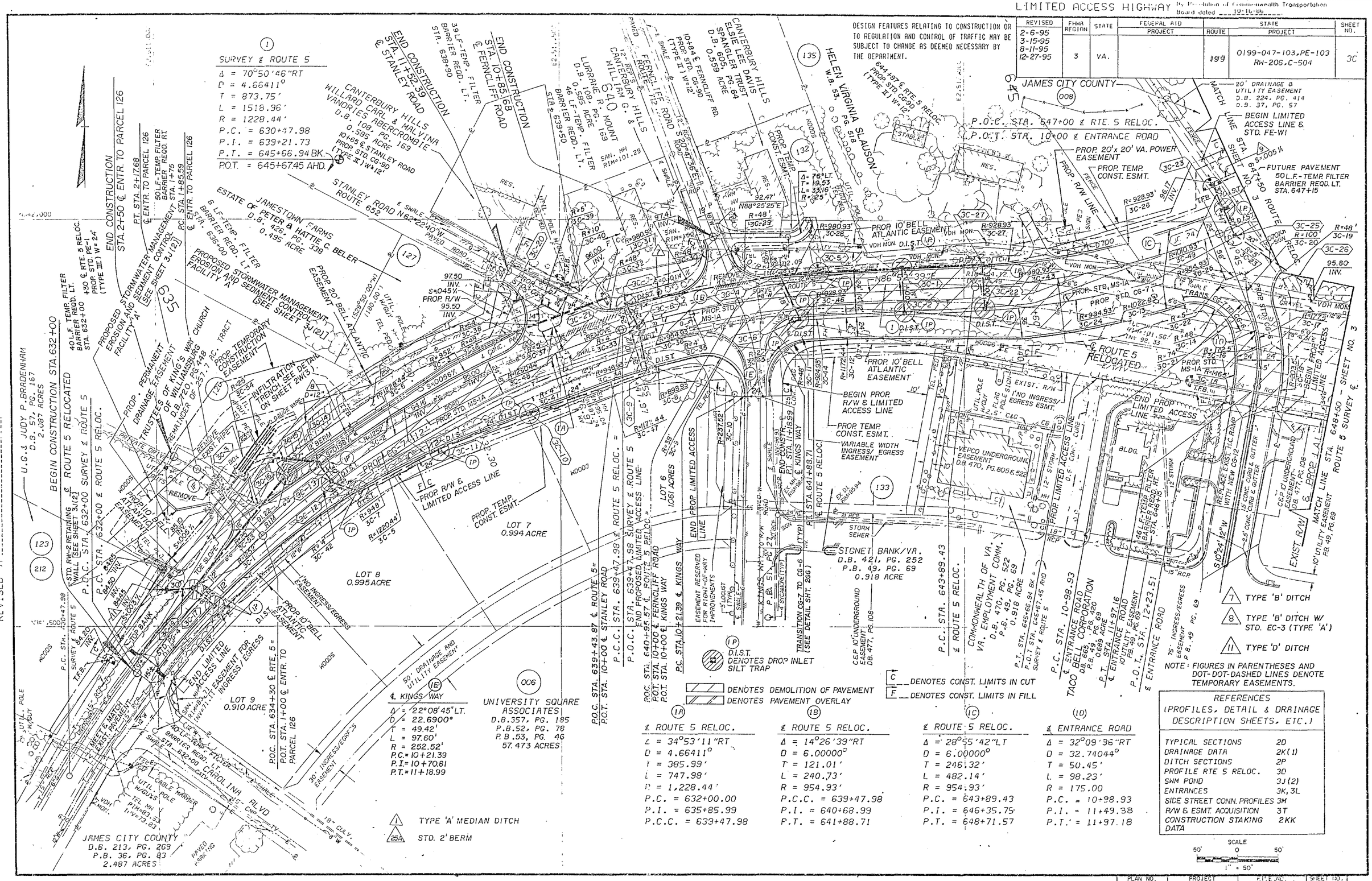
PLAN NO.	PROJECT	PLAN NO.	SHEET NO.
A	0199-047-103	73-14.1	3J(2)

CC026_ROUTE_199_&_ROUTE_5 - 068

LIMITED ACCESS HIGHWAY By Resolution of Commonwealth Transportation Board dated 10-16-86

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
2-6-95 3-15-95 8-11-95 12-27-95	3	VA.		199	0199-047-103, PE-103 RW-206, C-504	3C

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



REFERENCES (PROFILES, DETAIL & DRAINAGE DESCRIPTION SHEETS, ETC.)

TYPICAL SECTIONS	2D
DRAINAGE DATA	2K(1)
DITCH SECTIONS	2P
PROFILE RTE 5 RELOC.	3D
SWM POND	3J(2)
ENTRANCES	3K, 3L
SIDE STREET CONN. PROFILES	3M
R/W & ESMT. ACQUISITION	3T
CONSTRUCTION STAKING DATA	2KK

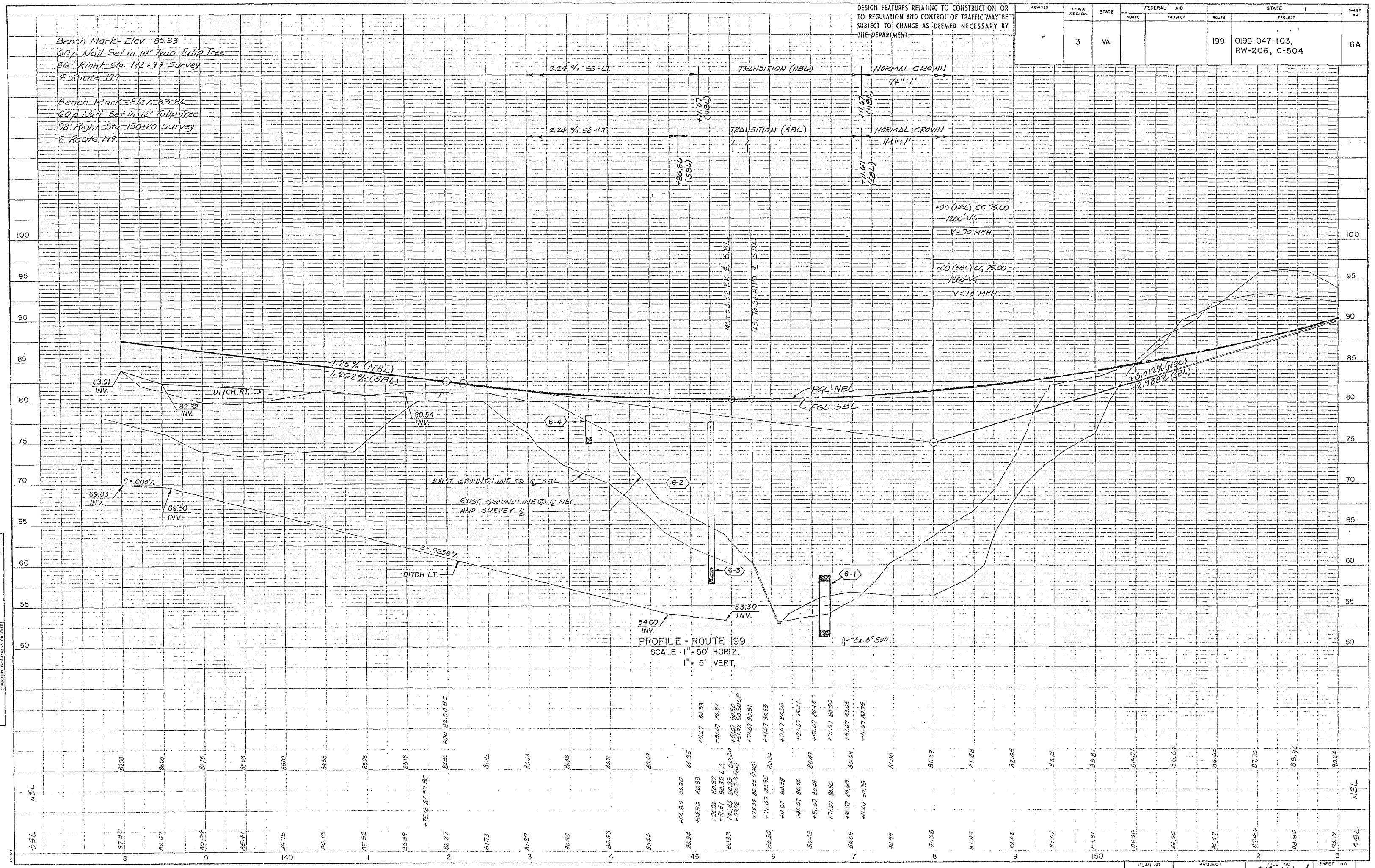
PLAN NO.	PROJECT	FED. NO.	SHEET NO.
	0199-047-103	75-14-1	3C

CC026_ROUTE_199_&_ROUTE_5 - 069

LIMITED ACCESS HIGHWAY By Resolution of Commonwealth Transportation Board dated 10-16-86.

