

VIRGINIA DEPARTMENT OF TRANSPORTATION  
GENERAL NOTES

1. QUALITY CONTROL

Streets to be graded, paved and all structural components erected in accordance with the Virginia Department of Transportation Road and Bridge Specifications and Road Design Standards dated January 1987. 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 rating of CBR10 or greater. The subgrade soil is to be tested by an independent laboratory and the results submitted to the Virginia Department of Transportation prior to pavement construction. Should the CBR values be less than CBR10, then additional base material will be required in accordance with departmental specifications.

The subgrade must be approved by the Virginia Department of Transportation prior to placement of base material. Base must be approved by the Virginia Department of Transportation for depth, template and compaction before surface is applied.

2. UTILITIES

All necessary utility laterals will be placed prior to pavement base and conduit provisions made for the same (i.e. water, sewer, gas and telephone). 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 AASB 31.8 Specification and Safety Regulations. Distribution lines with pressure less than 120 psi are unaffected by the above.

Permits will be required for all utilities within the 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

Standard CG-8 gutter will be provided at all entrances to private lots where standard CG-6 curb and gutter is approved for use.

Permits will be required for all private entrances constructed on street rights-of-way prior to 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 nuisance to surrounding areas.

The entire construction area back of the curbs and or pavement shall be backfilled and seeded together with ditches and channels, 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 gutters. If erosion is encountered in any drainage easement, it will be the responsibility of the Developer to sod, rip-rap, grout, pave, or do whatever is necessary to correct the problem.

All vegetation and overburden to be removed from shoulder to shoulder prior to conditioning (cutting and/or preparation) of the subgrade.

Minimum pavement radius of 25 feet required at all street intersections.

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 accommodations such as turning lanes.

Standard guardrail with safety end sections may be required on fills as deemed necessary by the VDOT Engineer. After completion of rough grading operations, the VDOT Engineer shall be notified so that a field review may be made of the proposed locations.

Field review will be made during construction to determine the need and limits of paved gutter and/or ditch stabilization treatments, 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.

Contractor shall obtain entrance permit to the existing Virginia Department of Transportation right-of-way from the Resident Engineer prior to road construction.

An Inspector will not be furnished except for periodic progress inspection, the above mentioned field reviews and checking the 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 Virginia Department of Transportation.

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.

In order to meet public service requirements, all streets must serve a minimum of three occupied dwellings prior to acceptance.

The Contractor shall verify the location and elevation of all underground utilities shown on the plans in areas of construction prior to starting work. Contact the Engineer immediately if the location or elevation is different from that shown on the plan. 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.

Approval of these plans will be based on specification and standards in effect at the time of approval and will be subject, until completion of the roadway and acceptance by the Virginia Department of Transportation, to future revisions of the Specifications and Standards.

# DEVELOPMENT PLANS

## FOR

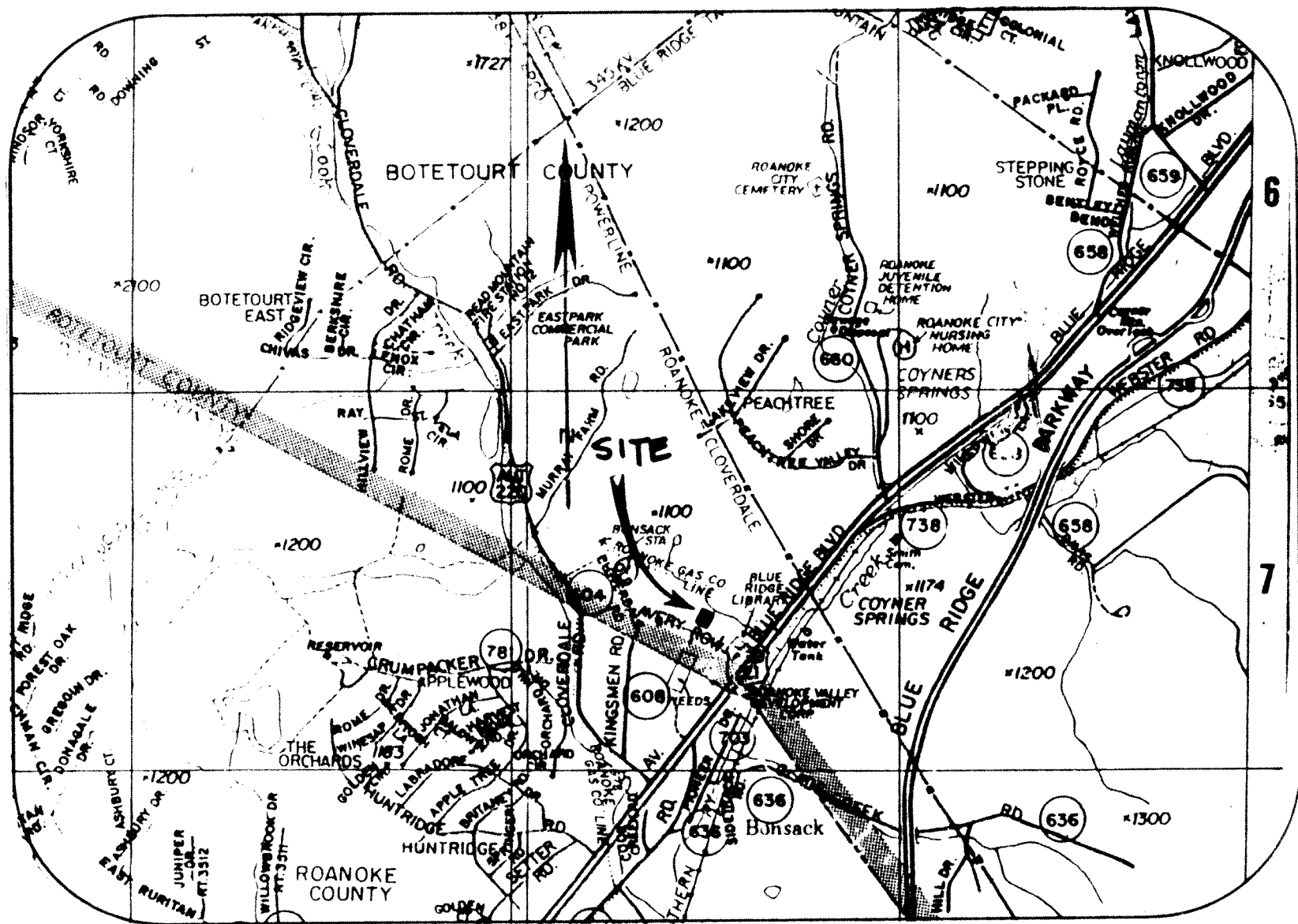
### DIAGNOSTIC IMAGING

#### LOT 2

### JACK SMITH INDUSTRIAL PARK

### BLUE RIDGE MAGISTERIAL DISTRICT

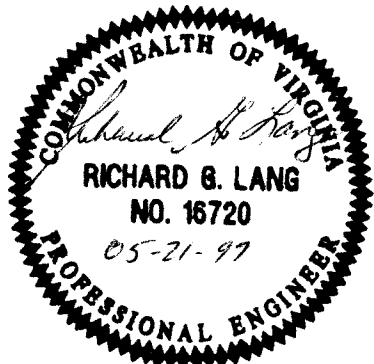
### BOTETOURT COUNTY, VIRGINIA



VICINITY MAP

TAX NOS: 112-(4)2  
TRACT SIZE: 1.420 ACRES  
PRESENT ZONING: M-1  
PRESENT USE: VACANT  
PROPOSED USE: INDUSTRIAL  
SEWER: BOTETOURT COUNTY  
WATER: ROANOKE COUNTY

DEVELOPER: DIAGNOSTIC IMAGING  
ADDRESS: 2101 SALEM AVE., S.W.  
ROANOKE, VA. 24016  
PHONE: (540) 982-7098  
FAX: (540) 982-1029



Lang  
R.B.

