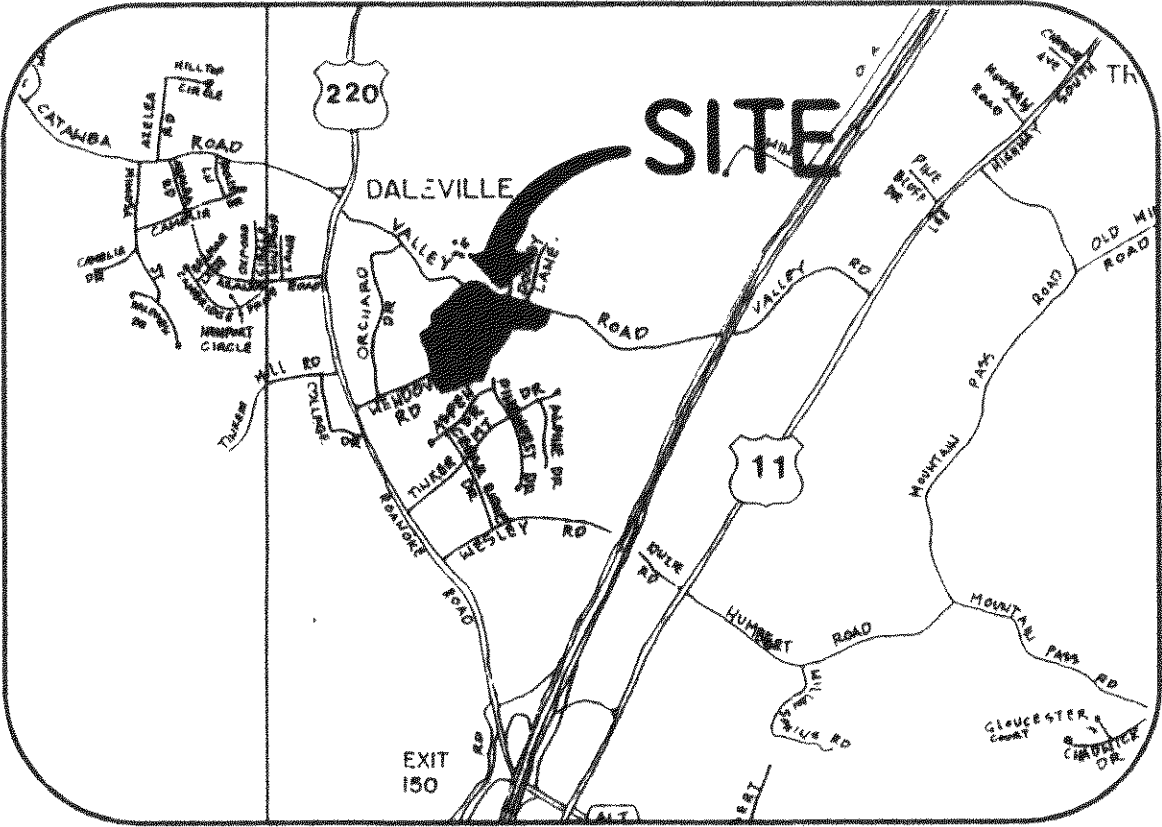


**SEWER EXTENSION PLANS**  
**FOR**  
**DR. G WAYNE FRALIN**  
**VALLEY MAGISTERIAL DISTRICT**  
**BOTETOURT COUNTY, VIRGINIA**



VICINITY MAP

**LEGEND**

<b>BOUNDARY:</b>	
TRACT BOUNDARY	=====
PROPERTY LINE	=====
RIGHT-OF-WAY	-----
CENTERLINE	-----
MIN. BUILDING LINE	-----
<b>UTILITIES:</b>	
EXISTING STORM SEWER	-----
PROPOSED STORM SEWER	-----
EXISTING SANITARY SEWER	-----
PROPOSED SANITARY SEWER	-----
EXISTING WATER MAIN	-----
PROPOSED WATER MAIN	-----
<b>TOPOGRAPHIC:</b>	
EXISTING CONTOUR	-----
PROPOSED CONTOUR	-----1200-----
<b>MISCELLANEOUS:</b>	
PROPOSED LIMIT OF CLEARING	-----
EXISTING CURB & GUTTER	=====
PROPOSED CURB & GUTTER	=====
PROPOSED PAVEMENT	=====

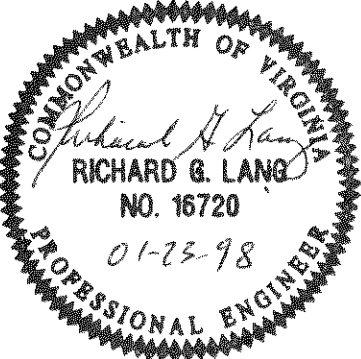
TAX NO: 101-84  
TRACT SIZE: 31.04 ACRES ±  
PRESENT ZONING: R-1  
PRESENT USE: SINGLE FAMILY DWELLING WITH SEPTIC  
PROPOSED USE: SINGLE FAMILY DWELLING WITH PUBLIC SEWER  
SEWER: BOTETOURT COUNTY  
WATER: PRIVATE WELL  
  
OWNER: DR. G. WAYNE & MARY JANE FRALIN  
ADDRESS: 1314 PETERS CREEK ROAD  
ROANOKE, VA 24017  
PHONE: (540) 562-2401

HORIZONTAL AND VERTICAL CONTROL SURVEY PERFORMED  
IN 1997 BY ROBERT G. CANTLEY, INC.

ALL ELEVATIONS ARE REFERENCED TO THE U.S.G.S. DATUM  
SOURCE OF TOPOGRAPHIC MAPPING IS ROBERT G. CANTLEY, INC.  
BOUNDARY SURVEY PERFORMED BY ROBERT G. CANTLEY, INC.

