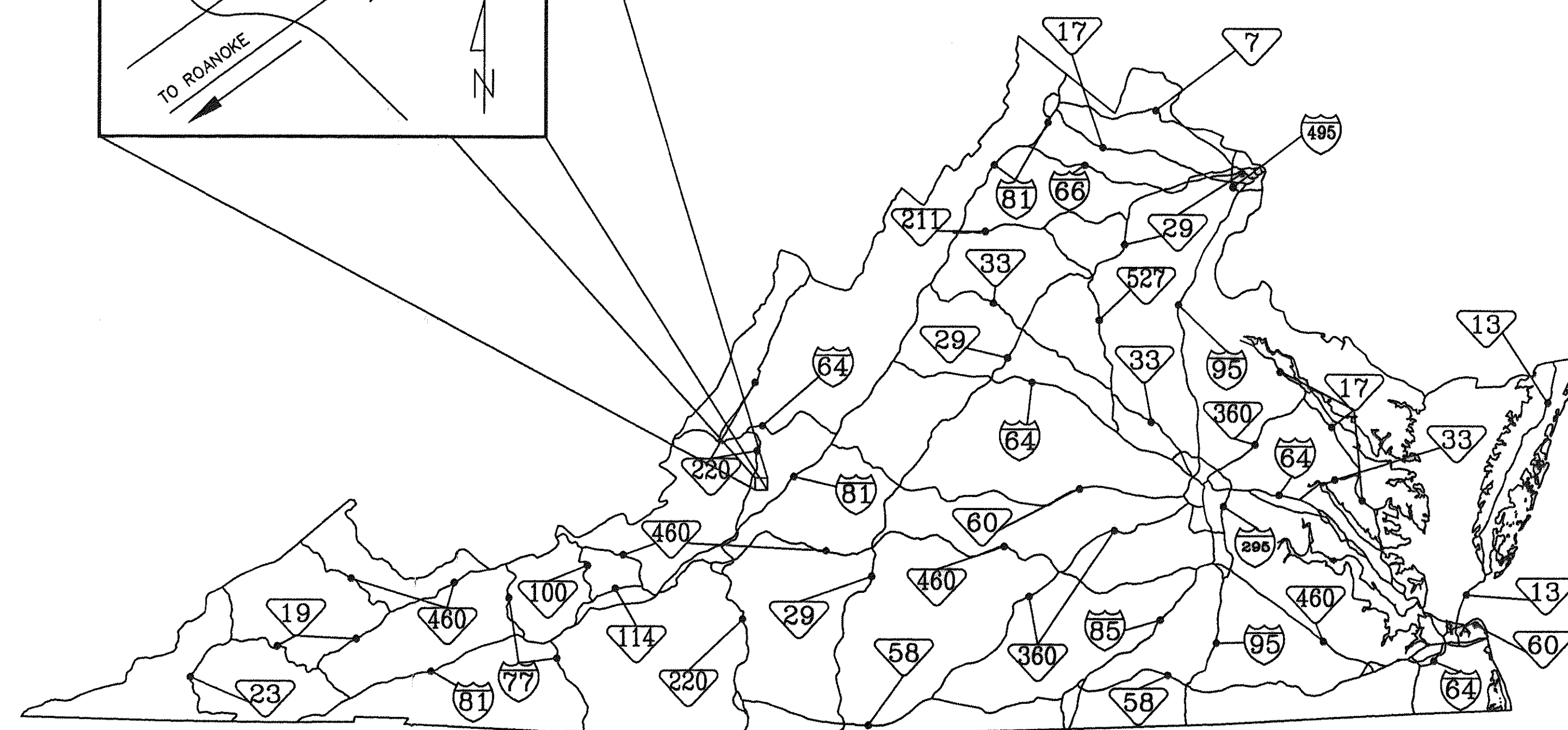
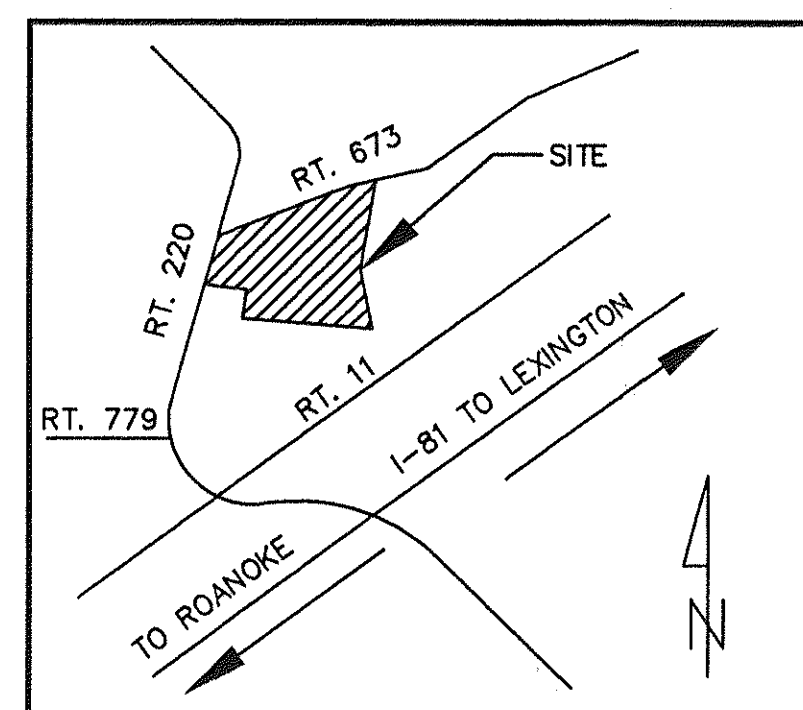


ASHLEY PLANTATION SECTION II UTILITY PLAN BOTETOURT COUNTY, VIRGINIA

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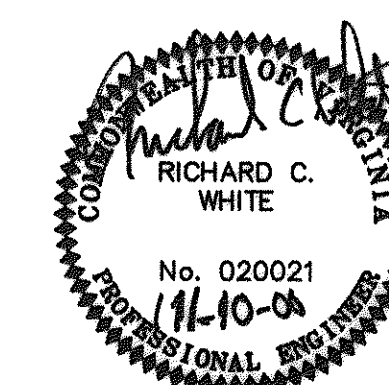
VICINITY MAP
NO SCALE



LOCATION MAP
NO SCALE

INDEX OF SHEETS NO SCALE

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ASHLEY PLANTATION
SECTION II
UTILITY PLAN

COMM. NO. 1070L

DATE: 05/26/99

SET NO.

PROJECT NAME: Ashley Plantation
DATE: 11-10-08
TYPE: Sewer
LOCATION: Site 220
SHEET NO.: 13
OF SETS: 1

ABBREVIATIONS

ABAN	ABANDON, ABANDONED	MECH	MECHANICAL
ABUT	ABUTMENT	MFR	MANUFACTURER
ADJ	ADJACENT	MH	MANHOLE
AGGR	AGGREGATE	MIN	MINIMUM
ANC	ANCHOR	MJ	MECHANICAL JOINT
APPROX	APPROXIMATE	MON	MONUMENT
BIT	BITUMINOUS	MTL	METAL
BJ	BELT JOINT	N & C	NAIL AND CAP
BL	BASE LINE	NIC	NOT IN CONTRACT
BEG	BEGIN, BEGINNING	NO	NUMBER
BLDG	BUILDING	NPW	NON POTABLE WATER
BM	BENCH MARK	NTS	NOT TO SCALE
BSP	BLACK STEEL PIPE	OC	ON CENTERS
BV	BUTTERFLY VALVE	OD	OUTSIDE DIAMETER
C & G	CURB AND GUTTER	PVMT	PAVEMENT
CI	CAST IRON	PC	POINT OF CURVE
CL	CENTER LINE	PCC	POINT OF COMPOUND CURVE
CONST	CONSTRUCTION	PER	PERIMETER
CMP	CORRUGATED METAL PIPE	PERF	PERFORATED
CMU	CONCRETE MASONRY UNITS	PERP	PERPENDICULAR
CND	CONDUIT	PI	POINT OF INTERSECTION
CO	CLEANOUT	PL	PLATE, PROPERTY LINE
COMB	COMBINATION	POL	POINT ON LINE
CONC	CONCRETE (PORTLAND CEMENT)	PT	POINT OF TANGENCY
CONN	CONNECT, CONNECTION	POT	POINT ON TANGENT
CONTR	CONTRACTOR	PP	POWER POLE
CONV	CONVEYOR	PRC	POINT OF REVERSE CURVE
COR	CORNER	PSI	POUNDS PER SQUARE INCH
CR	CRUSHED STONE	PT	POINT OF TANGENT
CTR	CENTER	PVC	POLYVINYL CHLORIDE
CULV	CULVERT	PVI	POINT OF VERTICAL INTERSECTION
D	DEPTH OR DEGREE OF CURVE	PUE	PUBLIC UTILITY EASEMENT
DE	DRAINAGE EASEMENT	R	RADIUS, RISER
DI	DROP INLET, DUCTILE IRON	RR	RAILROAD
DIA	DIAMETER	RCP	REINFORCED CONCRETE PIPE
DIM	DIMENSION	RD	ROAD
DISC	DISCONNECT	RDCR	REDUCER
DMH	DROP MANHOLE	REINF	REINFORCE, REINFORCEMENT
DN	DOWN	REF	REFERENCE
DTL	DETAIL	REL	RELOCATED
DW, D/W	DRIVEWAY	REQD	REQUIRED
DWL	DWELLING	REV	REVISION
DWG	DRAWING	RTE	ROUTE
EA	EACH	RT	RIGHT
E.B.L.	EASTBOUND LANE	R/W	RIGHT OF WAY
EL. ELEV	ELEVATION	SS	SANITARY SEWER
ELEC	ELECTRICAL	SAN	SANITARY
ENGR	ENGINEER	S/W	SIDEWALK
ENTR	ENTRANCE	SD	STORM DRAIN
EOL	END OF LINE	SE	SLOPE EASEMENT
EP	EDGE OF PAVEMENT	SECT	SECTION
EQ	EQUAL	SER	SERVICE
EQPT	EQUIPMENT	SH	SHEET
EW	EACH WAY, ENDWALL	SPEC	SPECIFICATION
EXIST	EXISTING	SPECS	SPECIFICATIONS
FES	FLARED END SECTION	SQ	SQUARE
FF	FINISH FLOOR	SSTL	STAINLESS STEEL
FFE	FINISHED FLOOR ELEVATION	STR	STREET
FIG	FIGURE	STA	STATION
FL	FLOOR	STD	STANDARD
FLEX	FLEXIBLE	STL	STEEL
FLG	FLANGE	STRUCT	STRUCTURAL
FT	FOOT	SUR	SURVEY
FTG	FOOTING	T & B	TOP AND BOTTOM
FUT	FUTURE	TELE	TELEPHONE
GAL	GALLON	TEMP	TEMPORARY
GALV	GALVANIZED	THK	THICK
GAR	GARAGE	TP	TELEPHONE POLE
GND	GROUND	TRTD	TREATED
GR	GRAVEL	TV	TELEVISION
GOVT	GOVERNMENT	TW	TOP OF WALL
GPM	GALLONS PER MINUTE	TYP	TYPICAL
GRTG	GRATING	UG	UNDERGROUND
GV	GATE VALVE	UON	UNLESS OTHERWISE NOTED
H&T	HUB AND TAC	USC&G.S	UNITED STATES COAST AND GEODETIC SURVEY
HORIZ	HORIZONTAL	V. VAL	VALVE, VENT
HPT	HIGH POINT	VC	VERTICAL CURVE
HYD	HYDRANT	VERT	VERTICAL
ID	INSIDE DIAMETER	VERSCR	VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS
IN	INCH	VOL	VOLUME
INSUL	INSULATION	VDOT	VIRGINIA DEPARTMENT OF TRANSPORTATION
INV	INVERT	V.S.D.	VERTICAL SIGHT DISTANCE
IP	IRON PIN (FOUND OR SET NOTED)	W.B.L.	WESTBOUND LANE
L	LENGTH, LONG	W	WIDE FLANGE, WIDE, WASTE, WATER
LF	LINEAL FOOT	W/	WITH
LG	LONG	WL	WATER LINE
LP	LIGHT POLE	W/O	WITHOUT
LR	LONG RADIUS	WS	WATER SURFACE
LT	LEFT	WT	WATERTIGHT, WEIGHT
MAS	MASONRY	WVDH	WEST VIRGINIA DEPARTMENT OF HIGHWAYS
MATL	MATERIAL		
MAX	MAXIMUM		
MB	MAIL BOX		
MBL	MINIMUM BUILDING LINE		

GENERAL NOTES

THE LOCATION OF EXISTING UTILITIES, INCLUDING UNDERGROUND UTILITIES, IS INDICATED ON THE DRAWINGS IN SO FAR AS THEIR EXISTENCE AND LOCATION WERE KNOWN AT THE TIME OF PREPARATION OF THESE DRAWINGS. HOWEVER, NOTHING IN THESE CONTRACT DOCUMENTS SHALL BE CONSTRUED AS A GUARANTEE THAT SUCH UTILITIES ARE IN THE LOCATION INDICATED OR THAT THEY ACTUALLY EXIST OR THAT OTHER UTILITIES ARE NOT WITHIN THE AREA OF OPERATIONS. THE CONTRACTOR SHALL MAKE ALL NECESSARY INVESTIGATIONS TO DETERMINE THE EXISTENCE AND LOCATIONS OF SUCH UTILITIES. THE CONTRACTOR SHALL PAY FOR ANY DAMAGE TO AND FOR MAINTENANCE AND PROTECTION OF EXISTING UTILITIES AND STRUCTURES.

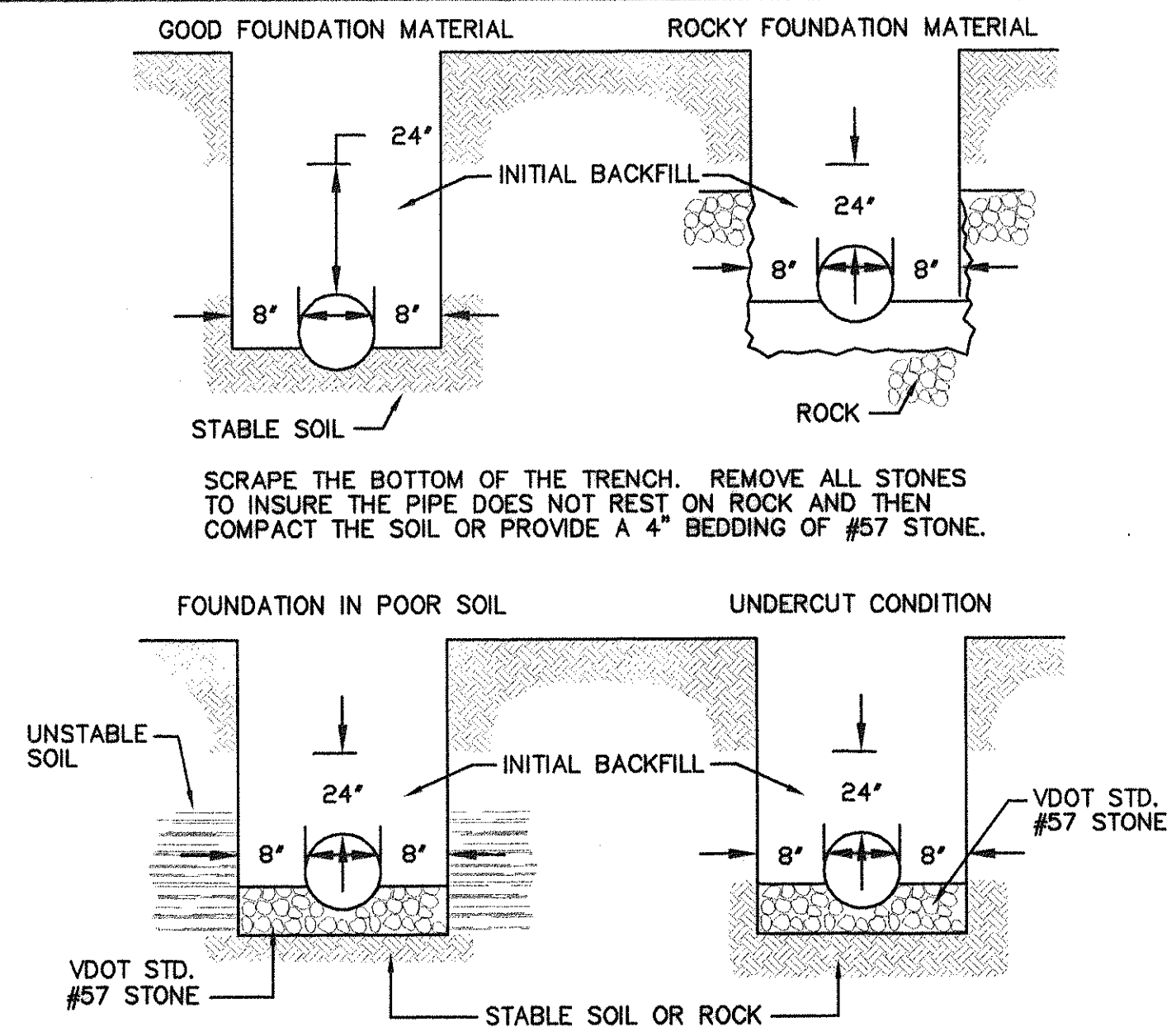
EXISTING WATER LINE LOCATIONS BOTH HORIZONTAL AND VERTICAL ARE APPROXIMATE. THE LOCATION IS NOT THE RESULT OF A FIELD SURVEY.

THE CONTRACTOR IS DIRECTED TO DIG AND LOCATE ALL UTILITIES IN ADVANCE OF PIPELAYING TO ALLOW FOR ADJUSTMENTS DUE TO CONFLICTS WITH EXISTING UTILITIES. SHOULD A CONFLICT ARISE THE ENGINEER IS TO BE NOTIFIED IMMEDIATELY.

THE CONTRACTOR IS REQUIRED TO NOTIFY "MISS UTILITY" AT 1-800-552-7001 AT LEAST TWO, BUT NOT MORE THAN TEN, WORKING DAYS IN ADVANCE OF CONSTRUCTION.

