ROADWAY PLANS

FOR

PHASE III
"BOTETOURT COMMONS"

SITUATED IN

AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

DATE: 20 MARCH 2001

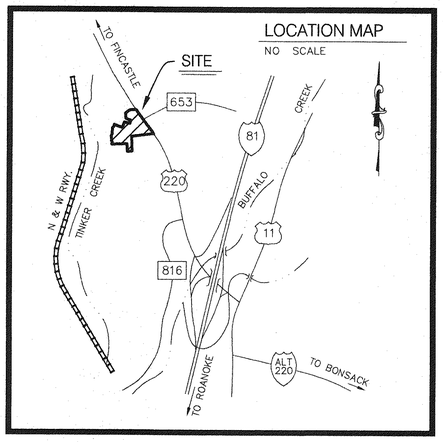
OWNER / DEVELOPER

TIMBERBROOK ASSOCIATES, L.C.
P.O. BOX 20287, ROANOKE, VIRGINIA 24018
(540) 989-7060

"AS-BUILT"

NOTE:

1. "AS-BUILT" INFORMATION TAKEN FROM PLANS FURNISHED BY J.P. TURNER & BROTHERS, INC., CONTRACTOR.
2. "AS-BUILT" DIMENSIONS SHOWN IN BRACKETS.



INDEX OF DRAWINGS

LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA
P.O. BOX 20669, ROANOKE, VIRGINIA 24018 - (540) 774-4411

REVISIONS			
DATE	SHEETS	DATE	SHEETS

P.B. 25 , PG. 43

KNOW ALL MEN BY THESE PRESENTS, TO WIT:

THAT TIMBERBROOK ASSOCIATES, L.C. IS THE FEE SIMPLE OWNER AND PROPRIETOR OF THE LAND SHOWN HEREON TO BE SUBDIVIDED BOUNDED BY OUTSIDE CORNERS 1 THROUGH 19 TO 1, INCLUSIVE, WHICH COMPRISES PART OF THE LAND CONVEYED TO SAID OWNER BY DEED FROM JAMES COULTER HANCOCK DATED JANUARY 6, 1998 AND RECORDED IN THE CLERK'S OFFICE OF THE CIRCUIT COURT OF BOTETOURT COUNTY, VIRGINIA IN DEED BOOK 547, PAGE 1022 AND SUBJECT TO A DEED OF CORRECTION DATED JANUARY 6, 1998 AND RECORDED IN THE AFORESAID CLERK'S OFFICE IN DEED BOOK 552, PAGE 1609, AND WHICH LAND IS SUBJECT TO A CERTAIN DEED OF TRUST TO DENNIS P. TRAUBERT AND DOUGLAS W. DENSMORE, TRUSTEES, SECURING FIRST-CITIZENS BANK & TRUST COMPANY DATED JANUARY 12, 1998 AND RECORDED IN DEED BOOK 547, PAGE 1024.

THE OWNER CERTIFIES THAT IT HAS SUBDIVIDED THIS LAND AS SHOWN HEREON ENTIRELY WITH ITS OWN FREE WILL AND CONSENT AND PURSUANT TO AND IN COMPLIANCE WITH THE VIRGINIA CODE OF 1950, AS AMENDED TO DATE AND FURTHER PURSUANT TO AND IN COMPLIANCE WITH THE COUNTY OF BOTETOURT LAND SUBDIVISION ORDINANCES.

THE SAID OWNER DOES BY VIRTUE OF THE RECORDATION OF THIS PLAT DEDICATE IN FEE SIMPLE TO THE COUNTY OF BOTETOURT ALL THE LAND EMBRACED WITHIN THE STREETS OF THIS SUBDIVISION AND ALL OF THE EASEMENTS WITHIN THE BOUNDARY AND OUTSIDE THE BOUNDARY AS SHOWN HEREON ARE HEREBY DEDICATED FOR PUBLIC USE.

THE SAID OWNER DOES AS A CONDITION PRECEDENT TO THE APPROVAL OF THIS PLAT AND SUBDIVISION AND THE ACCEPTANCE OF THE DEDICATION OF THE STREETS SHOWN HEREON BY THE BOARD OF SUPERVISORS OF BOTETOURT COUNTY, VIRGINIA, ON ITS BEHALF AND FOR AND ON ACCOUNT OF ITS HEIRS, DEVISEES, SUCCESSORS AND ASSIGNS, SPECIFICALLY RELEASES THE COUNTY OF BOTETOURT COUNTY, VIRGINIA, AND THE VIRGINIA DEPARTMENT OF TRANSPORTATION FROM ANY OR ALL CLAIM OR CLAIMS FOR DAMAGES WHICH SAID OWNER, ITS SUCCESSORS, DEVISEES AND ASSIGNS, MAY OR MIGHT HAVE AGAINST THE COUNTY OF BOTETOURT OR THE VIRGINIA DEPARTMENT OF TRANSPORTATION BY REASON OF ESTABLISHING PROPER GRADE LINES ON OR ALONG SUCH STREETS AS SHOWN ON THIS PLAT OF SUBDIVISION (OR SUCH CHANGED STREETS AS MAY BE AGREED UPON IN THE FUTURE) AND BY REASON OF DOING NECESSARY GRADING, CUTTING OR FILLING FOR THE PURPOSE OF PLACING SUCH STREETS UPON PROPER GRADE AS MAY FROM TIME TO TIME BE ESTABLISHED BY SAID COUNTY OR VIRGINIA DEPARTMENT OF TRANSPORTATION AND SAID COUNTY OR VIRGINIA DEPARTMENT OF TRANSPORTATION SHALL NOT BE REQUIRED TO CONSTRUCT ANY RETAINING WALL OR WALLS ALONG THE STREETS AND PROPERTY LINES THEREOF OR MAINTAIN ANY EASEMENTS AS SHOWN HEREON.

IN WITNESS THEREOF IS HEREBY PLACED THE FOLLOWING SIGNATURES AND SEALS ON THIS 10TH DAY OF SEPTEMBER 2001.

TIMBERBROOK ASSOCIATES, L.C.

BY: _____
STEVEN S. STRAUSS, MANAGER

BY: _____
DOUGLAS W. DENSMORE, TRUSTEE

BY: _____
DENNIS P. TRAUBERT, TRUSTEE
BENEFICIARY, FIRST-CITIZENS BANK & TRUST COMPANY

CURVE TABLE

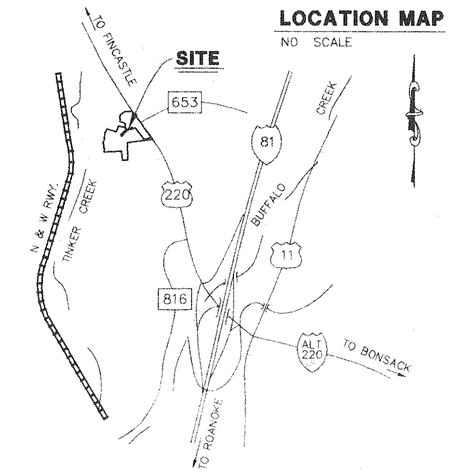
CURVE	CORNERS	RADIUS	LENGTH	TANGENT	CHORD	BEARING	DELTA
C1	1 TO 2	37.00'	87.41'	90.12'	68.46'	S 07°22'49" W	135°21'26"
C2	2 TO 3	381.00'	73.93'	37.08'	73.81'	N 79°11'56" E	11°07'03"
C3	3 TO 4	435.00'	110.84'	55.72'	110.54'	N 77°27'29" E	14°35'57"
C4	9 TO 10	972.00'	122.53'	61.35'	122.45'	S 62°19'49" W	07°13'21"
C5	11 TO 12	775.00'	134.40'	67.37'	134.23'	S 53°45'03" W	09°56'11"
C6	12 TO 13	975.00'	86.55'	43.30'	86.52'	S 46°14'23" W	05°05'10"
C7	13 TO 14	475.00'	53.27'	26.66'	53.24'	S 40°29'02" W	06°25'31"
C8	14 TO 15	18.00'	18.07'	9.88'	17.32'	S 08°30'26" W	57°31'42"
C9	15 TO 16	55.00'	276.15'	40.20'	64.91'	N 36°25'08" W	287°40'33"
C10	16 TO 17	18.00'	15.94'	8.53'	15.42'	N 62°03'10" E	50°43'58"
C11	17 TO 18	525.00'	64.24'	32.16'	64.20'	N 40°11'29" E	07°00'37"
C12	18 TO 19	1025.00'	468.32'	238.32'	464.25'	N 56°47'08" E	26°10'41"
C13	19 TO 1	525.00'	47.50'	23.77'	47.49'	N 72°28'01" E	05°11'04"
C14	9B TO 3	381.00'	98.81'	49.68'	98.53'	N 77°19'42" E	14°51'32"
C15	9B TO 2	381.00'	24.88'	12.44'	24.87'	N 71°46'10" E	03°44'29"
C16	9A TO 10	972.00'	132.19'	66.20'	132.08'	S 62°36'54" W	07°47'30"
C17	9 TO 9A	972.00'	9.66'	4.83'	9.66'	N 66°13'35" E	00°34'09"
C18	2 TO 2A	381.00'	59.40'	29.76'	59.34'	N 78°06'23" E	08°55'58"
C19	2A TO 2B	25.00'	15.90'	8.23'	15.63'	S 64°21'12" W	36°26'21"
C20	2B TO 2	37.00'	47.51'	27.66'	44.31'	S 82°55'04" W	73°34'05"
C21	9C TO 9D	975.00'	9.01'	4.51'	9.01'	S 66°13'47" W	00°31'46"

BOUNDARY COORDINATES
ORIGIN OF COORDINATES ASSUMED

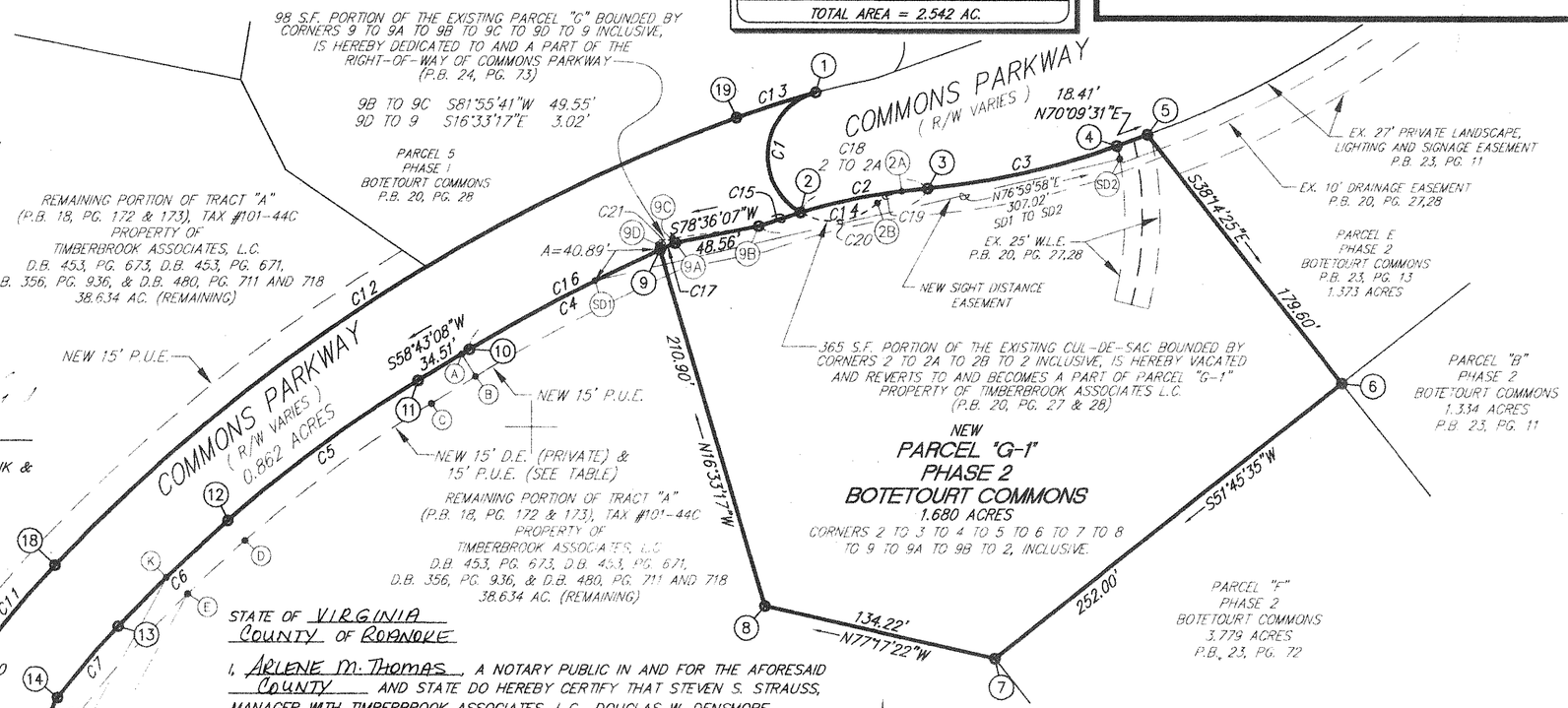
CORNER	NORTHING	EASTING
1	6231.1758	12776.3813
2	6163.2879	12767.5879
3	6177.1204	12840.0928
4	6201.1245	12947.9947
5	6207.3715	12965.3072
6	6066.3067	13076.4750
7	5910.3286	12878.5487
8	5939.8613	12747.6154
9	6142.0169	12687.5241
10	6085.1555	12579.0796
11	6067.2362	12549.5856
12	5987.8640	12441.3322
13	5928.0232	12378.8442
14	5887.5297	12344.2791
15	5870.3970	12341.7164
16	5906.2986	12287.6415
17	5913.5266	12301.2655
18	5962.5652	12342.6938
19	6216.8698	12731.1000
1	6231.1758	12776.3813

TOTAL AREA = 2.542 AC.

LOCATION MAP
NO SCALE



LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA
4664 BRAMBLETON AVENUE, SW
P.O. BOX 20669
ROANOKE, VIRGINIA 24018
PHONE: (540) 774-4411
FAX: (540) 772-9445
E-MAIL: MAIL@LUMSDENPC.COM



LEGEND:

R/W	RIGHT-OF-WAY
D.B.	DEED BOOK
PG.	PAGE
EX.	EXISTING
IP	IRON PIN
W.L.E.	WATER LINE EASEMENT
P.U.E.	PUBLIC UTILITY EASEMENT
D.E.	DRAINAGE EASEMENT
A=	ARC LENGTH

NEW 15' PRIVATE DRAINAGE EASEMENT TABLE

LINE	BEARING	DISTANCE
11 TO A	N 58°43'08" E	29.37'
A TO B	S 31°35'03" E	15.00'
B TO C	S 58°43'08" W	29.45'
C TO D	S 53°45'03" W	131.64' (CHD.)
D TO E	S 47°27'11" W	44.56' (CHD.)
E TO F	S 28°42'21" E	189.63'
F TO G	N 61°17'39" E	15.00'
G TO H	N 28°42'21" E	26.21'
H TO J	N 28°42'21" E	36.80' (CHD.)
J TO K	N 28°42'21" E	128.91'
K TO 12	N 47°23'07" E	47.56' (CHD.)
12 TO 11	N 53°45'03" E	134.23 (CHD.)

AREA = 5,912 S.F.

GRAPHIC SCALE

60 0 30 60 120 240
(IN FEET)
1 inch = 60 ft.

STATE OF VIRGINIA
COUNTY OF ROANOKE

I, ARLENE M. THOMAS, A NOTARY PUBLIC IN AND FOR THE AFORESAID COUNTY AND STATE DO HEREBY CERTIFY THAT STEVEN S. STRAUSS, MANAGER WITH TIMBERBROOK ASSOCIATES, L.C., DOUGLAS W. DENSMORE, TRUSTEE AND DENNIS P. TRAUBERT, TRUSTEE WITH FIRST-CITIZENS BANK & TRUST COMPANY HAVE PERSONALY APPEARED BEFORE ME IN MY AFORESAID COUNTY AND STATE AND ACKNOWLEDGED THE SAME ON SEPTEMBER 10, 2001.

MY COMMISSION EXPIRES MARCH 31, 2004
Arlene M. Thomas
NOTARY PUBLIC

IN THE CLERK'S OFFICE FOR THE CIRCUIT COURT OF BOTETOURT COUNTY, VIRGINIA, THIS PLAT WAS PRESENTED AND WITH THE CERTIFICATE OF ACKNOWLEDGMENT THERETO ANNEXED, IS ADMITTED TO RECORD AT 10:46O'CLOCK A.M. ON THIS 20th DAY OF September, 2001.