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

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



PROFILE
NOTE BOOK
SURVEYED
PLOTTED
GRADES COMPUTED
B.M.'S PLOTTED
STRUCTURE NOTATIONS CHECKED
BY:
DATE:

VDOT No. 6014

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

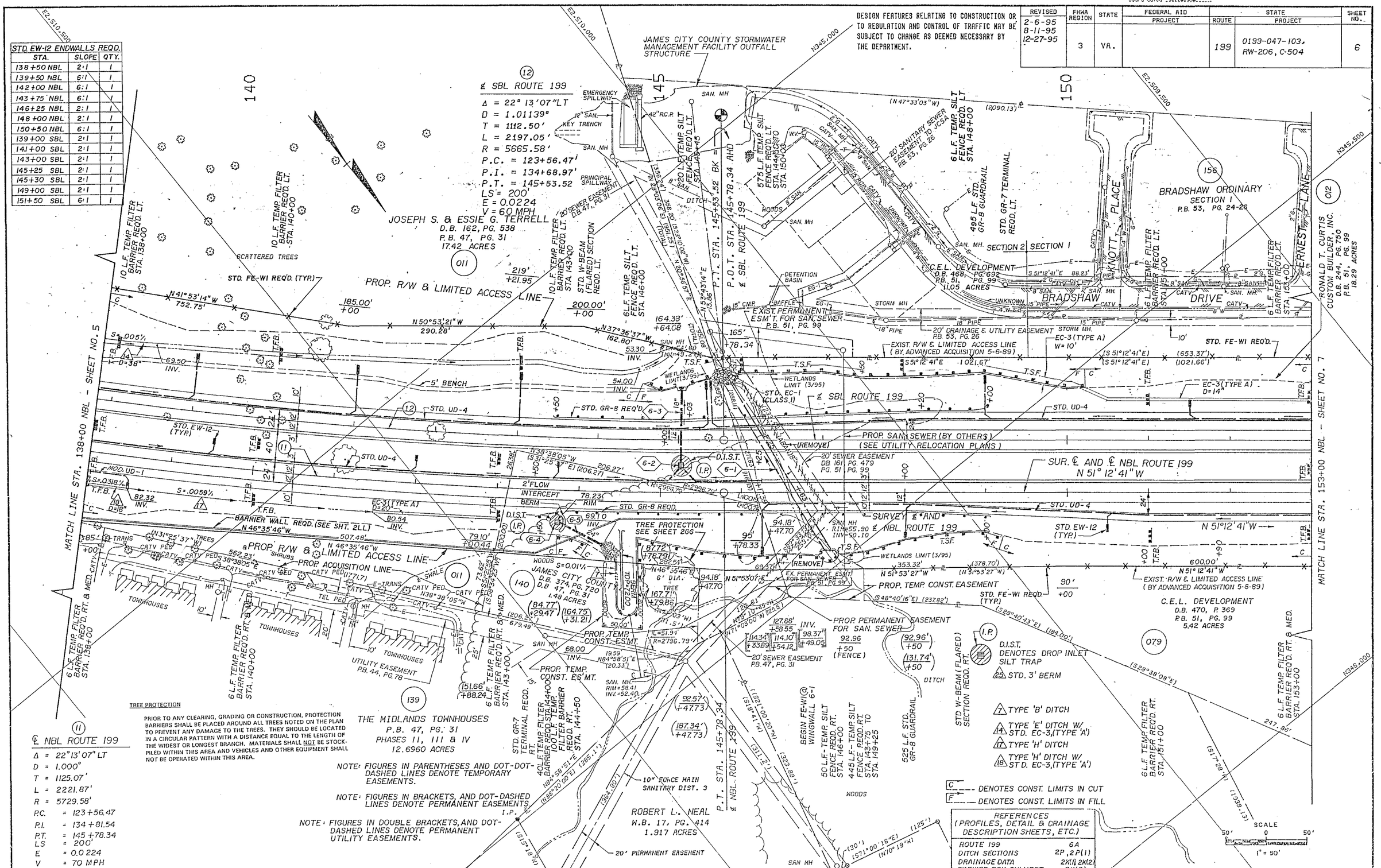
CC026_ROUTE_199_&_ROUTE_5 - 070

LIMITED ACCESS HIGHWAY By Resolution of Commonwealth Transportation Board dated 10/19/89

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
2-6-95 8-11-95 12-27-95	3	VA.		199	0199-047-103, RW-206, C-504	6

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

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



TREE PROTECTION

PRIOR TO ANY CLEARING, GRADING OR CONSTRUCTION, PROTECTION BARRIERS SHALL BE PLACED AROUND ALL TREES NOTED ON THE PLAN TO PREVENT ANY DAMAGE TO THE TREES. THEY SHOULD BE LOCATED IN A CIRCULAR PATTERN WITH A DISTANCE EQUAL TO THE LENGTH OF THE WIDEST OR LONGEST BRANCH. MATERIALS SHALL NOT BE STOCKPILED WITHIN THIS AREA AND VEHICLES AND OTHER EQUIPMENT SHALL NOT BE OPERATED WITHIN THIS AREA.

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

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

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

REFERENCES (PROFILES, DETAIL & DRAINAGE DESCRIPTION SHEETS, ETC.)	
ROUTE 199	6A
DITCH SECTIONS	2P, 2P(1)
DRAINAGE DATA	2K(1) 2K(2)
SKEWED BOX CULVERT DETAIL	2K(2)

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

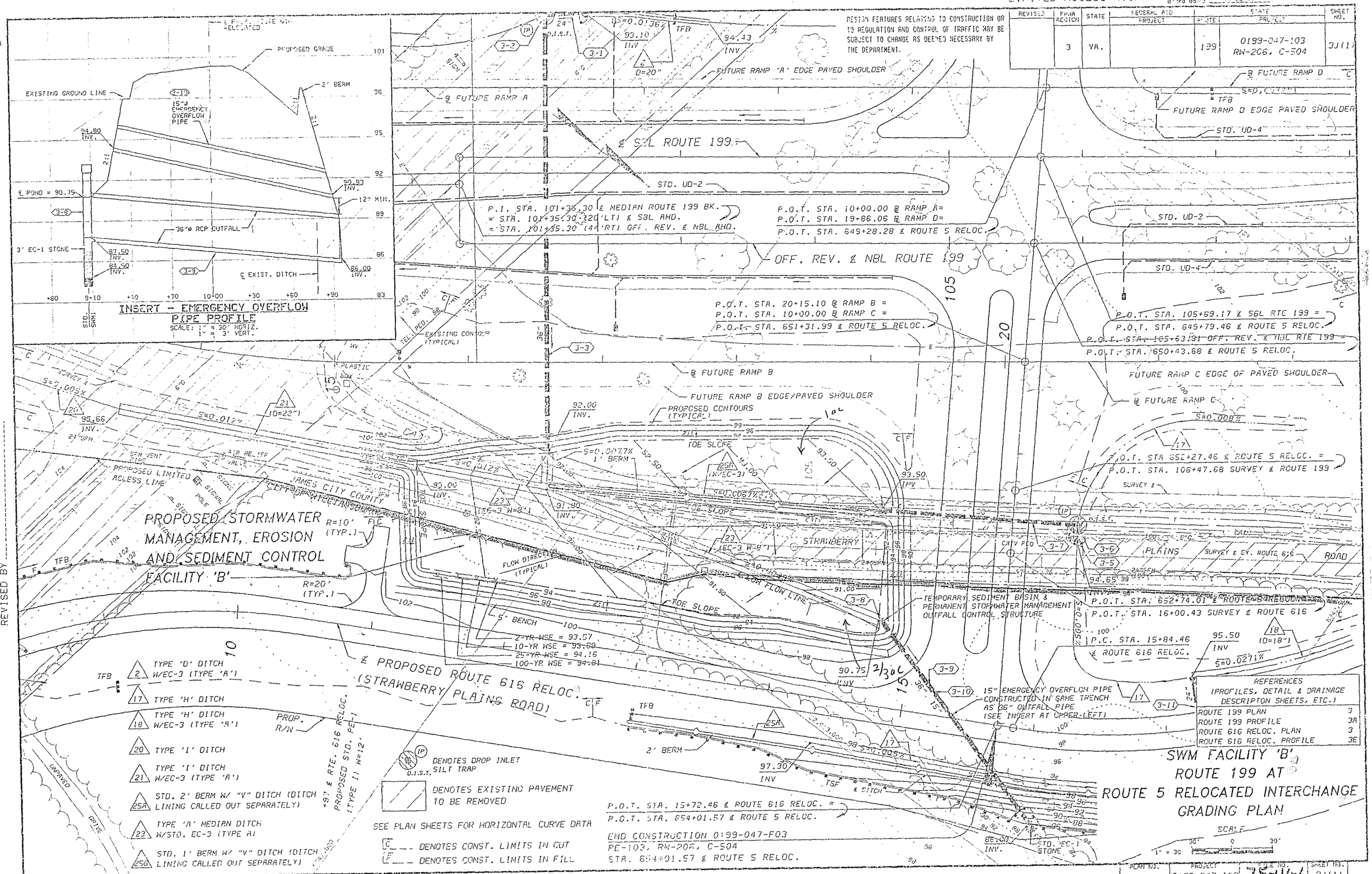
SUPERVISED BY E. M. White
DESIGNED BY MMM Design Group
REVISED BY