SHEET NO.	DESCRIPTION
1	COVER SHEET
2	MASTER ENGINEERING PLAN
3	SEWER PROFILE
4	SANITARY SEWER DETAILS

**-LANG-**  
engineering co.  
Consulting Engineers - Land Planners  
P.O. BOX 7566 ROANOKE, VA 24019 (540)366-4800



RECEIVED  
JAN 2 1998  
DEVELOPMENT SERVICES

GENERAL NOTES:

THE CONTRACTOR SHALL VERIFY THE LOCATION AND ELEVATION OF ALL UNDERGROUND UTILITIES AS SHOWN ON THE PLANS IN AREAS OF CONSTRUCTION PRIOR TO BEGINNING ANY WORK. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY IF:

- o ANY LOCATION OR ELEVATION IS DIFFERENT FROM THAT SHOWN ON THE PLANS.
- o IF THERE APPEARS TO BE A CONFLICT WITH ANY OF THE PROPOSED IMPROVEMENTS.
- o UPON DISCOVERY OF ANY UTILITY OR OBSTACLE NOT SHOWN ON THE PLANS.

UTILITIES MAY BE LOCATED BY CALL "MISS UTILITY" AT LEAST 24 HOURS PRIOR TO BEGINNING CONSTRUCTION AT THE FOLLOWING TELEPHONE NUMBER: 1-800-552-7001

ALL FILL MATERIAL SHALL BE PLACED IN 6"-8" LIFTS AND COMPACTED TO A DENSITY OF 95% STANDARD PROCTOR. COMPACTION OF ALL FILL MATERIAL SHALL BE TESTED BY AN INDEPENDENT SOIL TESTING LABORATORY WITH SUFFICIENT KNOWLEDGE OF SUCH TESTING PROCEDURES.

THE CONTRACTOR SHALL COORDINATE HIS CONSTRUCTION WITH THE BOTETOURT COUNTY DEPARTMENT OF PUBLIC WORKS WITH REGARD TO ANY WORK THAT MAY INVOLVE THE POSSIBLE DISRUPTION OF SERVICE TO EXISTING CUSTOMERS. ANY SERVICE DISRUPTION SHALL BE KEPT TO A MINIMUM.

BOUNDARY AND TOPOGRAPHIC INFORMATION OBTAINED FROM FIELD SURVEY AS PERFORMED BY ROBERT G. CANTLEY, INC., DATED FEB. 1997.

NOTE: THE SUBJECT PROPERTY IS NOT WITHIN THE LIMITS OF THE 100 YEAR FLOOD BOUNDARY AS SHOWN ON THE FEMA FLOOD BOUNDARY MAP.

NOTE: PROPERTY LINE, AS SHOWN WAS OBTAINED FROM DEED INFORMATION AND A PORTION THEREOF HAS NOT BEEN FIELD VERIFIED.

EROSION & SEDIMENT CONTROL SYMBOLS

- (CE) STD & SPEC 3.02; CONSTRUCTION ENTRANCE
- (SF) STD & SPEC 3.05; SILT FENCE
- (PS) STD & SPEC 3.32; PERMANENT SEEDING
- (MU) STD & SPEC 3.35; MULCHING

Property of  
Gene G. Willow  
4.04 Acres±  
Tax Parcel No. 101-85

EROSION AND SEDIMENT CONTROL NOTES:

ALL CONSTRUCTION METHODS AND MATERIALS SHALL BE IN ACCORDANCE WITH ALL STATE AND LOCAL REGULATIONS, INCLUDING THE STANDARDS AND SPECIFICATIONS OF THE "VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK" LATEST EDITION. REFER TO THIS HANDBOOK FOR DETAILS AND SPECIFICATIONS OF EROSION CONTROL DEVICES.

EROSION AND SEDIMENT CONTROL DEVICES SHALL BE INSTALLED AS SHOWN ON THE PLANS.

ALL DENUDED AREAS SHALL BE SEEDED AND MULCHED WITHIN 7 DAYS OF FINAL GRADING.

THE CONTRACTOR SHALL CHECK THE CONDITIONS OF THE EROSION CONTROL DEVICES AT THE END OF EACH DAY AND AFTER EVERY RAINFALL.

NOTE: THE OWNER/DEVELOPER OF THE PROJECT, DR. G. WAYNE FRALIN, HEREBY AGREES TO INSTALL ALL PROPOSED AND APPROVED EROSION AND SEDIMENT CONTROL DEVICES ACCORDING TO THE ENGINEERING PLANS.

SEE CONSTRUCTION PLANS  
FOR EXISTING SEWER  
AS PREPARED BY CLEAN  
WATER ENGINEERS

CONNECT TO  
EXISTING  
SANITARY  
MANHOLE

PROPOSED CONCRETE  
ENCASEMENT AT STREAM  
CROSSING (SEE DETAIL)

Daleville Farms

PROPERTY OF  
DR. G. WAYNE & MARY JANE FRALIN  
31.04 ACRES±  
TAX PARCEL No. 101-84

Daleville Farms

PROPERTY OF  
DR. G. WAYNE & MARY JANE FRALIN  
25.00 ACRES±  
TAX PARCEL No. 101-83

DATE: MARCH 18, 1997  
JOB No.: 960718  
ACAD #: 960718

SCALE: 1" = 50'  
DRAWN BY: MMB  
CHKD: RGL

DATE: 01/22/98  
PER COUNTY REVIEW

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CHKD: RGL

DATE: 01/22/98  
PER COUNTY REVIEW

REVISIONS

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0 25 50 100 200

DATE: MARCH 18, 1997  
JOB No.: 960718  
ACAD #: 960718

SCALE: 1" = 50'  
DRAWN BY: MMB  
CHKD: RGL

DATE: 01/22/98  
PER COUNTY REVIEW

REVISIONS

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JOB No.: 960718  
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PER COUNTY REVIEW

REVISIONS

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SCALE: 1" = 50'  
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PER COUNTY REVIEW