ATTEST: TOMMY L. MOORE, CLERK
DEPUTY CLERK

NOTES:

1. THIS PROPERTY IS NOT LOCATED WITHIN THE LIMITS OF OF A 100 YEAR FLOOD BOUNDARY AS DESIGNATED BY FEMA. SEE FLOOD INSURANCE RATE MAP 510018 0150 A.
2. THIS PLAT WAS PREPARED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT AND THERE MAY EXIST ENCUMBRANCES WHICH AFFECT THIS PROPERTY NOT SHOWN HEREON.
3. IRON PINS SET AT ALL CORNERS, UNLESS OTHERWISE NOTED.
4. THIS PLAT IS BASED ON A CURRENT FIELD SURVEY.
5. THIS PLAT IS A SUBDIVISION OF ORIGINAL BOTETOURT COUNTY TAX MAP #101-44C.
6. COVENANTS AND RESTRICTIONS WILL BE RECORDED SEPARATELY FROM THIS PLAT AND WILL AFFECT THE USE OF THE PROPERTY.
7. NEW DIVISION LINE FROM CORNERS 1 TO 2, INCLUSIVE, 9B TO 9A TO 9 TO 10 TO 11 TO 12 TO 13 TO 14 TO 15 TO 16 TO 17 TO TO 18 TO 19, INCLUSIVE.

COMMONWEALTH OF VIRGINIA
9/4/01
VINCENT K. LUMSDEN
No. 1428B
LAND SURVEYOR B

MERIDIAN OF P.B. 20, PG. 27-28

APPROVED:

C L Simpson
BOTETOURT COUNTY, SUBDIVISION AGENT
9/20/01
DATE

PLAT SHOWING

DEDICATION OF RIGHT-OF-WAY COMMONS PARKWAY, PHASE 3 "BOTETOURT COMMONS"

BEING A PORTION OF TRACT "A" (P.B. 18, PG. 172 & 173) AND A PORTION OF ORIGINAL PARCEL "G" (1.674 ACRES), PHASE 2, BOTETOURT COMMONS (P.B. 24, PG. 73), THUS CREATING NEW

PARCEL "G-1" (1.680 ACRES),

BEING THE REMAINING PORTION OF ORIGINAL PARCEL "G"
PROPERTY OF

TIMBERBROOK ASSOCIATES, L.C.

AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

DATE:	SEPTEMBER 4, 2001
SCALE:	1" = 60'
COMM. NO.:	00-336
CADD FILE:	F:\00\00336\00336RP.DWG

SHEET 1 OF 1

VIRGINIA DEPARTMENT OF TRANSPORTATION NOTES:

1. QUALITY CONTROL
STREETS TO BE GRADED, PAVED AND ALL STRUCTURAL COMPONENTS ERECTED IN ACCORDANCE WITH CURRENT VIRGINIA DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE SPECIFICATIONS AND ROAD DESIGN STANDARDS AND ROANOKE COUNTY DESIGN STANDARDS AND SPECIFICATIONS. ALL MATERIALS USED SHALL BE TESTED IN ACCORDANCE WITH STANDARD POLICIES. THE DEVELOPER MUST CONTACT THE OFFICE OF THE RESIDENT ENGINEER, PRIOR TO BEGINNING ANY CONSTRUCTION AT WHICH TIME AN INSPECTION AND TESTING PROCEDURE POLICY WILL BE DRAWN. THE DEVELOPER WILL PRODUCE TEST REPORTS FROM APPROVED INDEPENDENT LABORATORIES AT THE DEVELOPER'S EXPENSE.

THE PAVEMENT DESIGNS SHOWN ARE BASED ON A SUBGRADE CBR VALUE OF 10 OR GREATER. THE SUBGRADE SOIL IS TO BE TESTED BY AN INDEPENDENT LABORATORY AND THE RESULTS SUBMITTED TO THE VIRGINA DEPARTMENT OF TRANSPORATION PRIOR TO BASE CONSTRUCTION. SHOULD THE SUBGRADE CBR VALUES BE LESS THAN 10, THEN ADDITIONAL BASE MATERIAL WILL BE REQUIRED IN ACCORDANCE WITH DEPARTMENTAL SPECIFICATIONS.

THE SUBGRADE MUST BE APPROVED BY VIRGINIA DEPARTMENT OF TRANSPORTATION PRIOR TO PLACEMENT OF THE BASE. BASE MUST BE APPROVED BY VIRGINIA DEPARTMENT OF TRANSPORTATION FOR DEPTH, TEMPLATE AND COMPACTION BEFORE SURFACE IS APPLIED.

2. UTILITIES
ALL NECESSARY UTILITY LATERALS ALONG WITH PROVISIONS FOR CONDUITS (I.E. WATER, SEWER, STORM, GAS AND TELEPHONE) WILL BE CONSTRUCTED PRIOR TO PLACEMENT OF BASE MATERIAL.

GAS OR PETROLEUM TRANSMISSION LINES WILL NOT BE PERMITTED WITHIN THE PAVEMENT OR SHOULDER ELEMENT (BACK OF CURB TO BACK OF CURB) OF THIS DEVELOPMENT. SERVICE LATERALS CROSSING AND PIPE LINES LOCATED OUTSIDE THE PAVEMENT BUT INSIDE THE RIGHT OF WAY WILL BE CONSTRUCTED IN CONFORMITY WITH ASA B 31.8 SPECIFICATIONS AND SAFETY REGULATIONS. DISTRIBUTION LINES WITH PRESSURES LESS THAN 120 LBS. ARE UNAFFECTED BY THE ABOVE.

PERMITS WILL BE REQUIRED FOR ALL UTILITIES WITHIN STREET RIGHT OF WAY PRIOR TO ACCEPTANCE INTO THE SECONDARY HIGHWAY SYSTEM.

ANY EASEMENTS GRANTED TO A UTILITY COMPANY FOR PLACEMENT OF POWER, TELEPHONE, ETC. MUST BE RELEASED PRIOR TO ACCEPTANCE.

3. PRIVATE ENTRANCES
MODIFIED CG-9D GUTTER WILL BE PROVIDED AT ALL ENTRANCES TO PRIVATE LOTS WHERE STANDARD CG-6 CURB AND GUTTER IS APPROVED FOR USE.

DRIVEWAYS CONNECTING TO ROADS WITHOUT CURB & GUTTER SHALL CONFORM TO THE PAVEMENT, SHOULDER & SLOPE.

PERMITS WILL BE REQUIRED FOR ALL PRIVATE ENTRANCES CONSTRUCTED ON STREET RIGHTS OF WAY AFTER ACCEPTANCE INTO THE SECONDARY HIGHWAY SYSTEM.

4. EROSION CONTROL AND LANDSCAPING
CARE MUST BE TAKEN DURING CONSTRUCTION TO PREVENT EROSION, DUST AND MUD FROM DAMAGING ADJACENT PROPERTY, CLOGGING DITCHES, TRACKING PUBLIC STREETS AND OTHERWISE CREATING A PUBLIC OR PRIVATE NUISANCE TO SURROUNDING AREAS.

THE ENTIRE CONSTRUCTION AREA INCLUDING DITCHES, CHANNELS, BACK OF CURBS AND OR PAVEMENT ARE TO BE BACKFILLED AND SEEDED AT THE EARLIEST POSSIBLE TIME AFTER FINAL GRADING.

DRAINAGE EASEMENTS MUST BE DEFINED BY EXCAVATED DITCHES OR CHANNELS FOR THEIR FULL LENGTH TO WELL DEFINED EXISTING NATURAL WATERCOURSES.

THE ROAD WILL BE REVIEWED DURING CONSTRUCTION FOR THE NEED OF PAVED DITCHES. IF EROSION IS ENCOUNTERED IN ANY DRAINAGE EASEMENT, IT WILL BE THE RESPONSIBILITY OF THE DEVELOPER TO SOD, RIP RAP, GROUT, PAVE OR TO DO WHATEVER IS NECESSARY TO CORRECT THE PROBLEM.

ALL VEGETATION AND OVERBURDEN TO BE REMOVED FROM SHOULDER TO SHOULDER PRIOR TO THE CONDITIONING (CUTTING AND/OR PREPARATION) OF THE SUBGRADE.

5. INTERSECTION PAVEMENT RADIUS
MINIMUM PAVEMENT RADIUS OF 25 FEET IS REQUIRED AT ALL STREET INTERSECTION.

6. CONNECTIONS TO STATE-MAINTAINED ROADS
WHILE THESE PLANS HAVE BEEN APPROVED, SUCH APPROVAL DOES NOT EXEMPT CONNECTIONS WITH EXISTING STATE-MAINTAINED ROADS FROM CRITICAL REVIEW AT THE TIME PERMIT APPLICATIONS ARE MADE. THIS IS NECESSARY IN ORDER THAT THE PREVAILING CONDITIONS BE TAKEN INTO CONSIDERATION REGARDING SAFETY ACCOMPANIMENTS SUCH AS TURNING LANES.

7. GUARDRAILS
STANDARD GUARDRAIL WITH SAFETY END SECTIONS MAY BE REQUIRED ON FILLS AS DEEMED NECESSARY BY THE RESIDENT ENGINEER. AFTER COMPLETION OF ROUGH GRADING OPERATIONS, THE OFFICE OF THE RESIDENT ENGINEER, SHALL BE NOTIFIED SO THAT A FIELD REVIEW MAY BE MADE OF THE PROPOSED LOCATIONS.

WHERE GUARDRAILS ARE TO BE INSTALLED THE SHOULDER WIDTH SHALL BE INCREASED IN ACCORDANCE WITH VDOT ROAD AND BRIDGE STANDARDS.

8. STORM DRAINAGE
FIELD REVIEW WILL BE MADE DURING CONSTRUCTION TO DETERMINE THE NEED AND LIMITS OF PAVED DITCHES AND/OR DITCH STABILIZATION TREATMENTS, AND TO DETERMINE THE NEED AND LIMITS OF ADDITIONAL DRAINAGE EASEMENTS. ALL DRAINAGE EASEMENTS MUST BE CUT AND MADE TO FUNCTION TO A NATURAL WATERCOURSE. ANY EROSION PROBLEMS ENCOUNTERED IN AN EASEMENT MUST BE CORRECTED BY WHATEVER MEANS NECESSARY PRIOR TO SUBDIVISION ACCEPTANCE.

DITCH SLOPES ARE TO BE FOUR TO ONE (4:1) FOR SHOULDER WIDTHS OF SIX FEET (6') OR GREATER AND THREE TO ONE (3:1) FOR SHOULDER WIDTHS OF FOUR FEET (4') OR FIVE FEET (5'), UNLESS OTHERWISE SPECIFIED IN THE PLANS.

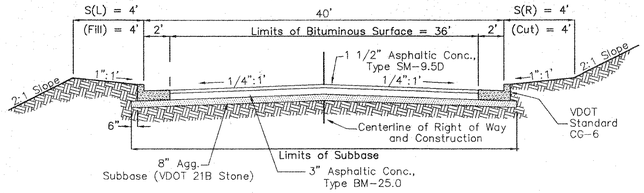
9. ENTRANCE PERMIT
CONTRACTOR SHALL OBTAIN ENTRANCE PERMIT TO THE EXISTING VIRGINIA DEPARTMENT OF TRANSPORTATION RIGHT OF WAY FROM RESIDENT ENGINEER PRIOR TO ROAD CONSTRUCTION.

10. INSPECTION
AN INSPECTOR WILL NOT BE FURNISHED EXCEPT FOR PERIODIC PROGRESS INSPECTION, THE ABOVE MENTIONED FIELD REVIEWS AND CHECKING FOR REQUIRED STONE DEPTHS. THE DEVELOPER WILL BE REQUIRED TO POST A SURETY TO GUARANTEE THE ROAD FREE OF DEFECTS FOR ONE YEAR AFTER ACCEPTANCE BY THE DEPARTMENT OF TRANSPORTATION.

11. STREET MAINTENANCE
THE STREETS MUST BE PROPERLY MAINTAINED UNTIL ACCEPTANCE. AT SUCH TIME AS ALL REQUIREMENTS HAVE BEEN MET FOR ACCEPTANCE, ANOTHER INSPECTION WILL BE MADE TO DETERMINE THAT THE STREET HAS BEEN PROPERLY MAINTAINED.

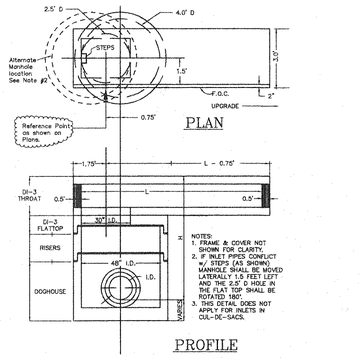
12. UNDERGROUND UTILITIES
CONTRACTOR SHALL VERIFTY LOCATION AND ELEVATION OF ALL UNDERGROUND UTILITIES SHOWN ON THE PLANS IN AREAS OF CONSTRUCTION PRIOR TO STARTING WORK BY CONTACTING MS. UTILITY. CONTACT SITE ENGINEER IMMEDIATELY IF LOCATION OR ELEVATION IS DIFFERENT FROM THAT SHOWN ON THE PLANS. IF THERE APPEARS TO BE A CONFLICT, AND UPON DISCOVERY OF ANY UTILITY NOT SHOWN ON THIS PLAN, CALL "MISS UTILITY" OF CENTRAL VIRGINIA AT 1-800-552-7001.

13. REVISIONS OF SPECIFICATIONS AND STANDARDS
APPROVAL OF THESE PLANS WILL BE BASED ON SPECIFICATIONS AND STANDARDS IN EFFECT AT THE TIME OF APPROVAL AND WILL BE SUBJECT, UNTIL COMPLETION OF THE ROADWAY AND ACCEPTANCE BY THE DEPARTMENT, TO FUTURE REVISIONS OF THE SPECIFICATIONS AND STANDARDS.



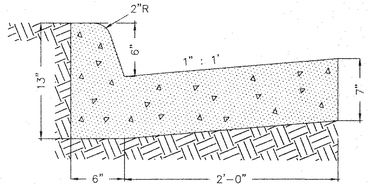
TYPICAL SECTION COMMONS PARKWAY

STA. 16+34.00 TO CUL-DE-SAC



LOCATION DETAIL FOR DI-3B (PRECAST)

NO SCALE



CONCRETE CURB AND GUTTER (CG-6)

NO SCALE

CONSTRUCTION NOTES

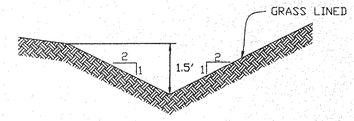
1. ALL WORK SHALL BE SUBJECT TO INSPECTION BY BOTETOURT COUNTY INSPECTORS. THE CONTRACTOR SHALL NOTIFY THE PROPER COUNTY OFFICIALS PRIOR TO THE START OF THE WORK.
2. ALL CONSTRUCTION SHALL CONFORM TO THE CURRENT COUNTY OF BOTETOURT STANDARDS AND SPECIFICATIONS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE OWNER AND THE ENGINEER OF ANY CHANGES OR CONDITIONS ATTACHED TO PERMITS OBTAINED FROM ANY AUTHORITY ISSUING PERMITS.
4. NO SUBSOIL INVESTIGATIONS HAVE BEEN MADE BY THE DESIGNING ENGINEER.
5. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO STARTING CONSTRUCTION.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING "MISS UTILITY" AND COMPLY WITH VIRGINIA'S UNDERGROUND UTILITY DAMAGE PREVENTION ACT.
7. ALL WATER AND SANITARY SEWER MATERIALS AND CONSTRUCTION SHALL COMPLY WITH THE MOST CURRENT VERSION OF THE WATER AND SEWER REGULATIONS OF BOTETOURT COUNTY AS ADOPTED BY THE BOTETOURT COUNTY BOARD OF SUPERVISORS.
8. ALL WATER AND SEWER PIPES SHALL HAVE A MINIMUM OF THREE AND A HALF (3.5) FEET OF COVER MEASURED FROM THE TOP OF PIPE, OVER THE CENTERLINE OF THE PIPE.
9. ALL WATER AND SANITARY SEWER CONNECTIONS TO EXISTING LINES SHALL BE PERFORMED BY THE CONTRACTOR WITH THE BOTETOURT COUNTY INSPECTOR ON SITE.
10. ALL WATER MAINS SHALL BE EITHER CLASS 52 DUCTILE CAST IRON PRESSURE PIPE OR MOLECULARLY ORIENTED POLYVINYL CHLORIDE (PVCO) PRESSURE PIPE AS SPECIFIED IN THE MOST CURRENT VERSION OF THE WATER AND SEWER REGULATIONS OF BOTETOURT COUNTY AS ADOPTED BY THE BOTETOURT COUNTY BOARD OF SUPERVISORS.
11. ALL SANITARY SEWER LINES SHALL BE DUCTILE IRON OR POLYVINYL CHLORIDE (PVC) AS SPECIFIED IN THE MOST CURRENT VERSION OF THE WATER AND SEWER REGULATIONS OF BOTETOURT COUNTY AS ADOPTED BY THE BOTETOURT COUNTY BOARD OF SUPERVISORS.
12. SEE VDOT ROAD AND BRIDGE STANDARDS FOR CONCRETE CURB AND STORM DRAINAGE DETAILS.