PROJECT NAME: Diagnostic Imaging Lot 2  
DATE: May 1997  
TYPE: Site plan  
LOCATION:  
TOTAL # SHEETS: 4  
A/E FIRM: Lang Engineering  
# OF SETS:

HORIZONTAL AND VERTICAL CONTROL SURVEY PERFORMED IN 1996 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.

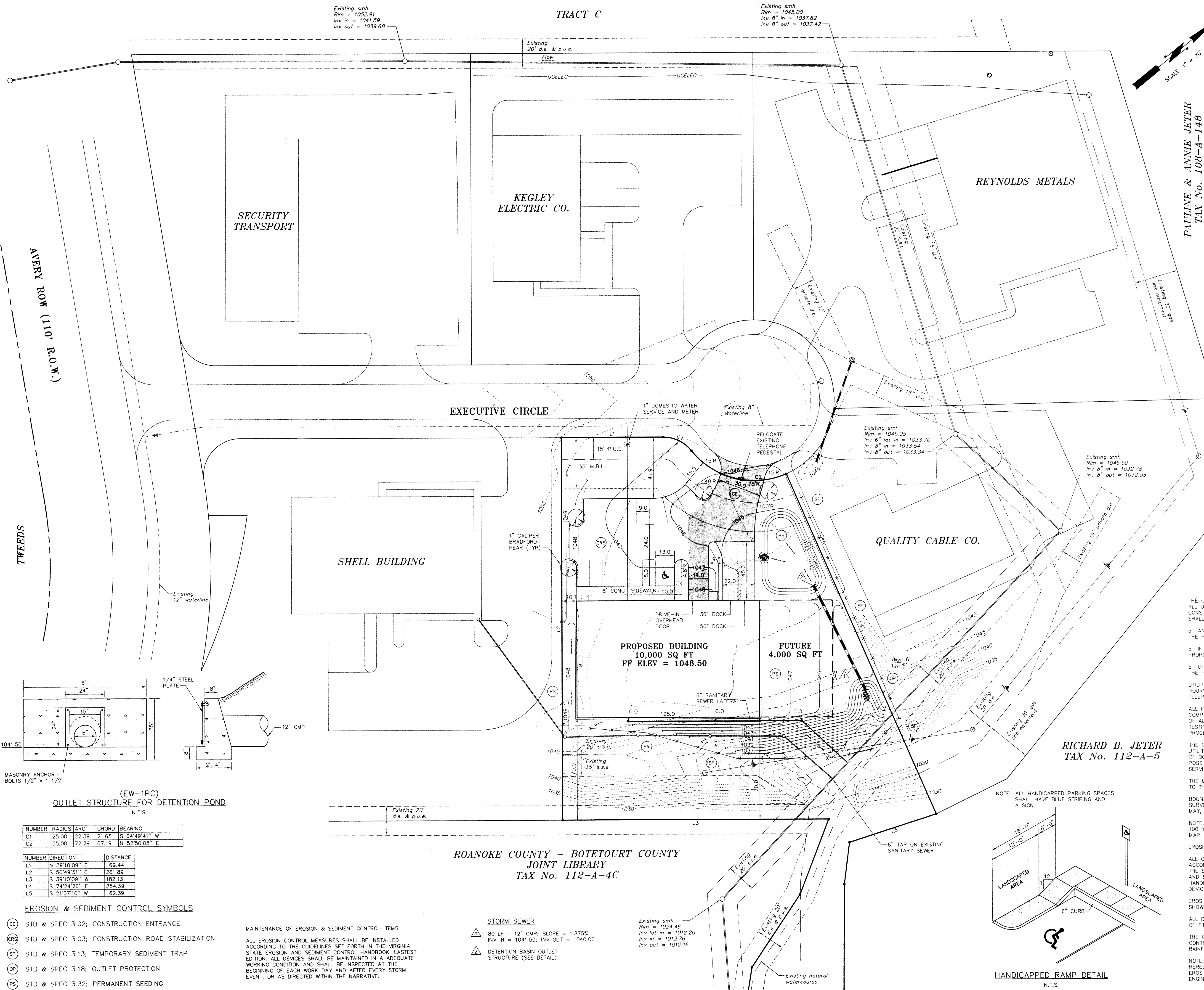
LEGEND

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

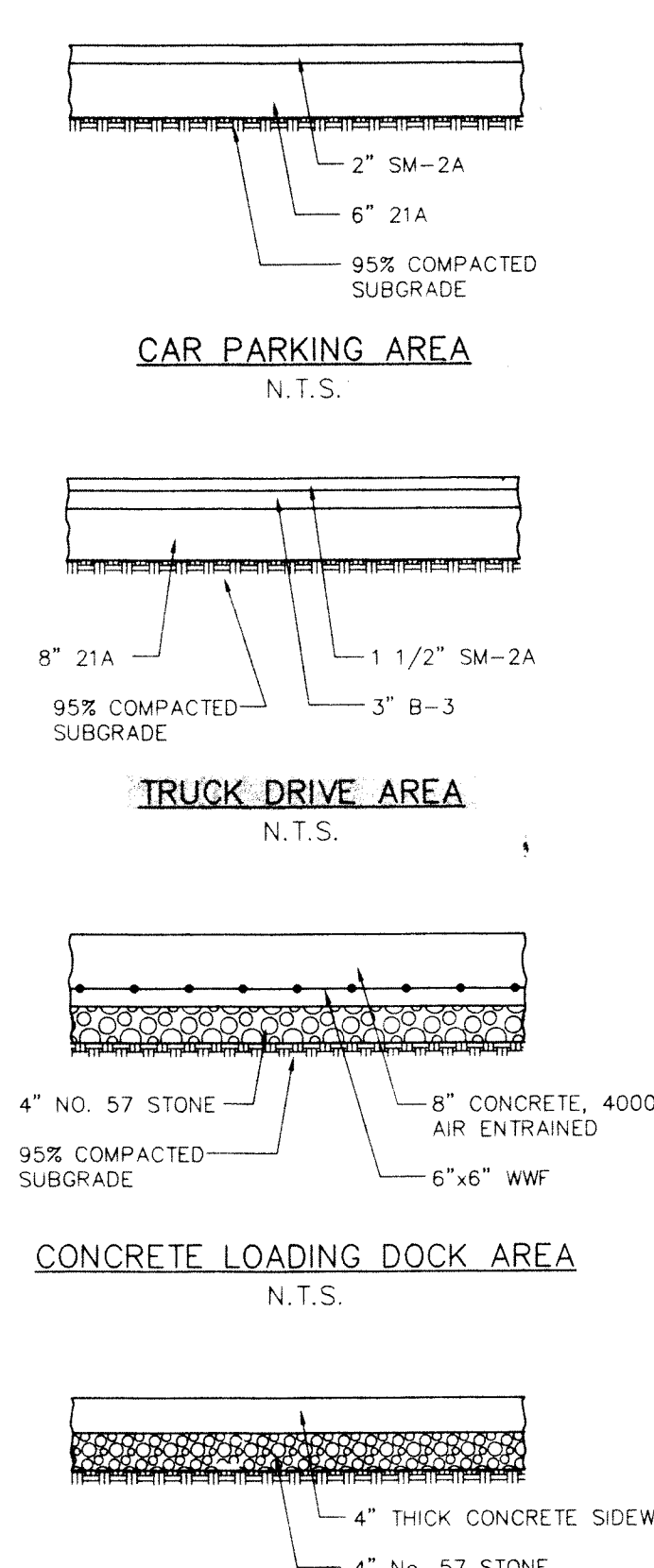
SHEET NO.	DESCRIPTION
1	COVER SHEET
2	MASTER ENGINEERING PLAN
3	SANITARY SEWER AND POTABLE WATER DETAILS
4	EROSION & SEDIMENT CONTROL DETAILS