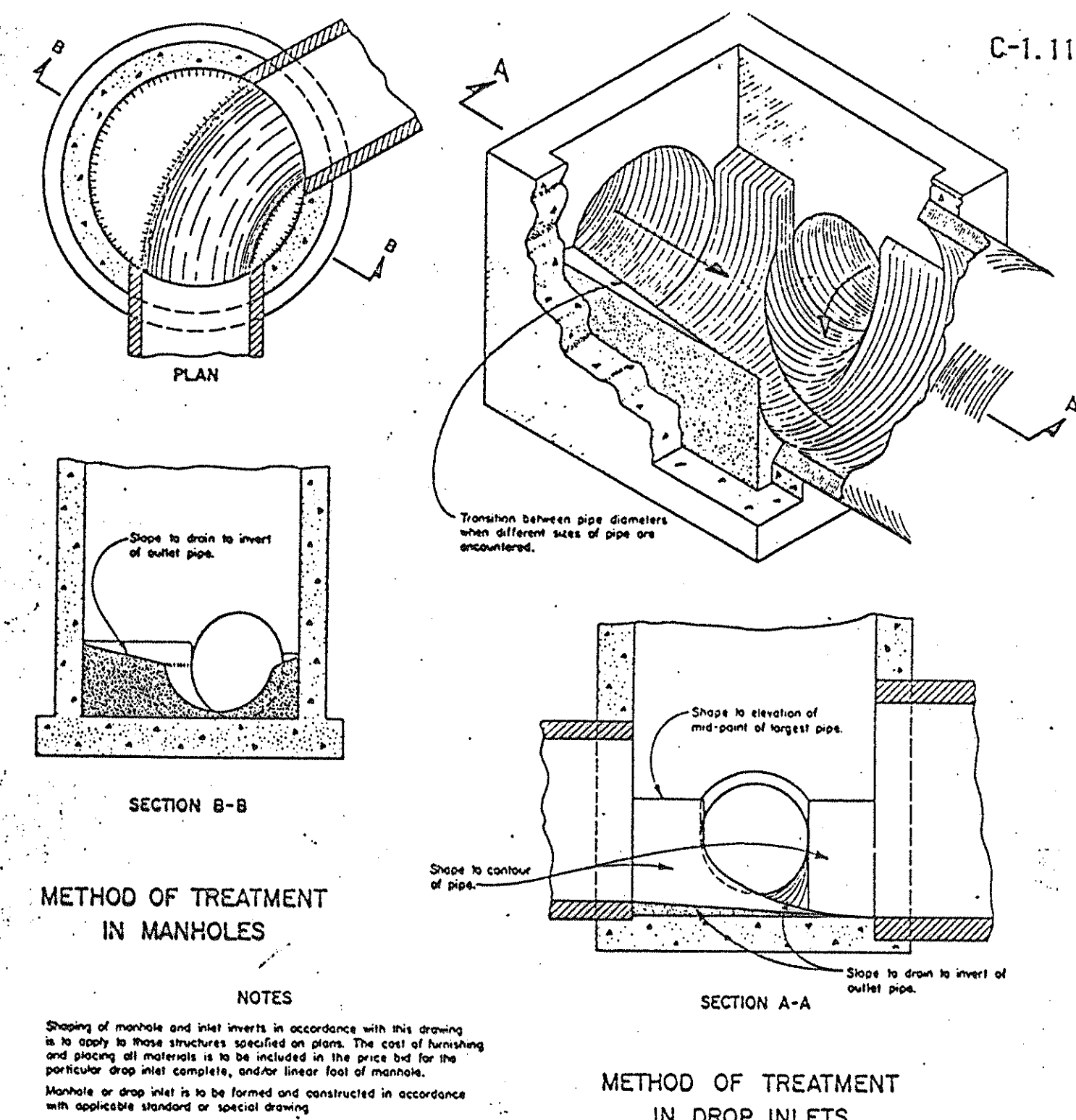
LEGEND / SYMBOLS

EXISTING	NEW	DESCRIPTION
		BUILDING WITH PORCH OR STOOP
		FOUNDATION ONLY
		CONTOUR, CONTOUR WITH ELEVATION
		SPOT ELEVATION
		CONCRETE CURB
		CONCRETE CURB & GUTTER
		CONCRETE WALK OR SLAB
		PAVEMENT
		UNPAVED OR GRAVEL ROAD
		CONSTRUCTION EASEMENT
		PERMANENT EASEMENT
		TREE LINE
		TREE OR SHRUB
		FENCE (EXISTING OR PROPOSED NOTED)
		CENTERLINE CREEK, SWALE, DITCH
		PROPERTY LINE
		CENTERLINE OR BASELINE
		FIELD SURVEY TRAVERSE POINT
		P.C. OR P.T.
		GEOLOGIC BORE HOLE
		BENCH MARK (EXISTING OR SET NOTED)
		STORM DRAIN AND ENDWALL
		SANITARY SEWER
		FORCE MAIN
		GAS MAIN OR SERVICE LINE
		WATER MAIN OR SERVICE LINE
		ELECTRICAL LINE
		UNDERGROUND TELEPHONE LINE
		UNDERGROUND ELECTRICAL LINE
		PIPE FITTINGS
		FIRE HYDRANT
		GATE VALVE
		CLEANOUT
		MANHOLE
		DROP INLET (CURB AND GRATING TYPES)
		WM - WATER METER
		DWM - DOUBLE WATER METER
		TELEPHONE POLE, GUY AND ANCHOR
		POWER POLE, GUY AND ANCHOR
		LIGHT POLE
		TELEPHONE PEDESTAL
		BURIED TELEPHONE VAULT
		PAVED DITCH
		STORM PIPE (SIZE / TYPE NOTED)
		CULVERT WITH FLARED END SECTION
		AIR RELEASE VALVE / VAULT ASSEMBLY
		BLOW OFF VALVE / VAULT ASSEMBLY
		STEEL ENCASEMENT
		CONCRETE ENCASEMENT
		ABANDON OR REMOVE
		LIMITS OF CONSTRUCTION



- NOTES:
- NO ROCKS SHALL BE ALLOWED WITHIN 24" OF THE PIPE.
 - NO ROCKS LARGER THAN 6" IN ANY DIMENSION SHALL BE ALLOWED ABOVE THE INITIAL BACKFILL.
 - THE INITIAL BACKFILL SHALL BE PLACED AND COMPACTED IN 6" LIFTS.
 - NO ORGANIC OR FROZEN MATERIAL OR DEBRIS SHALL BE ALLOWED IN THE TRENCH.
 - BELL HOLES SHALL BE DUG OUT IN ALL CASES.

TRENCH INSTALLATION - SANITARY SEWER FORCE MAIN



METHOD OF SHAPING MANHOLE & INLET INVERTS

REVISED	DATE	BY

STANDARD DETAILS

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102 ALBEMARLE AVE., S.E.
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ASHLEY PLANTATION SECTION II
UTILITY PLAN
BOTETOURT COUNTY, VIRGINIA

NO.	DATE	DESCRIPTION	BY

ABBREVIATIONS, LEGEND,
& GENERAL NOTES
& ADDITIONAL DETAILS

Designed By	RCW
Drawn By	DJB
Checked By	DRM
Approved By	RCW
Submitted By	RCW
Drawing	1070LABRV
Date	05/26/99
Scale	NONE
Commission No.	1070L
Sheet	2 of 17

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SPECIAL CONDITIONS

- A MINIMUM COVER OF THREE AND ONE HALF (3.5) FEET OVER THE PROPOSED LINES IS REQUIRED.
- A PRECONSTRUCTION CONFERENCE SHALL BE SCHEDULED WITH BOTETOURT COUNTY PRIOR TO COMMENCING WITH CONSTRUCTION.
- NO WORK SHALL BEGIN WITHOUT NOTIFYING BOTETOURT COUNTY 24 HOURS IN ADVANCE. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ANY AND ALL NECESSARY PERMITS.
- NO WORK SHALL BEGIN WITHOUT WRITTEN APPROVAL OF CONSTRUCTION PLANS.
- WORK SHALL BE SUBJECT TO INSPECTION BY THE COUNTY INSPECTORS AND DESIGN ENGINEER. SANITARY SEWER CUT SHEETS SHALL BE SUBMITTED TO THE BOTETOURT COUNTY ENGINEER.
- CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND UNCOVERING ALL VALVE BOXES AFTER SURFACE TREATMENT OF ROADS AND ADJUSTING BOXES TO FINAL ROAD GRADES, IF NECESSARY.
- ALL EXISTING UTILITIES MAY BE SHOWN OR MAY NOT BE SHOWN IN THE EXACT LOCATION. THE CONTRACTOR SHALL COMPLY WITH THE STATE WATER WORKS REGULATIONS, SECTION 12.05.03 WHERE LINES CROSS.
- THE CONTRACTOR SHALL NOTIFY THE COUNTY AND OBTAIN COUNTY APPROVAL OF ANY FIELD CORRECTION TO THE APPROVED PLANS PRIOR TO SUCH CONSTRUCTION.
- ALL TRENCHES WITHIN THE EXISTING OR FUTURE VIRGINIA STATE DEPARTMENT OF HIGHWAYS AND TRANSPORTATION RIGHT-OF-WAY MUST BE COMPACTED IN SIX INCH LAYERS.
- ALL LINES TO BE STAKED PRIOR TO CONSTRUCTION.
- CONTRACTOR TO COORDINATE WITH THE ENGINEER TO PROVIDE AS-BUILT PLANS. CONTRACTOR SHALL MAINTAIN A SET OF RED-LINE PLANS SHOWING AS-BUILT LOCATION OF ALL STRUCTURES. AS-BUILT INFORMATION TO BE SUBMITTED TO DESIGN ENGINEER FOR PREPARATION OF RECORD AS-BUILT PLANS. SUCH AS-BUILT PLANS SHALL BE SUBMITTED TO BOTETOURT COUNTY PRIOR TO COUNTY ACCEPTANCE.
- ALL CONSTRUCTION SHALL BE IN ACCORDANCE TO APPROVED CONSTRUCTION PRACTICES OF THE APPLICABLE TRADES.
- UNLESS NOTED OTHERWISE HEREIN ALL CONSTRUCTION SHALL BE IN ACCORDANCE TO THE LATEST EDITION OF AWWA STANDARDS.

EXCAVATION, STABILIZATION AND BEDDING

- TRENCHING
 - EXCAVATION FOR TRENCHES SHALL INCLUDE THE REMOVAL OF ALL MATERIAL ENCOUNTERED. REGARDLESS OF THE DEPTH, WHICH IN ACCORDANCE WITH THE ELEVATIONS AND GRADES AT THE LOCATIONS AND STATIONS INDICATED ON THE PLANS OR SPECIFIED HEREIN.
 - EXCAVATION, UNLESS OTHERWISE SPECIFIED, SHALL BE OPEN CUT. THE CONTRACTOR SHALL OPEN NO MORE THAN TWO HUNDRED (200) FEET OF TRENCH AT ONE TIME DURING THE LAYING OF PIPE, UNLESS APPROVED BY THE ENGINEER.
 - TRENCHES SHALL BE EXCAVATED IN STRAIGHT LINES AND SHALL BE ACCURATELY GRADED IN ORDER TO ESTABLISH A TRUE ELEVATION FOR THE INVERT OF THE PIPE.
 - THE WIDTH OF TRENCHES, FROM EXISTING GRADE TO ONE (1) FOOT ABOVE THE TOP OF THE PIPE SHALL BE OF SUFFICIENT WIDTH TO PERMIT THE PROPER INSTALLATION OF BRACING, SHORING OR SHEETING.
 - THE SIDES OF THE TRENCHES SHALL BE AS VERTICAL AS PRACTICAL.
 - EXCAVATION FOR STRUCTURES SHALL ALLOW A MINIMUM OF TWELVE (12) INCHES CLEAR BETWEEN THE STRUCTURE AND THE SIDES OF THE TRENCH OR ANY REQUIRED BRACING, SHORING OR SHEETING.
 - EXCAVATED MATERIALS SUITABLE FOR BACKFILL SHALL BE STOCKPILED IN AN ORDERLY MANNER AT A SUFFICIENT DISTANCE FROM THE SIDES OF THE TRENCH IN ORDER TO AVOID OVERLOADING THE BANKS OF THE TRENCH AND TO PREVENT SLIDES OR CAVE-INS.
 - EXCAVATED MATERIALS WHICH ARE NOT REQUIRED OR APPROVED FOR BACKFILL SHALL BE REMOVED FROM THE SITE AND DISPOSED OF BY THE CONTRACTOR, AT HIS EXPENSE.
 - CONTRACTOR TO ADHERE TO ALL LOCAL, STATE AND FEDERAL CONSTRUCTION LAWS, INCLUDING OSHA TRENCH SAFETY REGULATIONS.
- TRENCH STABILIZATION
 - TRENCH STABILIZATION MATERIAL SHALL BE COARSE AGGREGATE SIZE NUMBER 2 AND SHALL CONFORM WITH VDOT SECTION 203 AND/OR ASTM C 33.
 - WHenever EXCESSIVELY wet OR UNSTABLE MATERIAL IS ENCOUNTERED IN THE BOTTOM OF THE TRENCH, WHICH IN THE OPINION OF THE ENGINEER IS INCAPABLE OF PROPERLY SUPPORTING THE PIPE OR STRUCTURES, SUCH MATERIAL SHALL BE REMOVED AND BACKFILLED WITH TRENCH STABILIZATION MATERIAL AND SHALL BE GRADED TO ALLOW FOR THE COMPACTED BEDDING MATERIAL.
 - ALL UNAUTHORIZED OVERDEPTHS OF EXCAVATION SHALL BE BACKFILLED, AT THE CONTRACTOR'S EXPENSE, WITH TRENCH STABILIZATION MATERIAL AND SHALL BE GRADED TO ALLOW FOR THE COMPACTED BEDDING MATERIAL.
- COMPACTED BEDDING MATERIAL
 - BEDDING MATERIAL SHALL BE COARSE AGGREGATE SIZE NUMBER 57 AND SHALL CONFORM WITH VDOT SECTION 203 AND/OR ASTM C 33.
 - THE BOTTOM OF THE PIPE TRENCH SHALL BE EXCAVATED TO A MINIMUM OVERDEPTH OF SIX (6) INCHES BELOW THE BOTTOM OF THE PIPE, TO PROVIDE FOR THE COMPACTED BEDDING MATERIAL. BEDDING MATERIAL SHALL BE PLACED, SHAPED AND COMPACTED.
 - BELL HOLES AND DEPRESSIONS REQUIRED FOR THE JOINTING OF THE PIPE SHALL BE DUG AFTER THE COMPACTED BEDDING MATERIAL HAS BEEN GRADED AND SHAPED AND SHALL BE ONLY OF THE LENGTH, DEPTH AND WIDTH REQUIRED TO MAKE THE JOINT PROPERLY.

PIPE, JOINTS AND FITTINGS

- SCOPE OF WORK
 - ALL MATERIALS AND APPURTENANCES REQUIRED FOR THE WORK SHALL BE NEW, OR FIRST CLASS QUALITY AND SHALL BE FURNISHED, DELIVERED, ERECTED CONNECTED AND FINISHED IN EVERY DETAIL AS SPECIFIED OR INDICATED ON THE PLANS. MATERIALS FOUND DEFECTIVE, REGARDLESS OF THE CIRCUMSTANCES, SHALL BE REPLACED WITH NEW MATERIAL AT THE EXPENSE OF THE CONTRACTOR.
 - THE MATERIALS SPECIFIED FOR THE CONSTRUCTION SHALL COMPLY WITH THE LATEST REVISIONS OF THE APPLICABLE AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM), AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) AND/OR THE VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT) STANDARDS.

SANITARY SEWER FORCE MAIN

- INSTALLING SANITARY SEWER FORCE MAIN
 - THE WATER MAIN SHALL BE LAID AND MAINTAINED AT THE REQUIRED LINES AND GRADES WITH FITTINGS AND VALVES AT THE REQUIRED LOCATIONS.
 - DEFLECTION OF THE LINE OF PIPE, IN EITHER THE VERTICAL OR HORIZONTAL PLANE TO AVOID OBSTRUCTIONS, OR IN LOCATIONS WHERE LONG-RADIUS CURVES ARE REQUIRED, THE AMOUNT OF DEFLECTION SHALL NOT EXCEED APPROVED AWWA STANDARDS. ALIGNMENT THAT MAY REQUIRE REFLECTIONS IN EXCESS OF THE RECOMMENDED LIMITATIONS, SPECIAL BENDS, OR A SUFFICIENT NUMBER OF SHORTER LENGTHS OF PIPE TO PROVIDE THE ANGULAR DEFLECTIONS WITHIN THE LIMITS AS SET FORTH, SHALL BE APPROVED BY THE ENGINEER.
 - ALL PLUGS, EXCEPT MECHANICAL JOINT PLUGS AT CONNECTIONS FOR FUTURE LINES, ALL TEES, AND ALL BENDS IN WATER MAINS UNDER PRESSURE SHALL BE PROVIDED WITH REACTION BACKING CONSISTING OF CONCRETE THRUST BLOCKS. VALVES FOR CONNECTIONS TO FUTURE LINES AND FIRE HYDRANTS SHALL BE ANCHORED TO THE WATER MAIN WITH THE ROOS.
 - DETECTION TAPE TO BE INSTALLED 12"-18" ABOVE ALL NEW WATER LINES.

- OPTIONAL PIPE SELECTIONS
 - THE CONTRACTOR SHALL INSTALL ONLY ONE (1) TYPE OF PIPE BETWEEN STRUCTURES.
 - WATER LINE SHALL BE AWWA C909 PVC OR DUCTILE IRON.
 - SANITARY SEWERS WITH AN INSIDE DIAMETER LESS THAN OR EQUAL TO TWELVE (12) INCHES SHALL BE EITHER POLYVINYL CHLORIDE OR DUCTILE IRON PIPE, AT THE CONTRACTOR'S OPTION, UNLESS SPECIFIED OR INDICATED OTHERWISE. CONTRACTOR SHALL OBTAIN APPROVAL OF PIPE MATERIAL BY BOTETOURT COUNTY ENGINEER PRIOR TO BEGINNING CONSTRUCTION.
 - SERVICE LATERALS SHALL BE SCHEDULE 40 POLYVINYL CHLORIDE.
- TYPES OF PIPE
 - POLYVINYL CHLORIDE (PVC) WATER PIPE SHALL BE AWWA C909.
 - DUCTILE IRON PIPE SHALL CONFORM WITH AWWA C 151/ANSI 21.51 AND FITTINGS SHALL CONFORM WITH AWWA C 110/ANSI 21.10. THE PIPE AND FITTINGS SHALL BE BITUMINOUS COATED AND CEMENT LINED IN ACCORDANCE WITH AWWA C 104/ANSI 21.40. THE PIPE THICKNESS SHALL CONFORM WITH AWWA C 150/ANSI 21.50 AND SHALL BE CLASS 50, AS A MINIMUM, UNLESS SPECIFIED OR INDICATED OTHERWISE.
 - PVC SEWER PIPE AND FITTINGS SHALL BE SDR 35 (ASTM D 3034), UNLESS OTHERWISE SPECIFIED OR APPROVED.
- JOINTS COUPLINGS AND APPURTENANCES
 - PVC PIPE AND FITTINGS SHALL BE BELL AND SPIGOT TYPE JOINTS. THE BELL AND SPIGOT JOINT SHALL BE SEALED WITH ELASTOMER GASKETS CONFORMING TO ASTM D 3212. THE JOINTS SHALL BE MADE IN STRICT ACCORDANCE WITH THE RECOMMENDATIONS OF THE PIPE MANUFACTURER.
 - DUCTILE IRON PIPE AND FITTINGS SHALL BE EITHER MECHANICAL OR BELL AND SPIGOT TYPE JOINTS. THE JOINTS SHALL BE MADE WITH A SINGLE WATER TIGHT RUBBER GASKET MANUFACTURED IN ACCORDANCE WITH AWWA C 111/ANSI 21.11. THE JOINTS SHALL BE MADE IN STRICT ACCORDANCE WITH THE RECOMMENDATIONS OF THE PIPE MANUFACTURER.
 - GATE VALVES SHALL BE IRON-BODY, BRONZE-MOUNTED, DOUBLE-DISC, PARALLEL-SEAL, O-RING SEALED, INSIDE-SCREW, NON-RISING STEM, WITH 2 INCH SQUARE OPERATING HANDLE AND VALVE VAULT SERVICE. ALL IN ACCORDANCE WITH AWWA STANDARD C500 (LATEST REVISION). CONNECTIONS SHALL BE SUITABLE FOR THE PIPE WITH WHICH IT IS USED. THE VALVES SHALL BE SUITABLE FOR 200 P.S.I. WATER WORKING PRESSURE AND SHALL BE TESTED AT TWICE THE RATED WORKING PRESSURE. ALL GATE VALVES SHALL BE INSTALLED IN VALVE VAULTS AND EQUIPPED WITH A 2-INCH SQUARE OPERATING NUT. THE NUT SHALL BE MARKED WITH ARROWS INDICATING THE WORDS "OPEN" AND SHALL OPEN BY TURNING TO THE RIGHT (CLOCKWISE).
 - ALL OTHER MATERIALS AND APPURTENANCES TO BE IN ACCORDANCE WITH DETAILS SHOWN ON PLANS.