GRADING NOTES

1. ALL AREAS TO BE GRADED SHALL BE STRIPPED OF PAVEMENT AND ORGANIC MATTER. ALL MATERIAL NOT SUITED FOR USE AS FILL MATERIAL SHALL BE REMOVED FROM THE SITE AND DISPOSED OF PROPERLY.
2. ANY BORROW OR WASTE SITE MUST HAVE AN APPROVED EROSION AND SEDIMENT CONTROL PLAN PRIOR TO CONSTRUCTION.
3. FILL MATERIAL SHALL BE FREE OF ORGANIC MATTER AND ROCKS LARGER THAN 6 INCHES IN DIAMETER. FILL MATERIAL SHALL BE PLACED AND COMPACTED IN 8 INCH LIFTS TO 95% MINIMUM DENSITY, STANDARD PROCTOR.

SANITARY SEWER HORIZONTAL AND SLOPE DISTANCE DETAIL

NO SCALE



TYPE "A" DITCH

NO SCALE

LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA
4664 BRAMBLETON AVENUE
P.O. BOX 2569
ROANOKE, VIRGINIA 24018
PHONE (540) 774-4411
FAX (540) 772-1415
E-MAIL LUMSDENPC@AOL.COM

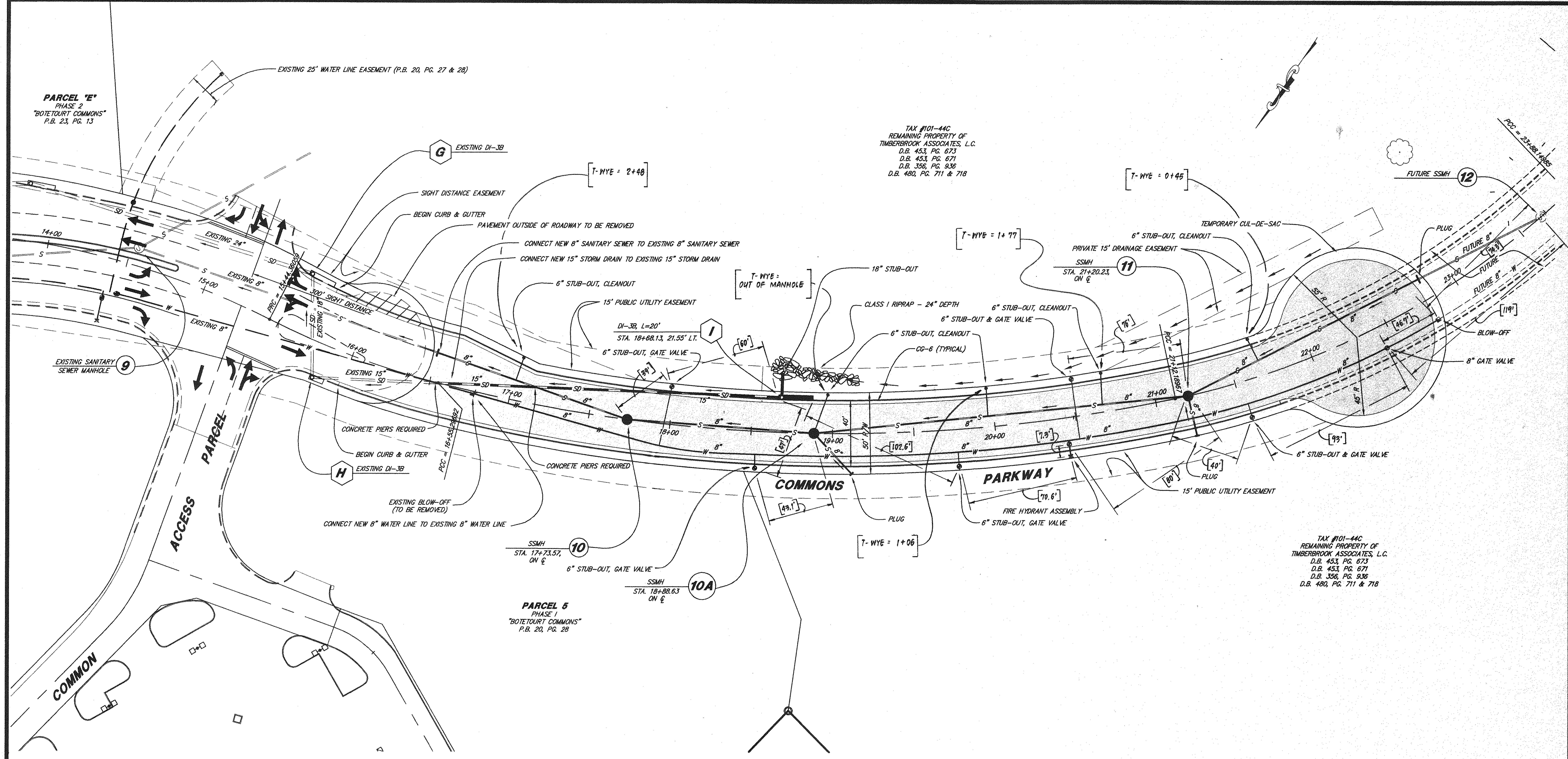
COMMONWEALTH OF VIRGINIA
MICHAEL S. WEBB
No. 012656
2-14-01
PROFESSIONAL ENGINEER

NOTES & DETAILS

PHASE III
BOTETOURT COMMONS
PREPARED FOR
TIMBERBROOK ASSOCIATES, L.C.
AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

REVISIONS		
NO.	DATE	DESCRIPTION
1		
2		
3		
4		
5		

DATE: 20 MARCH 2001
SCALE: NONE
COMMISSION NO: 2000-336
DADD FILE: F:\DEV\2000\336\ENGR\DEVPLAN\ND.DWG



LEGEND

ITEM	EXISTING	PROPOSED
Pavement		
Conc.Curb & Gutter, CG-6		
Manhole	Ⓢ	●
Sanitary Sewer Line	SS	S 8"
Stub-out, Cleanout		
Waterline	W	W 8"
Blow-Off		◩
Gate Valve		●
Fire Hydrant Assembly		
Storm Drain Line	SD	SD
Power Line	P	
Drop Inlet	▭	■
Direction of Traffic		➡

SANITARY SEWER LINE

BEARING AND DISTANCES

LINE	BEARING	DISTANCE
9-10	S 74°57'54" W	317.79'
10-10A	S 59°48'07" W	115.00'
10A-11	S 49°51'47" W	231.08'
11-12 (FUTURE)	S 28°42'21" W	243.11'

"AS-BUILT"

LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA
4664 BRAMBLETON AVENUE
P.O. BOX 20669
ROANOKE, VIRGINIA 24018
PHONE (540) 774-4411
FAX (540) 772-9445
E-MAIL LUMSDENPC@AOL.COM

COMMONWEALTH OF VIRGINIA
[illegible]
MICHAEL S. WEBB
No. 012656
3-28-01
PROFESSIONAL ENGINEER

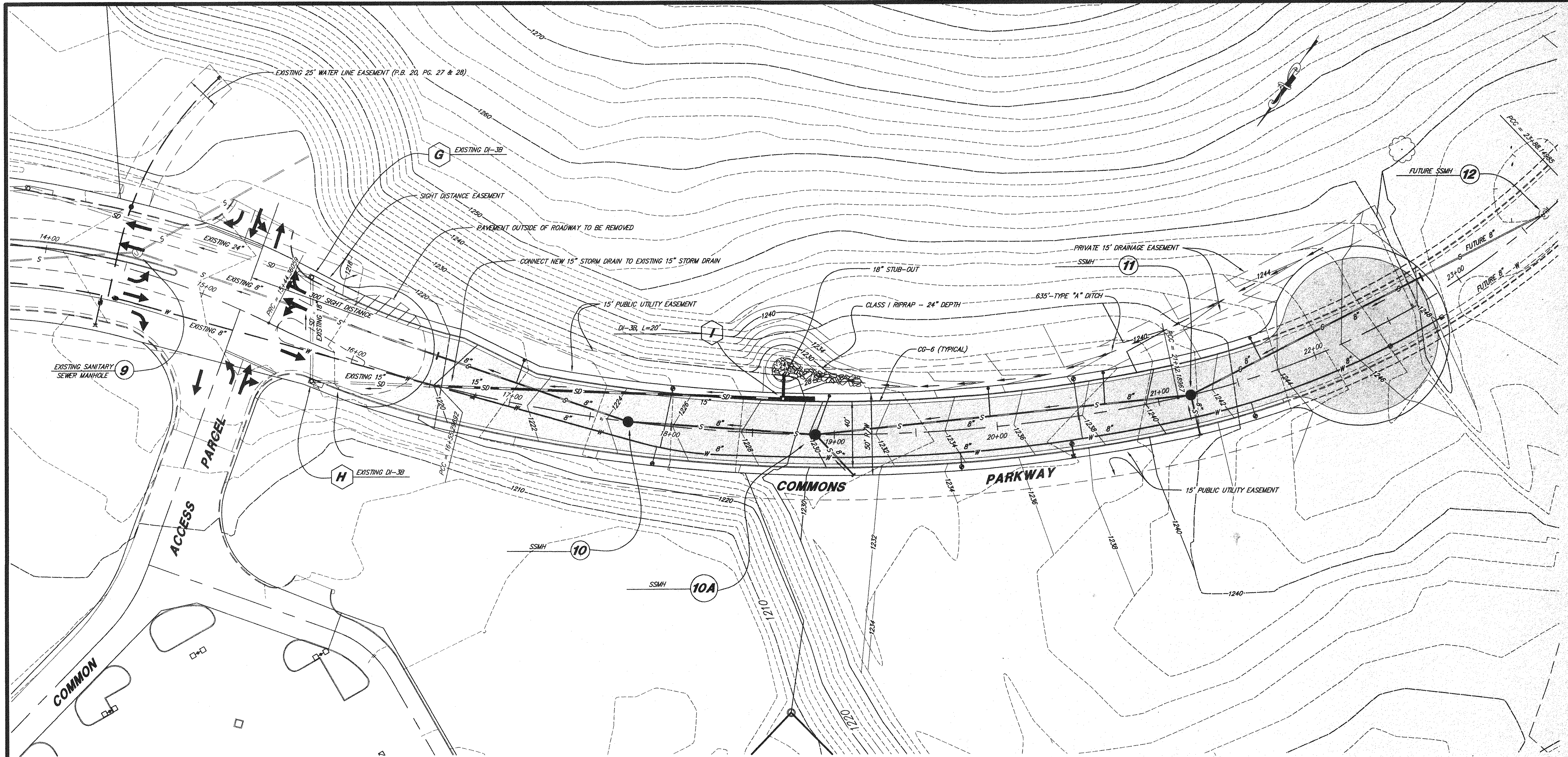
DIMENSIONAL LAYOUT & UTILITIES

PHASE III
BOTETOURT COMMONS
PREPARED FOR
TIMBERBROOK ASSOCIATES, L.C.
AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

REVISIONS

NO.	DATE	DESCRIPTION
1	9/26/01	AS-BUILT SAN. SEWER & WATER (SHOWN IN BRACKETS)
2		
3		
4		
5		

DATE: 20 MARCH 2001
SCALE: 1"=30'
COMMISSION NO: 00-336
CADD FILE: F:\00\00336\DEVPLAN\DEVPLAN



LEGEND

ITEM	EXISTING	PROPOSED
Pavement		
Conc.Curb & Gutter, CG-6		
Manhole	(S)	●
Sanitary Sewer Line	SS	S 8"
Stub-out, Cleanout		
Waterline	W	W 8"
Blow-Off		
Gate Valve		
Fire Hydrant Assembly		
Storm Drain Line	SD	SD
Power Line	P	
Drop Inlet		
Direction of Traffic		→
Contour	1240	1240

LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA
4664 BRAMBLETON AVENUE
P.O. BOX 20669
ROANOKE, VIRGINIA 24018
PHONE (540) 774-4411
FAX (540) 772-9445
E-MAIL LUMSDENPC@AOL.COM

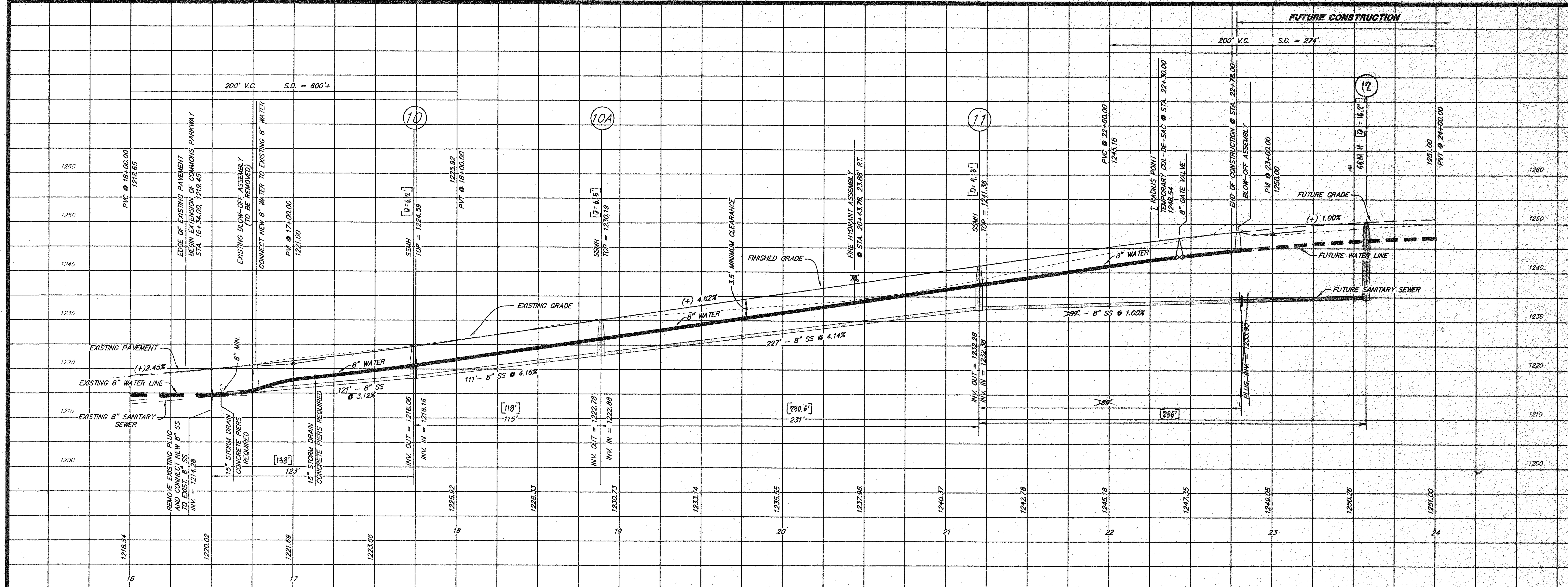
COMMONWEALTH OF VIRGINIA
MICHAEL S. WEBB
No. 012656
2-14-01
PROFESSIONAL ENGINEER

GRADING AND STORM DRAINAGE

PHASE III
BOTETOURT COMMONS
PREPARED FOR
TIMBERBROOK ASSOCIATES, L.C.
AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

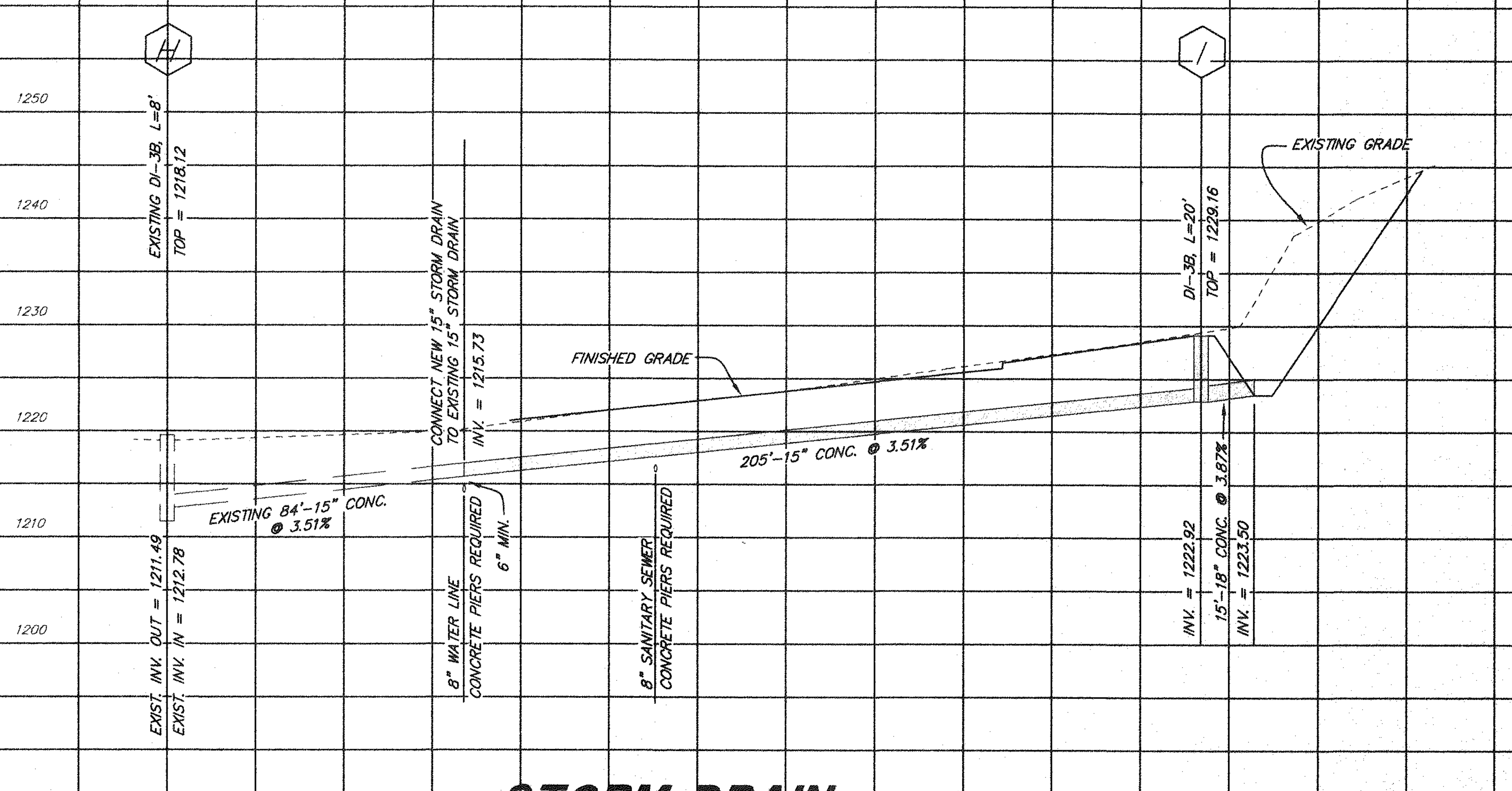
NO.	DATE	REVISIONS DESCRIPTION
1		
2		
3		
4		
5		