CC026_ROUTE_199_&_ROUTE_5 - 071

LIMITED ACCESS HIGHWAY By Resolution of Commonwealth Transportation Board dated 10-18-95

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		199	0199-047-103 RW-206, C-504	3J(1)

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



PLAN NO.	PROJECT	ROUTE NO.	SHEET NO.
A	0199-047-103	199	3J(1)

SUPERVISED BY E.M. White

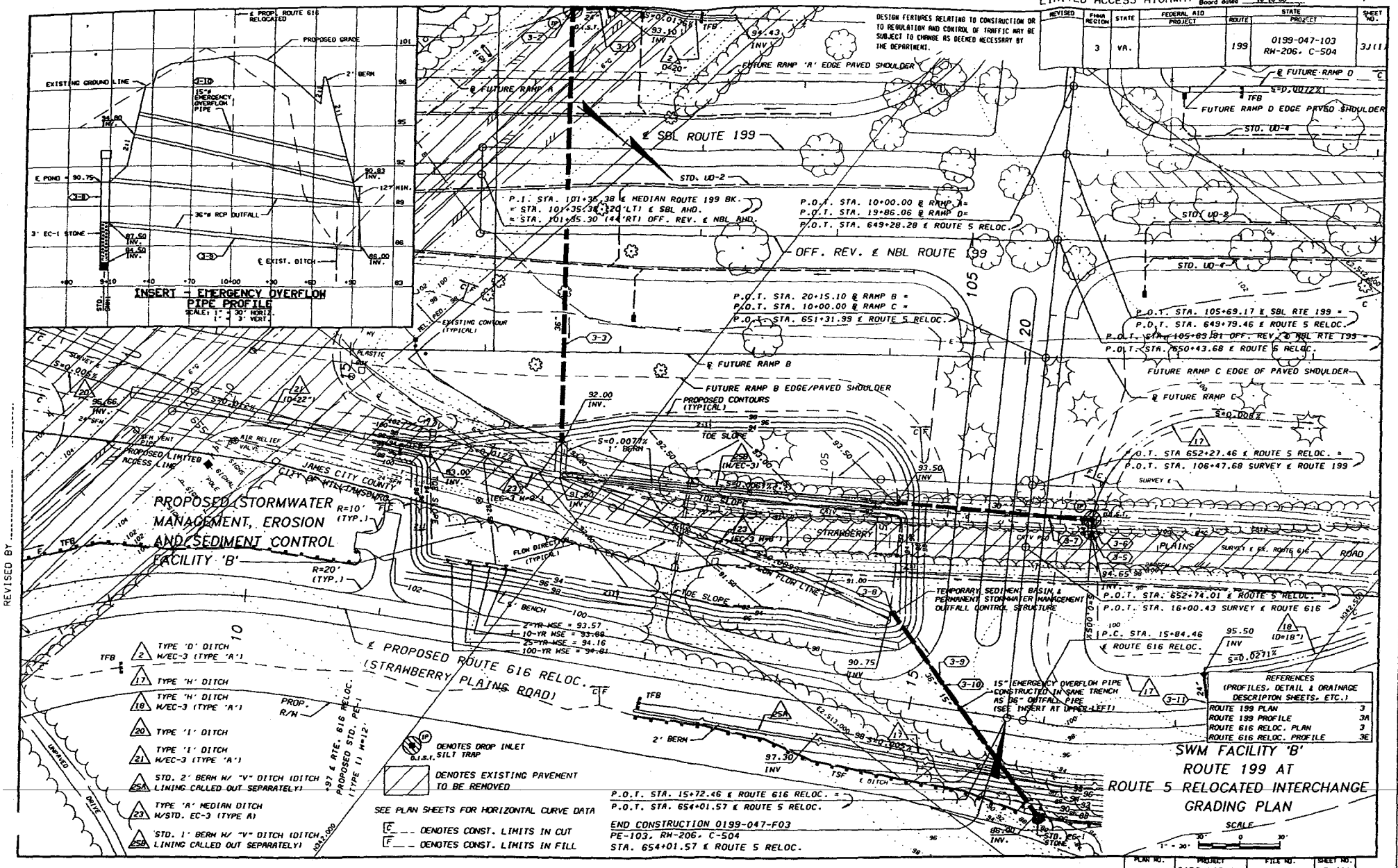
DESIGNED BY MMM Design Group

REVISED BY

LIMITED ACCESS HIGHWAY By Resolution of Commonwealth Transportation Board dated 10-19-96

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		199	0199-047-103 RW-206, C-504	3J(1)

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



PLAN NO.	PROJECT	FILE NO.	SHEET NO.
A	0199-047-103		3J(1)

66 3

REVISED BY

CC026_ROUTE_199_&_ROUTE_5 - 073

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

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

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 (SWM-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-2B 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-3B 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-2B 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-3B CURB DROP INLET REQUIRED (L = 6').
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-3B 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-3B 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-2B 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-12B 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-2B 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) 84.65, (OUT) 84.57.

3C-18 1 STD. DI-2B 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-3B DROP CURB INLET REQUIRED (L = 4').
H = 5.33, INV. = 98.70. CURB OPENING (SOUTH).

3C-22 TO 3C-27 54 LF - 18" CONC. PIPE REQUIRED (4' COVER).
INV. (IN) 98.70, (OUT) 98.50.

3C-23 1 STD. DI-3B 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.

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-2B 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-12B 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)

SUPERVISED BY E.M. White
DESIGNED BY MMM Design Group
REVISED BY

Date Record Created:

Created By:

WS_BMPNO: CC026

Print Record

PRINTED ON
Wednesday, March 10, 201
2:29:57 PM

WATERSHED	CC
BMP ID NO	026
PLAN NO	
TAX PARCEL	
PIN NO	
CONSTRUCTION DATE	
PROJECT NAME	Stormwater Facility B (Rte 5&199)
FACILITY LOCATION	Intersection Route 5 & US 199
CITY-STATE	Williamsburg Va. 23185
CURRENT OWNER	
OWNER ADDRESS	
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	
OWNER PHONE	
MAINT AGREEMENT	No
EMERG ACTION PLAN	No