RECEIVED  
MAY 22 1997  
DEVELOPMENT SERVICES





PAULINE & ANNIE JETER  
TAX No. 108-A-148



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 UTILITY DEPARTMENTS OF THE COUNTY OF ROANOKE AND THE COUNTY OF BOTETOURT 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.

THE MINIMUM DEPTH OF ALL WATERLINES SHALL BE THREE (3) FEET TO THE TOP OF THE WATERLINE.

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

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

EROSION AND SEDIMENT CONTROL NOTES:

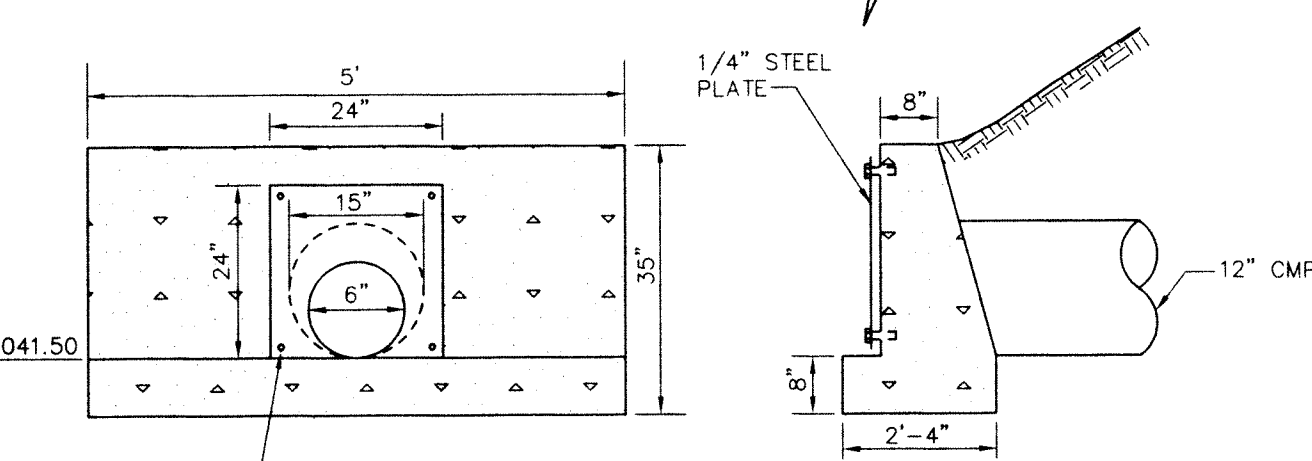
ALL CONSTRUCTION METHODS AND MATERIALS SHALL BE IN ACCORDANCE WITH ALL STATE AND LOCAL REGULATIONS, INCLUDING THE STANDARDS AND SPECIFICATIONS OF THE "VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK" LATEST EDITION. REFER TO THIS HANDBOOK FOR DETAILS AND SPECIFICATIONS OF EROSION CONTROL DEVICES.

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, DIAGNOSTIC IMAGING, HEREBY AGREES TO INSTALL ALL PROPOSED AND APPROVED EROSION AND SEDIMENT CONTROL DEVICES ACCORDING TO THE ENGINEERING PLANS AND EROSION CONTROL NARRATIVE.



OUTLET STRUCTURE FOR DETENTION POND  
N.T.S.

NUMBER	RADIUS	ARC	CHORD	BEARING
C1	25.00	22.39	21.65	S 64°49'41" W
C2	55.00	172.29	67.19	N 52°50'08" E

NUMBER	DIRECTION	DISTANCE
L1	N 39°10'09" E	69.44
L2	S 80°49'51" E	261.89
L3	S 39°10'09" W	182.13
L4	S 74°24'26" E	254.39
L5	S 21°07'10" W	62.39

- EROSION & SEDIMENT CONTROL SYMBOLS
- (CE) STD & SPEC 3.02; CONSTRUCTION ENTRANCE
  - (CRS) STD & SPEC 3.03; CONSTRUCTION ROAD STABILIZATION
  - (ST) STD & SPEC 3.13; TEMPORARY SEDIMENT TRAP
  - (OP) STD & SPEC 3.18; OUTLET PROTECTION
  - (PS) STD & SPEC 3.32; PERMANENT SEEDING

MAINTENANCE OF EROSION & SEDIMENT CONTROL ITEMS:

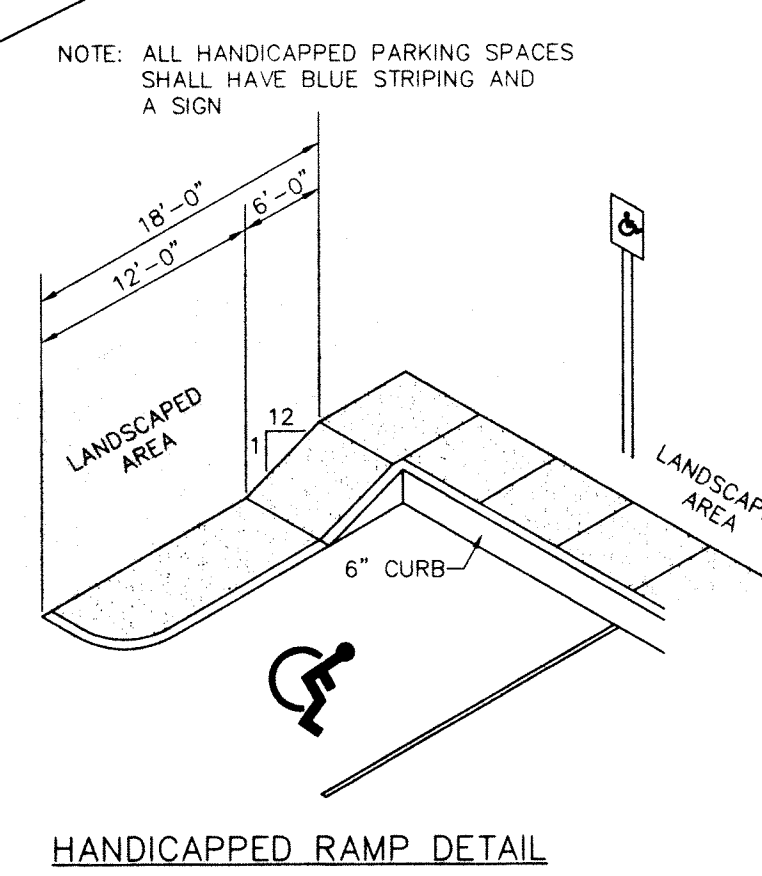
ALL EROSION CONTROL MEASURES SHALL BE INSTALLED ACCORDING TO THE GUIDELINES SET FORTH IN THE VIRGINIA STATE EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION. ALL DEVICES SHALL BE MAINTAINED IN A ADEQUATE WORKING CONDITION AND SHALL BE INSPECTED AT THE BEGINNING OF EACH WORK DAY AND AFTER EVERY STORM EVENT, OR AS DIRECTED WITHIN THE NARRATIVE.