DATE: 20 MARCH 2001
SCALE: 1"=30'
COMMISSION NO: 00-336
CADD FILE: F:\00\00336\DEVPLAN\DEVPLAN



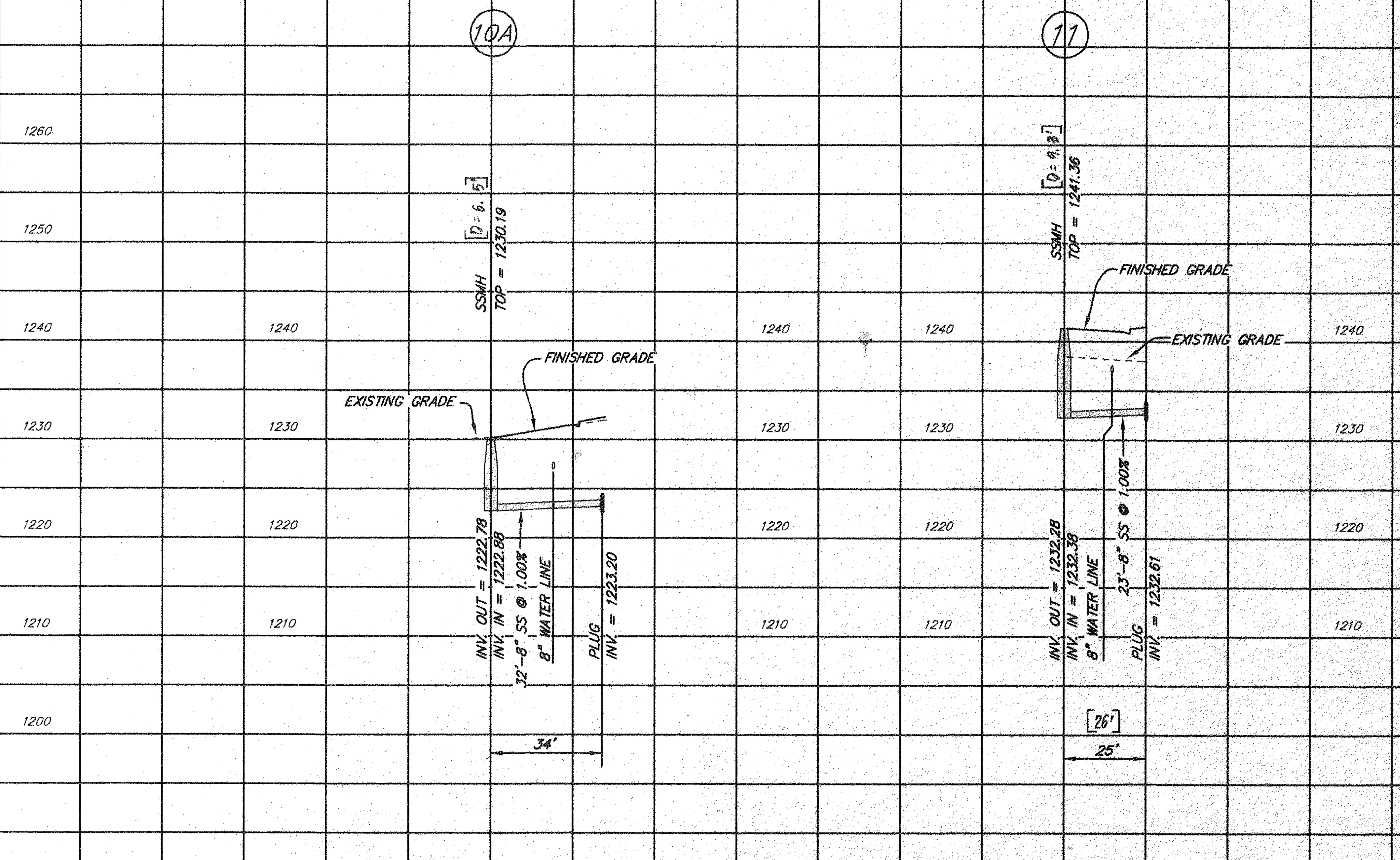
COMMONS PARKWAY

SCALE: 1" = 30' HORIZ.
1" = 10' VERT.



STORM DRAIN

SCALE: 1" = 30' HORIZ.
1" = 10' VERT.



SANITARY SEWER

SCALE: 1" = 30' HORIZ.
1" = 10' VERT.

"AS-BUILT"

LA LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA
4664 BRAMBLETON AVENUE
P.O. BOX 20669
ROANOKE, VIRGINIA 24018
PHONE (540) 774-4411
FAX (540) 772-9445
E-MAIL LUMSDENPC@AOL.COM

COMMONWEALTH OF VIRGINIA
MICHAEL S. WEBB
No. 012656
2-14-01
PROFESSIONAL ENGINEER

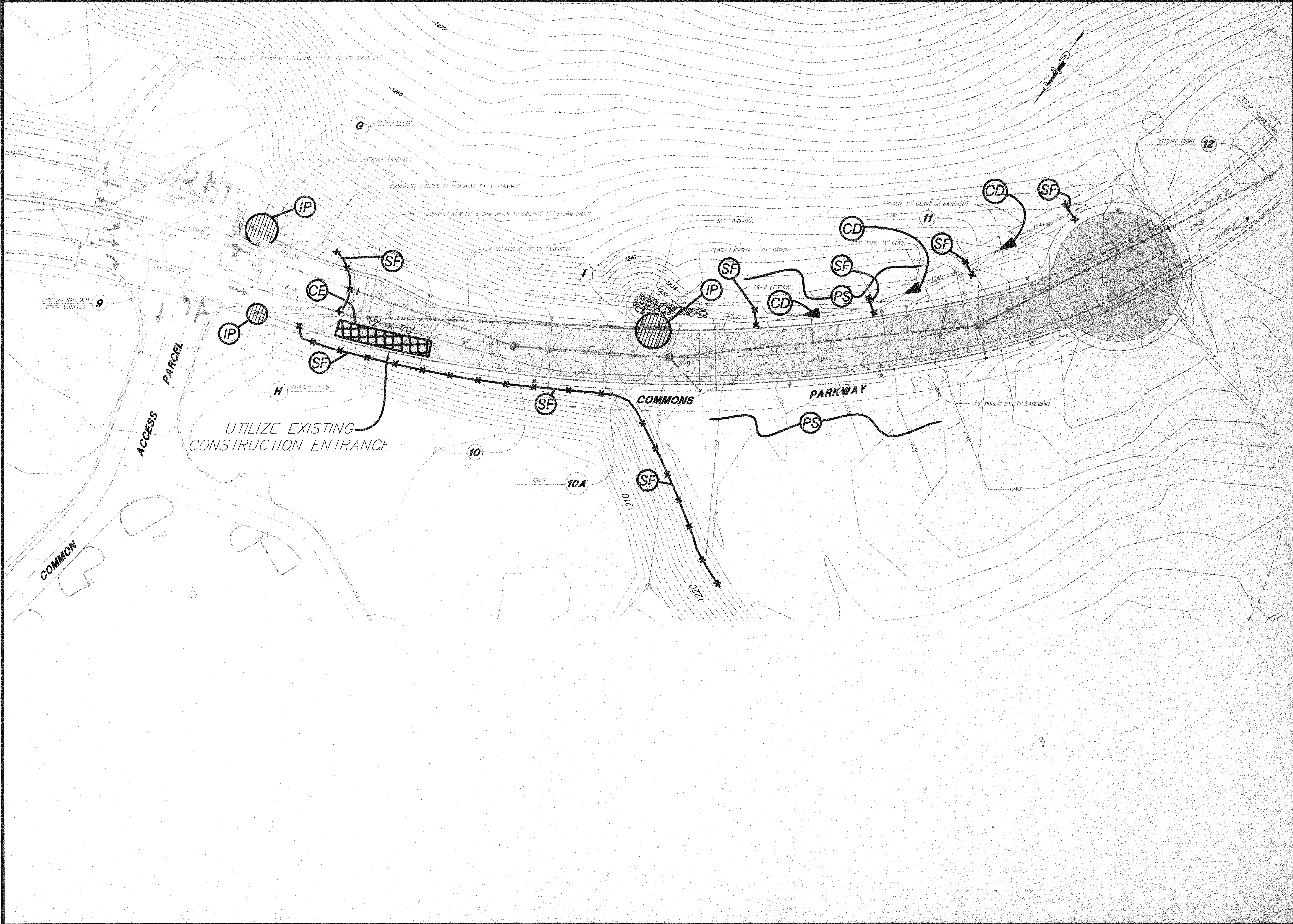
PROFILES

PHASE III
BOTETOURT COMMONS
PREPARED FOR
TIMBERBROOK ASSOCIATES, L.C.
AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

REVISIONS

NO.	DATE	DESCRIPTION
1	4/26/01	AS-BUILT SAN. SEWER (SHOWN IN BRACKETS)
2		
3		
4		
5		

DATE: 20 MARCH 2001
SCALE: AS SHOWN
COMMISSION NO: 2000-336
CADD FILE: F:\00\00336\DEVPLANS\PROFILES



LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA

4664 BRAMBLETON AVENUE
P.O. BOX 20669
ROANOKE, VIRGINIA 24018
PHONE (540) 774-4411
FAX (540) 772-9445
E-MAIL LUMSDENPC@AOL.COM

COMMONWEALTH OF VIRGINIA
MICHAEL S. WEBB
No. 012656
2-14-01
PROFESSIONAL ENGINEER

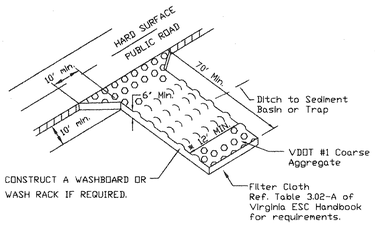
EROSION & SEDIMENT CONTROL PLAN

PHASE III
BOTETOURT COMMONS
PREPARED FOR
TIMBERBROOK ASSOCIATES, L.C.
AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

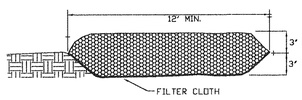
REVISIONS

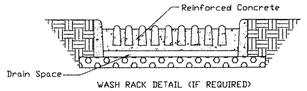
NO.	DATE	DESCRIPTION
1		
2		
3		
4		
5		

DATE: 20 MARCH 2001
SCALE: 1"=30'
COMMISSION NO: 00-336
CADD FILE: F:\00\00336\DEVPLAN\DEVPLAN

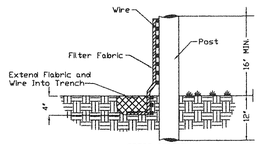


* MUST EXTEND FULL WIDTH OF INGRESS & EGRESS OPERATION.

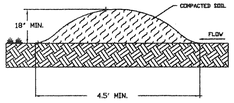




(CE) TEMPORARY GRAVEL CONSTRUCTION ENTRANCE



(SF) CONSTRUCTION OF A SILT FENCE

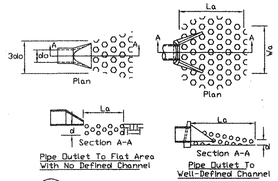


(DD) TEMPORARY DIVERSION DIKE

(FD) TEMPORARY FILL DIVERSION

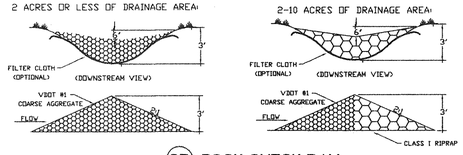
(RWD) TEMPORARY RIGHT-OF-WAY DIVERSION

(DV) DIVERSION

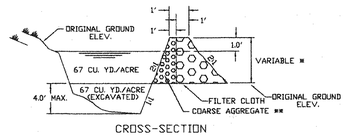


(OP) OUTLET PROTECTION

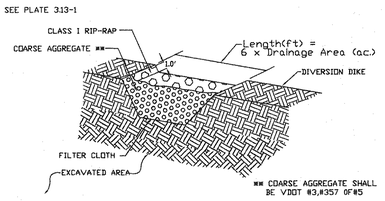
NOTES
1. Apron lining may be rip-rap, grouted rip-rap, or concrete.
2. La is the length of the rip-rap apron as calculated using plates 1.36d and 1.36e.
3. d = 1.5 times the maximum stone diameter, but not less than 6".



(CD) ROCK CHECK DAM

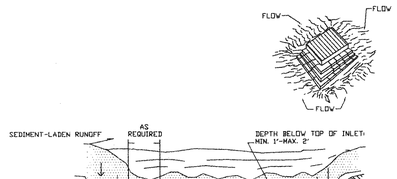


CROSS-SECTION



NOTE:
FOR AREAS LESS THAN 3.0 ACRES. FOR AREAS LARGER THAN 3.0 ACRES A SEDIMENT BASIN IS REQUIRED. SEE DETAIL THIS SHEET.

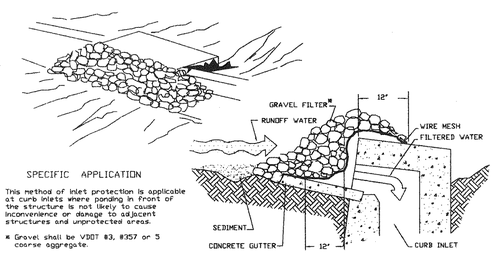
(ST) SEDIMENT TRAP



SPECIFIC APPLICATION

This method of inlet protection is applicable where heavy flows are expected and where an overflow capability and ease of maintenance are desirable.

(IP) EXCAVATED DROP INLET SEDIMENT TRAP

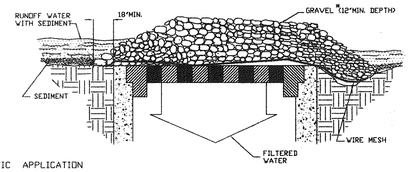


SPECIFIC APPLICATION

This method of inlet protection is applicable at curb inlets where ponding in front of the structure is not likely to cause inconvenience or damage to adjacent structures and unprotected areas.

* Gravel shall be VDOT #3, #357 or 5 coarse aggregate.

(IP) GRAVEL CURB INLET SEDIMENT FILTER



SPECIFIC APPLICATION

This method of inlet protection is applicable where heavy concentrated flows are expected, but not where ponding around the structure might cause excessive inconvenience or damage to adjacent structures and unprotected areas.

* Gravel shall be VDOT #3, #357 or #5 coarse aggregate.

(IP) GRAVEL AND WIRE MESH DROP INLET SEDIMENT FILTER

TEMPORARY SEDIMENT TRAP DATA

STRUCTURE	DRAINAGE AREA (ACRES)	STORAGE (C.Y.) REQ'D	STORAGE (C.Y.) DESIGN	WEIR LENGTH (FT.)	WEIR HEIGHT (FT.)	BERM HEIGHT (FT.)