Get Last BMP No | Return to Menu

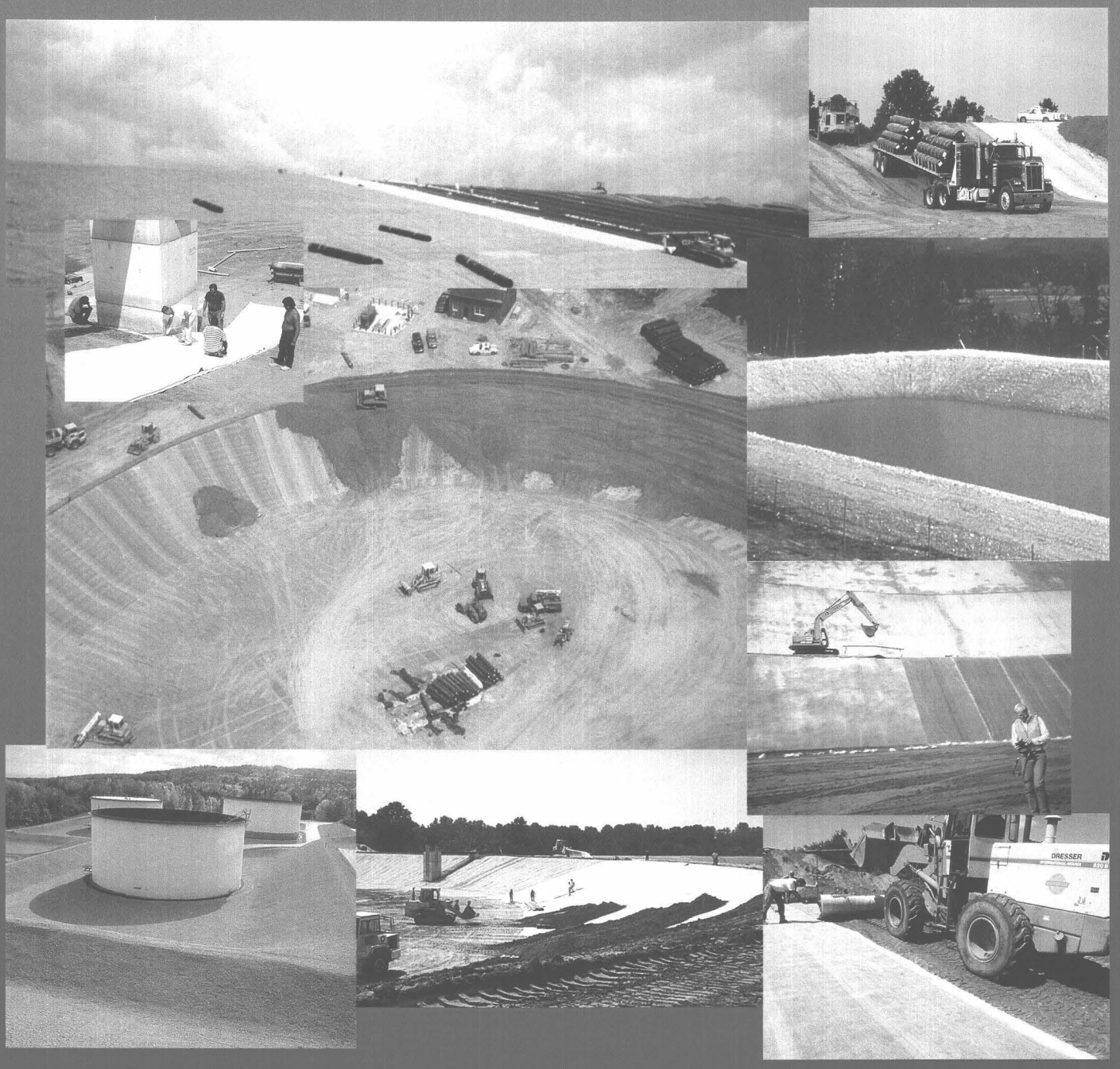
MAINTENANCE PLAN	No	CTRL STRUC DESC	DI-7 Conc
SITE AREA acre		CTRL STRUC SIZE inches	
LAND USE		OTLT BARRL DESC	RCP Barrel
old BMP TYP	Wet Pond	OTLT BARRL SIZE inch	36
JCC BMP CODE	A2 Wet Pond		
POINT VALUE	9	EMERG SPILLWAY	Yes
		DESIGN HW ELEV	94.81
		PERM POOL ELEV	na
SVC DRAIN AREA acres	29.02	2-YR OUTFLOW cfs	5.37
		10-YR OUTFLOW cfs	29.99
		REC DRAWING	No
SERVICE AREA DESCRI	Roadway & surrounding areas		
IMPERV AREA acres	0.00	CONSTR CERTIF	No
RECV STREAM	UT of College Creek		
EXT DET-WQ-CTRL	Yes	LAST INSP DATE	Inspected by:
WTR QUAL VOL acre-ft	0.778	INTERNAL RATING	
CHAN PROT CTRL	No	MISC/COMMENTS	
CHAN PROT VOL acre-ft	0	VDOT facility, Strawberry Plains Road. 15" E.S. pipe.	
SW/FLOOD CONTROL	Yes		
GEOTECH REPORT	Yes		

Additional Comments:

Sean Simapietri
1-800-588-9223

CETCO

Geosynthetic Clay Liners



BENTOMAT®

CLAYMAX®

CETCO

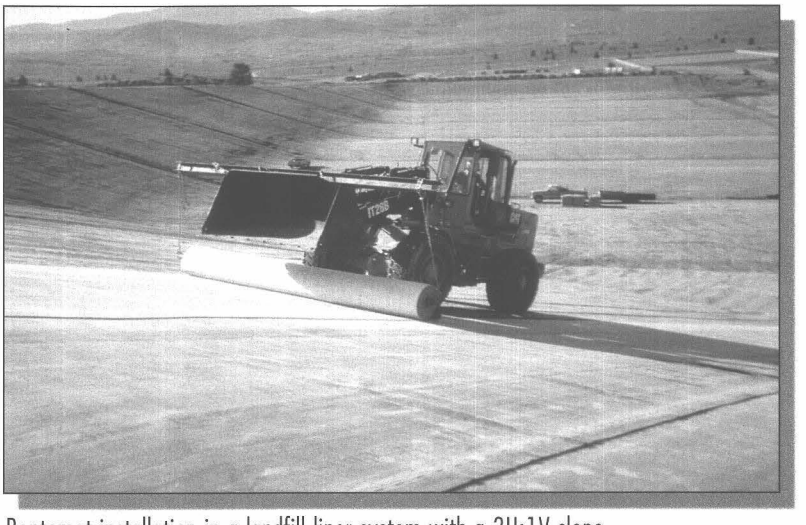
Experience, Innovation, and Value in Geosynthetic Clay Liners.

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 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 GCLs are made in large rolls for easy installation.

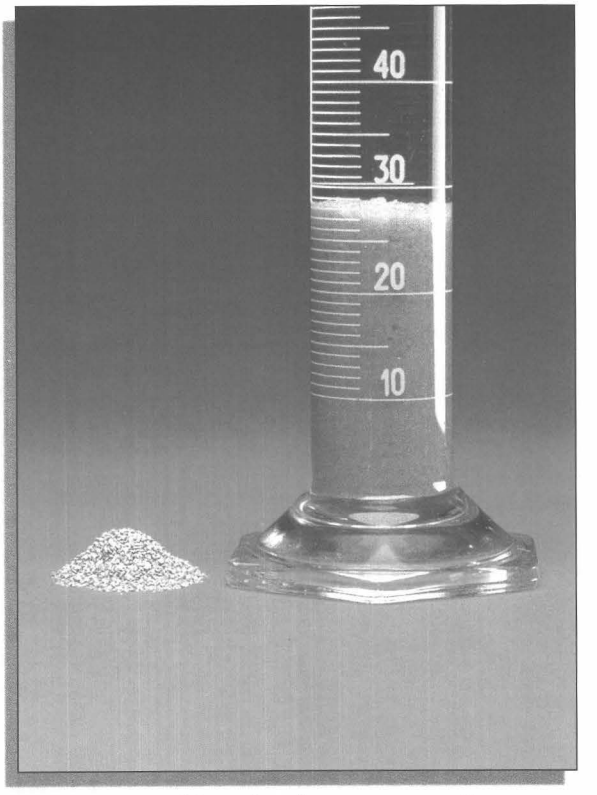


Bentomat installation in a landfill liner system with a 3H:1V slope.

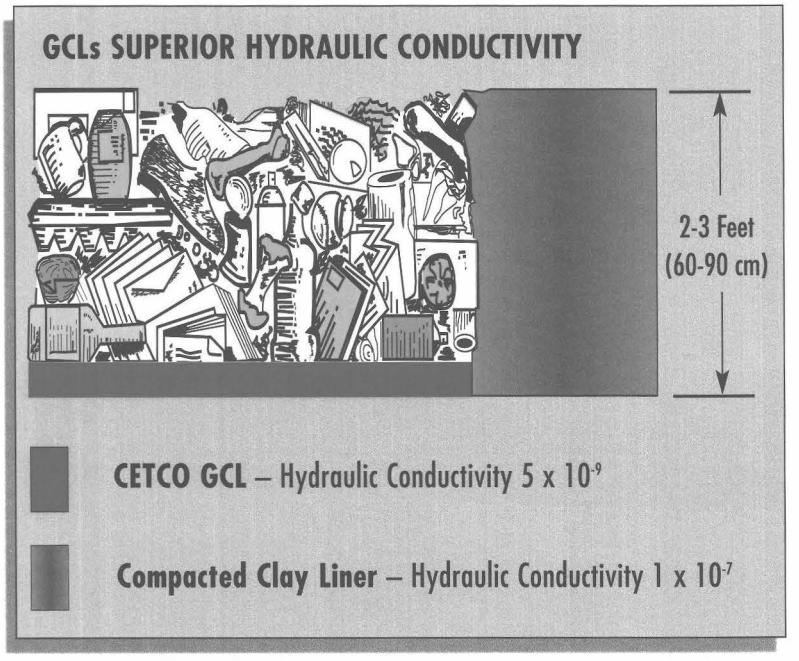
Sodium Bentonite – Nature's Best Liner

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 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 5×10^{-9} cm/sec, approximately one hundred times lower than a typical compacted clay layer.