ROANOKE COUNTY - BOTETOURT COUNTY  
JOINT LIBRARY  
TAX No. 112-A-4C

- STORM SEWER
- 80 LF - 12" CMP; SLOPE = 1.875%
  - INV IN = 1041.50; INV OUT = 1040.00
- DETENTION BASIN OUTLET STRUCTURE (SEE DETAIL)

Existing smh  
Rim = 1024.46  
Inv lat in = 1012.26  
Inv in = 1013.16  
Inv out = 1012.16

RICHARD B. JETER  
TAX No. 112-A-5



HANDICAPPED RAMP DETAIL  
N.T.S.

DATE

REVISIONS

DATE: MAY 21 1997  
JOB No.: 970321  
ACAD #: 970321

SCALE: 1" = 30'

DRAWN BY: MMB  
CHKD: RGL

0 15 30 60 120

RECEIVED  
MAY 22 1997  
DEVELOPMENT SERVICES

DIAGNOSTIC IMAGING  
MASTER ENGINEERING PLAN  
LOT 2  
BLUE RIDGE DISTRICT  
BOTETOURT COUNTY, VIRGINIA

SHEET NO.  
2  
4  
OF



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 trench.
- 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 channeling 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 an WYE or TEE-WYE fitting at the Contractor's 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 casing 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 proving 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.

WATER LINE GENERAL NOTES

1. PARALLEL INSTALLATION
- a. Normal conditions: Water lines shall be laid at least ten (10) feet horizontally from all sewers or sewer manholes whenever possible. The distance shall be measured edge to edge.
- b. Unusual conditions: When local conditions prevent a horizontal separation of ten (10) feet, the water line may be laid closer to a sewer line or sewer manhole provided that the following occurs:
1. The bottom (invert) of the water main shall be at least eighteen inches above the top (crown) of the sewer pipe.
2. 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.
3. The sewer manhole shall be of water-tight construction and tested in place.
2. CROSSING INSTALLATION
- a. Normal conditions: Water lines crossing sewers shall be laid to provided a separation of at least eighteen inches between the bottom of the water line and the top of the sewer line whenever possible.
- b. Unusual conditions: When local conditions prevent a vertical separation described in normal conditions, the following construction shall be used:
1. Sewers passing over or under waterlines shall be constructed of the materials described above.
2. Water lines passing under sewers shall, in addition, be protected by providing:
- (a) A vertical separation of at least eighteen inches between the bottom of the sewer and the top of the water line.
- (b) Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line.
- (c) That the length of the waterline be centered at the point of crossing so that the joints shall be equidistant and as far as possible from the sewer.
- No water lines shall pass through or come in contact with either sewer lines or sewer manholes.
- Water mains shall have a minimum cover of three (3) feet.
3. TESTING OF WATER LINES
- After placing all harnessing and all valve support concrete, sufficient backfill shall be placed prior to filling the pipe with water to field tested to prevent lifting of the pipe. When local conditions require that the trenches be backfilled immediately after the pipe has been laid, the testing shall be carried out after backfilling has been completed but prior to placement of the permanent surface. At least seven (7) days shall elapse after the last valve support or hydrant block has been cast (Type I Portland Cement) prior to testing, unless high early strength concrete (Type III) is used, in which case three (3) days shall elapse.
- All testing will be performed in accordance with the AWWA C600, latest revision.
- After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing.
- Test pressures shall:
- not be less than 1.25 times the working pressure at the highest point along the test section;
  - not exceed pipe or thrust restaint design pressures;
  - be of at least 2-hour duration
  - not vary by more that 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 or hydrants;
  - not exceed the rated pressure of the valve.
- Each valved section of pipe shall be filled slowly with properly disinfected water 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, and hydrants.
- All exposed pipe, fittings, valves, hydrants and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the 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:
- $$L = \frac{SD(P)^{0.5}}{133,200}$$
- 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. When hydrants are in the test section, the test shall be made on the basis of allowable leakage. 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.
- A continuous and uniform bedding shall be provided in the trench for all pipe. Stones and rocks found within the trench shall be removed for a depth of at least 6" below the bottom of the pipe and tamped select bedding be provided. After the pipe has been placed in the trench, the trench shall be backfilled with select material and compacted so as not to damage the pipe.
- All disinfection of water lines, valves, sample taps and appurtenances shall be performed using either if the following two methods:

Continuous Feed Method:  
Potable water shall be introduced into the pipe line at a constant flow rate. Chlorine shall be added at a constant rate to this flow so that the chlorine concentration in the water in the pipe shall me at least 50 mg/l. The chlorinated water shall remain in the pipe for at least 24 hours after which the chlorine concentration shall be at least 10 mg/l. All valves and appurtenances shall be operated while the chlorinated water remains in the pipeline.

Tablet Method:  
This method shall not be used if non-potable water or foreign materials have entered the lines or if the water temperature is below 5 C (41 F).

The tablets shall be placed in each section of pipe and all appurtenances. Enough tablets shall be placed to insure that a chlorine concentration of 25 mg/l is provided in the water. They shall be attached to the top of the pipe sections and crushed or rubbed in the appurtenances. The adhesives shall be acceptable to the Bureau. The velocity of the potable water in the lines shall be less than 1 ft/sec. The water shall remain in contact with the pipe for 24 hours. All valves and appurtenances shall be operated while the chlorinated water is in the pipeline.

• After the required detention period, the heavily chlorinated water shall be flushed from the pipe using potable water.

• After the lines have been flushed, the water lines shall be tested in accordance with Section 3.58 (VR 355-18-012.00) of the Virginia Waterworks Regulations outlined below.