PIPE INSTALLATION

- GENERAL
 - THE CONTRACTOR SHALL NOT LAY PIPE OR PLACE MANHOLES UNTIL ALL WATER HAS BEEN REMOVED FROM THE TRENCH, OR WHEN IN THE OPINION OF THE ENGINEER, THE TRENCH OR THE WEATHER CONDITIONS ARE UNSUITABLE FOR WORK.
 - PIPE THAT MAY REQUIRE FIELD CUTTING SHALL BE DONE SO IN A NEAT AND WORKMANLIKE MANNER, SO AS TO LEAVE A SMOOTH END AT RIGHT ANGLES TO THE AXIS OF THE PIPE. CARE SHALL BE TAKEN TO AVOID DAMAGING THE PIPE AND ANY COATINGS OR LININGS. DUCTILE IRON PIPE SHALL NOT BE CUT WITH AN OXYACETYLENE TORCH.
 - THE MATERIALS SHALL BE VISUALLY INSPECTED FOR DEFECTS BEFORE LOWERING THE PIPE OR PLACING THE MANHOLES INTO THE TRENCH. DURING THE LAYING OF THE PIPE, CLOTHING OR OTHER MATERIAL SHALL BE PLACED IN THE PIPE OR MANHOLE. THE INTERIOR OF THE PIPE SHALL BE CLEAR OF ALL SOIL, DEBRIS AND SUPERFLUOUS MATERIALS PRIOR TO AND DURING THE INSTALLATION.
 - THE CONTRACTOR SHALL EXERCISE EVERY PRECAUTION TO PREVENT FOREIGN MATERIAL FROM ENTERING THE PIPE WHILE IT IS BEING PLACED IN THE TRENCH. FAILURE BY THE CONTRACTOR TO TAKE SUCH PRECAUTIONS MAY RESULT IN THE ENGINEER REQUIRING A HEAVY, TIGHTLY WOVEN CANVAS BAG OF SUITABLE SIZE BE PLACED OVER EACH END OF THE PIPE AND REMOVED ONLY WHEN THE JOINT CAN BE MADE PROPERLY.
 - THE PIPE AND MANHOLES SHALL BE LOWERED CAREFULLY INTO THE TRENCH BY SUITABLE MEANS AND HANDLED WITH CARE AT ALL TIMES TO AVOID DAMAGE. UNDER NO CIRCUMSTANCES SHALL THE MATERIALS BE DROPPED OR DUMPED INTO THE TRENCHES.
 - WHEN WORK IS NOT IN PROGRESS, THE CONTRACTOR SHALL PLUG THE OPEN ENDS OF THE PIPE TO PREVENT TRENCH WATER OR OTHER SUBSTANCES FROM ENTERING THE PIPE. THE PIPE SHALL BE WATER TIGHT AND SHALL REMAIN IN PLACE UNTIL ANY REQUIRED Dewatering HAS BEEN COMPLETED.
 - PARALLEL INSTALLATION - WATER LINES SHALL BE LAID AT LEAST TEN FEET HORIZONTALLY FROM A SEWER OR SEWER MANHOLE WHENEVER POSSIBLE. WHEN LOCAL CONDITIONS PREVENT THIS HORIZONTAL SEPARATION OF TEN FEET, THE WATER LINE MAY BE LAID CLOSER TO A SEWER OR SEWER MANHOLE PROVIDED THAT:
 - THE INVERT OF THE WATER MAIN SHALL BE AT LEAST 18 INCHES ABOVE THE CROWN OF THE SEWER.
 - WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE PROTECTED BY AN APPROVED METHOD OF WATER PIPE FROM MANHOLE TO MANHOLE, PRESSURE TESTED IN PLACE WITHOUT LEAKAGE PRIOR TO BACKFILLING.
 - THE SEWER MANHOLE SHALL BE OF WATER-TIGHT CONSTRUCTION AND TESTED IN PLACE.

CROSSING - WATER LINES CROSSING SEWERS SHALL BE LAID TO PROVIDE A SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF THE SEWER WHENEVER POSSIBLE. WHEN LOCAL CONDITIONS PREVENT THIS VERTICAL SEPARATION, THE FOLLOWING CONSTRUCTION SHALL BE USED:

- SEWERS PASSING OVER OR UNDER WATER LINES SHALL BE CONSTRUCTED OF AWWA APPROVED WATER PIPE MANHOLE TO MANHOLE, PRESSURE TESTED IN PLACE WITHOUT LEAKAGE PRIOR TO BACKFILLING.
- WATER PIPE CROSSING UNDER SEWER SHALL NOT BE PERMITTED.

- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING AND MAINTAINING THE HORIZONTAL ALIGNMENT AND VERTICAL ELEVATION AND GRADE OF THE SYSTEM IN ACCORDANCE WITH THE SURVEY INFORMATION INDICATED ON THE PLANS.
- THE HORIZONTAL ALIGNMENT OF THE PIPE SHALL BE MAINTAINED BY A TRANSIT OR THEODOLITE PLUMBED OVER THE CENTER OF THE DOWNSTREAM MANHOLE. THE VERTICAL ELEVATION AND GRADE SHALL BE MAINTAINED BY NOT LESS THAN THREE (3) BATTER BOARD PLACED BETWEEN MANHOLES OR BY AN ADJUSTABLE LASER LEVEL MOUNTED AT THE INVERT OF THE DOWNSTREAM MANHOLE WITH TARGET(S) PLACED IN THE BELL END OF THE PIPE BEING LAID.
- SEWER PIPE SHALL BE INSTALLED IN 4 INCH GRAVEL BEDDING EXTENDING TO THE SPRINGLINE OF PIPE AND IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
- THE SANITARY SEWER SYSTEM SHALL BE LAID AND JOINED COMPLETE-IN-PLACE SO THAT EACH LENGTH AND SECTION OF PIPE BETWEEN THE MANHOLES SHALL HAVE A SMOOTH AND UNIFORM INVERT.
- THE PIPE SHALL BE CONNECTED TO MANHOLES THROUGH PRECAST OPENINGS AND JOINED WITH A FLEXIBLE BOOT ADAPTER OR A PIPE SEAL GASKET.
- DETECTION TAPE TO BE INSTALLED 12" TO 18" ABOVE ALL NEW SEWER PIPE MAINS AND SERVICE LATERALS.
- CONNECTION TO EXISTING SYSTEMS
 - THE NEW PIPE CONNECTION TO BE MADE TO AN EXISTING MANHOLE WHERE NO SUB OR OPENING EXISTS, SHALL BE MADE THROUGH AN OPENING OF MAXIMUM DIAMETER CUT INTO THE MANHOLE WALL AT THE REQUIRED LOCATION AND ELEVATION.
 - THE EXISTING INVERT CHANNELS AND BENCHES SHALL BE REWORKED AS REQUIRED TO FORM A NEW FLOW CHANNEL FROM THE NEW CONNECTION TO THE EXISTING FLOW CHANNEL.
 - THE NEW PIPE CONNECTED TO AN EXISTING MANHOLE SHALL BE SECURED IN POSITION AND MAINTAINED WITH A SUFFICIENT NUMBER OF SHORTER LENGTHS OF PIPE TO PROVIDE THE ANGULAR DEFLECTIONS WITHIN THE LIMITS AS SET FORTH, SHALL BE APPROVED BY THE ENGINEER.
 - ALL PLUGS, EXCEPT MECHANICAL JOINT PLUGS AT CONNECTIONS FOR FUTURE LINES, ALL TEES, AND ALL BENDS IN WATER MAINS UNDER PRESSURE SHALL BE PROVIDED WITH REACTION BACKING CONSISTING OF CONCRETE THRUST BLOCKS. VALVES FOR CONNECTIONS TO FUTURE LINES AND FIRE HYDRANTS SHALL BE ANCHORED TO THE WATER MAIN WITH THE ROOS.
 - DETECTION TAPE TO BE INSTALLED 12"-18" ABOVE ALL NEW WATER LINES.

DISINFECTION OF WATER MAINS

- ALL PIPE SHALL BE DISINFECTED, TESTED AND FLUSHED IN ACCORDANCE WITH AWWA STANDARD C801 (LATEST REVISION).
- CONTRACTOR SHALL PROVIDE ALL MATERIALS, EQUIPMENT, NECESSARY TAPS AND PERFORM ALL WORK REQUIRED FOR THE STERILIZATION, TESTING AND FLUSHING OF THE WATER MAIN.
- NO TESTED SECTION OF WATER LINE SHALL BE APPROVED TO DELIVER WATER SERVICE UNTIL A FAVORABLE LABORATORY REPORT HAS BEEN OBTAINED. ANY TESTED SECTION OF WATER LINE FAILING TO MEET THE REQUIREMENTS SPECIFIED SHALL BE REQUIRED BY THE CONTRACTOR AND RETESTED UNTIL THE RESULTS ARE WITHIN THE LIMITS SPECIFIED.
- THE WATER MAIN OR VALVED OFF SECTION THAT HAS BEEN COMPLETED SHALL BE FILLED, TESTED AND FLUSHED. TEST LOCATIONS SHALL BE SUBJECT TO THE DISCRETION OF THE ENGINEER AND AS VALVES AND SLOW-OPS PERMIT.
- AFTER TESTING AND BEFORE FINAL INSPECTION OF THE COMPLETED SYSTEMS, WATER MAINS AND SERVICE LATERALS SHALL BE FLUSHED AND DISINFECTED IN ACCORDANCE WITH AWWA STANDARDS C801 (LATEST REVISION). FLUSHING SHALL BE ACCOMPLISHED AT A FLOW VELOCITY OF NOT LESS THAN 2.5 FEET PER SECOND.

DISINFECTION AS DESCRIBED IN AWWA C851 - "PLACING OF CALCIUM HYPOCHLORITE TABLETS" SHALL BE USED. 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 EQUIVALENT. THE FOLLOWING NUMBER OF TABLETS FOR THE GIVEN PIPE SIZE SHALL BE USED FOR AN INITIAL DOSE OF 25 MG/L (PPM) CHLORINE:

PIPE DIAMETER	NUMBER TABLETS PER 18-20 FT. PIPE SECTION
8"	1
10"	2
12"	3
14"	4
16"	7

OR THE NUMBER OF TABLETS EQUAL TO 0.001202L 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 SLOW 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 DESIGN ENGINEER. WHEN FILLING THE PIPELINE FOR DISINFECTION, THE RATE OF FLOWING MUST RESULT IN A VELOCITY OF LESS THAN 1 FT./SEC.

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.

FOLLOWING CHLORINATION, THE PIPING SHALL BE THOROUGHLY FLUSHED. THE VIRGINIA WATERWORKS REGULATIONS REQUIRE AT LEAST TWO CONSECUTIVE TAPING OF THE WATER MAINS. SAMPLES AT 24 HOUR INTERVALS FROM THE DISTRIBUTION SYSTEM OF MAXIMUM SPACING OF 200 FEET SHALL BE OBTAINED. IF THE SYSTEM CAN BE PLACED IN SERVICE, IF THE INITIAL TESTING IS NOT SATISFACTORY THE NEW LINES WILL BE RETESTED UNTIL SATISFACTORY RESULTS ARE OBTAINED. IF THE CONTRACTOR SHALL PAY ALL COSTS ASSOCIATED WITH DISINFECTION AND TESTING OF INSTALLED FACILITIES INCLUDING ANY BACTERIOLOGICAL SAMPLES AND RETESTING IF REQUIRED. SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH THE VIRGINIA WATERWORKS REGULATIONS.

INSTALLING SEWER PIPE & MANHOLES

- THE INSTALLATION OF THE SANITARY SEWER SYSTEM SHALL BEGIN AT THE DOWNSTREAM MANHOLE AND PROCEED UPSTREAM. THE DOWNSTREAM SECTIONS SHALL BE COMPLETED, TESTED, AND APPROVED PRIOR TO ALLOWING SANITARY SEWAGE TO ENTER THE SYSTEM.
- THE PIPE SHALL BE INSTALLED IN ACCORDANCE WITH THE PIPE MANUFACTURER'S RECOMMENDATIONS AND AS DIRECTED BY THE ENGINEER. THE PIPE SHALL BE LAID IN TRUE STRAIGHT LINES WITH THE BELL ENDS UPSTREAM AND WITH THE INVERT OF THE PIPE BEING THE TRUE ELEVATION AND GRADE OF THE SYSTEM.

TEST PRESSURE RESTRICTIONS. TEST PRESSURES SHALL:

- NOT BE LESS THAN 1.50 TIMES THE WORKING PRESSURE AT THE HIGHEST POINT ALONG THE TEST SECTION.
- NOT EXCEED PIPE OR THRUST RESTRAINT DESIGN PRESSURES.
- NOT VARY BY MORE THAN 4.5 PSI.
- NOT EXCEED TWICE THE RATED PRESSURE OF THE VALVES OR HYDRANTS WHEN THE PRESSURE BOUNDARY OF THE TEST SECTION INCLUDES CLOSED GATE VALVES.
- NOT EXCEED THE RATED PRESSURE OF THE VALVE.

EACH VALVED SECTION OF PIPE SHALL BE FILLED WITH WATER SLOWLY, AND THE SPECIFIED TEST PRESSURE SHALL BE APPLIED BY MEANS OF A PUMP CONNECTED TO THE PIPE IN A MANNER SATISFACTORY TO THE ENGINEER.

BEFORE APPLYING THE SPECIFIED TEST PRESSURE, AIR SHALL BE EXPELLED COMPLETELY FROM THE PIPE & VALVES.

BACKFILL BELOW UNPAVED AREAS

- BACKFILL FROM THE TOP OF THE PIPE BEDDING OR BOTTOM OF THE PIPE TRENCH TO ONE (1) FOOT ABOVE THE TOP OF THE PIPE SHALL BE FREE OF STONES LARGER THAN ONE (1) INCH IN DIAMETER AND SHALL BE PLACED IN LAYERS NOT TO EXCEED SIX (6) INCHES AND COMPACTED WITH HAND OPERATED TAMPERS.
- BACKFILL FROM ONE (1) FOOT ABOVE THE TOP OF THE PIPE TO THE TOPSOIL SUBGRADE SHALL BE FREE OF STONES LARGER THAN FIVE (5) INCHES IN DIAMETER AND SHALL BE PLACED IN LAYERS NOT TO EXCEED TWELVE (12) INCHES AND COMPACTED WITH MECHANICAL TAMPERS.
- DRAINAGE CHANNELS TO BE CONSTRUCTED OF FILL MATERIAL SHALL BE GRADED AND SHAPED TO THE TOPSOIL SUBGRADE WITH MATERIAL FREE OF STONES LARGER THAN FOUR (4) INCHES IN DIAMETER AND SHALL BE PLACED IN LAYERS NOT TO EXCEED EIGHT (8) INCHES AND COMPACTED WITH MECHANICAL TAMPERS.
- BACKFILL BELOW EXISTING OR NEW PAVED AREAS AND SIDEWALKS
 - BACKFILL FROM THE TOP OF THE PIPE BEDDING OR BOTTOM OF THE PIPE TRENCH TO ONE (1) FOOT ABOVE THE TOP OF THE PIPE SHALL BE FREE OF STONES LARGER THAN FOUR (4) INCHES IN DIAMETER AND SHALL BE PLACED IN LAYERS NOT TO EXCEED SIX (6) INCHES AND COMPACTED WITH HAND TAMPERS.
 - BACKFILL FROM ONE (1) FOOT ABOVE THE TOP OF THE PIPE TO THE PAVEMENT SUBGRADE SHALL BE FREE OF STONES LARGER THAN FOUR (4) INCHES IN DIAMETER AND SHALL BE PLACED IN LAYERS NOT TO EXCEED EIGHT (8) INCHES AND COMPACTED WITH MECHANICAL TAMPERS.

INSPECTION AND TESTS

A. TESTING OF SANITARY SEWER

- THE CONTRACTOR SHALL PROVE THE WATER TIGHTNESS OF THE SEWER SYSTEM OR PORTIONS THEREOF BY ONE OF THE FOLLOWING TESTS, AT SUCH TIMES AS THE ENGINEER MAY DIRECT. TESTS SHALL BE MADE ONLY IN THE PRESENCE OF THE ENGINEER. THE CONTRACTOR SHALL FURNISH ALL LABOR AND EQUIPMENT REQUIRED FOR THE TEST AND SHALL MAKE REPAIRS NECESSARY UNTIL TEST RESULTS ARE SATISFACTORY. THE CONTRACTOR SHALL BE NOTIFIED OF ALL TESTS 48 HOURS PRIOR TO CONDUCTING SUCH TESTS. ALL TESTS SHALL BE COORDINATED WITH THE DESIGN ENGINEER. THE CONTRACTOR SHALL MAINTAIN OBSERVATION AND DOCUMENTATION. DOCUMENTATION BY THE CONTRACTOR WILL NOT BE ACCEPTABLE. ALL TEST DOCUMENTATION MUST BE SEALED BY THE CONTRACTOR'S PERSONAL ENGINEER RESPONSIBLE FOR THE DESIGN OF THE SYSTEM.

B. AIR TEST

- THE TESTING EQUIPMENT, PROCEDURE, AND RESULTS WILL ALL BE SUBJECT TO THE STRICT APPROVAL OF THE ENGINEER. RESULTS OF THE AIR TEST WILL BE REVIEWED FOR COMPLIANCE WITH ASTM DESIGNATION C-828, CURRENT REVISION. AN AIR TEST IS TO BE CONDUCTED BETWEEN TWO (2) CONSECUTIVE MANHOLES. THE TEST SHALL BE MADE ONLY IN THE PRESENCE OF THE ENGINEER. THE TEST EQUIPMENT SHALL CONSIST OF (1) A SHUT-OFF VALVE, (2) A PRESSURE REGULATING VALVE, A PRESSURE REDUCTION VALVE, AND A MONITORING PRESSURE GAUGE. THE PRESSURE RANGE FROM 0 TO 5 PSI, GRADUATED IN 0.10 PSI WITH AN ACCURACY OF PLUS/MINUS .04 PSI. THE TEST EQUIPMENT SHALL BE SET UP OUTSIDE THE MANHOLE FOR EASY ACCESS AND READING. AIR SHALL BE SUPPLIED TO THE TEST SLOWLY AND SHALL BE REGULATED TO PREVENT THE PRESSURE INSIDE THE PIPE FROM EXCEEDING 5.0 PSIG. THE PIPELINE SHALL BE FILLED UNTIL A CONSTANT INTERNAL PRESSURE OF 3.5 PSIG IS MAINTAINED. THE INTERNAL PRESSURE SHALL BE MAINTAINED AT 3.5 PSIG OR SLIGHTLY ABOVE FOR FIVE (5) MINUTE STABILIZATION PERIOD, AFTER WHICH TIME THE INTERNAL PRESSURE WILL BE ADJUSTED TO 3.5 PSIG. THE AIR SUPPLY SHUT OFF AND THE TEST BEGINS. NO PERSON SHALL REMAIN IN THE MANHOLE WHILE THE PIPE IS BEING PRESSURIZED OR THROUGHOUT THE TEST FOR SAFETY PURPOSES. A PRESSURE DROP OF 1.0 PSI FROM 3.5 TO 2.5 PSIG SHALL BE ALLOWED FOR THE TEST. THE TEST RESULTS SHALL BE BASED UPON THE DESIGNATED PIPE SIZE AND TEST SEGMENT LENGTH.