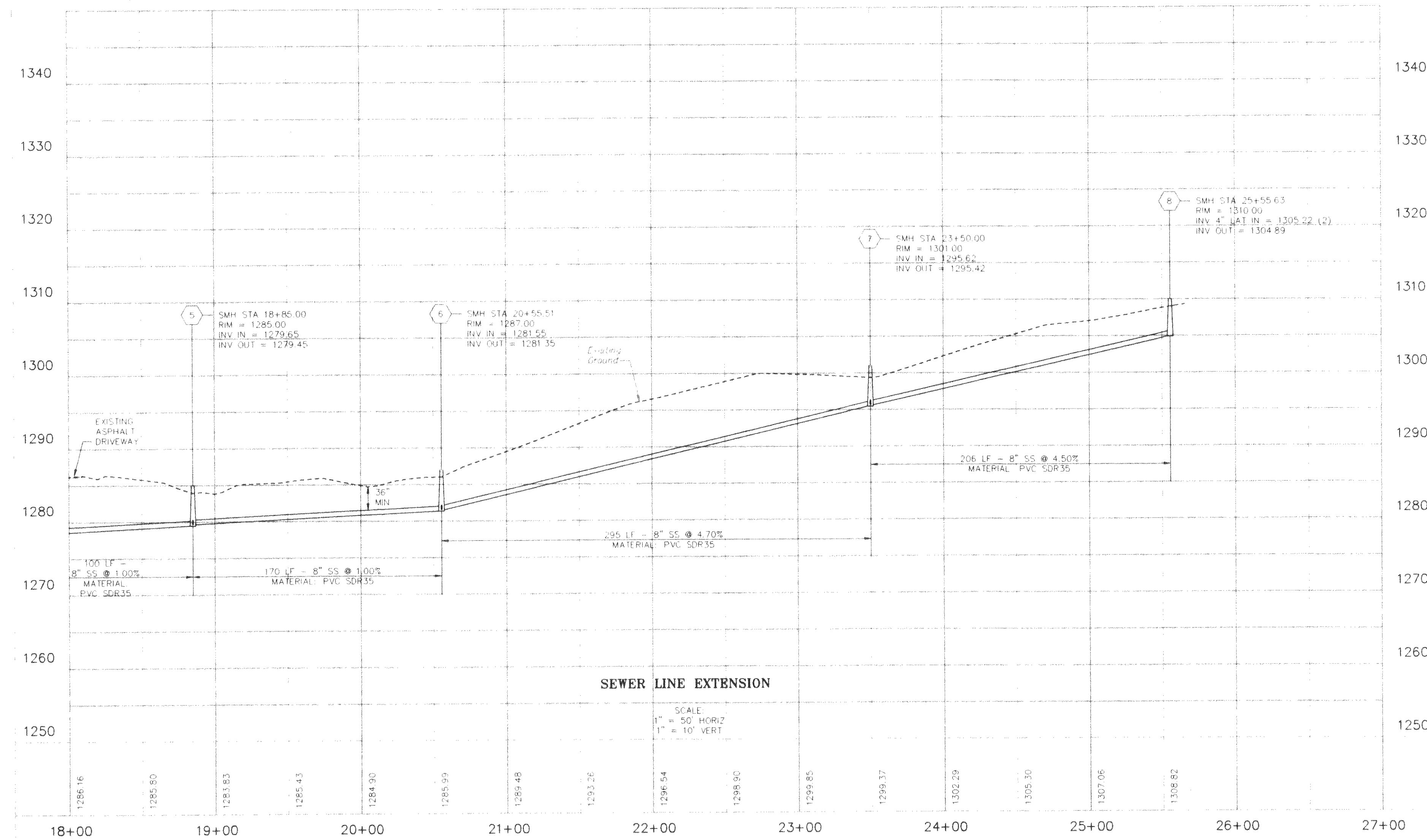
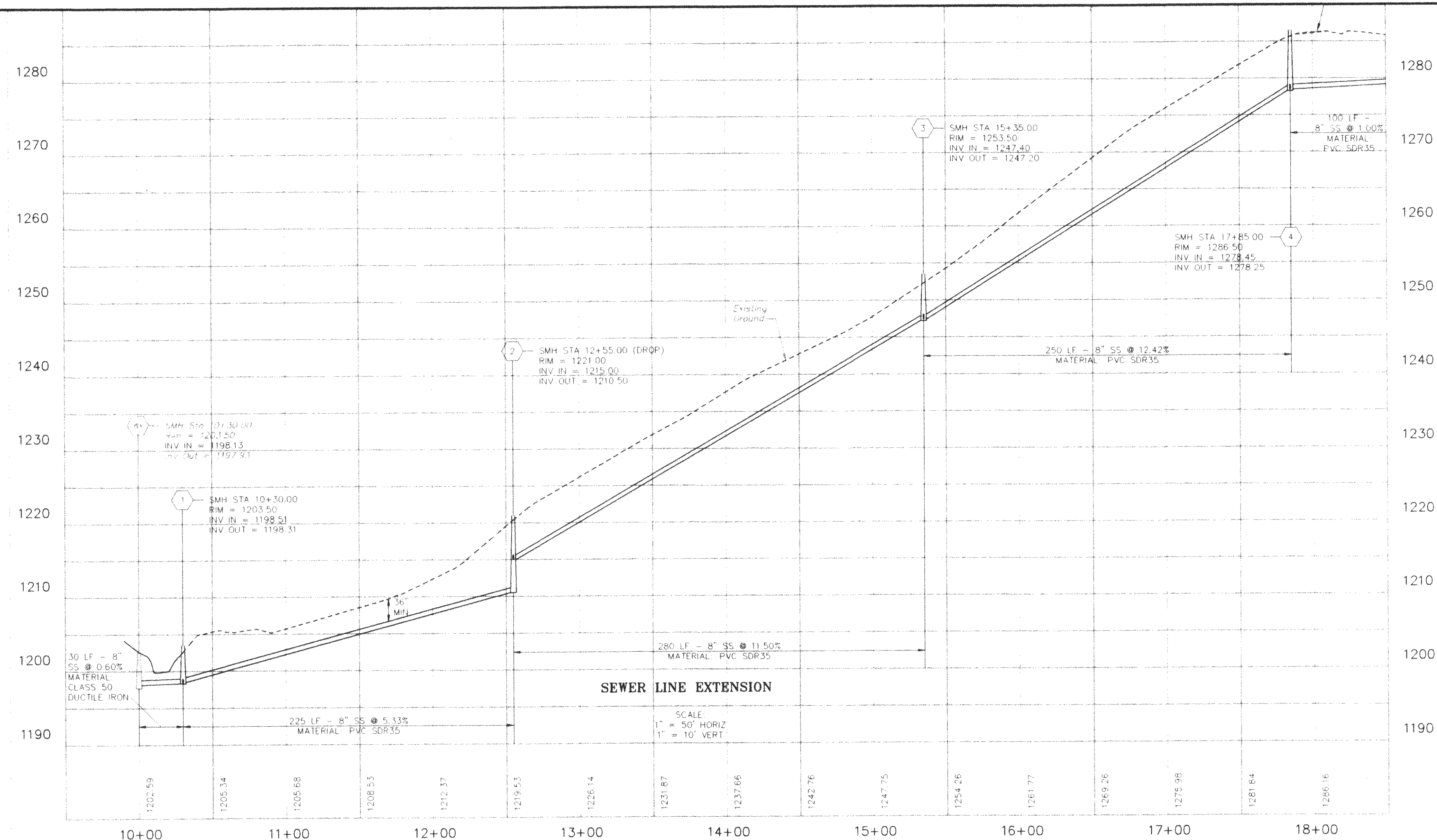
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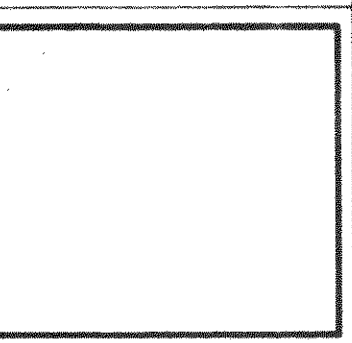