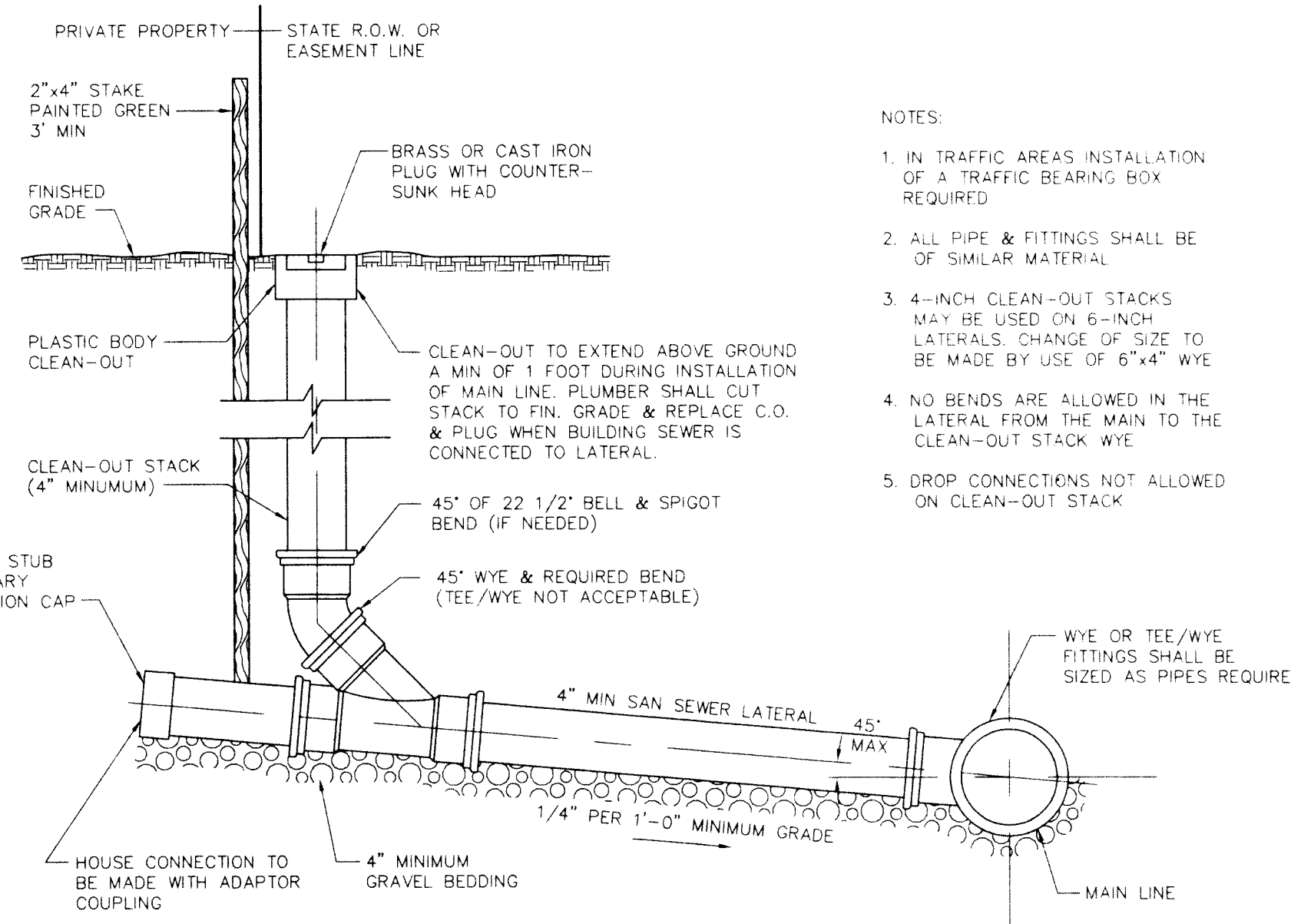
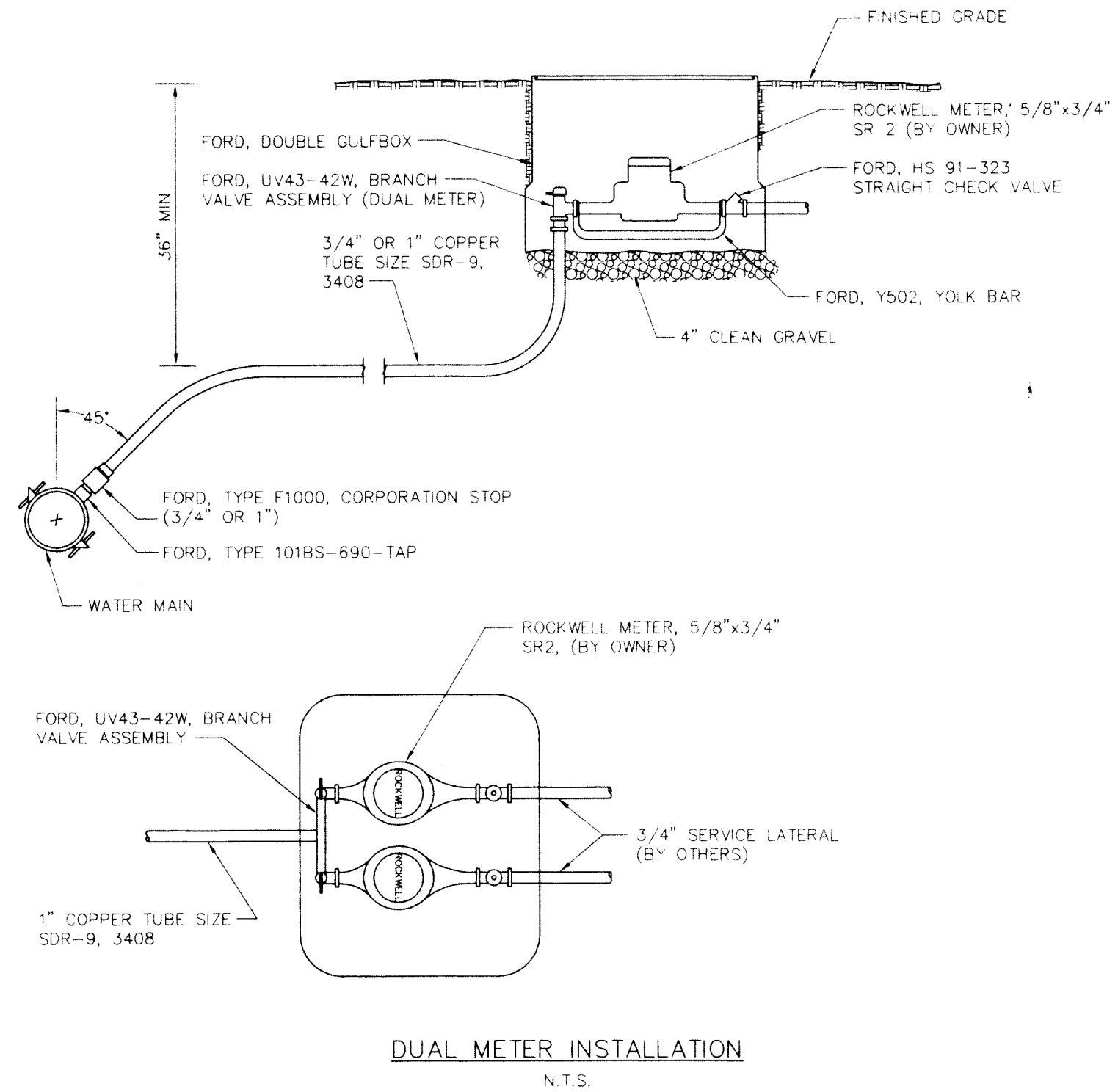
• Virginia Waterworks Regulations, Section 3.58 (VR 355-18-012.00) states the following test procedure following disinfection of the waterlines:

(a) Two water samples for bacteriological analysis must be collected 24 hours apart and analyzed by a certified laboratory. The results of these samples must indicate no coliform contamination before the pipe, tanks or equipment can be utilized as part of the waterworks. If contamination is indicated, the disinfection procedure must be repeated.

(b) All chlorine residual determinations shall be made using only those methods approved by the Bureau.

• All waterlines shall be a minimum standard of C900 PVC, DR-18 "Blue Brut" or equal with NSF-PW seal and fittings for solvent joints. Ductile Iron Pipe, Class 51 is an approved alternate.

• The contractor shall install electronically detectable location tape above all proposed waterlines, except in the case where ductile iron pipe is used. The location tape shall be installed continuously between valves, tees and other fittings, in the trench backfill, 6" above the pipe crown or where directed by the owner or engineer.



SANITARY SEWER LATERAL  
N.T.S.