BASED ON EQUATIONS FROM ASTM C-828-80 SPECIFICATIONS TIME (MIN:SEC) REQUIRED FOR PRESSURE DROP FROM 3.5 TO 2.5 PSI WHEN TESTING ONE PIPE DIAMETER ONLY.

LENGTH OF TEST SEGMENT	4	6	8	10	12	15	18
25	0:04	0:10	0:18	0:28	0:40	1:02	1:29
50	0:09	0:30	0:55	1:19	2:04	2:58	3:52
75	0:13	0:30	0:53	1:23	1:50	3:08	4:27
100	0:18	0:40	1:10	1:50	2:28	4:08	5:56
125	0:22	0:50	1:28	2:10	3:18	5:08	7:26
150	0:26	0:59	1:46	2:40	3:48	6:11	8:30
175	0:31	1:09	2:03	3:13	4:37	7:05	9:21
200	0:35	1:19	2:21	3:40	5:17	7:54	10:12
225	0:40	1:29	2:38	4:08	5:17	8:40	11:14
250	0:44	1:39	2:56	4:35	5:44	9:21	12:16
275	0:48	1:49	3:14	4:43	6:03	9:27	13:36
300	0:53	1:59	3:31	5:01	6:33	10:12	14:56
350	1:02	2:19	4:14	5:47	7:44	11:38	16:16
400	1:10	2:38	4:47	6:18	8:16	11:54	17:36
450	1:18	2:50	5:05	6:43	8:38	12:19	18:56
500	1:28	3:14	5:44	7:34	9:14	12:49	20:16

SHOULD THE 1.0 PSI DROP OCCUR IN LESS TIME THAN THAT SPECIFIED IN THE TABLE, THE SEWER SHALL BE RE-TESTED. IF THE TIME REQUIRED FOR THE PRESSURE TO DROP 1.0 PSI IS GREATER THAN THAT SHOWN IN THE TABLE, THE SEWER SEGMENT SHALL HAVE PASSED.

FOR A MORE DETAILED DESCRIPTION OF THE AIR TEST METHOD REFER TO ASTM DESIGNATION C-828, CURRENT REVISION. AN AIR PRESSURE CONNECTION SHALL BE REQUIRED WHEN THE PREVAILING GROUND WATER IS ABOVE THE SEWER LINE BEING TESTED. IT SHALL BE CALCULATED AS FOLLOWS:

GROUND WATER DEPTH (FT) + 3.5 = STARTING TEST PRESSURE
2.31
ENDING TEST PRESSURE = STARTING PRESSURE - 1.0 PSI

THERE IS NO CHANGE FROM TIME REQUIREMENTS ESTABLISHED FOR THE BASIC AIR TEST.

C. MANHOLE VACUUM TESTS

- MANHOLES SHALL BE TESTED BY VACUUM TEST, AFTER ASSEMBLY BUT PRIOR TO BACKFILLING. THE TEST SHALL COMPLY WITH ASTM C-828 STANDARDS. MANHOLES SHALL BE TESTED BY VACUUM ONLY IF CONSTRUCTED OF PRECAST CONCRETE. TESTING SHALL INCLUDE ALL CONCRETE RISER, INCLUDING SPACER RISERS, AND THE JOINT BETWEEN THE CONCRETE AND THE MANHOLE, UP THROUGH AND INCLUDING THE MANHOLE FRAME AND COVER.

ALL EXPOSED PIPE, FITTINGS, VALVES, AND JOINTS SHALL BE EXAMINED CAREFULLY FOR ANY DAMAGE OR DEFECTIVE PIPE, FITTINGS, OR VALVES THAT ARE DISCOVERED FOLLOWING THE PRESSURE TEST SHALL BE REPEATED UNTIL IT IS SATISFACTORY TO THE ENGINEER.

- A LEAKAGE TEST SHALL BE CONDUCTED CONCURRENTLY WITH THE PRESSURE TEST. LEAKAGE SHALL BE DEFINED AS THE QUANTITY OF WATER THAT MUST BE SUPPLIED INTO THE NEWLY LAID PIPE, OR ANY VALVED SECTION THEREOF, TO MAINTAIN PRESSURE WITHIN 5 PSI OF THE SPECIFIED TEST PRESSURE AFTER THE AIR IN THE PIPELINE HAS BEEN EXPELLED AND THE PIPE HAS BEEN FILLED WITH WATER. NO PIPE INSTALLATION WILL BE ACCEPTED IF THE LEAKAGE IS GREATER THAN THAT DETERMINED BY THE FOLLOWING FORMULA:

$$L = S(D/P)^{10}$$

133,200

IN WHICH L IS THE ALLOWABLE LEAKAGE, IN GALLONS PER HOUR; S IS THE LENGTH OF PIPELINE TESTED IN FEET; D IS THE NOMINAL DIAMETER OF THE PIPE, IN INCHES; AND P IS THE AVERAGE TEST PRESSURE DURING THE LEAKAGE TEST, IN POUNDS PER SQUARE INCH GAUGE. WHEN TESTING AGAINST CLOSED METAL-SEALED VALVES, AN ADDITIONAL LEAKAGE PER ENCLOSED VALVE OF 0.0078 GAL/HR/IN, OF NOMINAL VALVE SIZE SHALL BE ALLOWED. IF ANY TEST OF PIPE LAID DISCLOSES LEAKAGE GREATER THAN THE ALLOWABLE AMOUNT, THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE AND REPAIR THE DEFECTIVE MATERIAL UNTIL THE LEAKAGE IS WITHIN THE SPECIFIED ALLOWANCE. ALL VISIBLE LEAKS ARE TO BE REPAIRED REGARDLESS OF THE AMOUNT OF LEAKAGE.

NOTE

ALL SEWER AND WATER PIPES (MAINS AND SERVICE LINES) SHALL HAVE BOTH MAGNETICALLY LOCATABLE DETECTION WIRE AND OR TAPE AND WARNING TAPE. MAGNETICALLY LOCATABLE DETECTION WIRE AND OR TAPE SHALL BE INSTALLED AT THE SAME ELEVATION AS THE PIPE LINE OF PIPE. WARNING TAPE (CAUTION! BURIED SEWER/WATER PIPE) SHALL BE INSTALLED NO MORE THAN 18 INCHES ABOVE TOP OF PIPE.

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ASHLEY PLANTATION SECTION II

UTILITY PLAN

BOTETOURT COUNTY, VIRGINIA

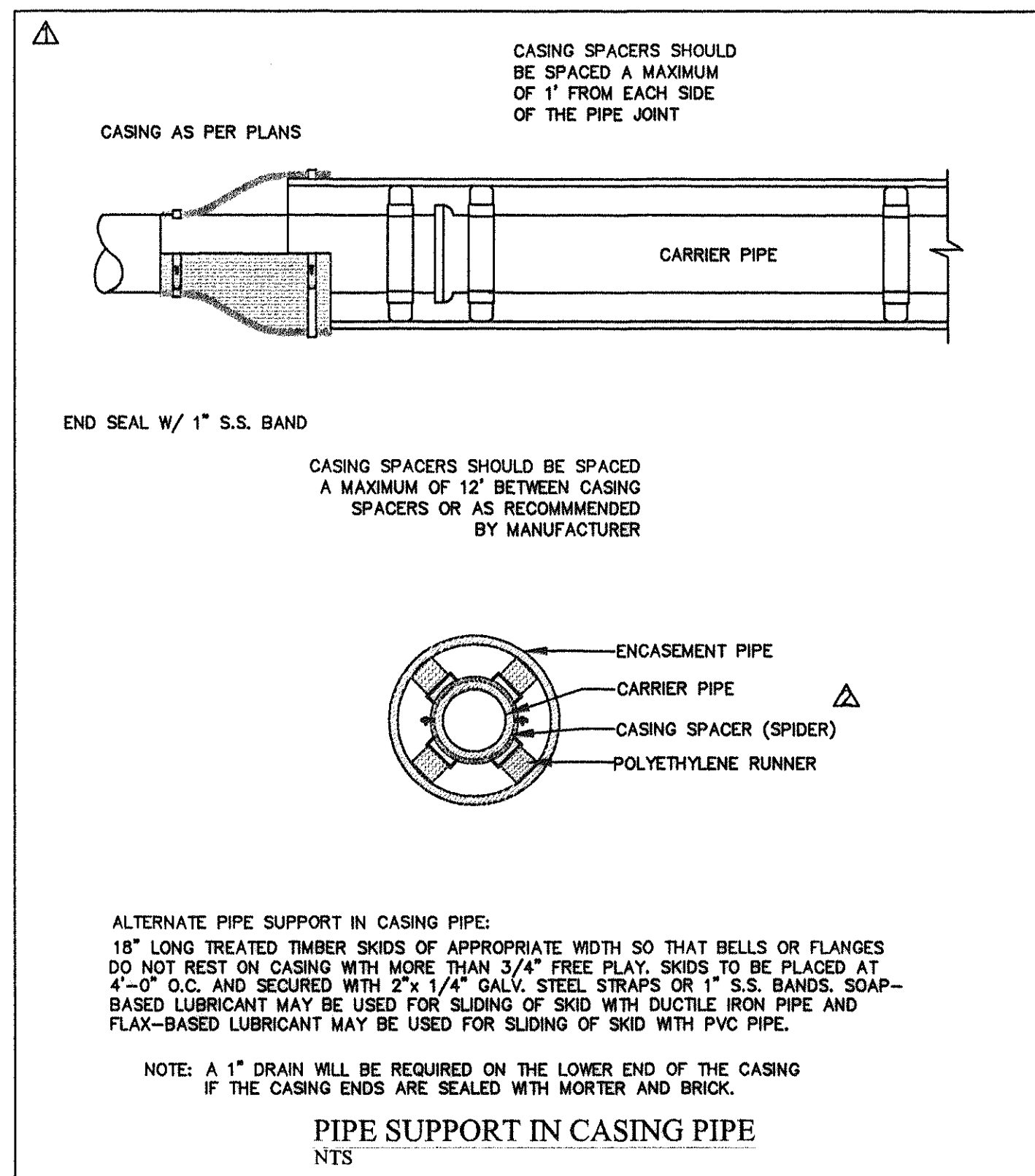
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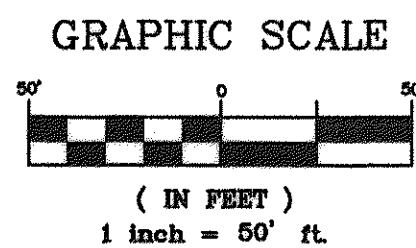
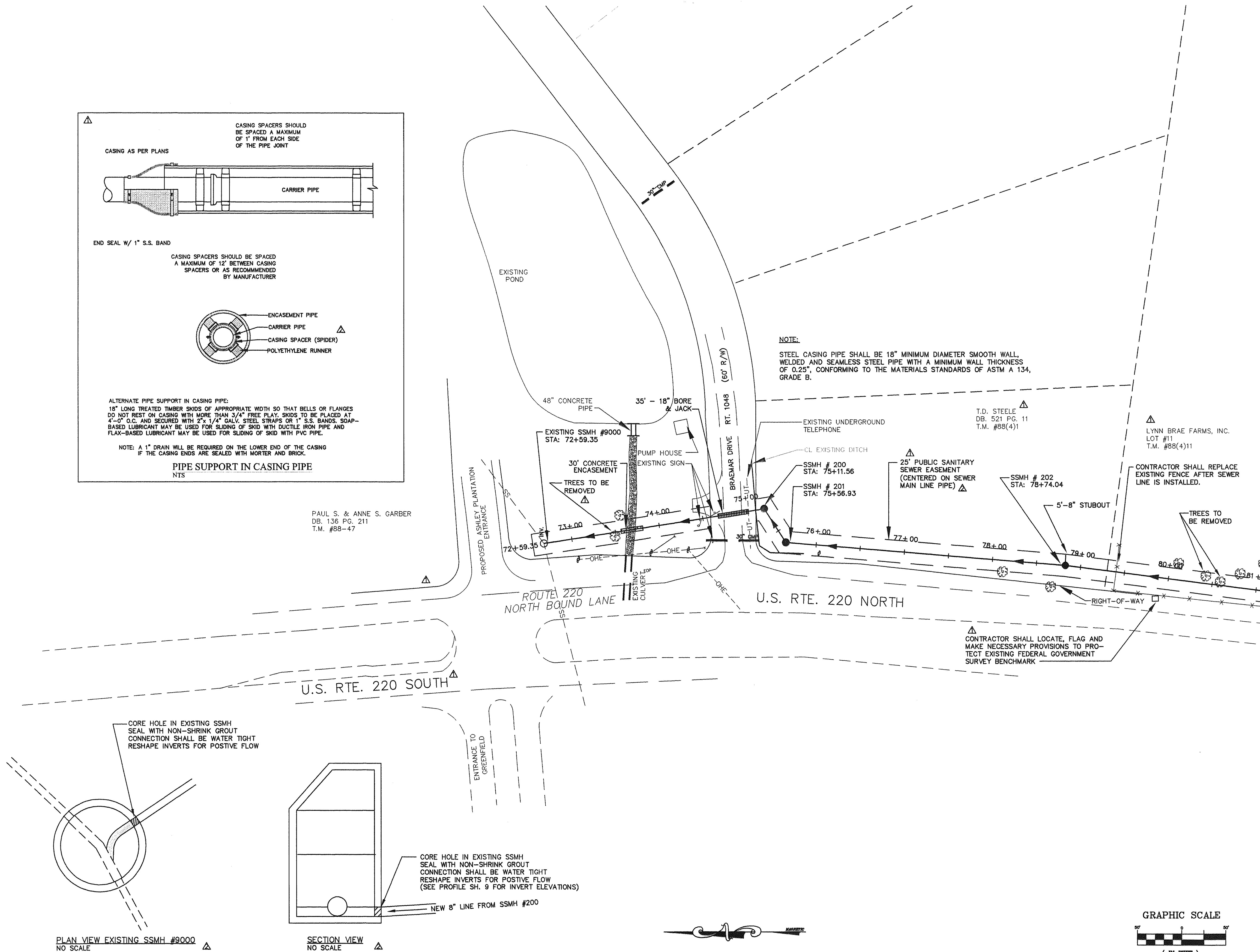
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RICHARD C. WHITE

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Drawn By DDW
Checked By RCW
Approved By RCW
Submitted By RCW
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Date 05/26/99
Scale NONE
Comm. No. 1070L
Sheet 3 of 17

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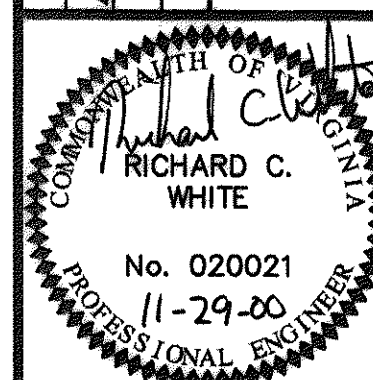
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DB. 136 PG. 211
T.M. #88-47



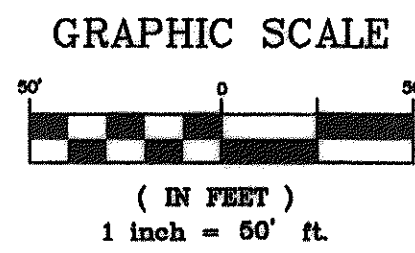
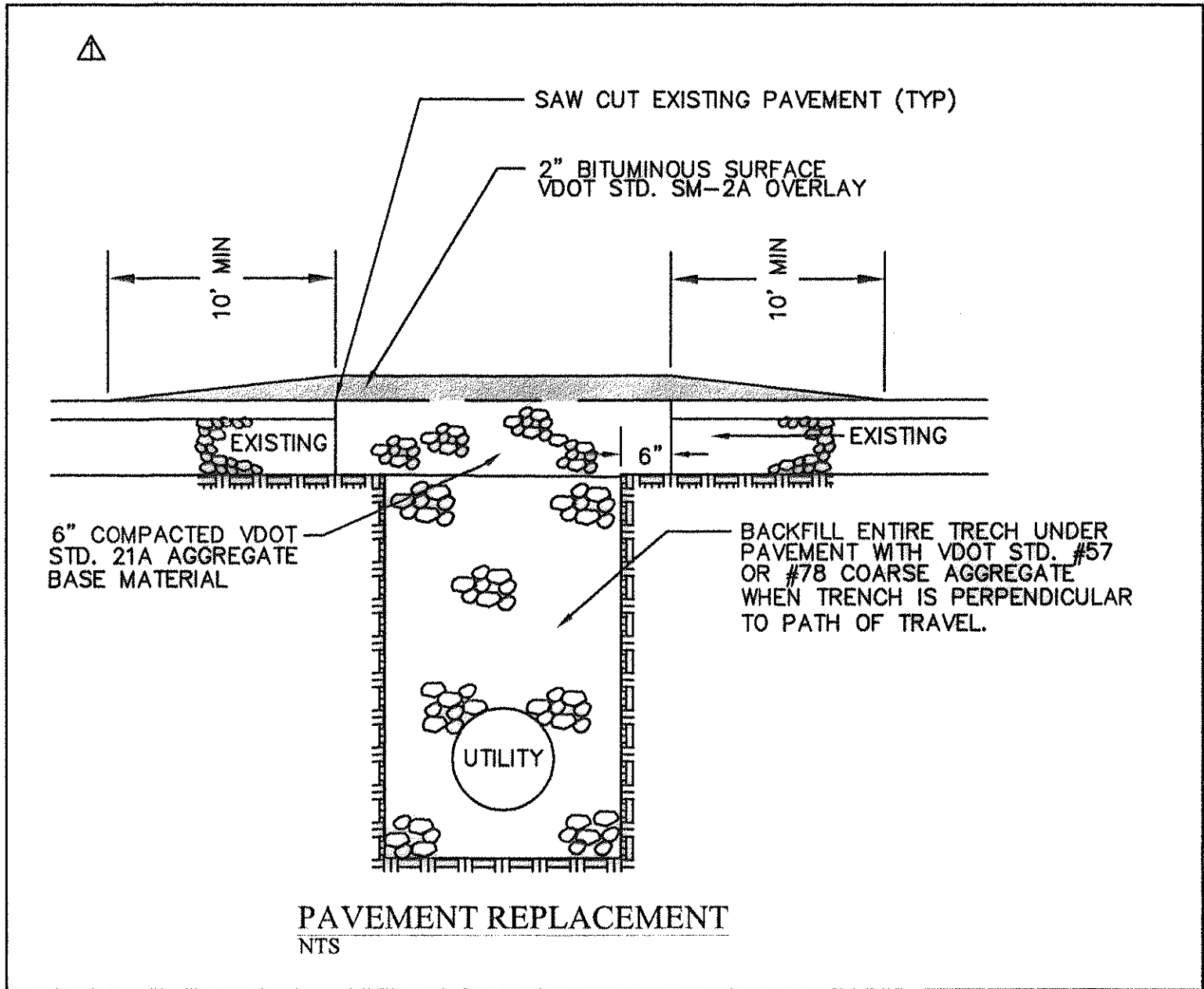
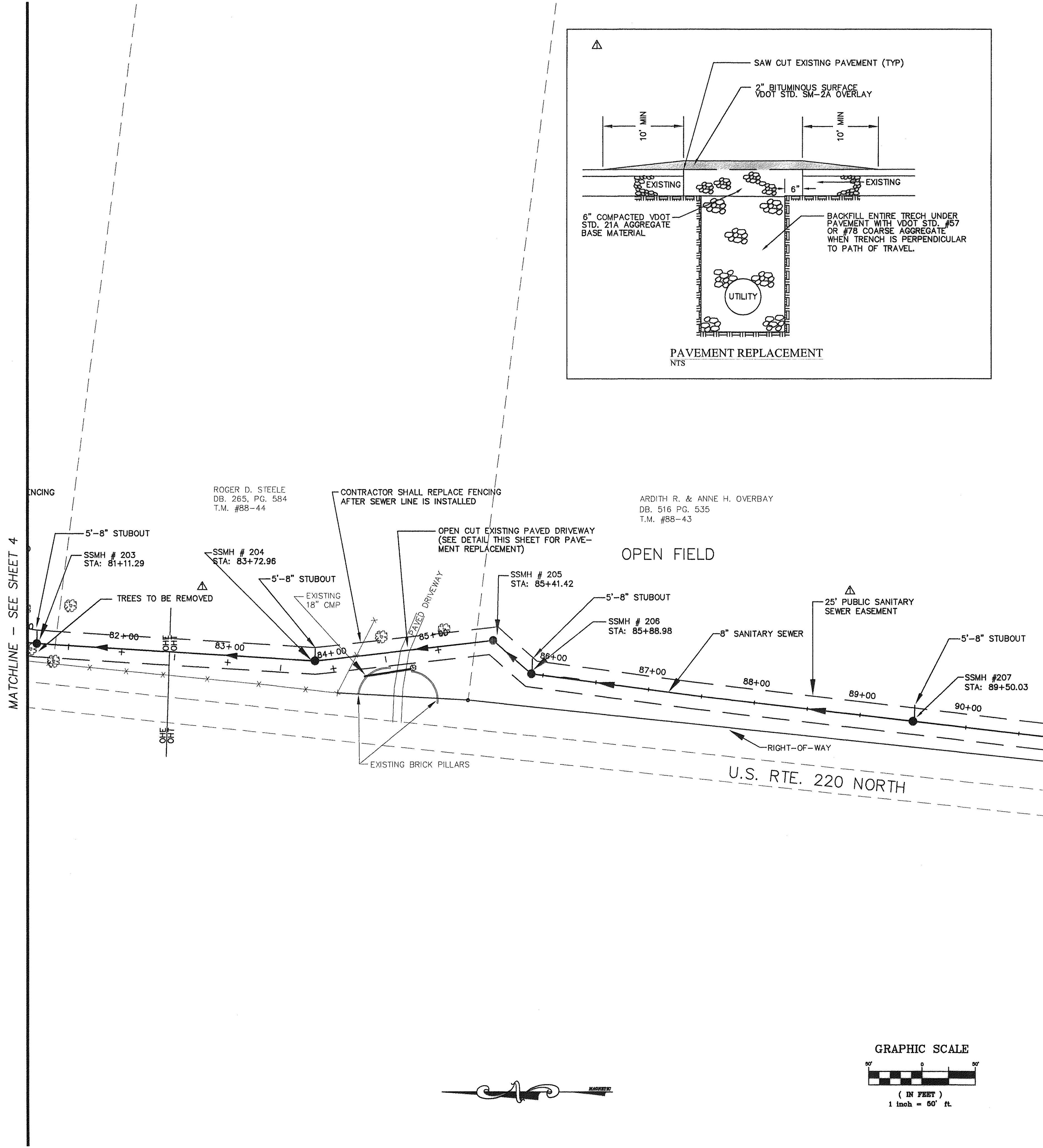
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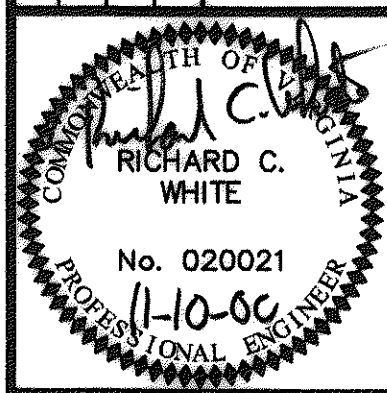
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9-18-00		PER BOTETOURT COUNTY	DB
11-27-00		PER BOTETOURT COUNTY	DB