NO.	TITLE	KEY
3.01	SAFETY FENCE	SAF
3.02	TEMPORARY GRAVEL CONSTRUCTION ENTRANCE	CE
3.03	CONSTRUCTION ROAD STABILIZATION	CRS
3.04	STRAW BALE BARRIER	STB
3.05	SILT FENCE	SF
3.06	BRUSH BARRIER	BB
3.07	STORM DRAIN INLET PROTECTION	IP
3.08	CULVERT INLET PROTECTION	CIP
3.09	TEMPORARY DIVERSION DIKE	DD
3.10	TEMPORARY FILL DIVERSION	FD
3.11	TEMPORARY RIGHT-OF-WAY DIVERSION	RWD
3.12	DIVERSION	DV
3.13	TEMPORARY SEDIMENT TRAP	ST
3.14	TEMPORARY SEDIMENT BASIN	SB
3.15	TEMPORARY SLOPE DRAIN	TSD
3.16	PAVED FLUME	PF
3.17	STORMWATER CONVEYANCE CHANNEL	SCC
3.18	OUTLET PROTECTION	OP
3.19	RIPRAP	RR
3.20	ROCK CHECK DAMS	CD
3.21	LEVEL SPREADER	LS
3.22	VEGETATIVE STREAMBANK STABILIZATION	VSS
3.23	STRUCTURAL STREAMBANK STABILIZATION	SSS
3.24	TEMPORARY VEHICULAR STREAM CROSSING	VSC
3.25	UTILITY STREAM CROSSING	USC
3.26	DEWATERING STRUCTURE	DS
3.27	TURBIDITY CURTAIN	TC
3.28	SUBSURFACE DRAIN	SD
3.29	SURFACE ROUGHENING	SR
3.30	TOPSOILING	TO
3.31	TEMPORARY SEEDING	TS
3.32	PERMANENT SEEDING	PS
3.33	SODDING	SO
3.34	BERMUDA GRASS AND ZOYSIAURASS ESTABLISHMENT	B/N
3.35	MULCHING	MU
3.36	SOIL STABILIZATION BLANKETS AND MATTING	BE/ZE
3.37	TREES, SHRUBS, VINES AND GROUND COVERS	VEG
3.38	TREE PRESERVATION AND PROTECTION	TP
3.39	DUST CONTROL	DC

GENERAL EROSION AND SEDIMENT CONTROL NOTES

1. ALL EROSION & SEDIMENT CONTROL MEASURES SHALL BE ACCOMPLISHED IN STRICT ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS CONTAINED IN THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION.
2. THE APPROVING AUTHORITY MAY ADD TO, DELETE, RELOCATE, CHANGE OR OTHERWISE MODIFY CERTAIN EROSION AND SEDIMENT CONTROL MEASURES WHERE FIELD CONDITIONS ARE ENCOUNTERED THAT WARRANT SUCH MODIFICATIONS.
3. ALL EROSION AND SEDIMENT CONTROL MEASURES AS SHOWN ON THE PLAN SHALL BE PLACED IN ADVANCE OF THE WORK BEING PERFORMED, AS FAR AS PRACTICAL.
4. IN NO CASE DURING CONSTRUCTION SHALL WATER RUNOFF BE DIVERTED OR ALLOWED TO FLOW TO LOCATIONS WHERE ADEQUATE PROTECTION HAS NOT BEEN PROVIDED.
5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LEAVE THE SITE ADEQUATELY PROTECTED AGAINST EROSION, SEDIMENTATION, OR ANY DAMAGE TO ANY ADJACENT PROPERTY AT THE END OF EACH DAY'S WORK.
6. FOR THE EROSION AND SEDIMENT CONTROL KEY SYMBOLS SHOWN ON THE PLANS, REFER TO THE VIRGINIA UNIFORM CODING SYSTEM FOR EROSION AND SEDIMENT CONTROL PRACTICES CONTAINED IN THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION. THESE SYMBOLS AND KEYS ARE TO BE UTILIZED ON ALL EROSION AND SEDIMENT CONTROL PLANS SUBMITTED.

MAINTENANCE

IN GENERAL, ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE CHECKED WEEKLY AND AFTER EACH SIGNIFICANT RAINFALL. THE FOLLOWING ITEMS WILL BE CHECKED IN PARTICULAR:

1. ALL SEDIMENT TRAPS WILL BE CHECKED REGULARLY FOR NECESSARY SEDIMENT REMOVAL.
2. ALL STORM DRAIN INLETS AND OUTLETS WILL BE CHECKED REGULARLY FOR SEDIMENT BUILDUP.
3. ALL SILT BARRIERS WILL BE CHECKED REGULARLY FOR UNDERMINING OR DETERIORATION.
4. ALL SEEDED AREAS WILL BE CHECKED REGULARLY TO SEE THAT GOOD STABILIZATION IS MAINTAINED. AREAS SHOULD BE FERTILIZED AND RESEEDED AS NEEDED.

PERMANENT STABILIZATION

ALL AREAS DISTURBED BY CONSTRUCTION WILL BE STABILIZED WITH PERMANENT SEEDING WITHIN 7 DAYS OR IMMEDIATELY FOLLOWING FINISH GRADING. SEEDING WILL BE DONE ACCORDING TO STANDARD AND SPECIFICATION 3.32 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK. PERMANENTLY SEEDED AREAS SHALL BE PROTECTED DURING ESTABLISHMENT WITH STRAW MULCH.

(PS) PERMANENT SEEDING MIXTURE

TYPE A

15 OCTOBER TO 1 FEBRUARY
K-31 FESCUE @ 5 LB / 1000 SF
BARZY WINTER RYE @ 1/2 LB / 1000 SF

1 FEBRUARY TO 1 JUNE
K-31 FESCUE @ 5 LB / 1000 SF
ANNUAL RYE @ 1/2 LB / 1000 SF

1 JUNE TO 1 SEPTEMBER
K-31 FESCUE @ 5 LB / 1000 SF
GERMAN MILLET @ 1/2 LB / 1000 SF

1 SEPTEMBER TO 15 OCTOBER
K-31 FESCUE @ 5 LB / 1000 SF
ANNUAL RYE @ 1/2 LB / 1000 SF

TYPE B (SLOPES 3:1 OR STEEPER)

15 MARCH TO 1 MAY
CROWN VETCH @ 1/2 LB / 1000 SF
PERENNIAL RYEGRASS @ 1/2 LB / 1000 SF
RED TOP @ 1/8 LB / 1000 SF

15 AUGUST TO 1 OCTOBER
CROWN VETCH @ 1/2 LB / 1000 SF
PERENNIAL RYEGRASS @ 1/2 LB / 1000 SF
RED TOP @ 1/8 LB / 1000 SF

LIME: 140 LB / 1000 SF PULVERIZED AGRICULTURAL LIMESTONE

FERTILIZER: 5-20-10 @ 25 LB / 1000 SF
30-0-0 @ 7 LB / 1000 SF

MULCH: IF REQUIRED, SHALL BE USED OVER ALL SEEDED AREAS AND SHALL BE APPLIED IN ACCORDANCE WITH SECTION 1.75 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION.

SOIL CONDITIONING: INCORPORATION OF LIME AND FERTILIZER, SELECTION OF CERTIFIED SEED, MULCHING, MAINTENANCE OF NEW SEEDLINGS, AND RESEEDING SHALL BE IN ACCORDANCE WITH SPECIFICATIONS CONTAINED WITHIN THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION. ADDITIONAL SEEDING TO BE PERFORMED AS REQUIRED BY THE INSPECTOR.

SEED APPLICATION: APPLY SEED UNIFORMLY WITH A CYCLONE SEEDER, DRILL, CULTIPACKER SEEDER, OR HYDROSEEDER ON A FIRM, FRIABLE, SEEDBED. MAXIMUM SEEDING DEPTH SHALL BE 1/4 INCH.

LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA
4564 BRAMBLETON AVENUE
P.O. BOX 20649
ROANOKE, VIRGINIA 24018
PHONE (540) 774-4417
FAX (540) 772-9445
E-MAIL LUMSDENPC@AOL.COM

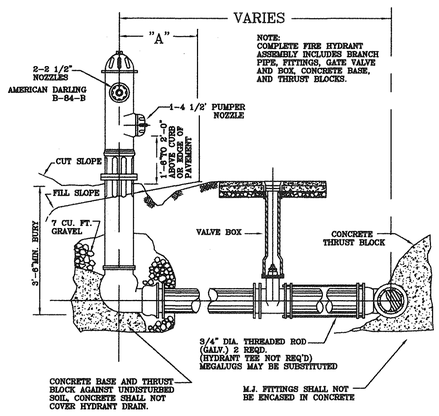
COMMONWEALTH OF VIRGINIA
MICHAEL S. WEBB
No. 012656
2-19-01
PROFESSIONAL ENGINEER

EROSION AND SEDIMENT CONTROL DETAILS

PHASE III
BOTETOURT COMMONS
PREPARED FOR
TIMBERBROOK ASSOCIATES, L.C.
AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

NO.	DATE	REVISIONS DESCRIPTION
1		
2		
3		
4		
5		

DATE: 20 MARCH 2001
SCALE: NONE
DOMMISSION NO: 00-336
DWG FILE: P:\00\00336\EMS\DEVPLAN\336ER01
SHEET 8 OF 11



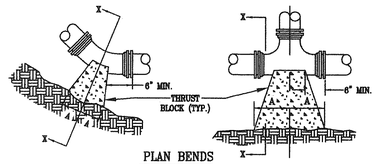
NOTES:
(1) MAIN BODY OF HYDRANT MUST BE PAINTED RED WITH COLOR CODED CAPS PER FLOW RATE.

(2) DISTANCE "A" WITH CURB AND GUTTER, 2' MIN., 4' MAX. FROM BACK OF CURB.

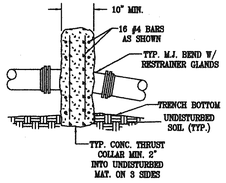
(3) DISTANCE "A" WITHOUT CURB AND CUTTER,

(4) AREA AROUND HYDRANT AT A RADIUS OF 4' TO BE APPROXIMATELY LEVEL AND UNOBSTRUCTED FOR ROAD CONSTRUCTION.

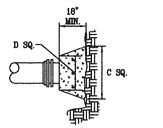
FIRE HYDRANT ASSEMBLY



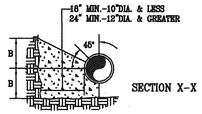
PLAN BENDS



SECTION OF VERTICAL BEND



PLAN AND ELEVATION PLUGS



SECTION X-X

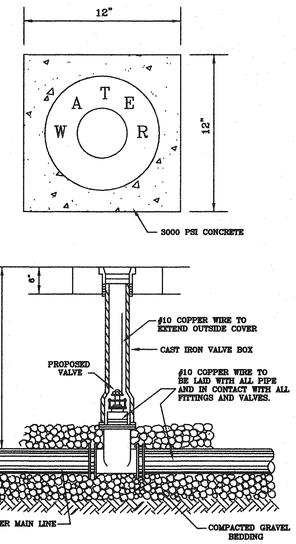
BENDS AND TEES

NOTES:
1. FOR VERT. BEND DOWN IN EXCESS OF 11 1/4" BEND, ANCHORAGE SHALL BE DESIGNED BY ENGINEER.
2. FOR VERT. BEND UPWARD, BLOCKING TO BE SIMILAR TO THAT FOR HORIZ. BEND.
3. GLANDS & BOLTS SHALL BE PROTECTED FROM CONC. BY PLASTIC SHEETING WHEN POURING THRUST BLOCKS.
4. ALL THRUST BLOCK & SUPPORT CONC. SHALL BE 3000 PSI READY MIX CONC.
5. THRUST BLOCKS WITH "B" DIMENSION GREATER THAN 36" SHALL HAVE THE RESTRAINED PIPE INSTALLED WITH A MINIMUM OF 4' OF COVER.

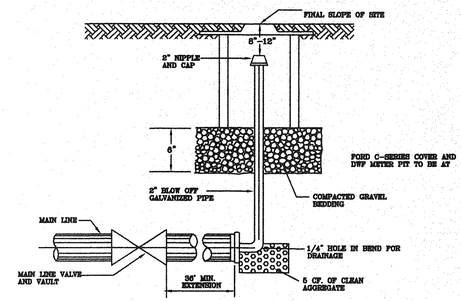
PRESSURE = 200 psi
BEARING = 2000 psf
FACTOR OF SAFETY = 1.5

PIPE SIZE	90° BEND A	90° BEND B	45° BEND A	45° BEND B	22 1/2° BEND A	22 1/2° BEND B	11 1/4° BEND A	11 1/4° BEND B	TEE A	TEE B	PLUG C	PLUG D
4"	8"	12"	8"	8"	6"	6"	6"	6"	11"	9"	10"	6"
6"	18"	12"	8"	10"	8"	8"	8"	8"	11"	10"	12"	18"
8"	18"	13"	10"	10"	8"	8"	8"	8"	11"	12"	12"	24"
10"	20"	16"	12"	14"	8"	12"	8"	12"	14"	16"	16"	30"
12"	20"	16"	12"	14"	8"	12"	8"	12"	14"	16"	16"	30"
16"	28"	20"	16"	18"	11"	13"	11"	13"	18"	20"	20"	36"
24"	82"	42"	62"	30"	44"	22"	22"	16"	82"	42"	82"	42"
30"	185"	42"	100"	42"	52"	42	40"	30"	185"	42"	185"	42"

THRUST BLOCK CONSTRUCTION
NO SCALE

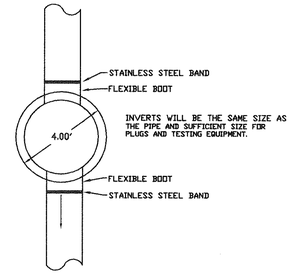


STANDARD VALVE BOX INSTALLATION

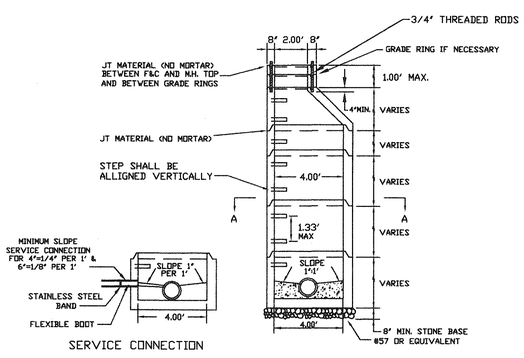


BLOW OFF ASSEMBLY FOR MAIN LINE TEMPORARY TERMINATION

NOTES:
1. ALL MANHOLE FRAMES AND COVERS SHALL BE RUSSELL PIPE & FOUNDRY MH-301 IN NON-PAVED AREAS REQUIRING WATERTIGHT FRAME & COVER AND MH-300 IN PAVED AREAS.
2. STEPS TO BE VERTICALLY ALIGNED.
3. THE FRAME AND COVER SHALL BE PROPERLY ALIGNED WITH THE 2 FOOT OPENING OF THE MANHOLE STRUCTURE AND BOLTED IN PLACE.
4. ALL SAMPLING MANHOLES SHALL BE CONSTRUCTED AS PER MANHOLE DETAILS. WHEN NECESSARY, THE FLAT TOP MANHOLE MAY BE SUBSTITUTED WITH ECCENTRIC OPENING.



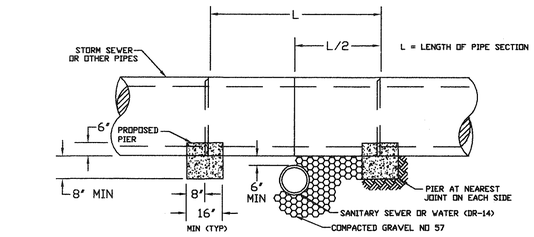
SECTION A-A

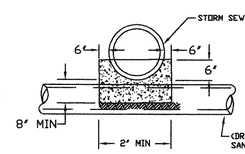


SERVICE CONNECTION

CONCENTRIC MANHOLE WITH PRECAST INVERT

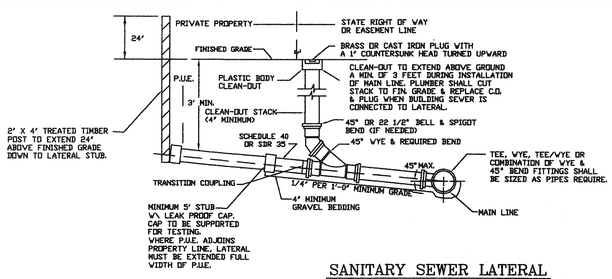
4' STANDARD MANHOLE FOR PIPE 15" OR SMALLER





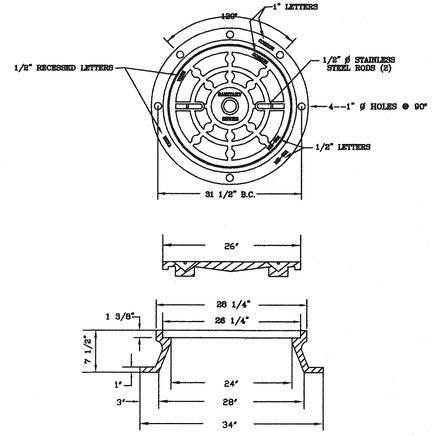
NOTE:
1. PIER REQUIRED WHEN STORM DRAIN OR OTHER PIPES CROSSES OVER THE OTHER UTILITY WITH A VERTICAL CLEARANCE OF LESS THAN 18".
2. PIER TO BE BUILT ON UNDISTURBED EARTH.
3. CONCRETE TO BE READY MIX, CLASS A3.