DATE	
REVISIONS	
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SCALE: N.T.S.	DATE: MAY 21, 1997
DRAWN BY: MMB	JOB No.: 970321
CHKD: RGL	ACAD #: 970321D

**LANG-**  
engineering co.  
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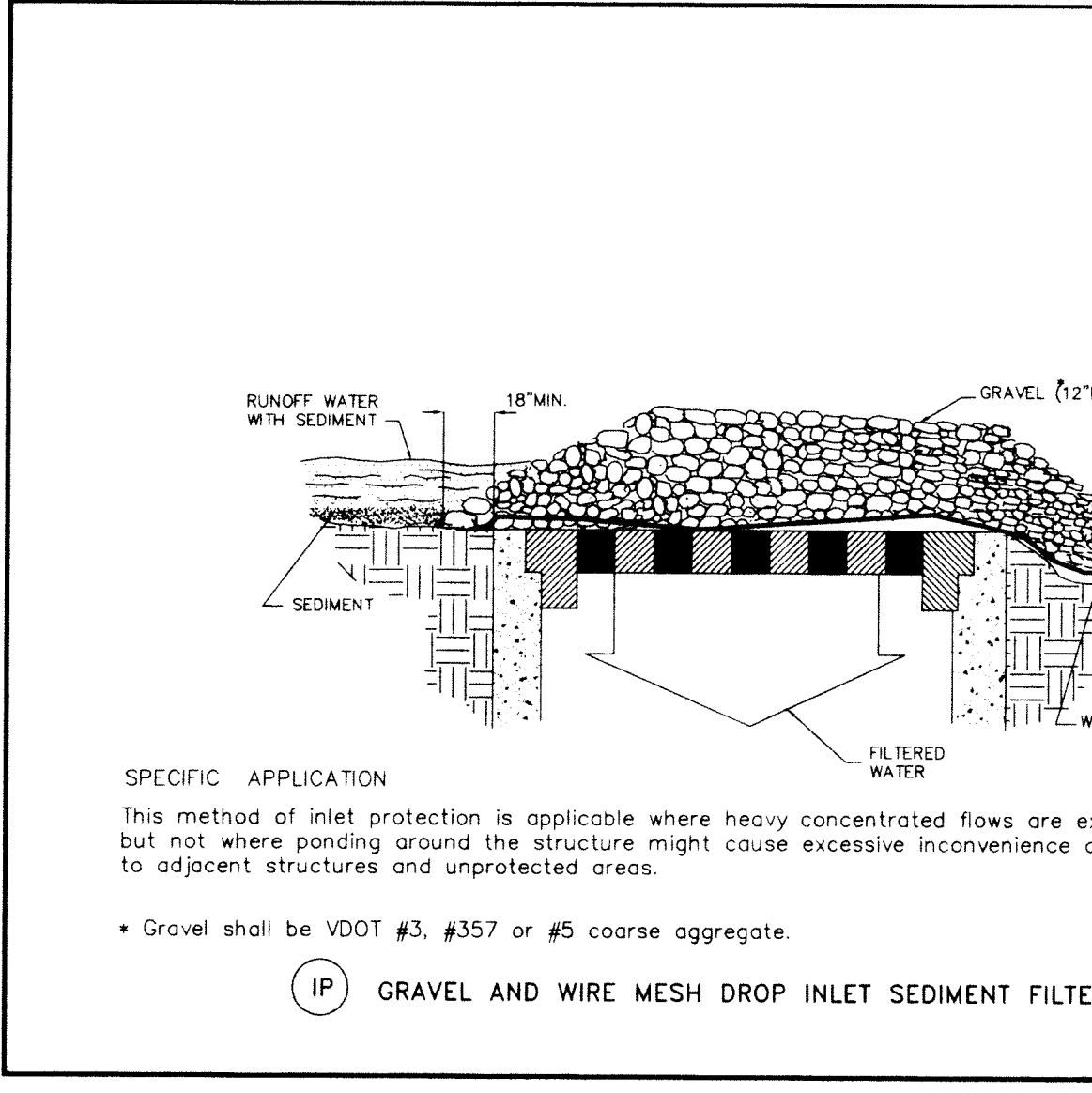
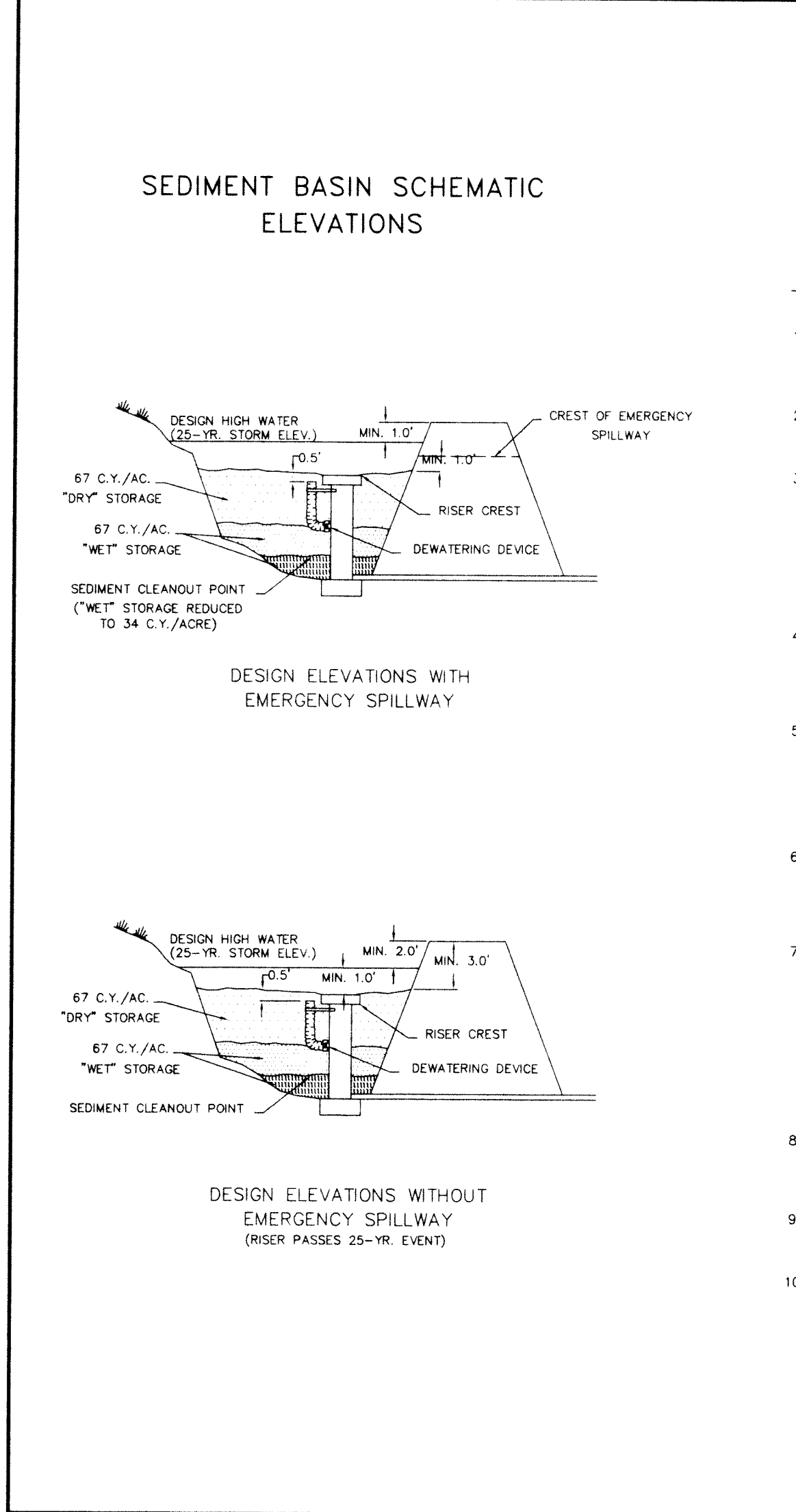
**RECEIVED**  
MAY 22 1997  
DEVELOPMENT SERVICES