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Checked By	
Approved By	RCW
Submitted By	RCW
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Date	07/25/00
Scale	1" = 50'
Commission No.	1070L
Sheet	4 of 15



NO.	DATE	DESCRIPTION	BY
1	9-18-00	PER BOTETOURT COUNTY COMMENTS	DB



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Sheet	5 of 17

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MATCHLINE - SEE SHEET 5

GRAPHIC SCALE
(IN FEET)
1 inch = 50' ft.

OPEN FIELD

ARDITH R. & ANNE H. OVERBAY
DB: 516 PG. 535
T.M. #88-43

U.S. RTE. 220 NORTH

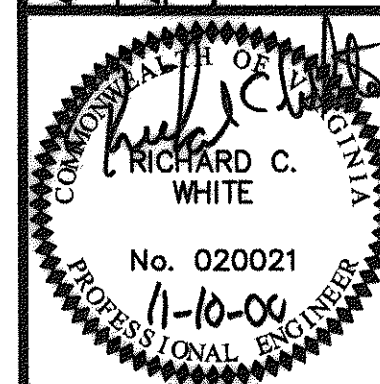
GOLF COURSE

MATCHLINE SHEET 7

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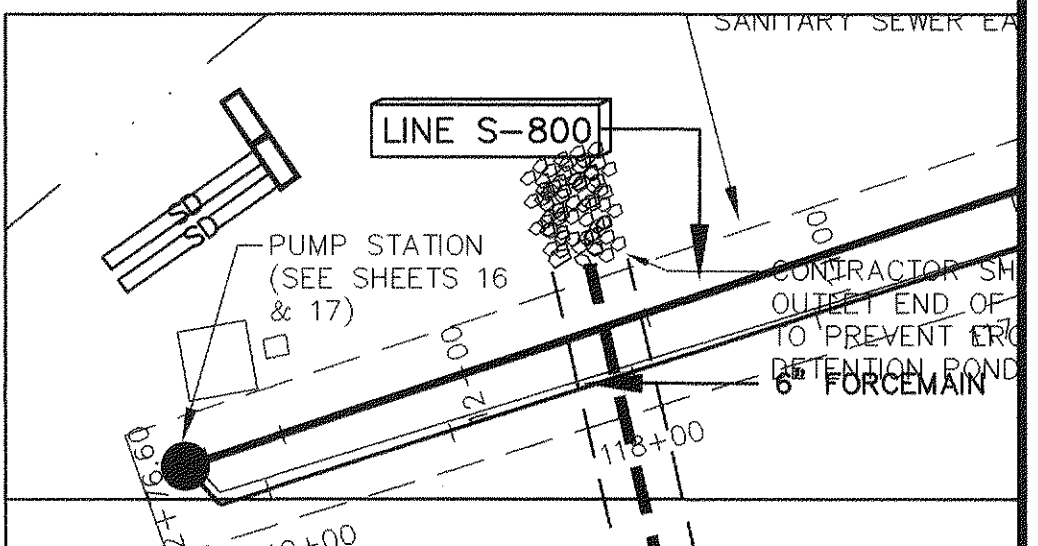
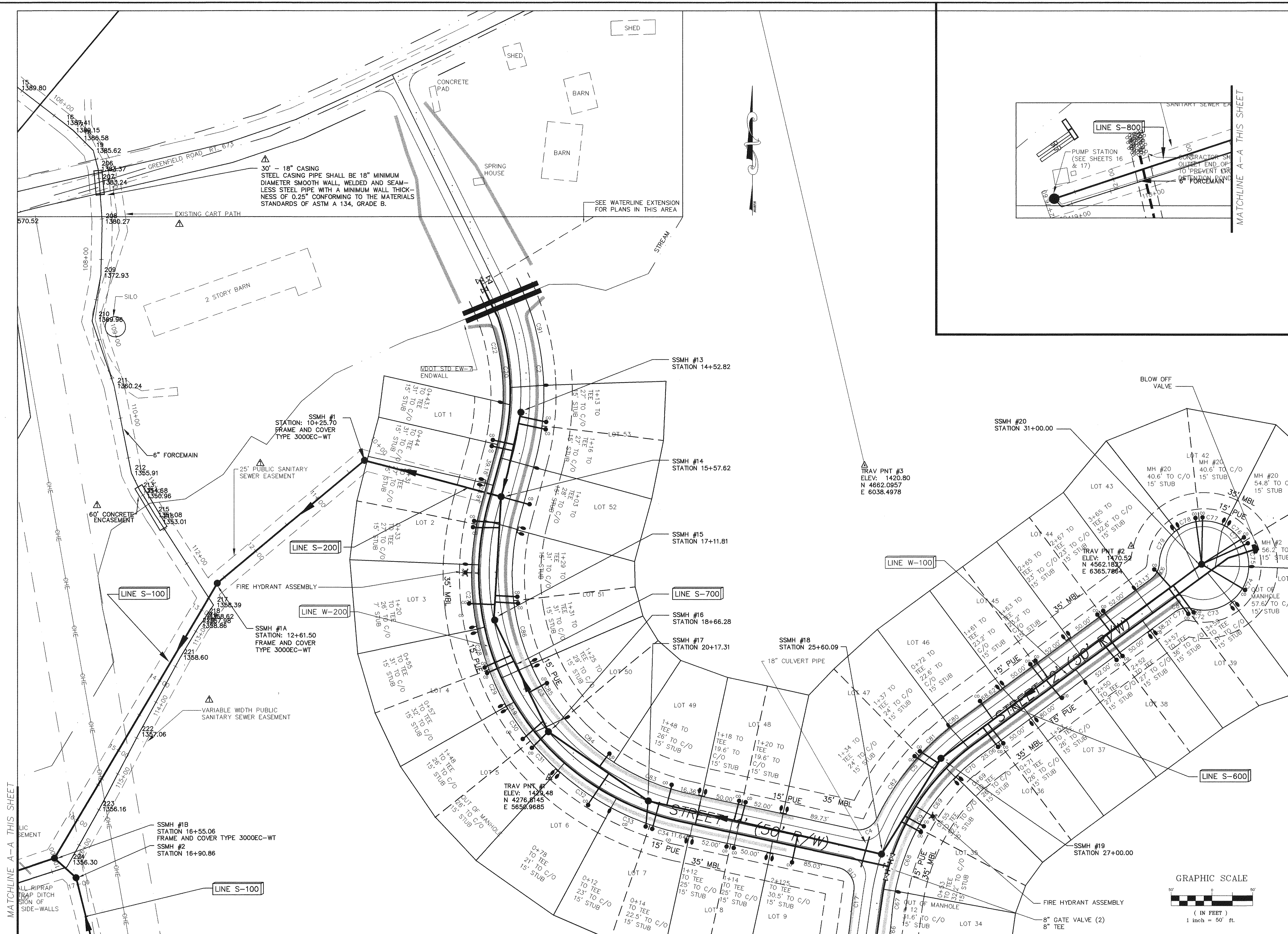
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10-27-00		PER VDH COMMENTS	DB



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Approved By RCW
Submitted By RCW
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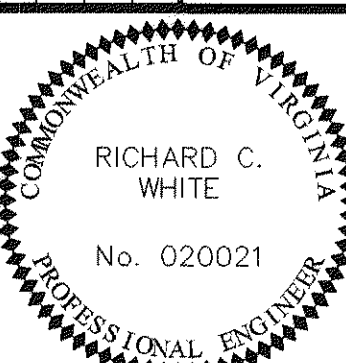
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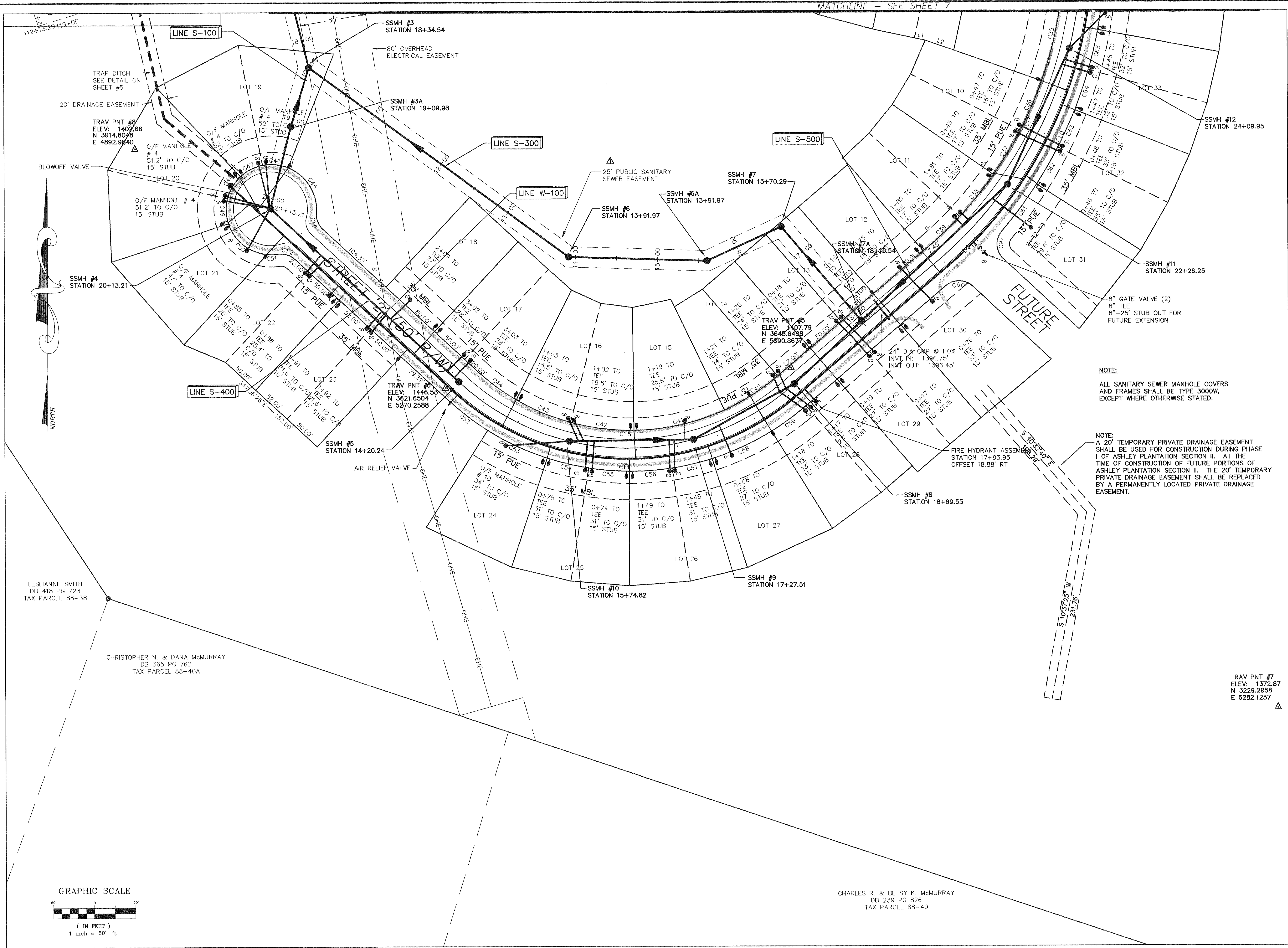
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BOTETOURT COUNTY, VIRGINIA

DB	PNC	BY
9-18-00	PER BOTETOURT COUNTY	
8-24-01	RECORD/BOTETOURT COUNTY	
NO.	DATE	DESCRIPTION



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Approved By	RCW
Submitted By	RCW
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Date	07/25/00
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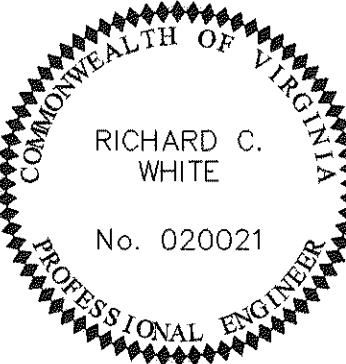
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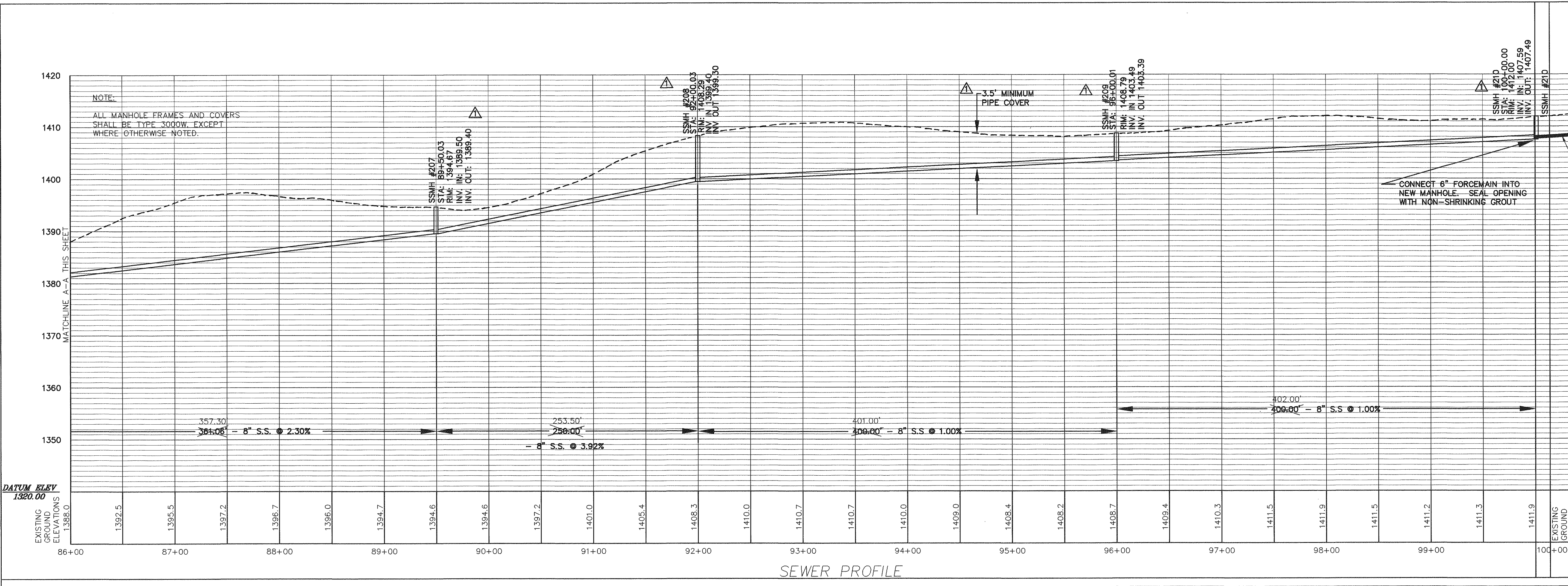
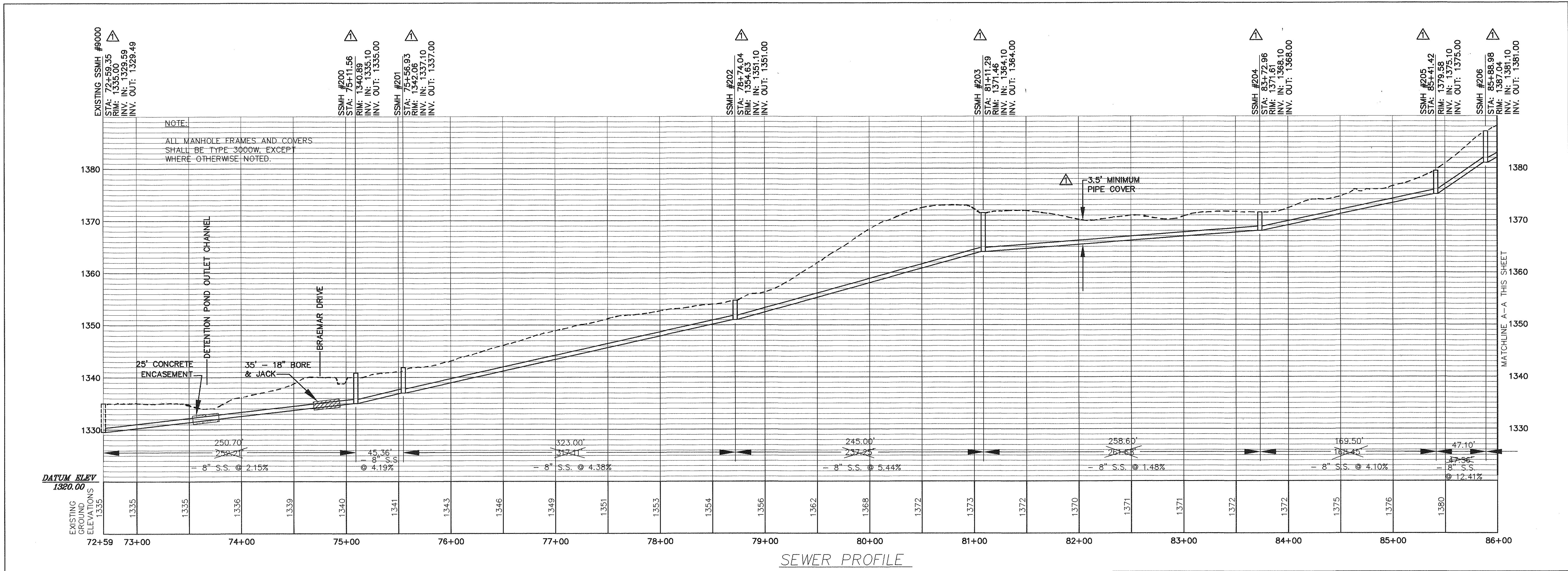
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8-24-01		RECORD / BOTETOURT COUNTY	PNC