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DATE	MARCH 18, 1997
JOB No.	960718
ACAD #	RC002001
SCALE	1" = 50'
DRAWN BY	MMB
CHKD	RGL

**-LANG-**  
engineering co.  
Consulting Engineers - Land Planners  
P.O. Box 7566 Roanoke, VA 24019 (540) 366-4500



**SEWER PROFILE**  
**DR. G. WAYNE FRALIN**  
**SANITARY SEWER EXTENSION**  
**VALLEY MAGISTERIAL DISTRICT**  
**BOTETOURT COUNTY, VIRGINIA**

SHEET NO.	3
OF	4



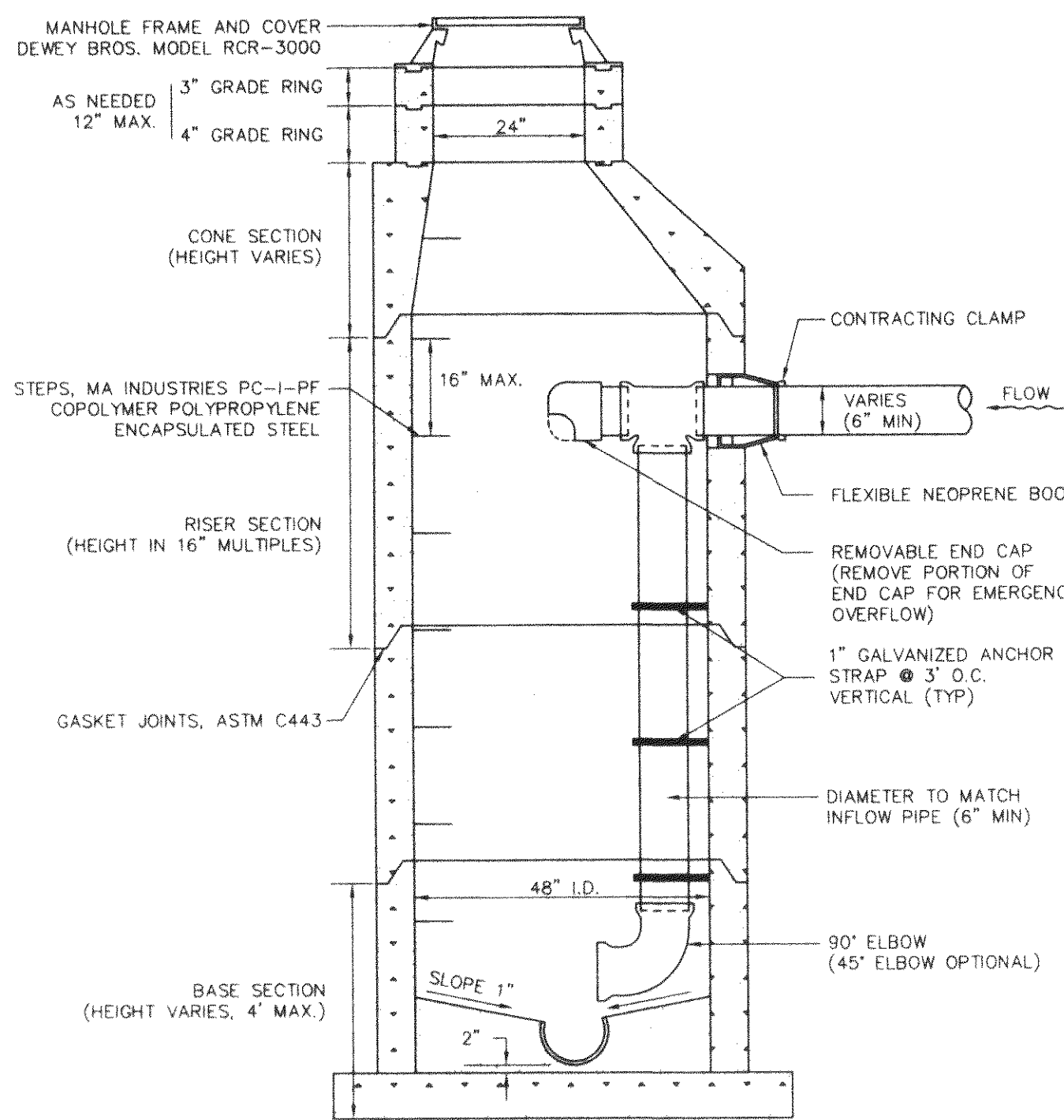
SEWER LINE GENERAL NOTES

1. SCOPE OF WORK

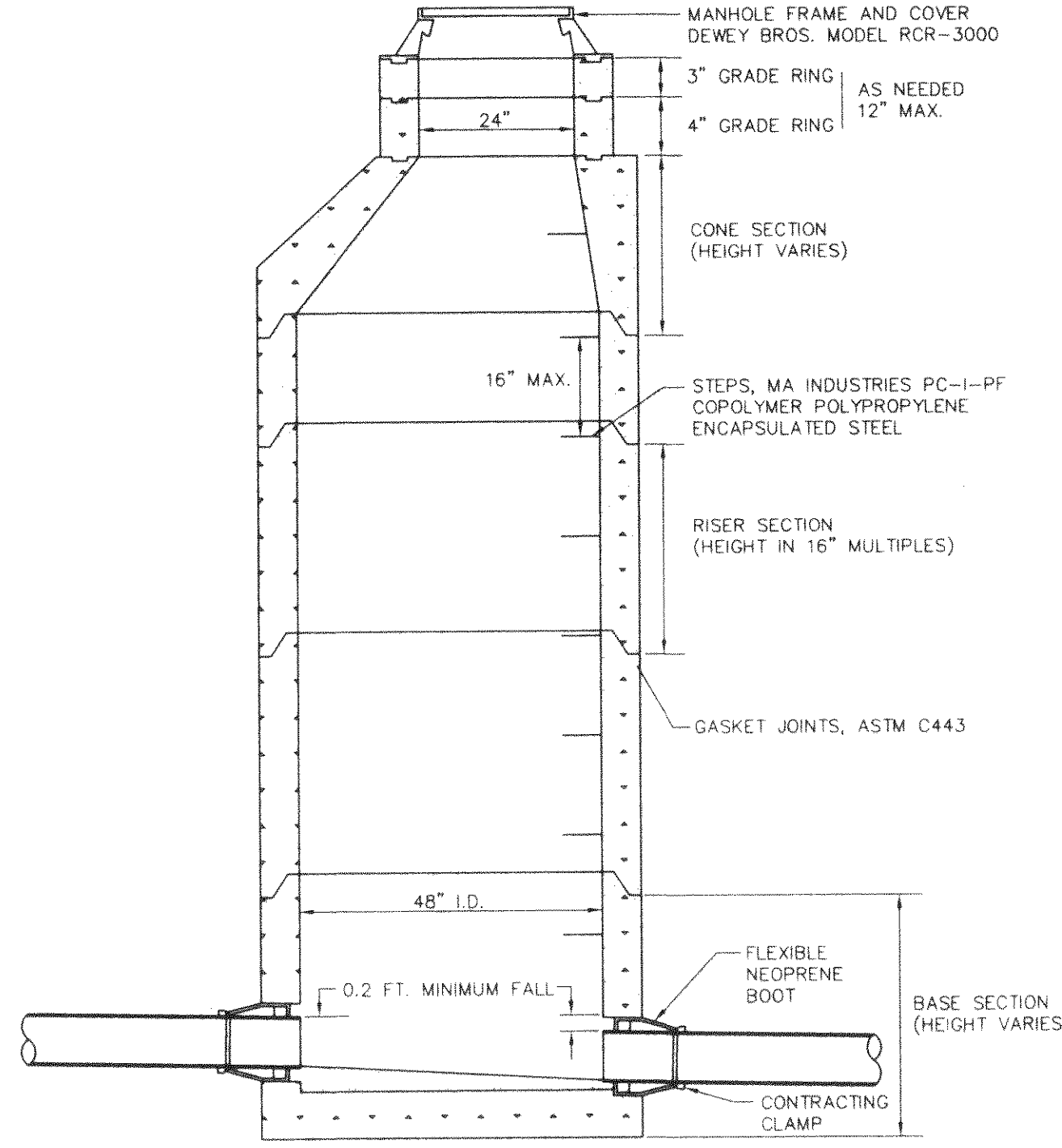
- 1.1 The work shall include the providing of all proper equipment, tools, accessories, labor and services required to install the sanitary sewer system, complete-in-place, using sound standard engineering techniques and construction practices.
- 1.2 Any equipment, tool or accessory found defective or not in a fit condition to accomplish the work continuously and expeditiously shall be promptly replaced with satisfactory equipment.
- 1.3 The Contractor shall include in the unit price per lineal foot of pipe, complete-in-place, the expenses of procuring the field services of experienced and qualified manufacturer representatives for the approved materials. The representative shall instruct the Contractor's employees as to the proper installation procedures for the particular material.
2. LAYING PIPE AND PLACING MANHOLES
- 2.1 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.
- 2.2 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 County Engineer, the trench or the weather conditions are unsuitable for work.
- 2.3 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 and linings. Ductile iron pipe shall not be cut with an oxyacetylene torch.
- 2.4 The materials shall be visually inspected for defects before lowering the pipe or placing the manholes into the trench. During the laying operation, no tools, clothing or other material shall be placed in the pipe or manhole. The interior of the pipe shall be free of all soil, debris and superfluous materials prior to and during the installation.
- 2.5 The Contractor shall exercise every precaution to prevent foreign material from entering the pipe while it is being placed in the trench.
- 2.6 The pipe and the 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.
- 2.7 The pipe shall be installed in accordance with the pipe manufacturer's specifications and as directed by the County Engineer. The pipe shall be laid in true straight lines with bell ends upstream and with the invert of the pipe being the true elevation and grade of the system.
- 2.8 The Contractor shall be responsible for establishing and maintaining the horizontal alignment and vertical elevation and grade of the system in accordance with the engineering information as indicated on the plans.