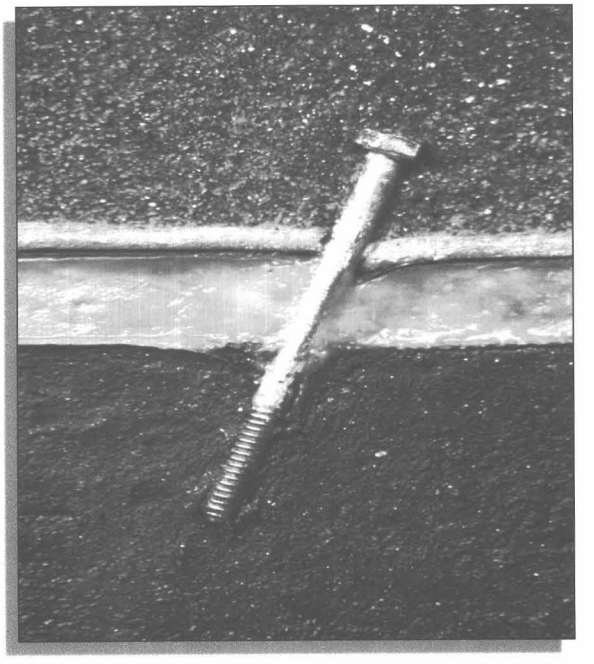
If high concentrations of salts are present, such as in seawater, CETCO may recommend Volclay CRC®. Volclay CRC is a contaminant-resistant sodium bentonite treated with special additives designed for use in high saline environments. Volclay CRC also performs well in a broad range of harsh chemical environments 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.



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.

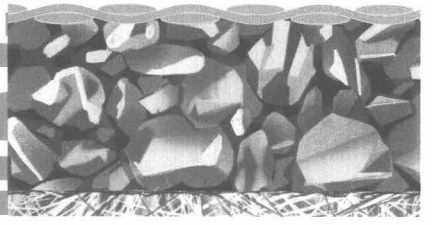


Sodium bentonite's swelling ability allows it to seal around accidental punctures.

CETCO GCLs - Maximum Performance, Maximum Choice

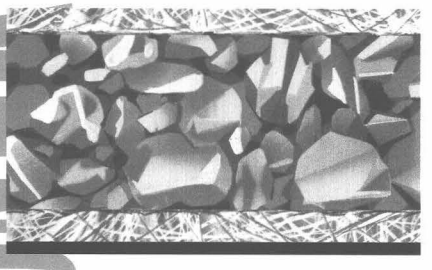
Regardless of the application, most lining projects have large, relatively flat central sections surrounded by steeper perimeter slopes. Each of these areas has the same stringent hydraulic performance requirements but very different shear strength requirements. To meet these varied demands in the most 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.

NON-REINFORCED GCLS



CLAYMAX® 200R

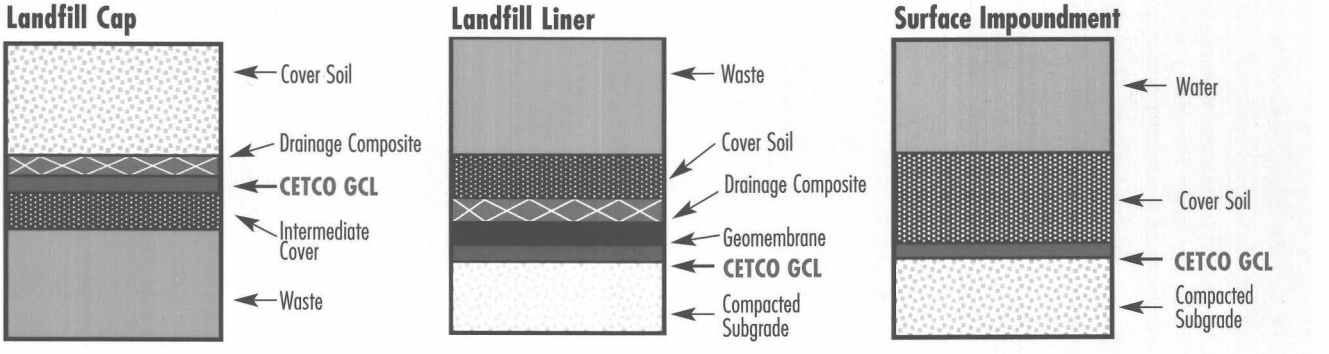
CLAYMAX 200R is a non-reinforced GCL with two lightweight geotextiles encapsulating a layer of Volclay sodium bentonite. Ideally suited for mild slopes, CLAYMAX 200R maximizes both performance and value in one product. A completely self-seaming GCL, CLAYMAX 200R is ideal for lining the flat areas of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



CLAYMAX® 600CL

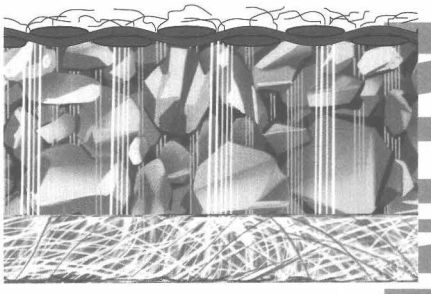
CLAYMAX 600CL is a non-reinforced GCL consisting of two lightweight geotextiles encapsulating a layer of Volclay sodium bentonite with a composite laminate applied to one of the geotextiles. CLAYMAX 600CL is the ideal solution for flat areas of landfill caps and high hydraulic head conditions in bottom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

CETCO GCL Application Details



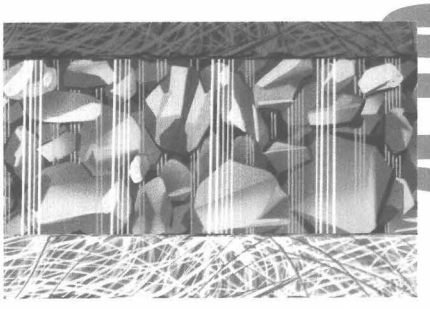
REINFORCED GCLS

BENTOMAT® ST



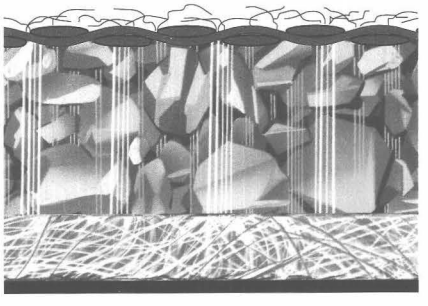
BENTOMAT ST is a reinforced GCL consisting of a layer of pure Volclay sodium bentonite encapsulated between two geotextiles, needlepunched together. BENTOMAT ST provides maximum performance under a wide variety of field conditions. This integrated matrix of bentonite and needlepunched fibers provides 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.

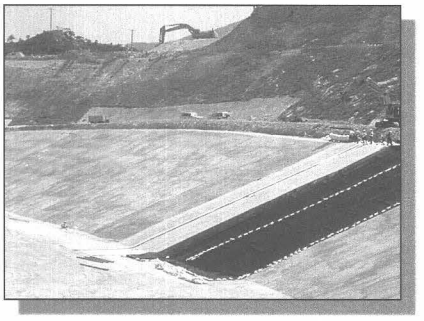
BENTOMAT® CL



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

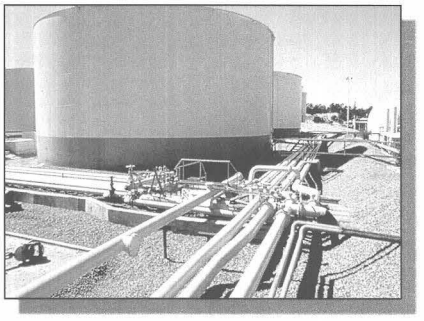
CUSTOM PRODUCTS. With a variety of manufacturing processes and materials available, CETCO can manufacture enhanced GCLs that provide high tensile strength, added drainage or gas venting capacity, or other physical properties that may be required. Additionally, CETCO's lamination process can provide composite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

CETCO GCLs For Every Lining Application



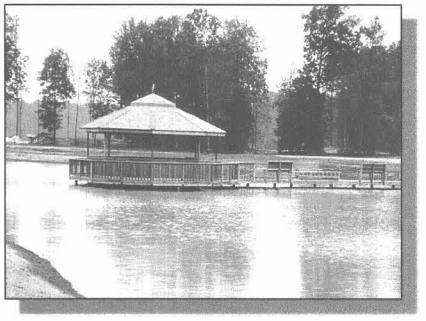
Landfill Liners

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.