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Approved By	RCW
Submitted By	RCW
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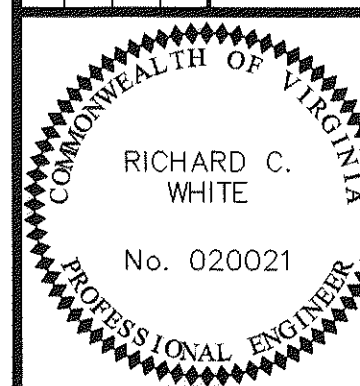
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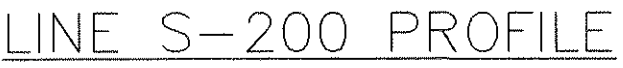
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NO.	DATE	DESCRIPTION	BY
9-18-00	PER BOTETOURT COUNTY	DB	
8-24-01	RECORD/BOTETOURT COUNTY	PNC	



Designed By	RCW
Drawn By	EKH
Checked By	
Approved By	RCW
Submitted By	RCW
Drawing	1070L_MASTER
Date	07/25/00
Scale	V: 1" = 10' H: 1" = 50'
Commission No.	1070L

LMW_{P.C.}

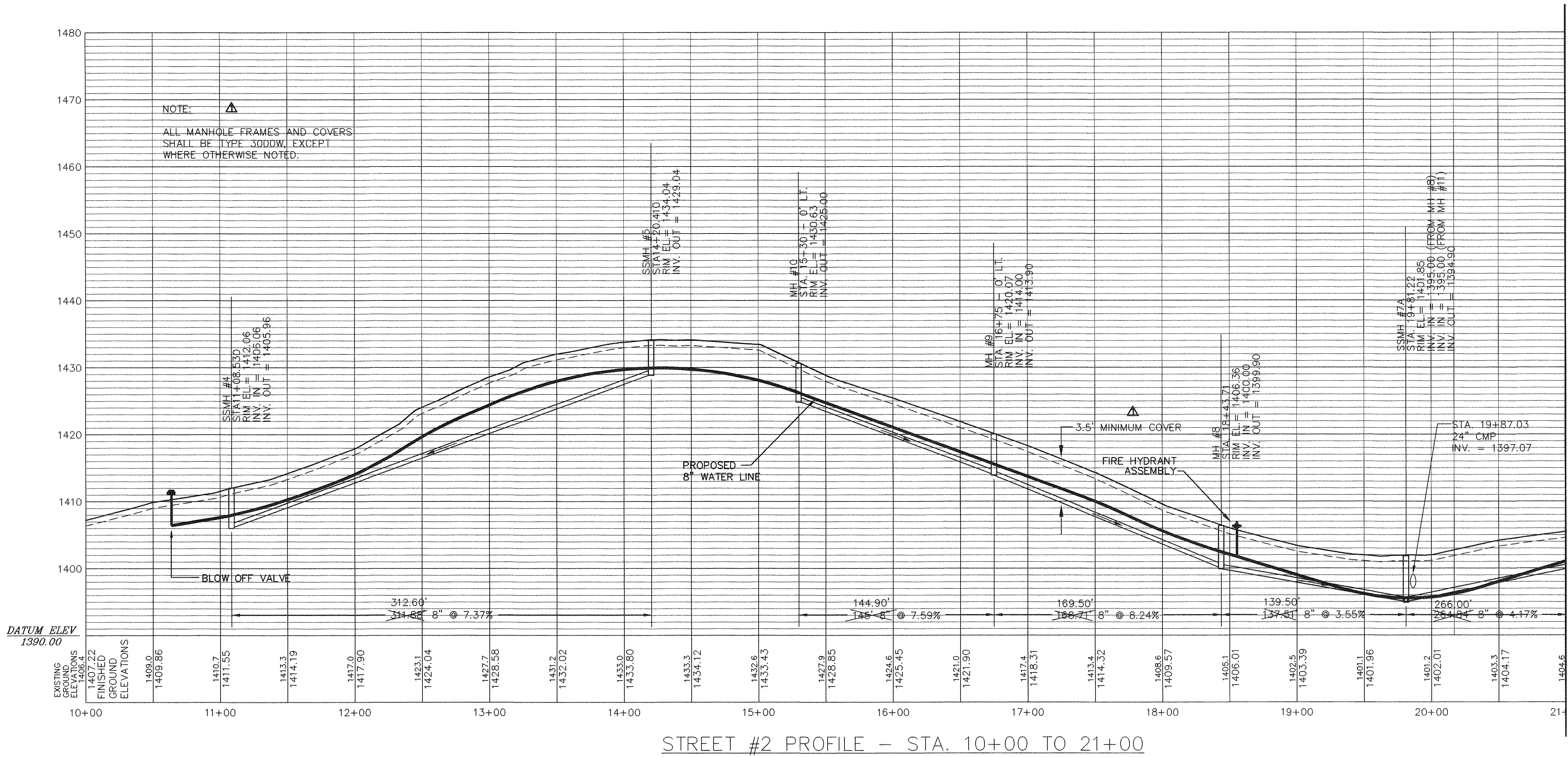
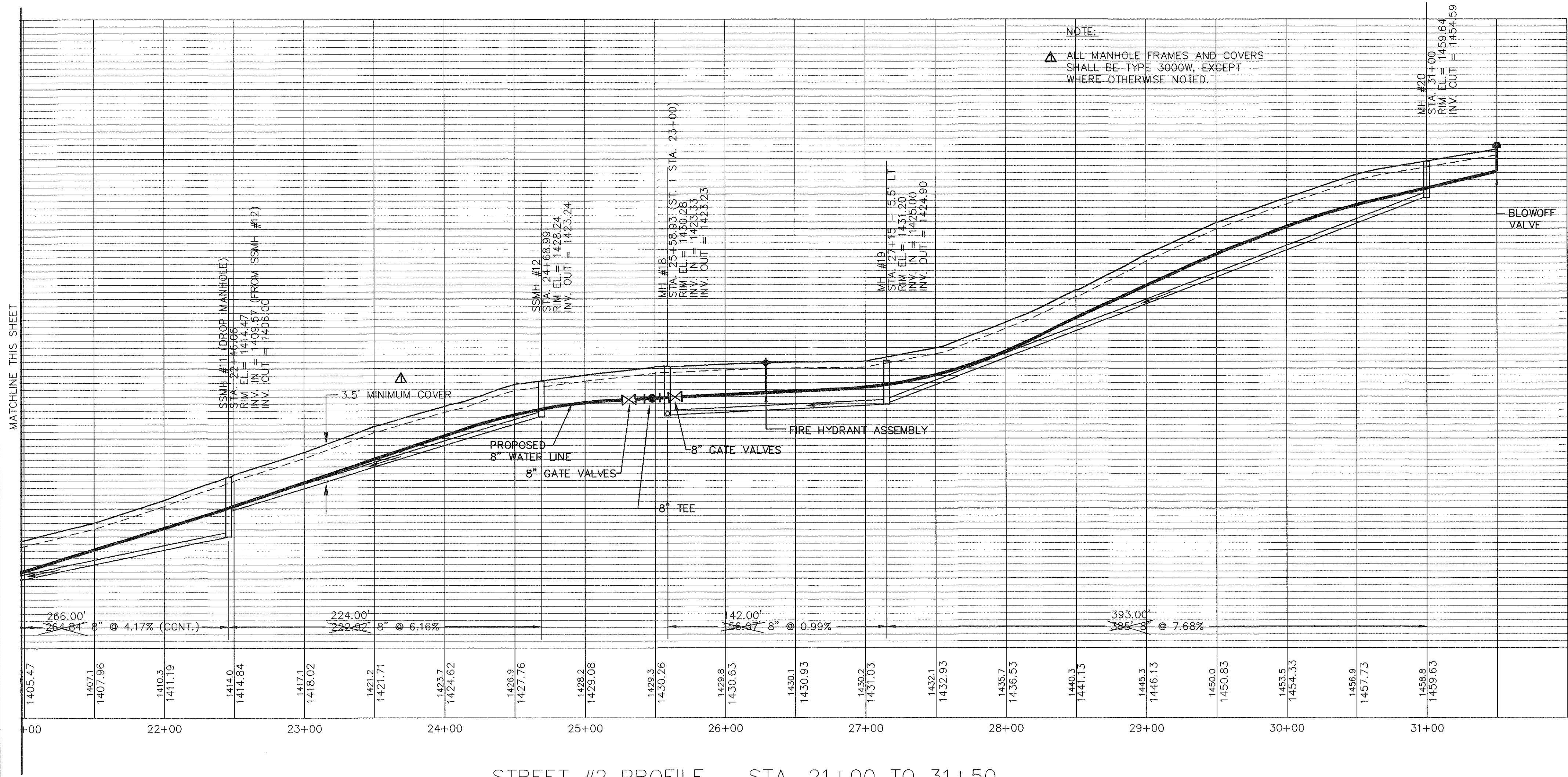
PROFILES	
DESCRIPTION	BY
BOJETOURT COUNTY MENTS	DB
ORD/BOJETOURT COUNTY	PNC



COMMONWEALTH OF VIRGINIA
RICHARD C. WHITE
 No. 020021
 PROFESSIONAL ENGINEER

Designed By	RCW
Drawn By	EKH
Checked By	
Approved By	RCW
Submitted By	RCW
Drawing	1070L_PROFIL
Date	08/07/00
Scale	H: 1" = 5' V: 1" = 1'
Commission No.	1070

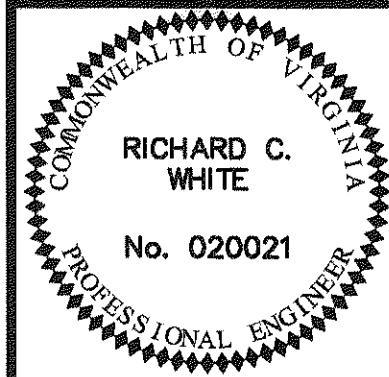
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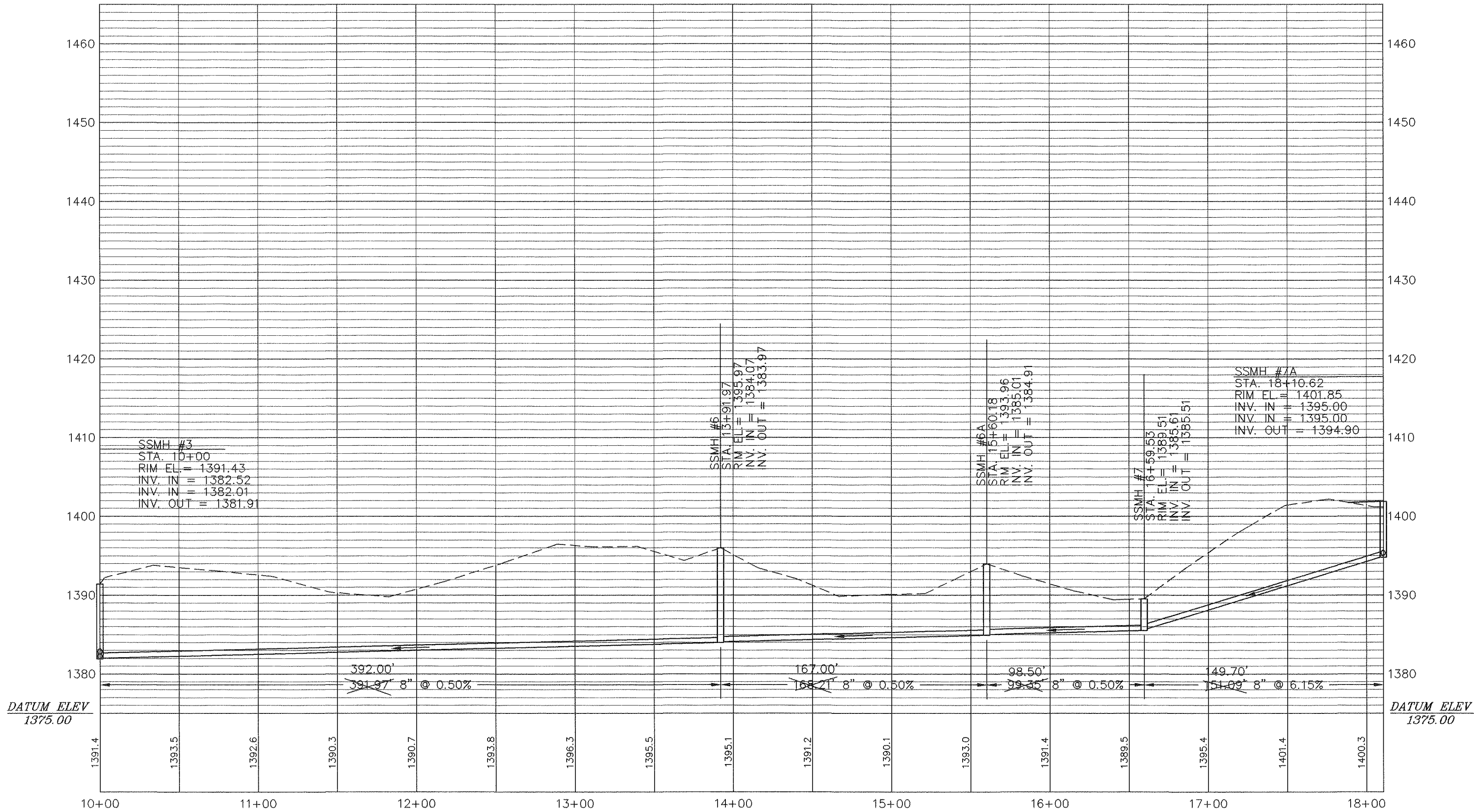
ASHLEY PLANTATION
UTILITY PLAN
BOTETOURT COUNTY, VIRGINIA

9-18-00	PER BOTETOURT COUNTY	DB
COMMENTS		
8-24-01	RECORD/BOTETOURT COUNTY	PNC
NO.	DATE	DESCRIPTION
		BY
PROFILES		



Designed By	RCW
Drawn By	EKH
Checked By	
Approved By	RCW
Submitted By	RCW
Drawing	1070L_PROFILES
Date	08/07/00
Scale	H: 1" = 50' V: 1" = 10'
Commission No.	1070L

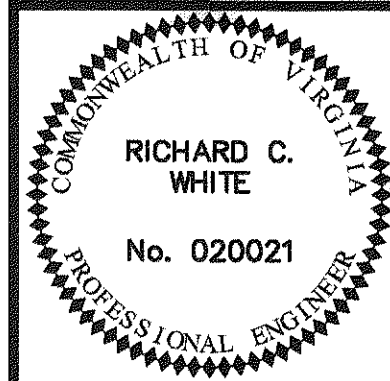
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ASHLEY PLANTATION
UTILITY PLAN
BOTETOURT COUNTY, VIRGINIA

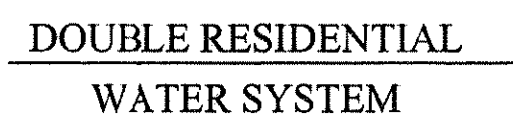
LMW P.C.
ENGINEERING · ARCHITECTURE · SURVEYING
102 ALBEMARLE AVE., S.E.
ROANOKE, VIRGINIA 24013
(540) 345-0675
FAX (540) 342-4456

8-24-01	RECORD/BOTETOURT COUNTY	PNC
NO.	DATE	DESCRIPTION
BY		



Designed By	RCW
Drawn By	EKH
Checked By	
Approved By	RCW
Submitted By	RCW
Drawing	1070L_PROFILES
Date	08/07/00
Scale	H: 1" = 50' V: 1" = 10'
Commission No.	1070L

MINIMUM
SPECIFIED TIME
REQUIRED FOR
A 1.0 PSIG
PRESSURE DROP
FOR SIZE AND
LENGTH OF PIPE
INDICATED FOR
 $Q = 0.0015$

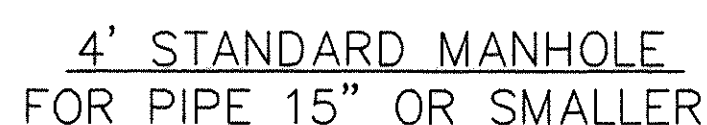
SECTION OF VERTICAL BEND

- 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



- GENERAL NOTES:
- | | |
|--|--|
| 1. TRAFFIC BEARING BOX REQUIRED IN TRAFFIC AREAS. | 5. PIPING BEHIND CLEANOUT TO BE INSTALLED PER BOCA CODE. |
| 2. ALL PIPE AND FITTINGS SHALL BE OF SIMILAR MATERIAL. | 6. MINIMUM LATERAL SIZE:
4" FOR RESIDENTIAL SERVICE
6" FOR NON-RESIDENTIAL SERVICE |
| 3. ALL PIPE SHALL BE OF SAME SIZE. | |
| 4. NO BENDS ARE ALLOWED IN THE LATERAL FROM THE MAIN TO THE CLEAN-OUT STACK WYE, (EXCEPT AS NOTED) | 7. MINIMUM COVER FOR ALL SEWER LATERALS SHALL BE THREE (3) FEET |



- NOTES:
1. ALL MANHOLE FRAMES AND COVERS SHALL BE DUMEY BROTHERS, INC. MH-RCR-3000G IN NON-PAVED AREAS REQUIRING WATERIGHT FRAME & COVERS AND MH-RCR-3000G-WT IN PAVED AREAS, OR APPROVED EQUAL.
 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. MANHOLE UNIT JOINTS SHALL BE MADE WITH EITHER FLEXIBLE BUTYL SEALANTS OR GASKETS, AT THE CONTRACTOR'S OPTION. FLEXIBLE BUTYL SEALANTS SHALL BE MANUFACTURED BY CORBIS SEALANTS, INC. (CS-302) OR EQUAL, AND FLEXIBLE BUTYL GASKETS SHALL BE MANUFACTURED BY CORBIS COMPANY (C-2 STOCK) OR EQUAL. THE GASKETS OR SEALANTS SHALL BE INSTALLED AND THE JOINT MADE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURERS.
 5. ALL MANHOLES DEEPER THAN 10' SHALL BE PROVIDED WITH A SAFETY SLAB.
 6. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C478.
- △ 7. SAFETY SLAB OPENING SHALL BE ALIGNED WITH STEPS.