CONCRETE PIER

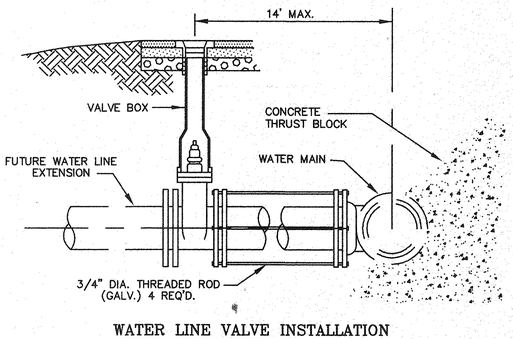


SANITARY SEWER LATERAL

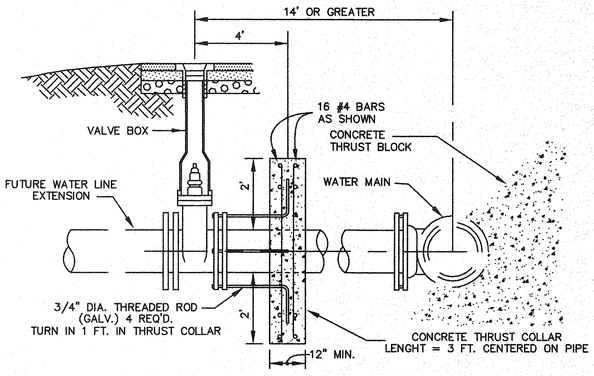
GENERAL NOTES:
1. TRAFFIC BEARING BOX REQUIRED IN TRAFFIC AREAS.
2. ALL PIPES AND FITTINGS SHALL BE OF SIMILAR MATERIAL.
3. ALL PIPE SHALL BE OF SAME SIZE.
4. NO BENDS ARE ALLOWED IN THE LATERAL FROM THE MAIN TO THE CLEAN-OUT STACK.
5. ALL MAIN LINE TAPS ON ACTIVE MAINS WILL BE PERFORMED BY CONTRACTOR AND INSPECTED BY BOTETOURT COUNTY UTILITY DEPARTMENT.
6. PIPING BEHIND CLEAN-OUT TO BE INSTALLED PER BOCA CODE.
7. MINIMUM LATERAL, SIZE 4" FOR RESIDENTIAL SERVICE, 6" FOR NON-RESIDENTIAL SERVICE
8. MINIMUM COVER FOR ALL SEWER LATERALS SHALL BE THREE (3')FEET.



MANHOLE FRAME AND COVER
(RUSSELL PIPE & FOUNDRY MH-300)



WATER LINE VALVE INSTALLATION
(VALVE 14' OR LESS FROM WATER MAIN)



WATER LINE VALVE INSTALLATION
(VALVE 14' OR GREATER FROM WATER MAIN)

LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA
PHONE (540) 774-4411
FAX (540) 772-3445
E-MAIL LUMSDENPC@IX.COM
4664 BRAMBLETON AVENUE
P.O. BOX 20649
ROANOKE, VIRGINIA 24018

COMMONWEALTH OF VIRGINIA
MICHAEL S. WEBB
No. 012656
3-28-01
PROFESSIONAL ENGINEER

WATER & SANITARY SEWER DETAILS

PHASE III
BOTETOURT COMMONS
PREPARED FOR
TIMBERBROOK ASSOCIATES, L.C.
AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

NO.	DATE	DESCRIPTION
1		
2		
3		
4		
5		

REVISIONS

DATE: 20 MARCH 2001
SCALE: AS SHOWN
COMMISSION NO: 2000-336
CADD FILE: 00336\ENG\DEVPLANS\WATSEWDET

SHEET 9 OF 11

WATER LINE CONSTRUCTION

A. General:

1. Except as specifically modified below, water line construction shall meet the requirements of AWWA C600, latest edition standards. Pipe, fittings, valves, hydrants, and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe shall be so handled that any coating or lining is not damaged.

2. The water main shall be laid and maintained to the required lines and grades with fittings, valves, hydrants and accessories set at the required locations as indicated on the approved plans for the project. All valve and hydrant stems shall be set plumb. Whenever obstructions not shown on the plans are encountered during progress of the work and interfere to such an extent that alteration in plans is required, the County, or its authorized representative, shall be advised and their approval given before such alterations are put into effect. Any such alternative design shall be designed or approved by the Engineer of record for the original design.

3. All water shop drawings/cut sheets shall be submitted by the contractor to both the design engineer and Botetourt County for approval prior to installation. Botetourt County will require three (3) complete sets of shop drawings for review.

4. The contractor shall schedule a preconstruction meeting to be attended by the contractor's site superintendent, design engineer, the design engineer's field representative/inspector, representatives from Botetourt County Utility Department and representatives from Botetourt County Engineering Department and any materials suppliers the contractor feels necessary.

5. The contractor shall obtain a copy of the most current edition of Botetourt County Water and Sewer Construction Standards and Specifications and provide proof (a letter) that the contractor has and is familiar with the requirements therein.

B. Excavation, Bedding and Backfill.

1. The trench shall be dug so that the pipe can be laid to the alignment and depth required and it shall be excavated not more than five hundred (500) feet in advance of the completed pipe laying operation. The width of the trench shall be ample to permit the pipe to be placed, backfilled and thoroughly compacted in accordance with the requirements of these specifications. Trenches shall be of such extra widths as will permit the convenient placing of timber supports, sheeting and bracing and handling of special fittings or appurtenances when required.

2. The trench shall be excavated to the depth required so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground at every point between bell holes; except that it will be permissible to disturb and otherwise damage the finished surface over a maximum length of eighteen (18) inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. The damaged area shall be refinished as near as possible. The part of the bottom of the trench excavated below the specified grade shall be backfilled with approved materials and be thoroughly compacted. The finished subgrade shall be prepared accurately by means of hand tools.

3. Bedding shall be placed as required by the pipe manufacturers written instructions.

4. Where excavation is made in fractured rock, boulders or other unsuitable material, the subgrade shall be made by backfilling with a minimum of four (4) inch compacted depth of gravel or clean selected soil which shall be thoroughly compacted.

5. Bell holes shall be provided at each joint to permit the jointing to be made properly and to permit maximum bedding length.

6. Ledge rock, boulders and large stones shall be removed to provide a clearance of at least six (6) inches below and on each side of the pipe and appurtenances being laid and any part, projection or joint of such rock stone.

7. No pipe shall be laid in water or when, in the opinion of the County or their authorized representative, trench conditions are unsuitable.

8. Backfill shall be placed in two (2) equal depth layers to the top of the pipe and each layer shall be thoroughly tamped to ninety five (95) percent of the maximum theoretical density as determined by ASTM D698 Standard Proctor Test. The remainder of the backfill shall be placed in a maximum of two (2) foot layers mechanically tamped. Backfill material shall be free of perishable material, frozen clods, sticky masses of clay and other unsuitable matter. Rock pieces larger than two (2) inches shall not be used in the backfill which is within two (2) feet of the pipe. Backfill within existing or proposed roads shall meet the requirements established and required by the Virginia Department of Transportation.

C. Installation of Pipe and Fittings

1. When installing pipe in the trench proper implements, tools, and facilities satisfactory to the County and as recommended by the material manufacturer shall be provided and used by the contractor for the safe and convenient prosecution of the work. All pipe, valves, fittings, hydrants, and accessories shall be carefully lowered into the trench, piece by piece, by means of a derrick, ropes, slings or other suitable tools or equipment in such a manner as to prevent damage to the water main material and any protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench. The pipe and fittings shall be inspected for defects, and while suspended above grade, be rung with a light hammer to detect cracks.

2. All lumps, blisters and excess coal tar coatings shall be removed from the ends of ductile iron pipe and the outside of the spigot and the inside of the bell shall be wiped clean, dry and free from oil and greases before the pipe is laid.

3. Every precaution shall be taken to prevent foreign material including non-potable water from entering the pipe while it is being placed in the line. If the pipe-laying crew cannot put the pipe into the trench and in place without getting earth into, a heavy tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations no debris, tools, clothing, or other materials shall be placed in the pipe. At the end of each day a watertight plug shall be placed in the end of all pipe openings.

4. After placing a length of pipe in the trench, the spigot end shall be centered in the open bell of the pipe line and the pipe pushed home so that the face of the spigot is in close contact with the shoulder of the bell. Water pipe shall be laid with the bell facing the direction of the laying.

5. No stub of any water main shall terminate with a capped or plugged valve. Where a valve is required to be installed near a stub end, one joint of pipe shall be installed after the valve. The pipe shall be plugged and a concrete kick block poured behind it.

6. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or cement lining and so as to leave a smooth end at right angles to the axis of the pipe.

7. When machine cutting is not available for cutting metal pipe twenty (20) inches in diameter or larger, the electric-arc cutting method will be permitted using a carbon or steel rod. Only qualified and experienced workmen shall be used for this work. The flame cutting of metal pipe by means of oxyacetylene torch will not be permitted.

8. Whenever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or plumb stems, or where long-radius curves are approved, the amount of deflection allowed shall not exceed the minimum required, for satisfactory jointing of the pipe, as specified in this manual. The maximum deflection permitted per joint shall be in accordance with AWWA C600 Table 4 for push-on joint and Table 5 for mechanical joint pipe.

9. All tees, bends, plugs, caps and fire hydrants shall be substantially braced, blocked and/or strapped to prevent any movements by providing adequate reaction backing and/or tie rods. Reaction backing shall be designed and installed as indicated in the standard details.

10. Hydrants shall be set to finished grade as follows:

a. Bottom of the four and one-half (4-1/2) inch nozzle shall be between eighteen (18) inches and twenty-four (24) inches above finish elevation of the edge of the shoulder on streets without curb and gutter and between eighteen (18) inches and twenty-four (24) inches above the elevation of the curb on streets with curb and gutter as indicated on the standard details.

b. The two and one-half (2 1/2) inch hose connections shall have a minimum of six (6) feet clearance on all sides.

c. Surface shall be approximately level within a six (6) foot radius of the hydrant.

B. Testing

1. All new water mains shall be tested, after backfilling to a hydrostatic pressure of not less than 100 psi above design water pressure for the system or 150 psi, whichever is greater. Allowable leakage shall be calculated by the following formula:

$$L = \frac{SDP^{1/2}}{133{,}200}$$

Where: L = allowable leakage in gallons per hour
S = length of pipe tested in feet.
D = nominal diameter of pipe in inches.
P = average test pressure during leakage test in psi

Allowable leakage is shown in columnar form in Table 6.

2. No water line shall be placed in service until the leakage is less than the allowable leakage as indicated above. Testing of water mains shall only be done after installation of all valves, taps and service laterals are complete. All portions of the water system, including hydrants and service lines, shall be subject to the hydrostatic pressure during the leakage test. Testing of water mains shall be observed and documented by the design engineer. All testing shall be coordinated with Botetourt County Department of Public Works.

3. All high points and service lines in the portion of the system under test shall be vented and all air shall be expelled from the system prior to beginning the test. All fittings and hydrants shall be properly braced or blocked before applying pressure. Where concrete thrust blocks are used, they shall have attained their final set prior to testing.

4. After the portion of the system under the test has reached the required pressure as stated herein, said pressure shall be maintained for two (2) hours. At the conclusion of the pressure test, the volume of makeup water required to refill the pipeline shall be determined by measurement with a displacement meter or by pumping from a vessel of known volume.

5. All joints or fittings at which leakage occurs shall be re-worked to insure tightness. All visible leaks shall be repaired regardless of amount of leakage. If the measured amount of leakage exceeds the values for the appropriate size as found in AWWA Specifications C600, Hydrostatic Testing (Table 6), the pipe-line shall be repaired and re-tested until leakage is within the limit set by the referenced specification. Methods of repair prior to re-testing will be done with the County's approval and inspection. Repairs of new construction will be by adjustment or replacement of material only. The use of repair clamps or bell clamps will not be acceptable.

Waterline Pipe, Fittings, and Accessories

A. General

1. All pipe for water main construction shall be either ductile cast iron pressure pipe of the push-on joint or mechanical joint variety, conforming to AWWA C151, latest revision. Thickness class shall be Class 52 for all pipe twelve (12) inches in diameter or less. Water mains larger than twelve (12) inches diameter in size shall have thickness class as determined by thickness design of ductile-iron pipe AWWA C150 or;

2. Molecularly Oriented Polyvinyl Chloride (PVCO) pressure pipe conforming to AWWA C909, dimension Ratio (OR) 18, shall be minimum for water pipe. SDR-21 in two (2) inch size only may also be used where approved by County.

B. Ductile Cast Iron Standard Mechanical Joint Pipe

1. All ductile cast iron standard mechanical joint water pipe shall conform to ANSI Specification A21.51 and shall be lined with cement mortar and have a protective exterior coating. The linings and protective coatings equal to "Enameline" with tar coating in the exterior will be considered as a satisfactory lining for the water pipe, however, any substitution in pipe lining and/or coating from ASNI A21.4 shall be specifically approved by the County. Joints of standard mechanical joint pipe shall conform to ANSI Specifications A21.11.

2. High strength cast iron tee head bolts, hex nuts, cats or ductile iron glands and rubber gaskets shall be as furnished by the pipe manufacturer. All tie bolts and nuts shall be constructed of the same size and type material as head bolts and hex nuts.

3. In making connections of ductile cast iron pipe using the standard mechanical joint the gland followed by the rubber gasket shall be placed over the plain end of the pipe which shall be carefully inserted and aligned into the socket end of the pipe. Gasket shall then be pushed into position so that it is evenly seated in the socket. The gland shall then be moved into position against the face of the gasket, bolts, inserted and made finger tight. Bolts shall then be tightened in accordance with AWWA C600 Table 3 (75-90 ft-lb torque for pipe size 4-12"). All other requirements concerning bedding, alignment, and cleaning of the pipe before making the joint shall be followed.

B. Ductile Cast Iron Pipe-Push on Joint

1. All push-on or 'slip' joint pipe shall conform to the requirements of standard mechanical joint pipe in regard to strength, class, protective coatings, etc.

C. Molecularly Oriented Polyvinyl Chloride (PVCO) pressure pipe

1. PVCO pipe meeting the AWWA Specification C909 for DR 18, pressure class 150 may be used for water lines.

a. PVCO pipe shall be installed, embedded and backfilled according to the manufacturers written instructions. To facilitate future locating of PVCO water pipe, a copper wire, size 10, shall be laid with the pipe and in contact with all fittings and valves as shown on the Water Detail Drawing.

b. All service line connections to PVCO pipe shall be made using a service saddle and corporation stop. Service saddle shall be of a type specifically manufactured for PVCO pipe and shall be extra wide or double-band type. No direct tap to PVCO pipe will be permitted.

c. Only bell and spigot with elastomeric gasket joints shall be used. Solvent-cement joints or pipe requiring couplings shall be used.

d. SDR-21 shall be used for all pipe sized two (2) inch.

e. For lines five (5) foot or deeper, a monument (as shown on the Water Detail Drawing) shall be installed every five-hundred (500) feet of water line installed.

D. Cast Iron Pipe Fittings

1. Fittings for all water pipes shall be ductile iron or gray cast iron in accordance with AWWA Specification C11 0, latest revision, with a minimum pressure rating of 250 psi.

E. Gate Valve

1. All gate valves shall be of superior quality thin-walled, ductile iron valves, manufactured by American Flow Control. The valves shall be resilient seat, epoxy coated bronze mount type. All gate valves shall withstand a working pressure of 200 psi and shall be in strict conformance to all applicable AWWA Standards. Wrench nut shall turn to the left (counterclockwise) to open the valve. Valves shall be so arranged to fit into pipe lines having standardized mechanical joints or slip joints. All gate valves shall be resilient seat type valves meeting AWWA C509, latest revision standards.

2. On valves fourteen (14) inches or larger, butterfly valves conforming to AWWA C504 may be used.

F. Fire Hydrants

1. All hydrants shall be traffic model, Dry-barrel type, meeting AWWA C502, latest revision standard; American Flow Control B 84 B. Hydrants shall be of the compression type with main valve openings not less than four and one-half (4-1/2) inches in diameter. Hydrants shall have a cast or ductile iron body with full bronze trim and shall withstand a hydrostatic test pressure of 300 psi. Hydrants shall have a six (6) inch connection base for setting with a minimum of thirty-six (36) inch cover on connection pipe. Hydrants shall be equipped with hose connections as follows:
Two (2) each, 2-1/2" N.S.T. hose connections
One (1) each, 4-1/2" N.S.T. pumper connection

2. Hydrant shall be operated by a National Standard one and one-half (1-1/2) inch pentagon shaped operating nut, opening counterclockwise. The direction of opening shall be clearly marked by an arrow cast on the outside of the hydrant. Hydrants shall be connected to the main with a six (6) inch pipe and shall be controlled by an independent six (6) inch gate valve. The six (6) inch gate valve shall be located as near to the service main as practical and connected to the tee with tie rods.