- 2.9 The horizontal alignment of the pipe shall be maintained by a transit or other acceptable instrument plumbed over the center of the down-stream manhole. The vertical elevation and grade shall be maintained by not less than three batter boards placed between manholes or by an adjustable laser level mounted at the invert of the downstream manhole with targets placed in the bell end of the pipe joint being laid.
- 2.10 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 plug shall be watertight and shall remain in place until any required dewatering is completed.
- 2.11 All sewers shall be installed with a minimum of three (3) feet of cover, measured from the existing ground to the top of the installed pipe. Any pipe that is installed with less than three (3) feet of cover shall be concrete encased as per the detail.
- 2.12 All line construction shall be installed according to the latest edition of the Uniform Building Code of Virginia.
- 2.13 All connections shall be made to sewers by replacing a length of pipe with branch fittings, wye or tee-wye only.
- 2.14 Pipe beddings shall be only Class A, B or C (ASCE Manuals and Reports on Engineering Practice No. 37, WPCF Manual of Practice No. 9) The class of bedding shall be determined by the Engineer to provide strength necessary for the soil and load conditions that will be encountered.
- 2.15 Trenches shall be carefully backfilled with approved excavation materials consisting of earth, loam, sandy clay, sand and gravel, soft shale or other approved materials. All backfill shall be free from clods of earth or stones larger than two (2) inches in diameter, deposited in six (6) inch layers and thoroughly and carefully tamped until the pipe has been covered by twelve (12) inches of material, measured from the top of the pipe.
- 2.16 The remainder of the backfill shall be placed in the trench in layers not exceeding two (2) feet and thoroughly tamped. No stone or rock larger than ten (10) inches in its greatest dimension shall be used for backfilling.
- 2.17 Trenches in public roadways shall be excavated, backfilled and compacted in accordance with the requirements of the Virginia Department of Transportation's Road and Bridge Specifications and under the direction of the resident inspector.
- 2.18 The flow channels through the manholes shall be of such shape and slope so as to provide a smooth transition between the inlet and outlet sewers and to reduce any turbulence that may occur. Benches shall be sloped to the channel to prevent the accumulation of solids.
- 2.19 Line connections directly into the manhole or to short stubs integral with the manhole, shall be made with flexible joints. Flexible joints shall be such as to permit the manhole to settle without destroying the integrity of the line connections.