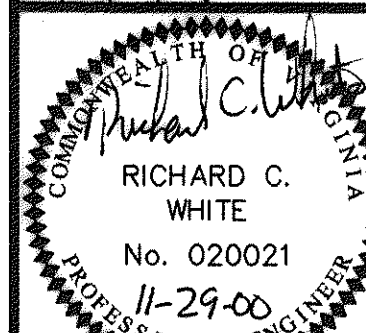


MANHOLE FRAME AND COVER

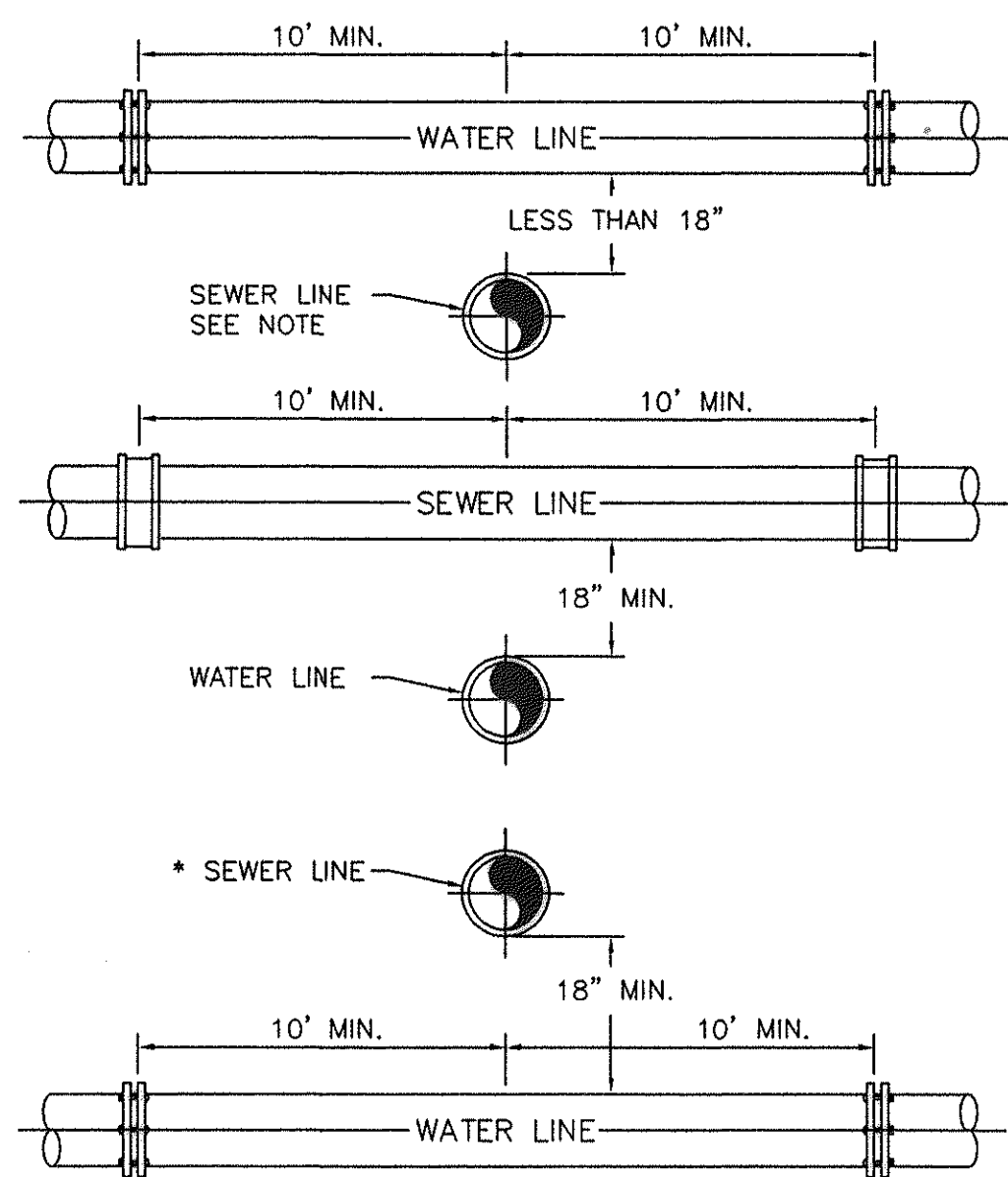
**WASHLEY PLANTATION SECTION II
UTILITY PLAN
BOTETOURT COUNTY, VIRGINIA**

NO.	DATE	DESCRIPTION	BY
Δ	9/18/00	PER BOIETOURT COUNTY	DB
Δ	10/27/00	PER VDH COMMENTS	DB
Δ	11/27/00	PER BOIETOURT COUNTY	DB

WATER DETAILS

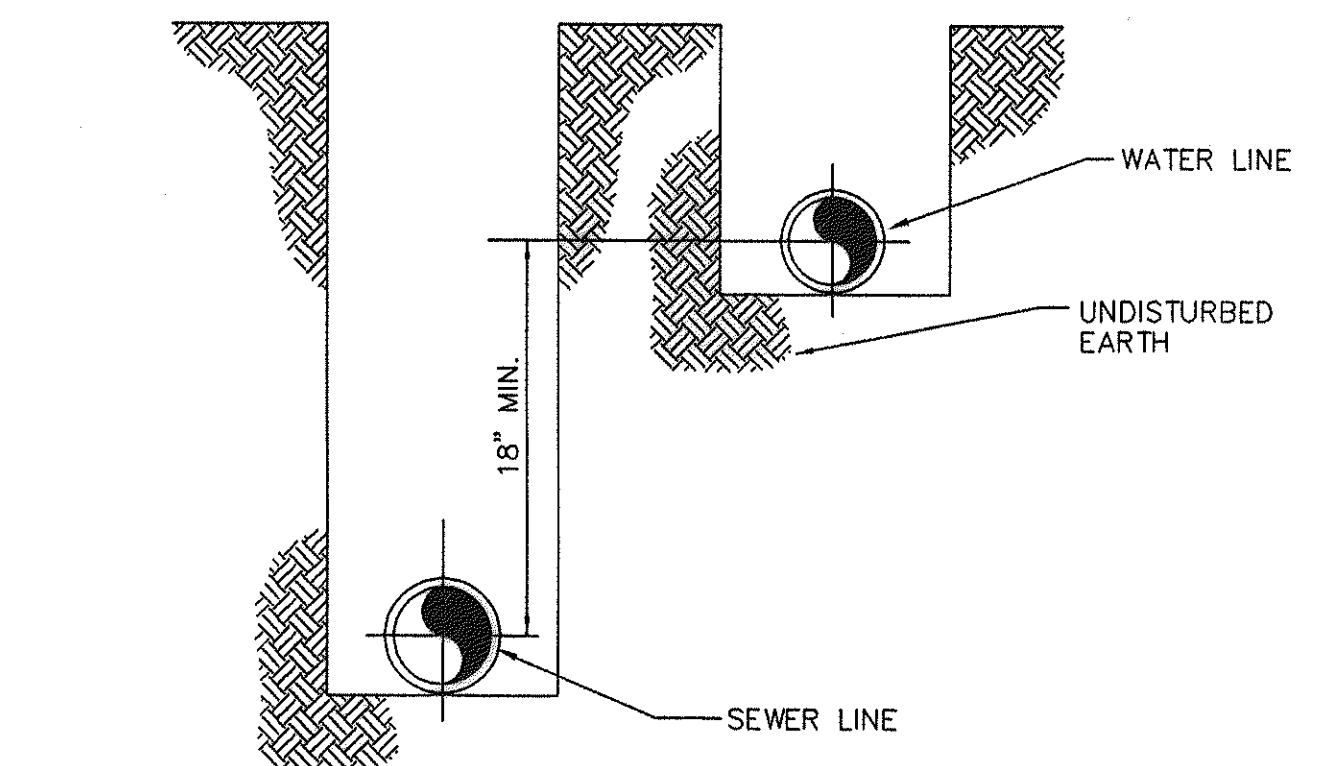


Designed By	RCW
Drawn By	DJB/JDC
Checked By	RCW
Approved By	RCW
Submitted By	RCW
Drawing	DETAILS
Date	05/26/99
Scale	NONE
Commission No.	1070L

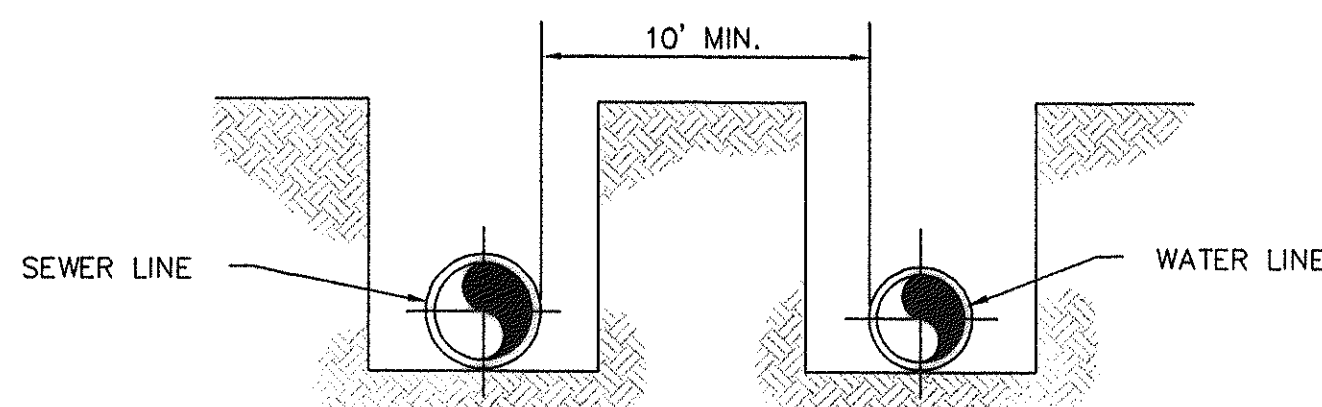


NOTE:
* SEWER LINE ABOVE WATERLINE TO BE CONSTRUCTED OF ANWW WATER LINE MATERIAL & PRESSURE TESTED (SEE SPEC.) AT NO ADDITIONAL COST (SEE SEWER LINE COUPLING DETAIL).