3. All hydrant barrels and caps shall be painted red.

G. Valve Boxes

1. All valve boxes, base extensions, lid and cover shall be of cast or ductile iron. Valve boxes shall be of the American Flow Control sliding type, round head marked "Water'. The shaft diameter shall not be less than five (5) inches. The valve boxes shall have a minimum range of extension to fit two (2) inch to twelve (12) inch valves inclusive, placed on mains at depths of three (3) feet to five (5) feet of cover in order that the cover of the valve box is set to finished grade as shown in the Water Detail Drawing. For valves five (5) feet or deeper an American Flow Control Adjustable Trench Adapter shall be used with the cover of the valve box set to finished grade as shown in the Water Detail Drawing.

H. Special Conditions

1. The County may require that special material and/or construction be used where normal water pressure exceeds the pressure rating used in these standards and where the design will not permit reducing these pressures to acceptable levels.

Disinfection of Water Mains

A. General

1. After testing and before final inspection of the completed systems, water mains and service laterals shall be flushed and disinfected in accordance with AWWA Specification C651 latest revisions. Flushing shall be accomplished at a flow velocity of not less than 2.5 feet per second.

2. Disinfection as described in AWWA C651-"Placing of calcium hypochlorite tab-lets" shall be used. Five (5) gram calcium hypochlorite tablets with 3.25 gram available chlorine per tablet shall be attached at the inside top of the pipe by an adhesive such as Permatex No.2 or equal. The following number of tablets for

the given pipe size shall be used for an initial dose of twenty-five (25 mg/1 (ppm)) chlorine:

Pipe Diameter	Number of Tablets Per 18-20 Ft. Pipe Section
6"	1
8"	2
10"	3
12"	4
16"	7

or the number of tablets equal to 0.0012 (d)2L rounded to the next higher integer, where d is the inside diameter, in inches, and L is the length of the pipe section, in feet. Use of the continuous feed or slug method of disinfecting may only be used to re-chlorinate a water pipe after the initial disinfection or in other specific cases approved by the County.

3. The disinfection solution shall remain in the pipe line for not less than twenty-four (24) hours, after which time a chlorine residual of 10 ppm at all parts of the line shall be required. All valves and appurtenances shall be operated while the chlorinated water is in the main.

4. Following chlorination piping shall be thoroughly flushed. Water in the new main shall be proven comparable in quality to the existing public water supply. The Virginia Waterworks Regulations require at least two consecutive satisfactory bacteriological samples from the distribution system before the system can be placed in service. Samples must be collected at regular intervals not exceeding 2000 feet throughout the length of the main and must be taken to an approved laboratory for testing and the Developer/Contractor shall pay all costs associated with disinfection and testing of installed facilities and bacteriological samples as required.

Separation of Water Lines and Sanitary Sewers

A. General:
1. The following factors shall be considered in providing adequate separation:
a. Materials and types of joints for water and sewer pipe
b. Soil Conditions
c. Service branch connections into the water line and sewer lines
d. Compensating variations in the horizontal and vertical separations
e. Offsetting of pipes around manholes

B. Parallel Installation

1. Normal conditions: water lines shall be laid at least ten (10) feet horizontally from a sewer line whenever possible, the distance shall be measured edge-to-edge unless determined by the County to be unusual conditions.

2. Unusual conditions: when local conditions prevent a horizontal separation described above, the following construction shall be used:

a. The bottom (invert) of the water main shall be at least eighteen (18) inches above the top (crown) of the sewer.

b. Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved water pipe, pressure tested in place without leakage prior to backfilling. Pressure test shall be 30 psi.

3. The sewer manhole shall be made 100% water-tight construction and tested in place by Standard vacuum test.

C. Crossing

1. Normal Conditions: water lines crossing over sewers shall be laid to provide a separation of at least eighteen (18) inches between the bottom of the water line and the top of the sewer whenever possible.

2. Unusual conditions: when local conditions prevent a vertical separation as described above, the following construction shall be used:

a. Sewers passing over or under water lines shall be constructed of AWWA approved water pipe, pressure tested in place without leakage prior to backfill. Pressure test will be conducted at 30 psi.

b. Water lines passing under sewers shall, in addition, be protected by providing:

i. A vertical separation of at least eighteen (18) inches between the bottom of the sewer and the top of the water line. Sewer line shall be encased along its length where it is within 10' of the water line.

ii. Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line.

iii. The length of the water line be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer.

D. Sewers or Sewer Manholes

1. No water pipes shall pass through or come in contact with any part of a sewer manhole.

E. Other Utilities

1. When other underground utilities (storm drains, gas, electrical, phone, etc.) cross within twelve (12) inches above or below water lines adequate structural support of the utilities shall be addressed.

Valve, Air Relief, and Blow-Off Chamber

A. General

1. During construction air and sediment accumulations may be removed through a standard fire hydrant; compressed air and pumping may be used for de-watering mains through hydrants.

2. Chambers or pits containing valves, blow-offs, meters, or other such appurtenances to a distribution system shall not be connected directly to any storm drain or sanitary sewer, nor shall blow-offs or air relief valves be connected directly to any storm drain or sanitary sewer.

3. Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water, or to absorption pits underground in areas with sufficiently water table.

4. The design engineer shall indicate the size of the air relief discharge required on the plan sheet.

INSTALLATION OF DUCTILE-IRON WATER MAINS

TABLE 4

Maximum Joint Deflection* Full Length Pipe-Push On Type Joint

Nominal Pipe Size (in.)	Deflection Angle 0 degrees	Maximum Offset-S In. (m) 18 ft. (5.5m) L	Maximum Offset-S In. (m) 20 ft. (6.1 m) L	Approx. Radius of Curve-R Produced by Succession of Joints-ft.(m) 18 ft. (5.5m) L	Approx. Radius of Curve-R Produced by Succession of Joints-ft.(m) 20 ft. (6.1m) L
3	5	19(0.48)	21(0.53)	205(62)	230(70)
4	5	19(0.48)	21(0.53)	205(62)	230(70)
6	5	19(0.48)	21(0.53)	205(62)	230(70)
8	5	19(0.48)	21(0.53)	205(62)	230(70)
10	5	19(0.48)	21(0.53)	205(62)	230(70)
12	5	19(0.48)	21(0.53)	205(62)	230(70)
14	3*	11(0.28)	12(0.30)	340(104)	380(115)
16	3*	11(0.28)	12(0.30)	340(104)	380(115)
18	3*	11(0.28)	12(0.30)	340(104)	380(115)
20	3*	11(0.28)	12(0.30)	340(104)	380(115)
24	3*	11(0.28)	12(0.30)	340(104)	380(115)
30	3*	11(0.28)	12(0.30)	340(104)	380(115)
36	3*	11(0.28)	12(0.30)	340(104)	380(115)
42	2*	7 1/2(0.19)	8(0.20)	510(155)	570(174)
48	2*	7 1/2(0.19)	8(0.20)	510(155)	570(174)
54	1 1/2*	5 1/2(0.14)	6(0.15)	680(207)	760(232)

*For 14-in and larger push-on joints maximum deflection angle may be larger than shown above. Consult manufacturer.

INSTALLATION OF DUCTILE-IRON WATER MAINS

TABLE 5

Maximum Joint Deflection* Full Length Pipe-Mechanical Joint Pipe

Nominal Pipe Size (in.)	Deflection Angle 0 degrees	Maximum Offset-S In. (m) 18 ft. (5.5m) L	Maximum Offset-S In. (m) 20 ft. (6.1 m) L	Approx. Radius of Curve-R Produced by Succession of Joints-ft.(m) 18 ft. (5.5m) L	Approx. Radius of Curve-R Produced by Succession of Joints-ft.(m) 20 ft. (6.1m) L
3	8-18	31(0.79)	31(0.89)	125(38)	140(43)
4	8-18	31(0.79)	35(0.89)	125(38)	140(43)
6	7-07	27(0.69)	30(0.76)	145(44)	160(49)
8	5-21	20(0.51)	22(0.56)	195(59)	220(67)
10	5-21	20(0.51)	22(0.56)	195(59)	220(67)
12	5-21	20(0.51)	22(0.56)	195(59)	220(67)
14	3-35	13 1/2(0.34)	15(0.38)	285(87)	320(98)
16	3-35	13 1/2(0.34)	15(0.38)	285(87)	320(98)
18	3-00	11(0.28)	12(0.30)	340(104)	380(116)
20	3-00	11(0.28)	12(0.30)	340(104)	380(116)
24	2-23	9(0.23)	10(0.25)	450(137)	500(152)
30	2-23	9(0.23)	10(0.25)	450(137)	500(152)
36	2-05	8(0.20)	9(0.23)	500(152)	550(167)
42	2-00	7 1/2(0.19)	8(0.20)	510(155)	570(174)
48	2-00	7 1/2(0.19)	8(0.20)	510(155)	570(174)

TABLE 6

Allowable Leakage per 1,000 ft. (305 m) of Pipeline*--gph

Average Test Pressure psi (Bar)	Nominal Pipe Diameter - In. 3	4	6	8	10	12
450 (31)	0.48	0.64	0.95	1.27	1.59	1.91
400 (28)	0.45	0.60	0.90	1.20	1.50	1.80
350 (24)	0.42	0.56	0.84	1.12	1.40	1.69
300 (21)	0.39	0.52	0.78	1.04	1.30	1.56
275 (19)	0.37	0.50	0.75	1.00	1.24	1.49
250 (17)	0.36	0.47	0.71	0.95	1.19	1.42
225 (16)	0.34	0.45	0.68	0.90	1.13	1.35
200 (14)	0.32	0.43	0.64	0.85	1.06	1.28
175 (12)	0.30	0.40	0.59	0.80	0.99	1.19
150 (10)	0.28	0.37	0.55	0.74	0.92	1.10
125 (9)	0.25	0.34	0.50	0.67	0.84	1.01
100 (7)	0.23	0.30	0.45	0.60	0.75	0.90

* If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA
4664 BRAMBLETON AVENUE
P.O. BOX 20669
ROANOKE, VIRGINIA 24018
PHONE (540) 774-4411
FAX (540) 772-9445
E-MAIL LUMSDENPC@AOL.COM

COMMONWEALTH OF VIRGINIA
MICHAEL S. WEBB
No. 012656
3-26-01
PROFESSIONAL ENGINEER

PHASE III
BOTETOURT COMMONS
PREPARED FOR
TIMBERBROOK ASSOCIATES, L.C.
AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

WATER SPECIFICATIONS

REVISIONS

NO.	DATE	DESCRIPTION
1		
2		
3		
4		
5		

DATE: 20 MARCH 2001
SCALE: NONE
COMMISSION NO: 2000-336
DADD FILE: 2000\ENGINEER\DEVPLANS\WAT_SPECS.DWG

SANITARY SEWER

SANITARY SEWER PIPE MATERIALS

1. Bedding:
All pipe (PVC and ductile iron) up to and including eighteen inch (18") shall be bedded in compacted granular material and compacted granular bedding shall completely cover the pipe barrel to a depth of 6" over top of pipe. The granular material shall be well-graded, crushed stone meeting the requirements of V DOT gradation 57 or 67 stone. Bedding for pipe larger than eighteen inches (18") shall be designed on an individual basis and approved by the County. Refer to Detail Drawings.

2. Pipe Material Selection:
The pipe materials listed hereunder have been approved for use in Botetourt County. However, the acceptability of specific pipe material for use within a specific soil type or condition shall be determined by the County on an individual basis at the time of design review of the plans. The type or types of pipe allowable for use on any specific project shall be shown on the approved construction plans.

a. Ductile Iron Pipe:
Ductile iron pipe shall be centrifugally cast manufactured in accordance with ANSI Specification A21.511 latest revision, and shall be cement mortar lined in accordance with ANSI Specification A21.4–80. Slip joint or mechanical joint pipe shall be used for gravity sewers. Slip joint pipe shall be designed in accordance with ANSI standard A21–50 and specified according to ANSI standard A21–11. Class 51 pipe shall be minimum strength used in all sewer applications. May only be used upon approval of County. Gaskets shall be furnished by the manufacturer and installed in accordance with his recommendations. Ductile iron pipe shall be used in exposed pipe installations, and where approved by the County when other pipe materials are subject to crushing.

b. Polyvinyl Chloride (PVC):
PVC sewer pipe shall be manufactured in accordance with ASTM Designation 3034–77 (SDR 35). Gravity sewer pipe shall be unplasticized polyvinyl chloride with integral rubber ring wall bell and spigot joints furnished in 12.5' and 20' nominal lengths. Installation of PVC gravity sewer pipe and fittings shall be in accordance with ASTM Designation 2321and manufacturer's recommendations.

i. PVC sewer pipe shall be stored in accordance with manufacturer's recommendations on flat, even surfaces and shall remain racked on the pallets as delivered to the job site until such time as the trench is ready for placement of the pipe; i.e., PVC pipe shall not be strung out on the job site in excess of one day's work.

ii. The County may require additional strength PVC pipe including SDR–26, SDR–21, DR–18 or concrete encasement of SDR–35, or both where depth exceeds twelve feet (12') and where additional protection is required for the pipe.

c. PVC (Ribbed Pipe): Ultra–Rib pipe meeting ASTM F–794 with a stiffness factor of 46 may be used on County projects. Installation shall be in strict compliance with manufacturer's written instructions. All fittings used shall be designed specifically for pipe used and be approved for use by same manufacturer of pipe. Connections to manholes shall be made by manufacturer's recommended methods and approved by County.

3. Service Connections: Polyvinyl chloride (PVC) sewer pipe conforming to ASTM Designation 3034–77 (SDR–35); or Schedule 40 PVC pipe conforming to ASTM Designation 1785–76 shall be used between the sewer main and the cleanout. SDR–21 PVC pipe shall be used where additional strength pipe is required.

a. The PVC SDR 35 joints shall be made with bonded–in–bell elastomeric seal. Schedule 40 PVC joints shall be made with a solvent weld bell and spigot joint using PVC pipe cleaner and glue as supplied by the manufacturer .

b. No–hub pipe shall not be permitted.

c. There shall be no bends in service line from main to cleanout except as indicated on approved Botetourt County Sewer Detail Drawings.

4. There shall be no change in pipe size and/or material from manhole to manhole.

SANITARY SEWER CONSTRUCTION

A. General Requirements:

1. All construction of sanitary sewer mains and appurtenances in Botetourt County shall be in strict accordance with plans and specifications prepared as part of the Contract Documents and as approved by the County. All materials shall be new and unused. Prior to construction of the approved sanitary sewer, Contractor shall provide field stakeout including adequate line and grade stakes in order that sanitary sewer and appurtenances may be constructed in accordance with Contract Drawings.

2. If any deviation is contemplated in location or line grade of any sewer, structure or appurtenance as shown on the Contract Drawings, a revision of the Drawings showing the proposed deviation shall be submitted to the County for review and approval before any changes are constructed. Design Engineer of Record must concur in any revision of drawings.

3. All sewer shop drawings/cut sheets shall be submitted by the contractor to both the design engineer and Botetourt County for approval prior to installation. Botetourt County will require three (3) complete sets of shop drawings for review.

4. The contractor shall schedule a preconstruction meeting to be attended by the contractor's site superintendent, design engineer, the design engineer's field representative/inspector, representatives from Botetourt County Utility Department and representatives from Botetourt County Engineering Department and any materials suppliers the contractor feels necessary.

5. The contractor shall obtain a copy of the most current edition of Botetourt County Water and Sewer Construction Standards and Specifications and provide proof (a letter) that the contractor has and is familiar with the requirements therein.

B. Excavation:

1. Excavation shall conform to the lines and grades shown on the plans. The width of excavation for trenches shall be a minimum of 24" plus the outside diameter of the pipe. Excavation shall not be carried below the established grades and any excavation below the required level shall be backfilled with suitable, thoroughly compacted granular bedding material. Contractor shall install all sheeting, bracing, and shoring necessary to perform the work, to protect existing structures and all excavations as required under Virginia OSHA Regulations. Compliance with provisions of the Overhead High Voltage Line Safety Act is required.

2. Dewatering equipment shall be sized to maintain the trench in a satisfactory de–watered condition suitable for pipe laying and backfilling. Pipe laying will be permitted only where the depth of water is maintained below the bedding material. Bedding material shall not be placed on unstable trench material.

3. Not more than one hundred fifty feet (150') of trench shall be opened in advance of the completed pipe laying. Trench walls shall be protected in accordance with current OSHA regulations. Excavation at manholes and similar structures shall provide a minimum clearance of eighteen inches (18") between the outer surface of the structure and the embankment or sheeting.

4. Rock excavation: Rock excavation, when needed, shall be performed in accordance with industry standards. All blasting operations shall be in accordance with existing ordinances and regulations. Where excavation is made in fractured rock or boulders, no rock shall remain nearer than six inches (6") to any part of the sewer pipe when laid, nor shall rock project beyond the lines and grades of masonry structures. No blasting shall be performed within forty feet (40') of a tested or completed sewer. The ends of sewers adjacent to blasting shall be covered to avoid receiving debris.

5. Wherever foundation material is unsuitable, it shall be excavated until a stable foundation is achieved. Granular material, VDOT stone type 21A, shall then be placed in six inch (6") layers and compacted until the trench bottom has been stabilized. Standard granular pipe bedding material shall be placed as heretofore specified.