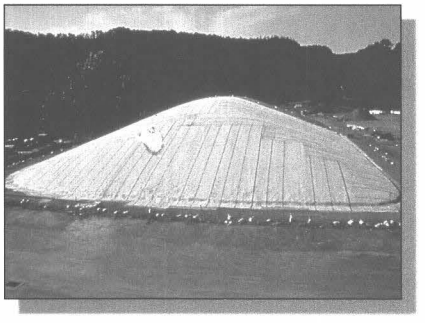
Secondary Containment

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

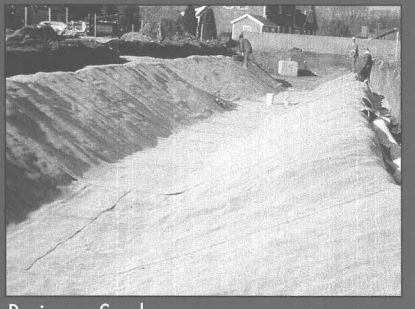
CETCO GCLs are widely used in decorative lakes, aeration lagoons, fly ash lagoons, and other surface impoundments. Because they do not require specialized equipment or labor, GCLs can be installed with minimal instruction and supervision.



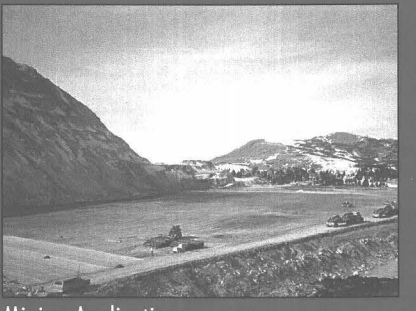
Landfill Covers

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

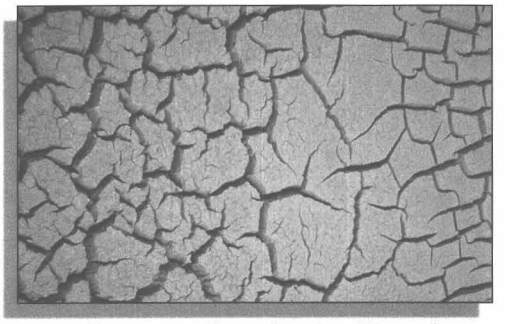
Wetland Creation and Conservation

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!

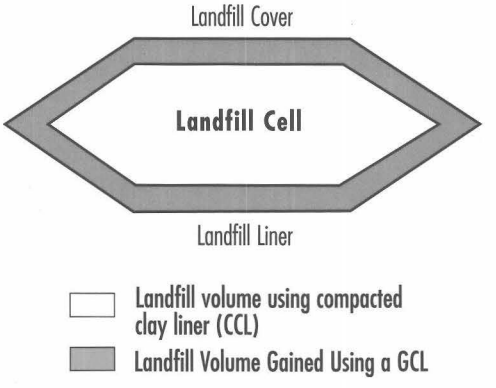
One truckload of GCLs covers the same area as approximately 150 truckloads of compacted clay.

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.

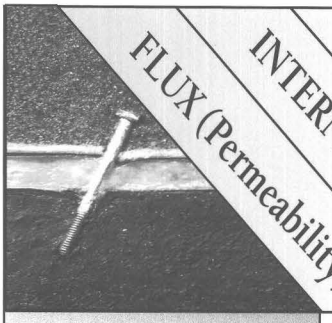


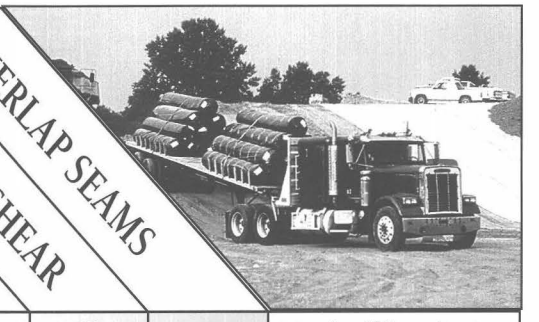
GCLs vs. CCLs

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 AMCOL 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

© 1997 Colloid Environmental Technologies Company

Form No.: GCL-3 11/97 Recycled Paper Printed in U.S.A.

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 - Kenny McDowell
804-353-7811 or Joe Crystal

Benseal - 50# bags
2 lb/SF - clay
4 lb/SF - foundation
$8-9/bag ⇒

PVC LINERS

Darryl; 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)

8/18/93

Darrell

FAX COVER SHEET

DATE: 10/3/97

NUMBER OF PAGES , INCLUDING THIS COVER SHEET: 2

TO: DARRELL RICKMAND **COMPANY:** RICKMAND 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

Rickmond Engineering, Inc
1643 A Merrimac Trail
Williamsburg, VA 23185-5624

Attn: Darrell Rickmond

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/SM=$3,142.
This is a delivered price to Richmond (23201) Virginia

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

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

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

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
Inst. - $5000 their crew
or - $2000 - supervise only
Liner placed in 1 day
Shipping - $300-400
1 week to 10 days - once ordered
Warranty - 1 year
Longevity - 30 yrs +
30 mil - $0.05/SF more

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:

ENHANCING OUR ENVIRONMENT BY PRESERVING WATER RESOURCES FOR FUTURE GENERATIONS.

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 Gundle Rd., Houston, TX 77073
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 Gundle 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
Tel 412 331-3000
Fax 412 331-7751
www.pdm.com
See our ad on **Page C-49** and
Circle Number 91 for details

Smith, A. O., Engineered Storage Products Co., Municipal/Industrial Dept.
345 Harvestore Dr., Dekalb, IL 60115
Tel 815 756-1551
Fax 815 756-7821
http://www.aquastore.com
See our ad on **Page C-51** and
Circle Number 73 for details

Soil Sealants

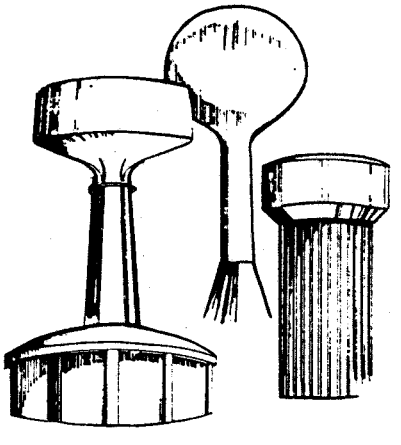
CETCO (Colloid Environmental Technologies Co.)
1350 W. Shure Dr., Arlington Heights, IL 60004
Tel 847 392-5800

Tank Coatings & Painting

Dixon Engineering, Inc.
1104 Third Ave., Lake Odessa, MI 48849
Tel 616 374-3221

Pittsburg Tank & Tower Co.
P.O. Box 913, Henderson, KY 42420-0913
Tel 502 826-9000
Fax 502 827-4417
E-mail: pittsbrg@ldd.net
http://www.watertank.com
See our ad on **Page H-260** and
Circle Number 289 for details

TANK INDUSTRY CONSULTANTS, INC.



Offices Nationwide
317/271-3100

The Engineering and Inspection Specialists for Your Water Storage Tanks

For **FREE LITERATURE** circle No. 288 on card

CC026_ROUTE_199_&_ROUTE_5 - 087

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,

Ken Tigard
Sales Representative

Accepted by:

Name:_____

Company:_____

Date:_____

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.