- 2.20 Frames, covers and steps shall be of suitable material and designed to accommodate prevailing site conditions and to provide safe operation and maintenance.
- 2.21 A drop pipe shall be provided for any sewer entering a manhole at an elevation of two (2) feet or more above the manhole invert. See the detail for the correct installation of a drop manhole.
3. JOINTING
- 3.1 The sanitary sewer system shall be laid and joined complete-in-place to such a degree that each length and section of pipe between manholes shall have a smooth and uniform invert.
- 3.2 The previous joint shall be completed and the entire length well bedded prior to joining another length of pipe. Bell holes shall be dug large enough to insure proper jointing.
- 3.3 The Contractor shall not use excavation equipment to push the pipe into the home position, unless approved by the County Engineer, and then only for one joint length at a time.
- 3.4 The Contractor shall join the pipe as recommended by the Manufacturer to obtain the degree of watertightness required. The use of lubricants, primers, adhesives or similar materials shall be as recommended by the Manufacturer and approved by the County Engineer.
- 3.5 The pipes shall be connected to the manholes through precast openings and joined with either a flexible boot adapter or pipe seal gasket.
4. CONNECTIONS TO EXISTING SYSTEMS
- 4.1 The Contractor shall maintain the existing sewage flows at all times by pumping, diverting, or other means acceptable to the County Engineer. Care shall be taken to avoid the entering of foreign debris into the existing system.
- 4.2 The Contractor shall at no time allow sewage flow to be diverted into a natural watercourse or back-up into any service connections. The Contractor shall be responsible for all damages which may occur as a result of failing to maintain the sewage flow.
- 4.3 The new pipe connection to be made to an existing manhole, where no stub or opening exists, shall be made through an opening of minimum diameter, cut into the manhole at the required elevation and location.
- 4.4 The existing invert channels and benches shall be reworked as required so as to form a new flow channel from the connection to the existing flow channel.
- 4.5 The new pipe connected into an existing manhole shall be secured in position and the remaining opening filled and sealed with brick and mortar. The outer surface of the connection shall be coated with heavy bitumastic waterproofing compound.
5. SERVICE CONNECTIONS
- 5.1 The Contractor shall make all service connections to the sewer pipe and from manholes where shown on the plans or where located in the field by the County Engineer. The service connections to the sewer pipe shall be made with either a WYE or TEE-WYE fitting at the Contractors option.
- 5.2 The WYE or TEE-WYE branch fittings for service connections shall be commercially manufactured and installed in strict accordance with the recommendations of the pipe manufacturer.
- 5.3 All service connections shall be a minimum of four (4) inches in diameter and shall be installed at a minimum grade of 0.25" per foot or 2.08%.
- 5.4 Future service connections shall be extended to the property line or edge of the sanitary sewer easement and be properly capped with a watertight fitting to prevent infiltration into the sewage system. The fitting shall be installed in strict accordance with the recommendations of the pipe manufacturer.
- 5.5 Future service connections shall be field marked with a treated wooden (2"x4") marker to the depth of and set vertically plumb with the end of the capped extension pipe. The tops of the markers shall be painted green and set to a height of 18" above finished grade.
- 5.6 Existing services in satisfactory condition to be connected to the new sewer pipe shall not be replaced to the property lines. Replace and connect existing line to the first joint which will insure a water tight connection.
6. MATERIALS
- 6.1 All materials and appurtenances required for the work shall be new, of first class quality and shall be furnished, delivered, erected, connected, and finished in ever detail as specified and indicated. All materials found defective, regardless of the circumstances, shall be replaced at the expense of the Contractor.
- 6.2 The materials specified for the construction shall comply with the latest revisions of the applicable American Society of Testing Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), Virginia Department of Health (VDH) and the Virginia Department of Transportation (VDOT).
- 6.3 The Contractor shall install only one type of pipe between structures except where ductile iron pipe is specified or indicated.
- 6.4 Polyvinyl chloride (PVC) pipe and fittings shall be SDR 35 and conform with ASTM D 3034.
- 6.5 Roadway and railway crossing pipe shall be a minimum of sixteen (16) inches in diameter, meeting all requirements of ASTM A139 and having a minimum yield strength of 35,000 psi.
- 6.6 Manholes shall be precast, conforming to ASTM C 478 with rubber gasket type joints or mastic.
- 6.7 PVC pipe and fittings shall be bell and spigot type joints. The bell and spigot joints shall be sealed with elastomeric gaskets conforming to ASTM D 3132. The joints shall be made in strict accordance with the recommendations of the manufacturer.