WATER and SEWER CROSSING DETAIL
NTS

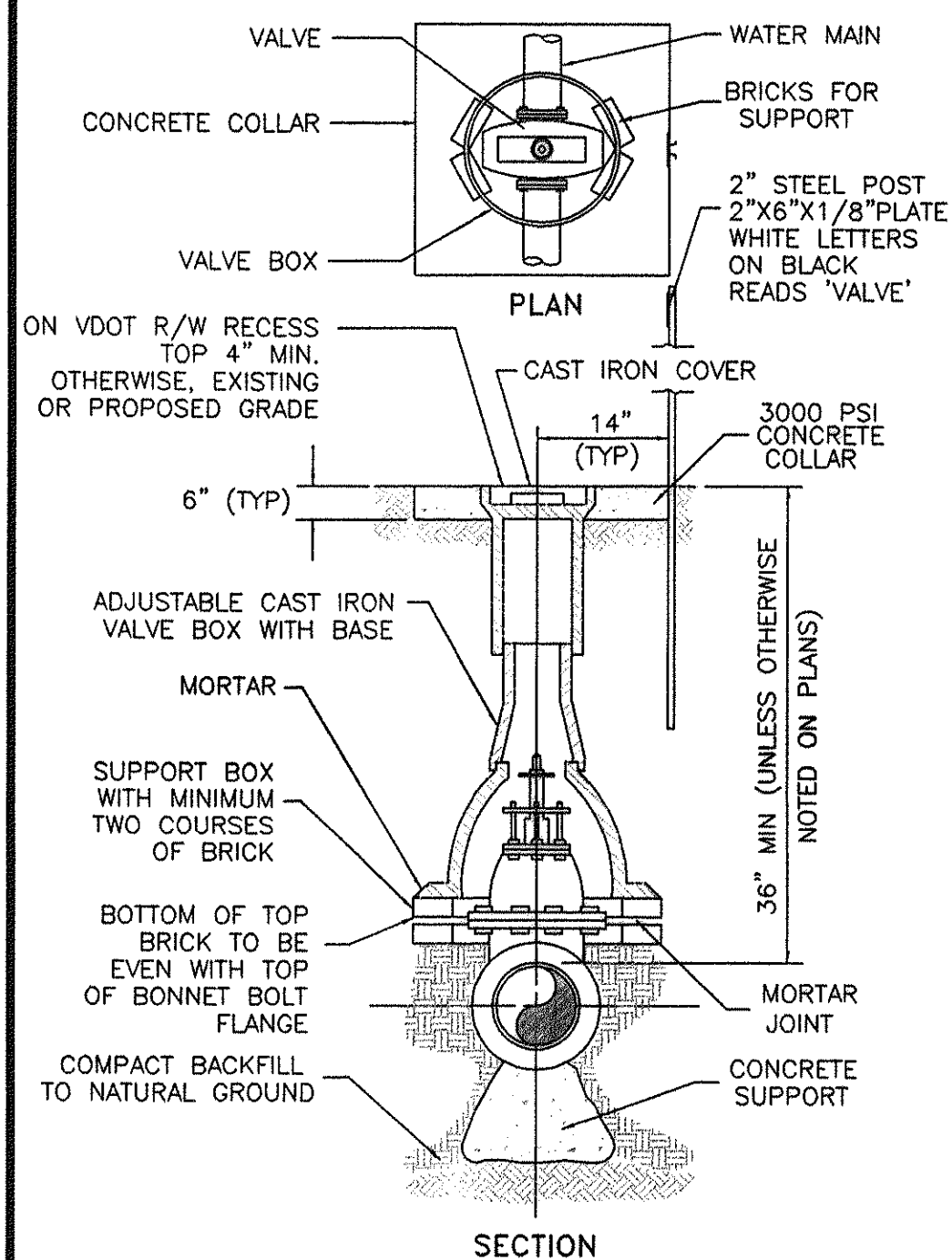


VERTICAL SEPARATION

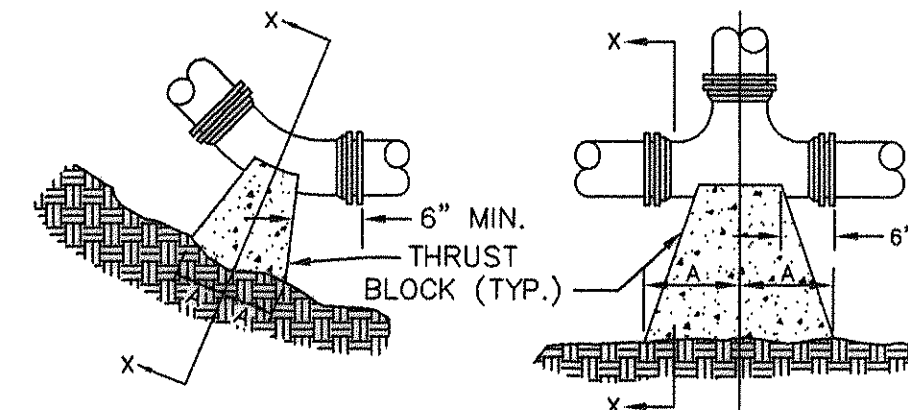


HORIZONTAL SEPARATION

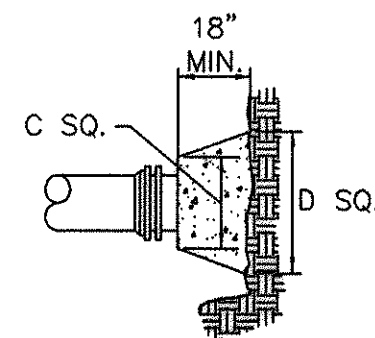
WATER and SEWER SEPARATION DETAIL
NTS



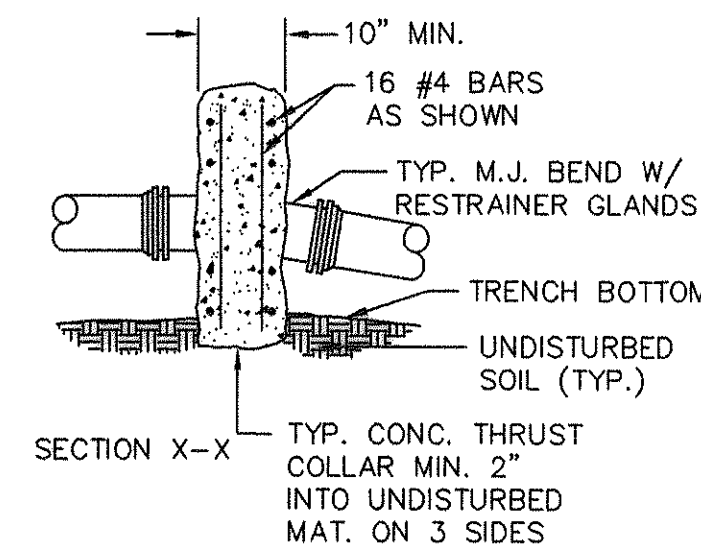
TYPICAL VALVE SETTING DETAIL
NTS



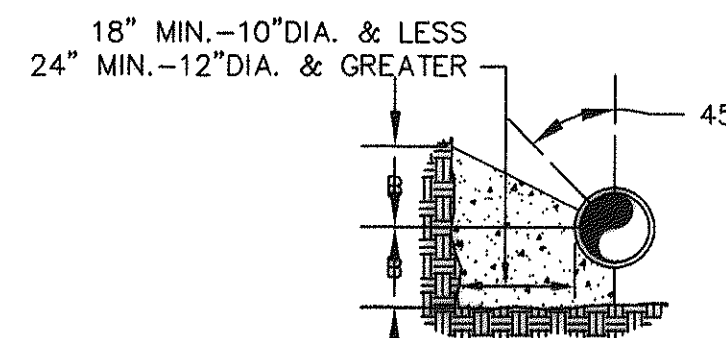
PLAN - BENDS



PLAN & ELEVATION - PLUGS



SECTION OF VERTICAL BEND



BENDS AND TEES

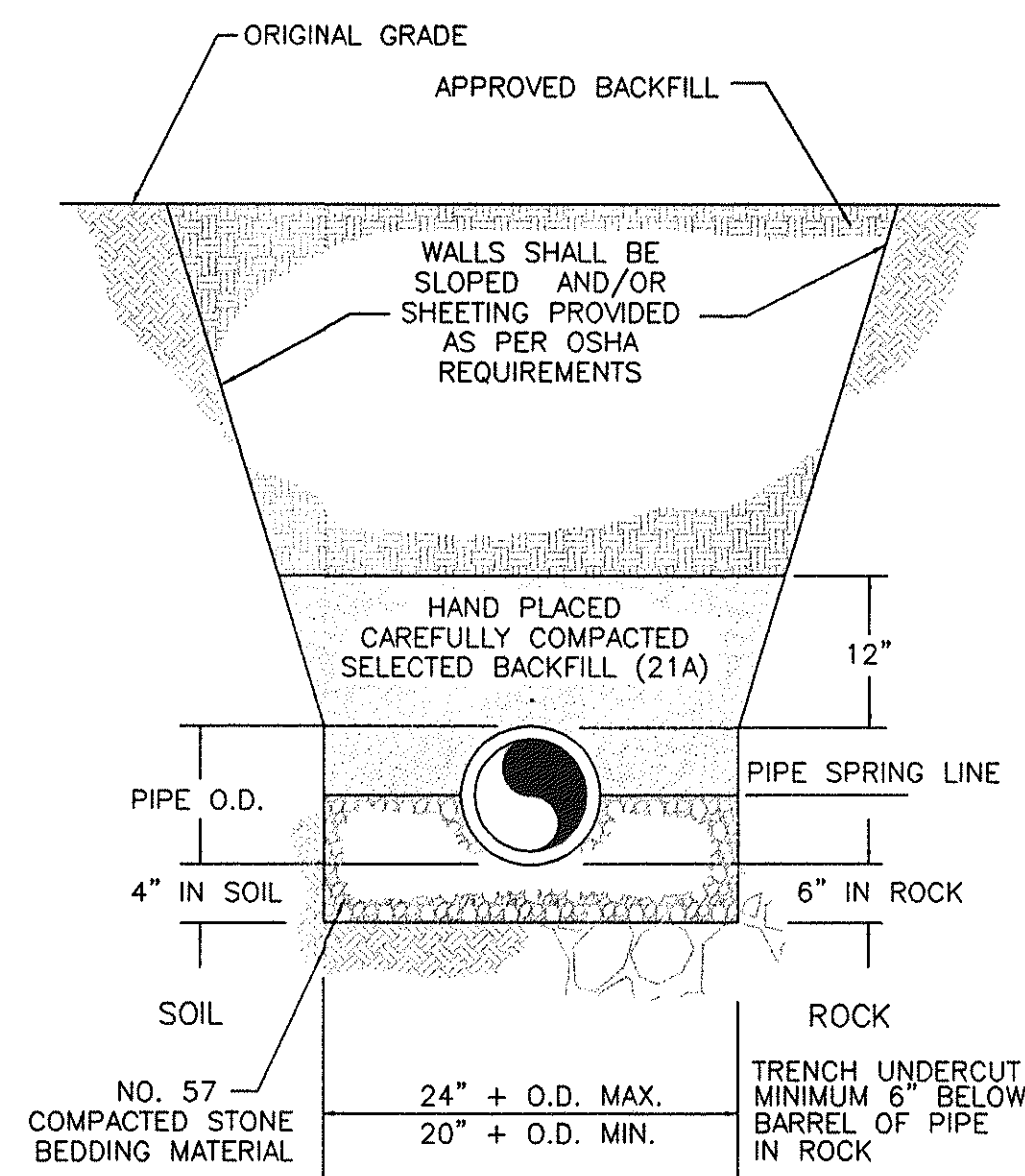
NOTES:

- FOR VERT. BEND DOWN IN EXCESS OF 11 1/4" BEND, ANCHORAGE SHALL BE DESIGNED BY ENGINEER.
- FOR VERT. BEND UPWARD, BLOCKING TO BE SIMILAR TO THAT FOR HORIZ. BEND.
- GLANDS & BOLTS SHALL BE PROTECTED FROM CONC. BY PLASTIC SHEETING WHEN POURING THRUST BLOCKS.
- ALL THRUST BLOCK & SUPPORT CONC. SHALL BE 3000 PSI READY MIX CONC.
- THRUST BLOCKS WITH "B" DIMENSION GREATER THAN 30" SHALL HAVE THE RESTRAINED PIPE INSTALLED WITH A MINIMUM OF 4' OF COVER.

PRESSURE = 200 PSI
BEARING = 2000 PSF
FACTOR OF SAFETY = 1.5

THRUST BLOCK CONSTRUCTION

NO SCALE



PIPE LAYING CONDITION for GRAVITY SEWER
NTS

NOTE:

- ALL SANITARY LINES SHALL BE TESTED BY PULLING A STANDARD TEST MANDREL BETWEEN TEST SECTIONS.
- MANHOLES SHALL BE TESTED BY VACUUM TEST, AFTER ASSEMBLY BUT PRIOR TO BACKFILLING. TEST SHALL COMPLY WITH ASTM STANDARDS OR DIVISION OF WATER PROGRAMS WORKING MEMO #550, DATED NOV. 4, 1987. MANHOLES SHALL BE TESTED BY VACUUM ONLY IF CONSTRUCTED OF PRE-CAST CONCRETE. TESTING SHALL INCLUDE ALL CONCRETE RISER, INCLUDING SPACER RINGS, AND THE JOINT BETWEEN THE CONCRETE AND THE MANHOLE, UP THROUGH AND INCLUDING THE MANHOLE FRAME AND COVER.
- ALL WATERLINES & SANITARY SEWER LINES SHALL HAVE WARNING/DETECTOR TAPE LOCATED 18" ABOVE TOP OF PIPE OR WARNING TAPE AT 18" ABOVE PIPE AND DETECTOR WIRE LOCATED ON TOP OF PIPE.

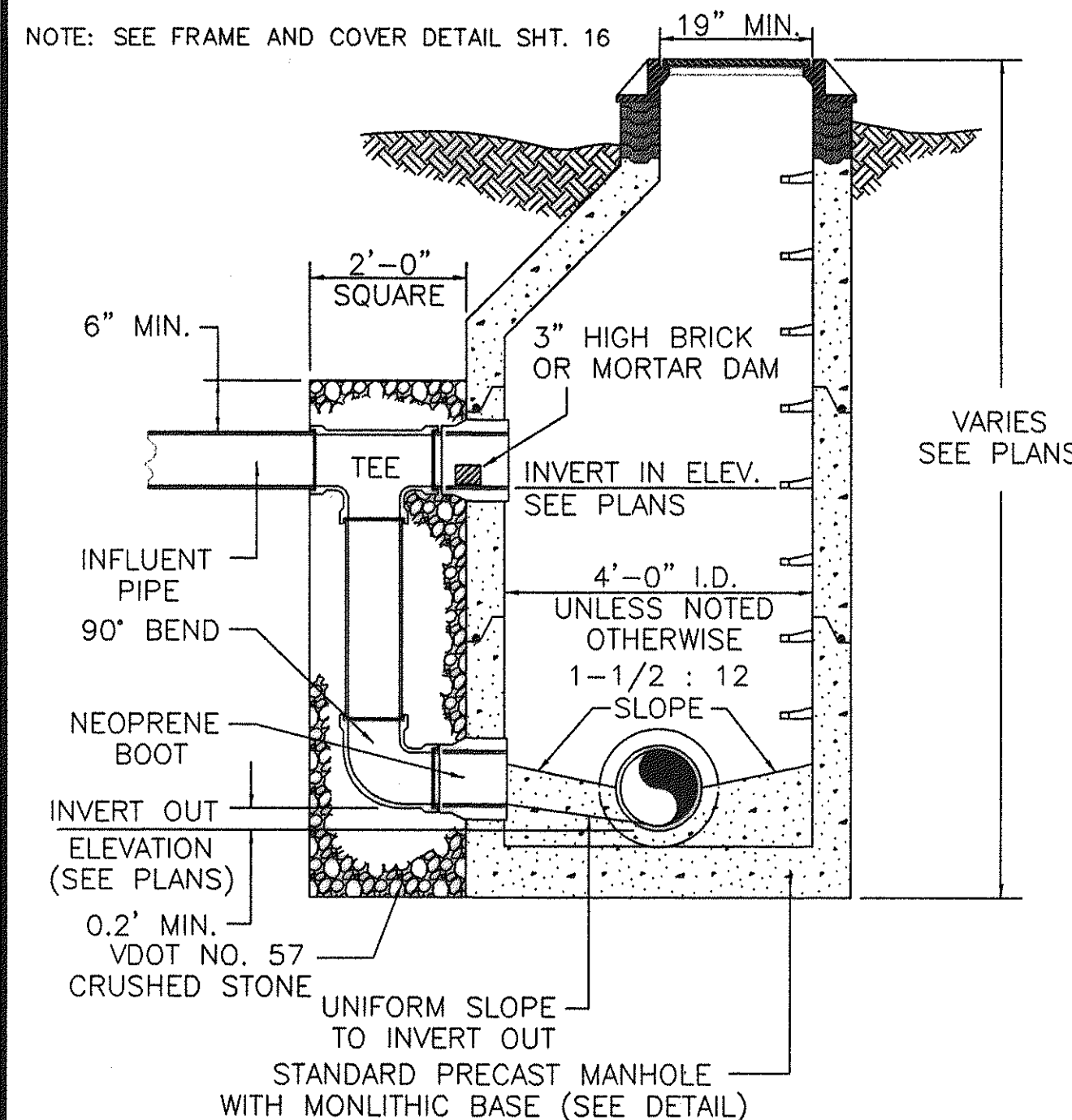
TESTING OF FLEXIBLE PIPES (MANDREL TEST)

- SHOULD PVC OR ABS GRAVITY PIPE BE UTILIZED, THE CONTRACTOR SHALL DEFLECTION TEST THE ENTIRE LENGTH OF PIPE BY MEANS OF A GO-NO-GO MANDREL TO ASSURE THAT A 5.0% DEFLECTION HAS NOT BEEN EXCEEDED. THE TESTING SHALL BE PERFORMED COMPLETELY AT THE EXPENSE OF THE CONTRACTOR AND SHALL BE PERFORMED IN THE PRESENCE OF THE ENGINEER. MANDREL AND PROVING RING DETAILS SHALL BE APPROVED BY THE ENGINEER AND SHALL BE SIZED AT 5% LESS THAN ASTM DIMENSIONS FOR THE SEWER PIPE (IN ACCORDANCE WITH ASTM D-3034 AND F-679). THE MANDREL TEST SHALL BE PERFORMED NO SOONER THAN THREE (3) MONTHS AFTER BACKFILL OF THE PIPE IS COMPLETED. ALL PIPE THAT FAILS THE DEFLECTION TEST SHALL BE REMOVED AND REPLACED AT THE CONTRACTOR'S EXPENSE. THE "REROUNDER" TECHNIQUE SHALL NOT BE ALLOWED. THE CONTRACTOR SHALL USE APPROVED NINE (9) ARM MANDRELS AND PROVING RINGS FOR EACH SIZE OF MAINLINE PIPE. THE CONTRACT LENGTH "L" OF THE MANDREL ARMS AND THE ACTUAL MANDREL DIAMETER "D" (ID OF THE PROVING RING) SHALL EQUAL THE DIMENSIONS IN TABLE 1 BELOW. CRITICAL MANDREL DIMENSIONS SHALL CARRY A TOLERANCE OF +/- 0.01". MANDREL AND PROVING RING MAY BE OBTAINED FROM WORTCO, INC., 220 HIGH STREET, FRANKLIN, OHIO 45005 (1-513-746-6439). HURCO ENTERPRISES (1-800-843-1300), CHERNE INDUSTRIES (1-800-843-7584) OR EQUAL.
- RIBBED PVC AND RIBBED HDPE SHALL BE TESTED FOR DEFLECTIONS BY PULLING A GO/NO-GO MANDREL THROUGH THE PIPE AT LEAST ONE MONTH AFTER FINAL BACKFILL. DEFLECTIONS OF THE PIPE SHALL NOT EXCEED 5%. IF DEFLECTIONS EXCEED 5%, THE PIPE SHALL BE RELAID.
- THE OWNER RESERVES THE RIGHT TO INSPECT THE COMPLETE-IN-PLACE SANITARY SEWER PIPE WITH IN-LINE TELEVISION INSPECTION EQUIPMENT OPERATED BY MUNICIPALITY FORCES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST TWO (2) WEEKS PRIOR TO A SECTION BEING COMPLETED IN ORDER TO SCHEDULE THE TELEVISION INSPECTION. ANY DEFECTIVE WORK REVEALED BY THIS INSPECTION SHALL BE REPAIRED BY THE CONTRACTOR, AT HIS EXPENSE.

TABLE 9 ARM MANDREL D DIMENSION			
NOM. DIA.	L	ASTM D3034 SDR 35	ASTM D2751 (6" ONLY)* ASTM D 2680
6"	6"	5.65"	5.65" (SDR 35)
8"	8"	7.56"	5.49" (SDR 23.5)
10"	10"	9.45"	9.31"
12"	12"	11.26"	11.22"
15"	15"	13.78"	14.09"

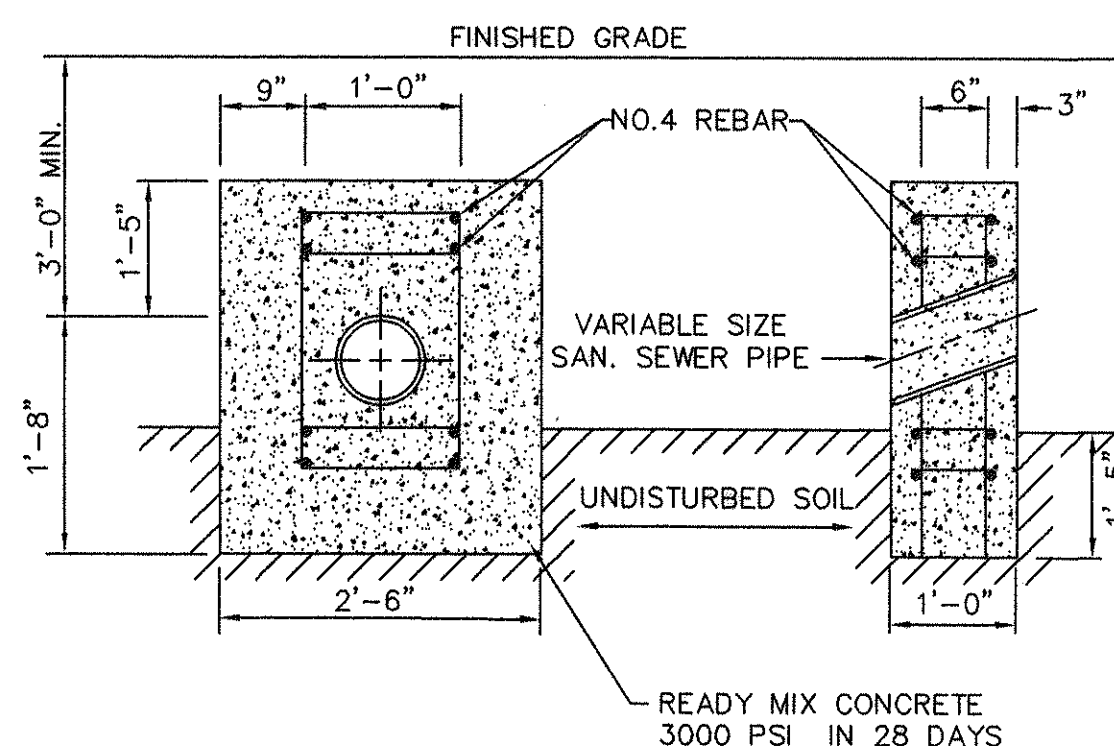
MANHOLE ACCEPTANCE TESTS (VACUUM TEST)

- 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 TEST SHALL BE MADE WITH A VACUUM OF 10" Hg. THE TEST TIME FOR THE VACUUM TO DROP FROM 10" TO 9" OF Hg MUST BE GREATER THAN 60 SECONDS.
- CONTRACTOR SHALL FURNISH WEIRS, STAND PIPES, PIPE PLUGS, WATER, PRESSURE GAUGES, STOP WATCHES, AIR COMPRESSORS, VACUUM PUMP, HOSE AND SUCH MATERIALS AND ASSISTANCE AS REQUIRED TO PERFORM THESE TEST. ALL ACCEPTANCE TEST SHALL BE CONDUCTED BY CONTRACTOR IN THE PRESENCE OF A COUNTY INSPECTOR.
- 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.
- 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.



TYPICAL OUTSIDE DROP MANHOLE
NTS

- MANHOLE UNIT JOINTS SHALL BE MADE WITH EITHER FLEXIBLE BUTYL SEALANTS OR GASKETS, AT THE CONTRACTOR'S OPTION. FLEXIBLE BUTYL SEALANTS SHALL BE MANUFACTURED BY CONCRETE SEALANTS, INC. (CS-302) OR EQUAL AND FLEXIBLE BUTYL GASKETS SHALL BE MANUFACTURED BY CONCRETE PRODUCTS SUPPLY COMPANY (E-2 STICK) OR EQUAL. THE GASKETS OR SEALANTS SHALL BE INSTALLED AND THE JOINT MADE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER(S).
- ALL MANHOLES DEEPER THAN 10' SHALL BE PROVIDED WITH A SAFETY SLAB.
- TEE, BEND, AND ALL PIPING SHALL BE SAME SIZE AS INFLUENT PIPE (SEE PLANS)



GRADES 20% TO 35% -- 36 FT ON CENTER
* GRADES 35% TO 50% -- 24 FT ON CENTER
* GRADES 50% TO 60% -- 16 FT ON CENTER

* WITH WRITTEN APPROVAL OF UTILITY DIRECTOR

ANCHOR BLOCK

NOTE:

CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING TO BE ATTENDED BY NO LESS THAN THE FOLLOWING: BOTETOURT COUNTY REPRESENTATIVES, CONTRACTOR REPRESENTATIVE INCLUDING THE PROPOSED SEWER CONTRACTOR SITE SUPERINTENDENT, DESIGN ENGINEER, ANY MATERIAL SUPPLIERS OR SUBCONTRACTORS THAT THE SEWER CONTRACTOR FEELS NECESSARY TO ATTEND.

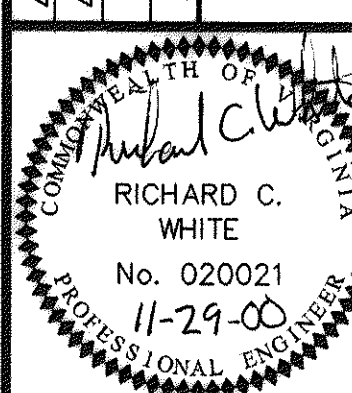
NOTE:

ALL TEST ARE TO BE PERFORMED IN THE PRESENCE OF THE DESIGN ENGINEER AND PROPERLY DOCUMENTED BY THE DESIGN ENGINEER FOR SUBMITTAL WITH THE RECORD DRAWINGS TO BOTETOURT COUNTY. TEST SUBMITTALS DOCUMENTED BY ANYONE OTHER THAN THE DESIGN ENGINEER (I.E. THE CONTRACTOR) WILL NOT BE ACCEPTABLE AS PROOF OF COMPLIANCE.

ASHLEY PLANTATION SECTION II

UTILITY PLAN BOTETOURT COUNTY, VIRGINIA

DB	DB	BY
9/18/00 PER BOTETOURT COUNTY	11/27/00 PER BOTETOURT COUNTY	NO
DATE	DESCRIPTION	



Designed By	RCW
Drawn By	DUB/JDC
Checked By	RCW
Approved By	RCW
Submitted By	RCW
Drawing	DETAILS
Date	05/26/99
Scale	NONE
Commission No.	10701
Sheet	15 of 17