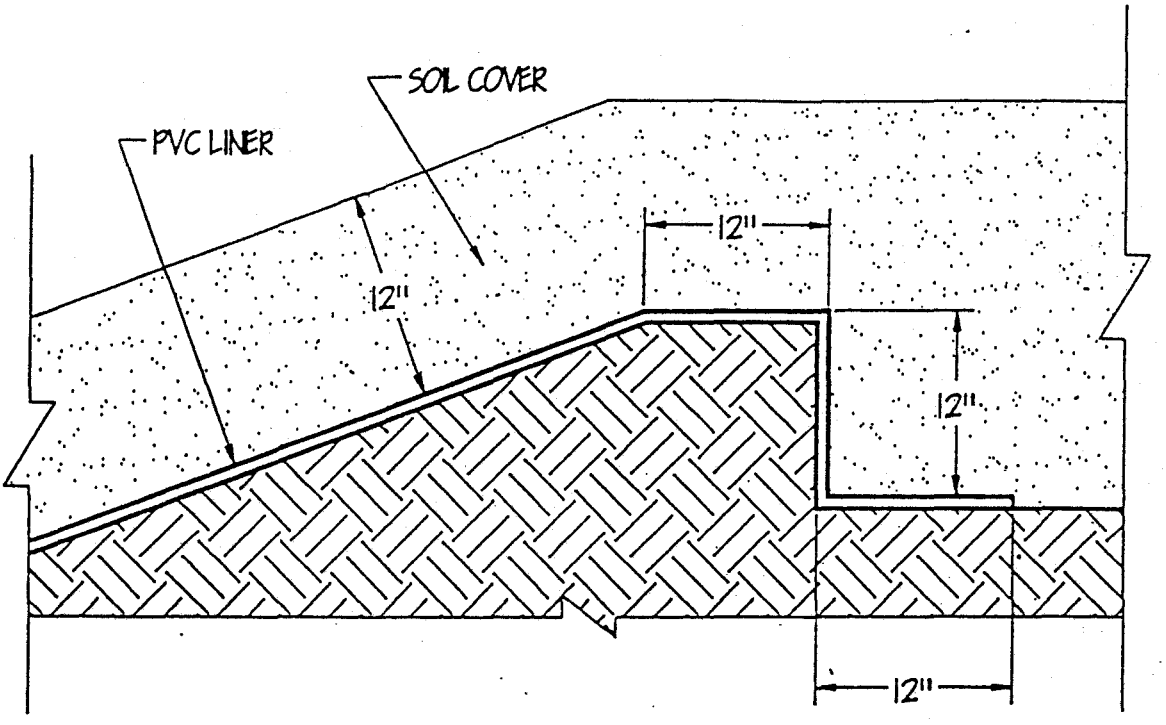
To enable EPI's technical staff to properly determine the cause of any alleged defect and to take appropriate steps to effect timely corrective measures if such defect is within the warranty, any claim for alleged breach of warranty must be made and presented to EPI within thirty (30) days after the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

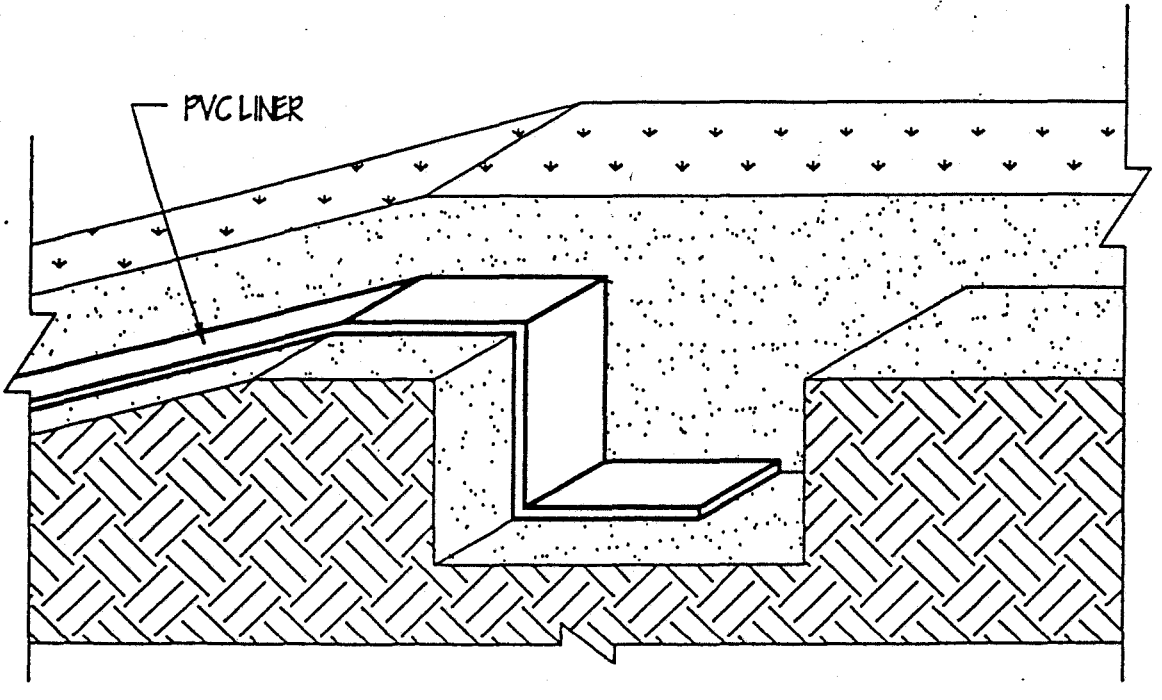
During the warranty period, EPI reserves the right to have one or more of its representatives visit (with or without giving prior notice) the site at which its material(s) are being utilized to observe the site preparation, liner installation, emplacement of cover material(s) and/or factory and field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

1	ENVIRONMENTAL PROTECTION INCORPORATED	Ph #: 800-345-4637 Fx #: 616-587-8020	File Name: anvtrnch	Do Not Scale 2/2/95

CC026_ROUTE 90 & ROUTE 5A 091

The Liner Company

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
- Landfills
- Reservoirs
- Industrial Waste Ponds
- Secondary Containment
- Cooling Ponds
- Canals
- Decorative Ponds
- Golf Course Ponds
- Recreation Ponds
- Tailings 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

The Liner Company

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).

The Liner Company

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.

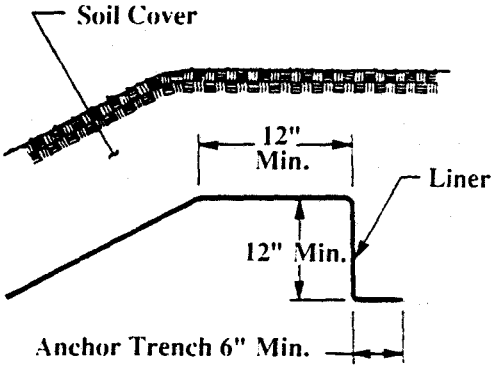
The Liner Company

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

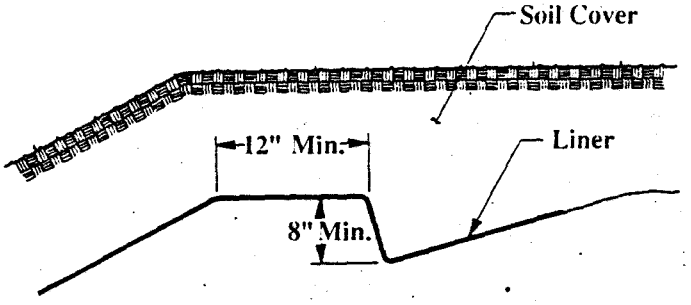
A-9211

The Liner Company

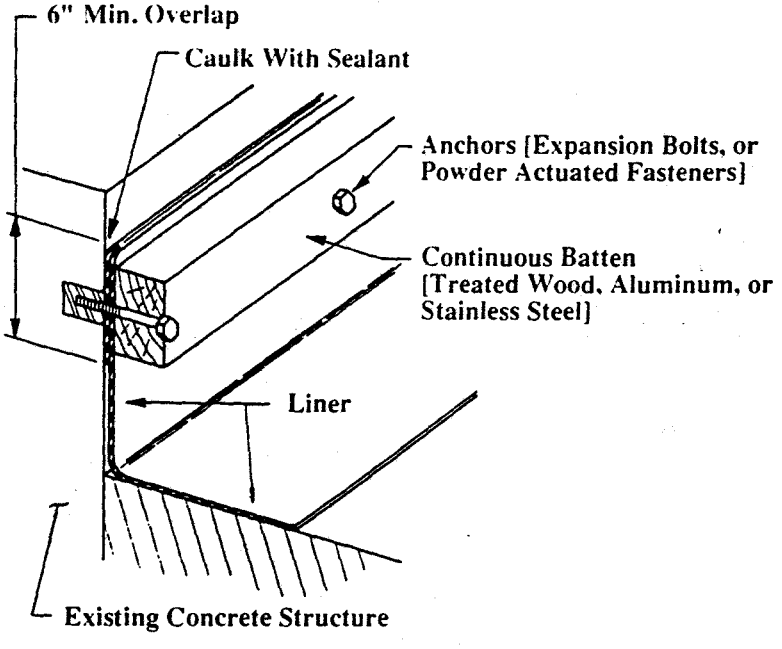
Anchoring Details



Conventional Trench



Dozer Trench



Bolting to Concrete

The Liner Company

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

The Liner Company

UltraTech® 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® 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.) 1. Breaking Factor 2. Elongation at Break	ASTM D-3083 (NSF modified)	 5 20	 5 20	 5 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.