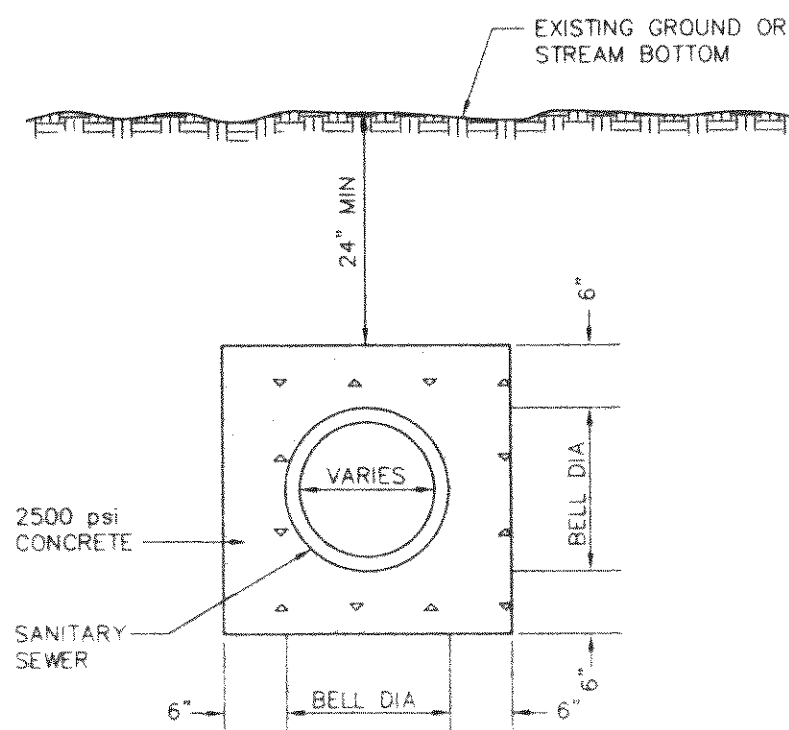
- 6.8 Sewer lines shall be tested for exfiltration or infiltration not to exceed 200 gallons per inch of pipe diameter per mile per day. Test must be performed with a minimum of four (4) feet of head. All tests to be performed by contractor at the contractor's own expense and witnessed by design engineer or Botetourt County Engineer for approval.
- 6.9 Sewer lines may also be tested by air pressurization. If air testing is employed, the manholes must be tested by exfiltration, with inflatable stoppers used to plug all lines into and out of the manhole. The manhole shall then be filled to the top with water and allowed to soak for 12 hours. Leakage shall not exceed one half (1/2) gallon per hour. All tests to be performed by contractor at the contractor's own expense and witnessed by design engineer or Botetourt County Engineer for approval.
- 6.10 Should PVC or ABS gravity pipe be utilized, the contractor shall deflection test the entire length of pipe. A correctly sized mandrel shall be hand-pulled through each completed sewer run to assure that a 5.0% deflection has not been exceeded. Any sewer run that prevents the successful passage of the mandrel shall be rejected until such time that the deflected section has been properly removed and replaced at the contractor's expense and a mandrel pull is successfully completed. The testing shall be performed completely at the expense of the contractor and shall be performed in the presence of the engineer. Mandrel and praving ring details shall be approved by the engineer and shall be sized at 5% less than ASTM dimensions for the sewer pipe. The mandrel test shall be performed no sooner than three (3) months after backfill of the pipe is completed. The "rerounder" technique shall not be allowed.
- 6.11 The contractor shall install electronically detectable location tape above all sanitary sewers and laterals, except where ductile iron pipe is used. The location tape shall be installed continuously between adjacent manholes in the trench backfill 6" above the pipe crown or where directed by the owner or engineer.
- 6.12 A preconstruction meeting shall be held at the site between contractor, developer, engineer, and Botetourt County prior to construction.



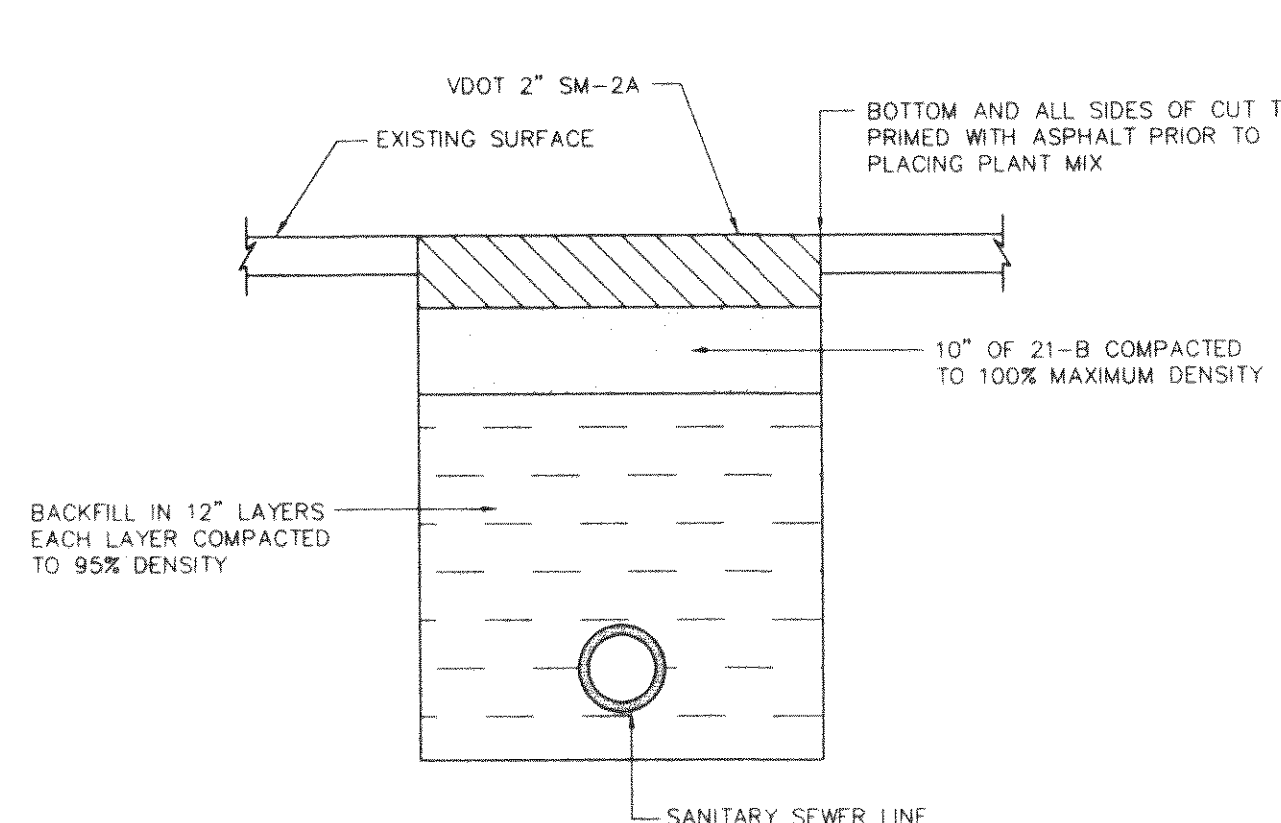
INSIDE DROP MANHOLE  
N.T.S.