**DIAGNOSTIC IMAGING**  
SANITARY SEWER AND  
POTABLE WATER DETAILS  
LOT 2  
BLUE RIDGE DISTRICT  
BOTETOURT COUNTY, VIRGINIA

SHEET NO. **3**  
**4**  
OF

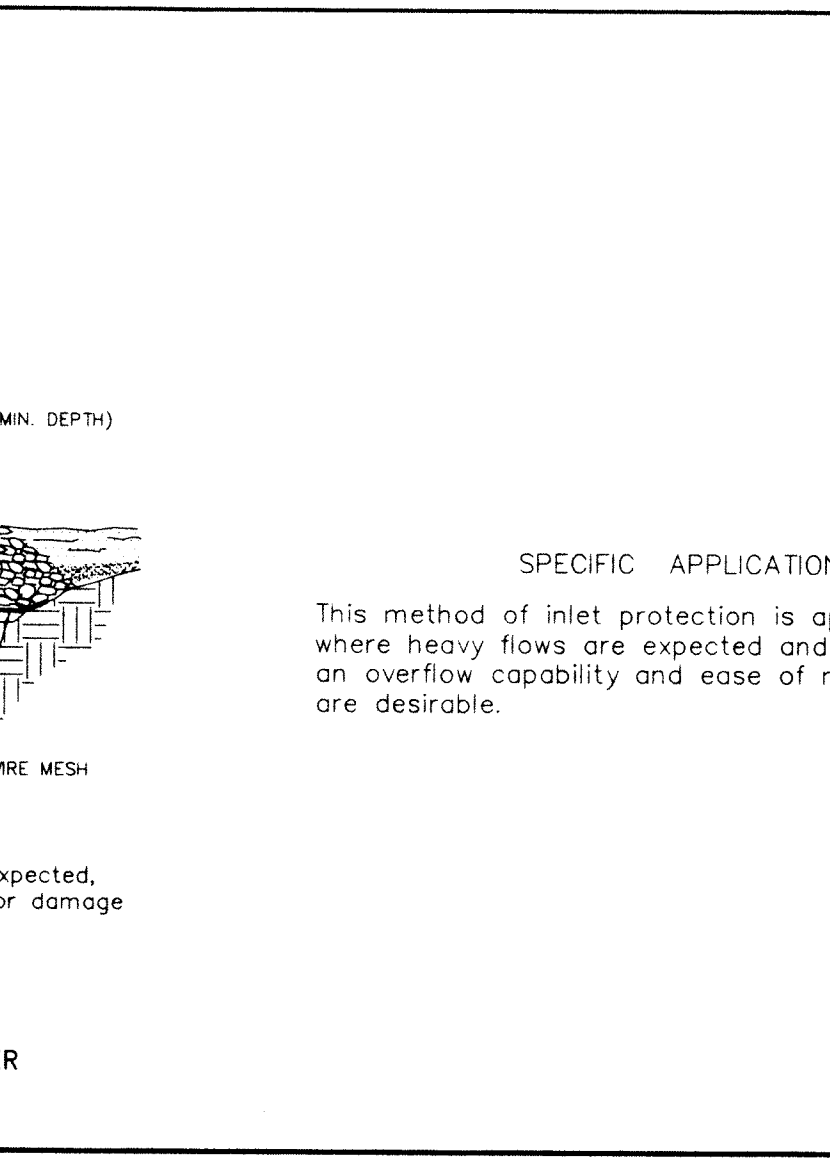


STORMWATER MANAGEMENT COST ESTIMATE				
ALL COSTS GIVEN ARE COMPLETE IN PLACE				
DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
CLEARING & GRUBBING	LS			
EXCAVATION	CY			
EMBANKMENT	CY			
FENCING	LF			
STRUCTURES	LS			
ACCESS ROAD	EA			
AS-BUILTS	LS			
SUB-TOTAL				
10% CONTINGENCY				
TOTAL PROJECT COST				