The Liner Company

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).

The Liner Company

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, naptha, 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.

The Liner Company

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

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

Aquatic Services

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

MAR 1999
RECEIVED
ENVIRONMENTAL DIVISION

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.

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

Aquatic Services

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

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 $Concept_2$ 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 $Concept_2$ 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, $Concept_2$ units do not need to be removed from the water in the winter.

Five spray patterns are available in the Otterbine $Concept_2$ 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.

Item	Price
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

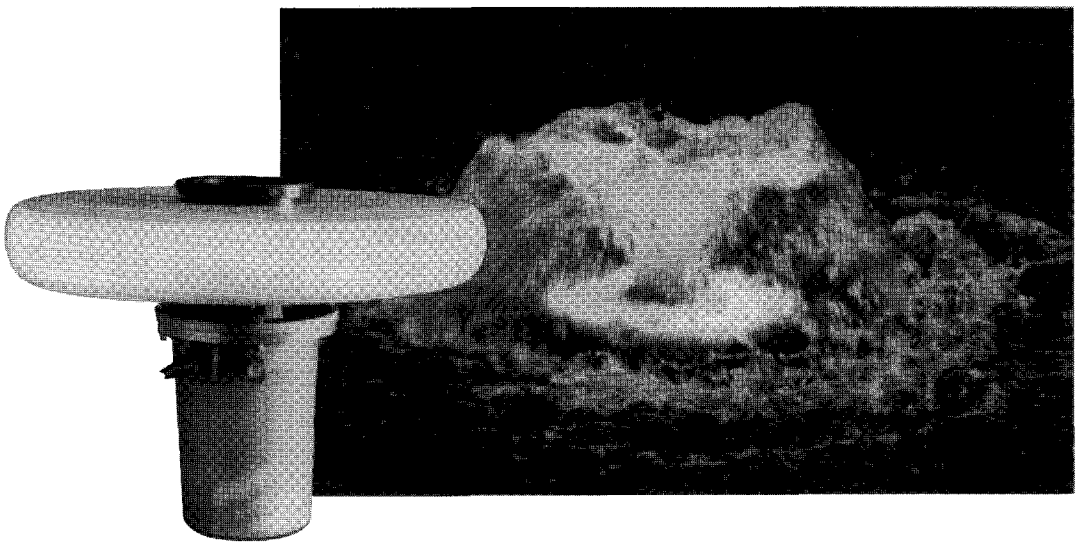
Thank you for this opportunity to quote you 1999 prices on Otterbine equipment. Please call if you have any additional questions or need information for other sites. We look forward to working with you in the future.

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/ .9m 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

CC026_ROUTE_199_&_ROUTE_5 - 106

Distributed in your area by:

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

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

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

John T. P. Horne
Development Manager

I understand and accept the conditions of this letter.

William Taylor

William Taylor

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

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

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

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

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

JAMES CITY COUNTY FAX FORM

Name: Billy Taylor
Firm or Company: Tozna Contractors
Facsimile Number:
Number of pages including this transmittal: 3
From: Darryl Cook

James City County
P.O. Box 8784
Williamsburg, Virginia 23187-8784
Office Phone: 757-253-____
Fax Number: 757-253-6850

Comments: Please sign + return - I need to get your schedule for beginning work as soon as I can.

- Revised Letter -

Date:

Time:

If you do not receive all pages, call 757-253-6671 as soon as possible

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

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 President

To DARRYL COOK	From FORREST MILLER
Co./Dept. JCC	Co. McCALE
Phone #	Phone #
Fax # 253-6850	Fax #

DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6671 FAX: (757) 253-6850 E-MAIL: devman@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

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

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

John T. P. Home
Development Manager

I understand and accept the conditions of this letter.

William Taylor

William Taylor

JAMES CITY COUNTY FAX FORM

Name: Lewis McMurran

Firm or Company: McCabe Realty

Facsimile Number:

Number of pages including this transmittal: 2

From: Darryl Cook

James City County
P.O. Box 8784
Williamsburg, Virginia 23187-8784
Office Phone: 757-253-6673
Fax Number: 757-253-6850

Comments: Please Sign + Return by Fax. We will follow up with original in the mail. I hope to verify this morning when Tosco Contractors will start work.

Date:

Time:

If you do not receive all pages, call 757-253-6671 as soon as possible

TRANSACTION REPORT

Transmission
Transaction(s) completed

NO.	TX DATE/TIME	DESTINATION	DURATION	PGS.	RESULT	MODE
944	NOV. 30 9:38	757 873 0651	0° 01' 02"	002	OK	N ECM

JAMES CITY COUNTY FAX FORM

Name: Lewis McMurran
Firm or Company: McCue Realty
Facsimile Number:
Number of pages including this transmittal: 2
From: Darryl Cook

James City County
P.O. Box 8784
Williamsburg, Virginia 23187-8784
Office Phone: 757-253-6673
Fax Number: 757-253-6850

Comments: Please Sign + Return by Fax. We will follow up with original in the mail. We hope to verify the morning when Tazna Contractors will start work.

Date:

If you do not receive all pages, call 757-253-6671 as soon as possible

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. McMurran, 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 10th, 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

TRANSACTION REPORT

Transmission
Transaction(s) completed

NO.	TX DATE/TIME	DESTINATION	DURATION	PGS.	RESULT	MODE
971	NOV. 30 15:41	95668874	0° 01' 24"	003	OK	N ECM

JAMES CITY COUNTY FAX FORM

Name: Billy Taylor
Firm or Company: Tom Contracting
Facsimile Number:
Number of pages including this transmittal: 3
From: Darryl Cook

James City County
P.O. Box 8784
Williamsburg, Virginia 23187-8784
Office Phone: 757-253-[illegible]
Fax Number: 757-253-6850

Comments: Please sign + return - I need to get your schedule for beginning work as soon as poss.
- Pearson & Letter

Date: Time:

If you do not receive all pages call 757-253-6671 as soon as possible

BILL TAYLOR'S PROPOSAL -

IN

170 loads clay × 70 = $11,900

2 load topsoil × 70 = $140

OUT

142 loads sand to Landfill × $70 = $9940

19 loads sand to Pond/BK × $70 = 1330

Const Entrance - $1000

$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 dozer time - $70/hr = $140

creation of berms

$24,450

24,460

24,215

COUNTY PROPOSAL

IN

170 loads Clay × 70 = 11,900

2 loads topsoil × 70 = $140

OUT

142 loads to Landfill × 70 = $9940 ← $2840

24 loads delivered local × $20 = $480

$1000

$23,800

$23,650

Const Entr.

Upper Pond Work

1 hr dozer to shape pond area × 70 = $70

1 hr dozer to construct rock checks × 70 = $70

Seed, mulch = $50

$190

Creation of berms near Burger King - $150

172 x 70

142 x 70

12 x 40

14 x 20 $40

12 loads - $40

7 - $20

3 hrs - dozen @ $75

rock - $200

seeding - $50

24,215 > $24,000 annum

25,800

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.....

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

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 sofl 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

SOIL PERMEABILITY

$q = k i A$

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

$A = 1\ ft^2$

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

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

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

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

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

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

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

lose 1.1 ft/day - no

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

if L = 4' - 2.83 ft/day - 1×10^{-3}

= .283 ft/day - 1×10^{-4}

= .03 ft/day or .33"/day 1×10^{-5}

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

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

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

2 inches/week

L = 4' → loss 0.5"/week

Toano Contractors, Inc.

8589 Richmond Road
Post Office Box 712
Toano, Virginia 23168

Fax 566-8874 Phone 566-0097

****

FAX COVER LETTER

****

DATE: 11/30/98 TIME SENT:

TOTAL NUMBER OF PAGES INCLUDING THIS COVER PAGE: 3

PLEASE DELIVER THE FOLLOWING PAGES TO:

NAME: Darryl Cook

COMPANY:

CITY:

FAX: 253-6850 PHONE:

FROM: Bill Taylor

FAX: PHONE:

COMMENTS:

Contract with signature mailed 11/30/98

IF YOU DO NOT RECEIVE ALL PAGES, PLEASE CALL BACK AS SOON AS POSSIBLE.

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 conjuction w/ in situ clay

check w/ Soil Scientist, NRCS

Bentonite - Richmond

Wajo - Wayne Britt - directional drill

POND

- get copy plan
- Mark Eversole

ACF - Sean Simonpietri - will be back 9/3 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 job site