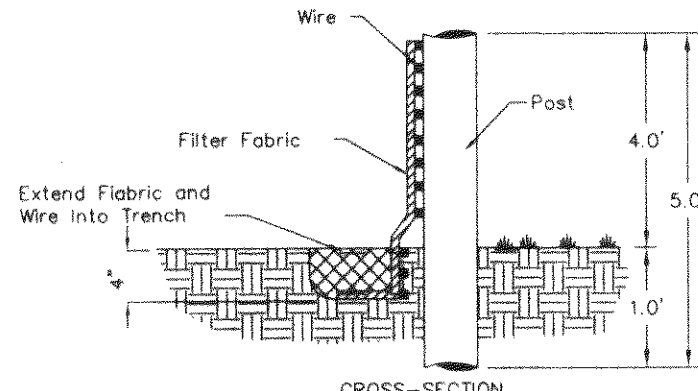
STANDARD MANHOLE  
N.T.S.



REQUIRED WHEN COVER IS 3' OF LESS  
CONCRETE ENCASEMENT  
N.T.S.



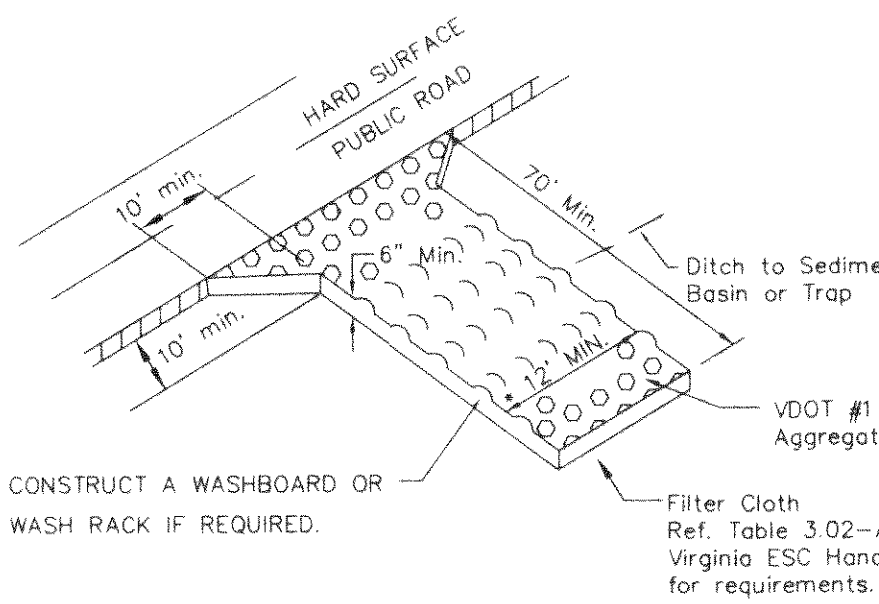
OPEN CUT ROAD CROSSING  
N.T.S.



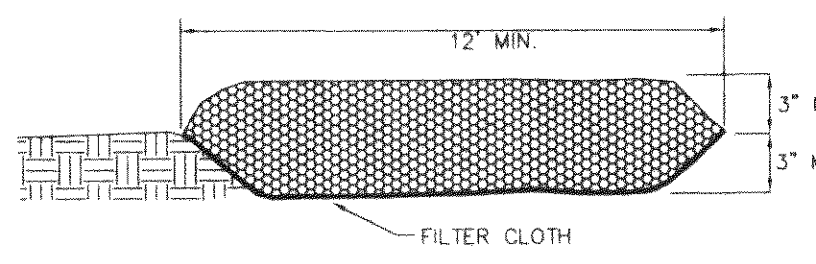
(SF) CONSTRUCTION OF A SILT FENCE

(PS) PERMANENT SEEDING MIXTURE

PERMANENT SEEDING SPECIFICATION:  
PERMANENT SEEDING SHALL BE APPLIED TO ALL DISTURBED AREAS WITHIN 7 DAYS OF FINAL GRADING OPERATIONS. THE SPECIFICATIONS FOR THE SEEDING TYPE AND APPLICATION RATE SHALL BE AS FOLLOWS:  
LIME: 3 TONS/ACRE OF PULVERIZED AGRICULTURAL LIMESTONE 140 LBS./1000 SQ. FT.  
FERTILIZER: 1000 LBS./ACRE OF 5-20-10 OR 7 LBS./1000 SQ.FT. OF 38-0-0 (SPRING APPLICATION)  
SEED MIXTURE: 80% TALL FESCUE 20% KENTUCKY BLUEGRASS SOW AT 200 LBS./ACRE  
MULCH: IF REQUIRED, SHALL BE USED OVER ALL SEEDS 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 SEEDINGS, AND RESEEDING SHALL BE IN ACCORDANCE WITH SPECIFICATIONS CONTAINED WITHIN THE VIRGINIA SOIL 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.



• MUST EXTEND FULL WIDTH OF INGRESS & EGRESS OPERATION.



(CE) TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

EROSION-SILTATION CONTROL  
COST ESTIMATE

ALL COSTS GIVEN ARE COMPLETE IN PLACE				
DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
CONSTRUCTION ENTRANCE	EA	2	400.00	800.00
SILT FENCE	LF	560	3.00	1680.00
PERMANENT SEEDING	1000 SF	60.8	40.00	2432.00
SUB-TOTAL				4912.00
10% CONTINGENCY				491.20
TOTAL PROJECT COST				5403.20

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SCALE: N.T.S.  
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**-LANG-**  
engineering co.  
Consulting Engineers & Land Planners  
P.O. BOX 7566 ROANOKE, VA 24019 (540)366-4800

SANITARY SEWER DETAILS  
DR. G. WAYNE FRALIN  
SANITARY SEWER EXTENSION  
VALLEY MAGISTERIAL DISTRICT  
BOTETOURT COUNTY, VIRGINIA