6. All material excavated but not used in backfill shall be properly removed and disposed of by contractor in a location approved by the County.

C. Backfill:

1. Backfill shall begin at the top of the standard granular bedding and shall be placed in six (6") layers and shall be thoroughly tamped to ninety–five percent (95%) of the maximum theoretical compaction density as determined by a standard proctor on the material until the top of the pipe has a minimum cover of one foot (1'). Remainder of the backfill shall be in two foot (2') layers and shall be thoroughly tamped to 95% of the maximum theoretical density as determined by a standard proctor on the material. Testing shall be performed by an independent laboratory at the developer's expense. The minimum testing shall be one test per job or 1000 feet. Location of test will be at the discretion of the Botetourt County field inspector. The contractor will be responsible for correcting any areas that fail, and retesting will be required. If the County representative requires additional test, the responsibility of payment for testing will be based upon the test results.

2. Backfill material shall be free of perishable material, frozen clods, sticky masses of clay and other unsuitable matter. Rock pieces larger than one inch (1") shall not be used in the backfill which is within two feet (2') of the pipe. No rock over five inches (5") in its greatest dimension shall be used in any backfill. Manholes and cleanouts shall be backfilled in same manner as the sewer pipe. Backfill material shall not be dropped directly on the pipe from a height greater than three feet (3').

3. Backfill in areas not subject to vehicular traffic shall be compacted to such a degree that any subsidence will not be objectionable or detrimental to normal use. Backfill and replacement in existing or proposed roads shall be executed in full accordance with the requirements of the Virginia Department of Transportation Standards.

D. Pipe Installation:

1. All gravity sewer mains and service laterals and force mains shall have a minimum cover of three and one half (3 ½') measured from top of pipe to finish grade. The County may require additional cover as needed for pipe protection.

2. All pipe and fittings shall be carefully handled with non–metallic slings or other approved devices to prevent damage to protective coatings or joints. Lifting equipment shall be satisfactorily rated to handle the pipe sizes used. Pipe shall not be dumped or dropped into trench. Each section of pipe shall be thoroughly inspected for defects before being lowered into the trench.

3. Pipe shall be laid true to line and grade with bells upstream and shall be jointed together such that the completed pipe will have a smooth invert. Pipe shall be pushed home by hand. The use of equipment (i.e. backhoe) shall not be permitted. Cutting of pipe shall be performed by sawing.

4. Standard bedding shall be shaped to the curvature of both the bell and barrel of the pipe. The trench shall be kept free of water while the work is in progress. The ends of the pipe shall be cleaned so that proper joints can be made. As the work progresses, the interior of the pipe shall be cleared of dirt, cement, or other deleterious material.

5. Except as required for use of a laser level, exposed end of all pipe and fittings shall be fully closed to prevent earth, water or other substances from entering pipe. Trench shall be completely backfilled at end of each workday. When new pipe is tied into an existing manhole, new pipe shall be plugged with a standard sewer plug and shall remain plugged until all new line(s) that will flow to existing manhole have been completed, tested, and accepted.

E. Service Connections:

1. SDR 35 and schedule 40 PVC pipe lateral service connections to the sewer main shall be made by means of a commercially manufactured tee, tee–wye, or wye branch. Service laterals may also be connected to the sewer system at a manhole. A sewer cleanout the same size as the service line shall be installed in, accordance with the Detail Drawings. Pipe material shall be of the same type to and including the cleanout stack.

2. All taps to an existing manhole or pipe shall be made by licensed professional plumber and inspected by Botetourt County.

3. Sewer service line shall be four inches (4") minimum for residential service and six inches (6") minimum for non–residential service. Sewer cleanouts shall be same size as service line and shall be installed per Botetourt County Sewer Detail Drawing. Additional sections of pipe shall be installed behind clean out as indicated on detail drawings to prevent conflict with other utilities generally located in this area.

4. Sewer service connections from manhole or sewer main to the cleanout shall be installed with the same care as the sewer main. Proper excavation, slope of pipe and standard granular bedding shall be provided throughout. All gravity sewer mains and service laterals shall be air tested.

5. No connection shall be made to the vertical portion of a cleanout except for private force main.

6. All sewer service connections or portions of sewer service connections outside of the public right–of–way or sewer easement shall be privately owned and maintained.

7. A sampling and/or metering manhole, which conforms to Detail Drawings, shall be installed on sewer service lateral for all non–residential facilities. Manholes may be installed at property line in lieu of cleanout or between cleanout at the property line and the facility. Sampling manholes shall be tested by either vacuum method or exfiltration.

F. Manholes:

1. Only precast manhole sections shall be used. Manholes shall be constructed with manhole frames, covers and steps. Frames and covers shall be Russel Pipe & Foundry MH301, watertight in paved and non–paved areas and Russel Pipe & Foundry MH300 in areas not subject to flooding or surface drainage.

2. Casting shall be best quality tough, gray iron, free from defects, blow holes, and other imperfections and shall meet the requirements of ASTM Designation A–48, Class 20. The castings shall be sound, free to form and thickness, cleaned by means of sand blast and neatly finished. The material bearing surfaces shall be machine ground and finished to insure satisfactory seating. Covers shall have the words "Sanitary Sewer" cast into the top. Castings shall receive one coat of black asphaltum paint at the factory. Locations and type of manhole vents will be as indicated on the approved plans and as per Detail Drawings. Change in location must be approved by the County.

3. Covers shall be furnished with means of lifting. Covers that rock under normal load or will not seat will be rejected. Frames shall be bolt–down type, with butyl mastic sealer placed between frame and manhole. Mortar shall not be permitted. Frames shall have a nut and washer installed on top and bottom to facilitate minor elevation adjustments. The adjustment space between the bottom of the frame and the top of the manhole section shall be formed and filled with 3000 psi concrete.

4. Steps for manholes shall be made of steel and shall have a plastic coating. Steps shall be spaced 16 inches (16") apart. The first step shall be within 12 inches (12") of the cover. The bottom step shall be within 24 inches (24") of the bottom of the manhole.

5. Precast concrete manholes shall consist of precast reinforced concrete sections, an eccentric conical section and a standard base section with poured uniform bottom inverts. Flat top manholes can be used only with approval of the County. Where soil conditions dictate their use, expanded base section, extending a minimum of four inches (4") and a maximum of eight inches (8") beyond the outside vertical wall (riser section) of the manhole shall be used. Manhole shall be installed with steps vertically aligned over manhole bench. Access hole in flat top manhole section shall be centered over manhole steps.

6. Precast base section shall be installed on a compacted stabilized foundation of bedding material foundation prepared similar to that required for the proper installation of the adjacent sewer pipe as described elsewhere in these Specifications.

7. Precast manhole sections shall be manufactured in accordance with ASTM Designation C478, latest revision. Each section shall have not more than two (2) holes for the purpose of handling and setting. These holes shall be tapered and shall be plugged up with rubber stoppers and an approved non–shrink grout after installation.

8. A cold applied butyl mastic joint sealer manufactured specifically for the purpose shall be used to make a watertight joint between manhole sections and/or grade rings. Mortared joints are not permitted. All new manholes shall be pre–cast concrete inverts except straddle manhole. All straddle manholes and all field–constructed inverts shall be with ready mix (3000 psi) concrete and shall only be used with approval of the County.

9. Standard manhole drop connections shall be installed where indicated on the drawings. Drop connections shall conform to the Detail Drawings.

10. The invert channels of the manhole shall be smooth and semi–circular in shape conforming to the inside of the adjacent sewer section. Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Invert benches shall be constructed of ready mix concrete (3,000 psi) over the entire existing bench.

11. The invert channel shall be at least 0.75 times the diameter of the pipe in depth. The minimum difference in elevation of inverts of incoming and outgoing pipes shall be 0.10 feet.

12. Where grade rings are required to meet specified grade, the maximum height/thickness and minimum number of rings shall be used. Cone sections and grade rings shall be predrilled with matching holes to accept threaded rod installation. Refer to Detail Drawings.

G. Pipe Connection at Manholes:

1. All new manholes shall be supplied with an approved flexible boot connection suitable for specified pipe and manhole. All rubber boots for 8 inch (8") pipe shall have a maximum flexibility of 24° in any direction from center. Boot flexibility for pipe sizes larger than 8 inch (8") shall be per the manufacturer's recommendations. Twenty inch (20") and larger pipe connections shall have the first joint located four feet (4') from the inside face of the manhole. Flexible joint manhole connection shall be as manufactured by Pres–Seal Gasket Corporation, Fort Wayne, IN; or approved equal.

2. Manhole to pipe installation procedures shall be as follows:

a. After manhole has been set to line and grade, inspect flexible connector boot for damage and clean out inside of boot. Clean surface of pipe barrel to be installed.

b. Insert pipe into connector boot until end of pipe breaks plane of manhole wall and flush with manhole invert. Position pipe in center of connector.

c. Install take–up clamp(s) in groove(s) at pipe receiving end of boot and tighten clamps to 60 in/lbs. of torque prior to adjusting pipe to desired angle of deflection.

d. After desired deflection angle of pipe has been achieved, install bedding and backfill material in accordance with these Construction Standards.

3. Precast manhole sections shall be manufactured for the specified size, angle and number of pipe connections required. Field modification or abandonment of any part of a precast manhole will not be permitted without written approval of the County. Any approved field modification(s) or repairs shall be performed by a qualified person(s) approved by the manufacturer .

4. Inside of manholes (walls, steps, invert, pipe connections, benches) and frame and cover shall be kept clean and free of dirt, stone, mastic, trash and construction materials. Manholes shall be cleaned prior to testing.

5. Abandonment of manholes and sewer lines shall be performed in accordance with the Detailed Drawings.

6. A rubber water stop shall be used around pipe at manhole connection of straddle manhole. Refer to Detail Drawings.

H. Hydraulic Cement Mortar and Gravel: Cement mortar and grout shall consist of a mixture of hydraulic cement, fine aggregate, water and admixture.

a. Cement shall be Portland Cement Type I or II.

b. Fine Aggregate Grade C shall be used.

c. Water used with cement or lime shall be clean, clear, and free of oil, acid, salt, alkali, organic matter or other deleterious substances.

d. Admixtures shall conform to Section 217 of VDOT Specifications.

e. Hydraulic cement mortar and grout shall contain from 3 to 7 percent entrained air. Air entrained cement may be used in lieu of plain cement and air entraining admixture. Mortar and grout shall be mixed with a minimum amount of water necessary to obtain required consistency. Mortar and grout shall be properly cured and protected for not less than three (3) days.

i. Cement Mortar shall consist of one part hydraulic cement, 2 1/2 parts fine aggregate by weight and sufficient water to produce a stiff mix. Grade C Fine Aggregate shall be used.

ii. Non–Shrink Mortar shall consist of one part hydraulic cement, 2 1/2 parts fine aggregate by weight, a set retardant or other admixture which will reduce the amount of required mixing water and sufficient water to produce a stiff mix. Grade C Fine Aggregate shall be used.

iii. Cement Grout shall consist of one part hydraulic cement, 2 parts fine aggregate by weight and sufficient water to produce a free flowing mix. Grade A fine aggregate shall be used.

iv. High Strength Grout and Mortar shall consist of a pre–packaged, non–shrink hydraulic cement mixture with a 7 –day compressive strength of at least 4,000 psi when tested in accordance with ASTM C 109 and with a 7 –day bond strength of at least 1,000 psi when tested in accordance with VTM–41, except that epoxy will not be used to develop the bond.

I. Acceptance Tests:

1. General

a. Sewers will be inspected to determine if any deviation from line and grade have occurred. Pipe alignment will be checked by illuminating interior of pipe. If pipe shows poor alignment, displaced pipe, or any defect, including a visible leak, defect shall be corrected before leak testing of the pipe. All sewer lines are subject to internal inspection and testing by closed circuit TV by the County based upon inspection results at the developer's expense.

b. Air testing shall be used, test methods and acceptability criteria shall be in accordance with the Uni–Bell low pressure air test. Air testing of gravity lines shall be required for all types of pipe and materials.

2. Manhole Acceptance Tests

a. Manholes, including frame, shall be tested by vacuum testing from the top of the frame. Inflatable stoppers shall be used to plug all lines into and out of the manhole being tested including any vent line. The stoppers shall be positioned in the lines far enough from the manhole to insure testing to those portions of the lines not air tested. Vacuum tests shall be made with a vacuum of 10" Hg. The time for the vacuum to drop from 10" to 9" of Hg must be greater than 60 seconds.

b. Contractor shall furnish weirs, stand pipes, pipe plugs, water, pressure gauges, stop watches, air compressor, vacuum pump, hose and such materials and assistance as required to perform these tests. All acceptance tests shall be conducted by Contractor in the presence of a County inspector.

c. Acceptance tests shall not be made until sanitary sewer, manholes and proposed sewer service connections, as shown on the approved sewer plans, have been installed, the sewer trenches (including manholes and cleanout stacks) backfilled and compacted to finished sub–grade.

d. Contractor shall schedule all acceptance tests with the project inspector at least forty–eight (48) hours in advance. Each section of completed sewer shall be tested from manhole to manhole. No sewers or sewer service connections are to be excluded from this testing procedure.

3. Sewer Pipe Testing Procedures

a. Whenever it is necessary to construct underdrains or place gravel under pipe lines in order to dewater trench during construction of sewers, acceptance test will not be made until any pumps, which have been used in dewatering process, have been disconnected or drains have been taken out of service.

b. Contractor shall schedule all acceptance tests with the County at least forty–eight (48) hours in advance. Each section of completed sewer shall be tested. Generally, sewers will be tested from manhole to manhole. No sewer or sewer service connection is to be excluded from this testing procedure.

c. Low Pressure Air Testing Procedure –The test procedure shall be conducted in the following manner: (Vacuum test of manholes is generally inverse of low pressure air test of sewer lines)

i. Contractor shall thoroughly clean and remove all debris, silt, earth or other materials from the sewer prior to acceptance testing.

ii. Proper test plugs shall be supplied and installed by Contractor. Test gauges used in air test procedure shall have a range of 0–10 psi and shall be calibrated in divisions of 0.10 psi with an accuracy of +1– one percent. Test gauges shall be calibrated at least once a year and the date and results displayed on the equipment including date of calibration. Calibrations shall be certified by an independent testing lab. Test gauges shall be located outside of manhole during testing.

iii. If pipe to be tested is expected to be below ground water table, Contractor shall either:

–Install a small diameter perforated vertical pipe from invert elevation of the sewer to the surface prior to backfilling; or

–Insert a pipe probe by boring or driving into the backfilling material adjacent to the invert elevation of the pipe, and determine the depth of the ground water level above the pipe invert immediately prior to acceptance testing.

–All gauge pressures for test shall be increased by the amount of this back pressure due to ground water over the invert of the pipe.

–In lieu of the above water depth determination, Contractor may add three (3) psi to the gauge pressure in the test.

iv. Contractor shall add air slowly to the portion of the pipe under test until the internal air pressure is raised to 4.0 psi gauge plus the ground water pressure.

v. As a safety precaution, no one shall be allowed in manhole after air pressure is increased in the sewer line. If the inspector suspects that the test plug may be leaking, pressure shall first be relieved before any adjustments are made to eliminate air leakage at the plug.

vi. Contractor shall allow air temperature to stabilize for at least two (2) minutes with the pipe subjected to an internal pressure of 4.0 psi by adding only the amount of air required to maintain the pressure.

vii. After temperature stabilization, the test will begin. If the internal air pressure decreases, the time required for the pressure to drop from 3.5 to 2.5 psi gauge will be observed and recorded. The time interval shall be compared with the established standards in accordance with the DD–30 or DD–31 for time and length of test section for various diameters of the sewer. All pipes 15 inches or less shall be tested for a pressure drop of 1.0 psi gauge.

viii. Pipe which fails to maintain the stipulated pressure for a period equal to or greater than the holding time shown in Table I shall be deemed to have failed the low pressure air test and is unsatisfactory for acceptance by the County. Any sewer that fails to pass this test shall be replaced by the Contractor at his expense.

LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA
4664 BRAMBLETON AVENUE
P.O. BOX 20669
ROANOKE, VIRGINIA 24018
PHONE (540) 774-4411
FAX (540) 772-9445
E-MAIL LUMSDENPC@AOL.COM

COMMONWEALTH OF VIRGINIA
MICHAEL S. WEBB
No. 012656
3-28-01
PROFESSIONAL ENGINEER

SANITARY SEWER SPECIFICATIONS

PHASE III
BOTETOURT COMMONS
PREPARED FOR
TIMBERBROOK ASSOCIATES, L.C.
AMSTERDAM MAGISTERIAL DISTRICT
BOTETOURT COUNTY, VIRGINIA

REVISIONS

NO.	DATE	DESCRIPTION
1		
2		
3		
4		
5		

DATE: 20 MARCH 2001
SCALE: NONE
COMMISSION NO: 2000-336
CADD FILE: 00336\ENG\DEVPLANS\WAT-SPECS.DWG
SHEET 11 OF 11