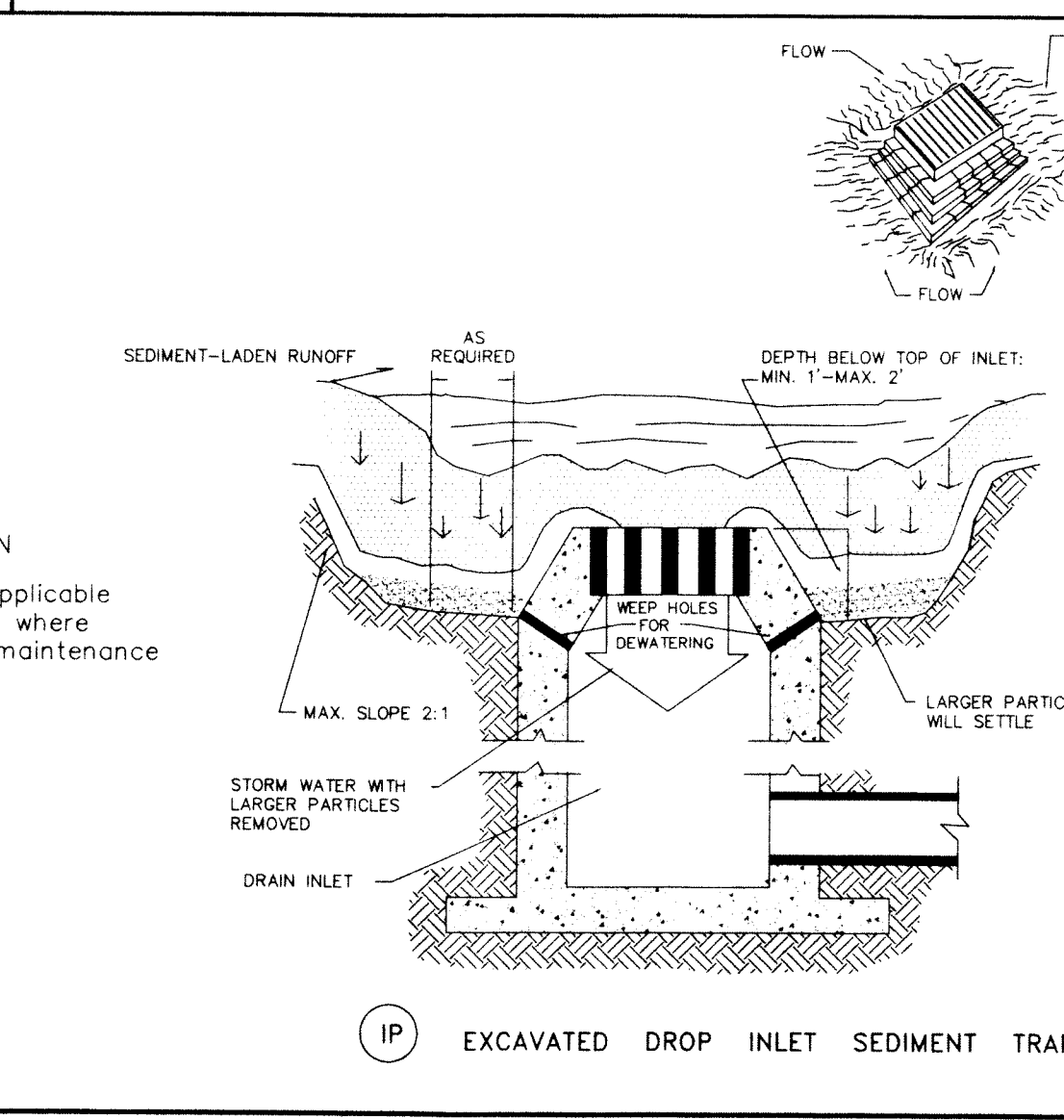
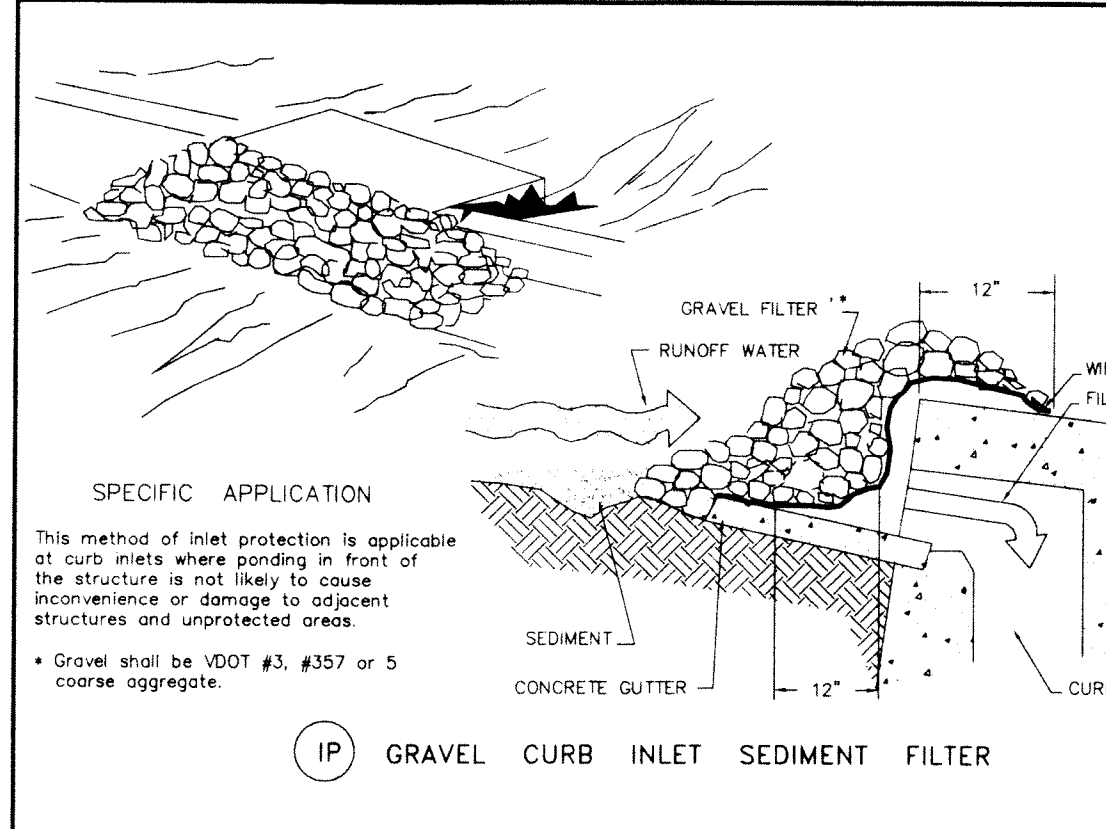
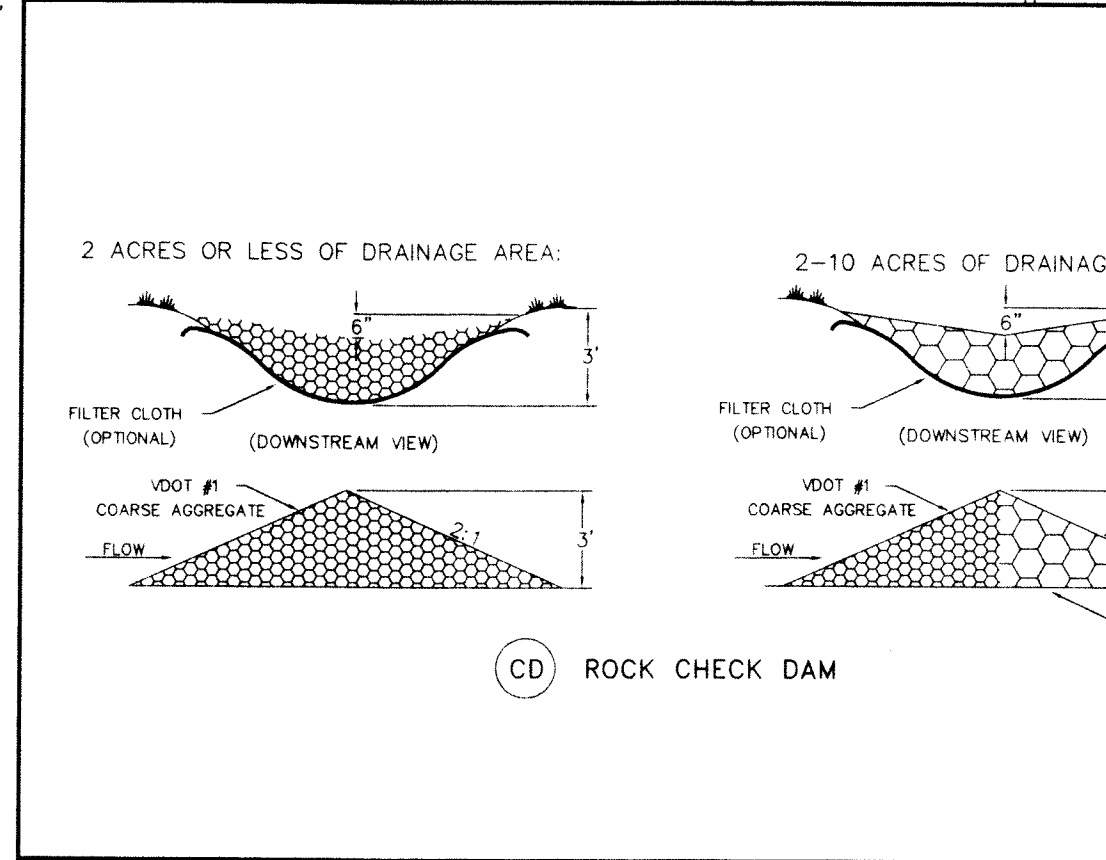


NO.	TITLE	KEY	SYMBOL	NO.	TITLE	KEY	SYMBOL
3.01	SAFETY FENCE	SAF		3.20	ROCK CHECK DAMS	CD	
3.02	TEMPORARY GRAVEL CONSTRUCTION ENTRANCE STABILIZATION	CE		3.21	LEVEL SPREADER	LS	
3.03	CONSTRUCTION ROAD STABILIZATION	CRS		3.22	VEGETATIVE STREAMBANK STABILIZATION	VSS	
3.04	STRAW BALE BARRIER	STB		3.23	STRUCTURAL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

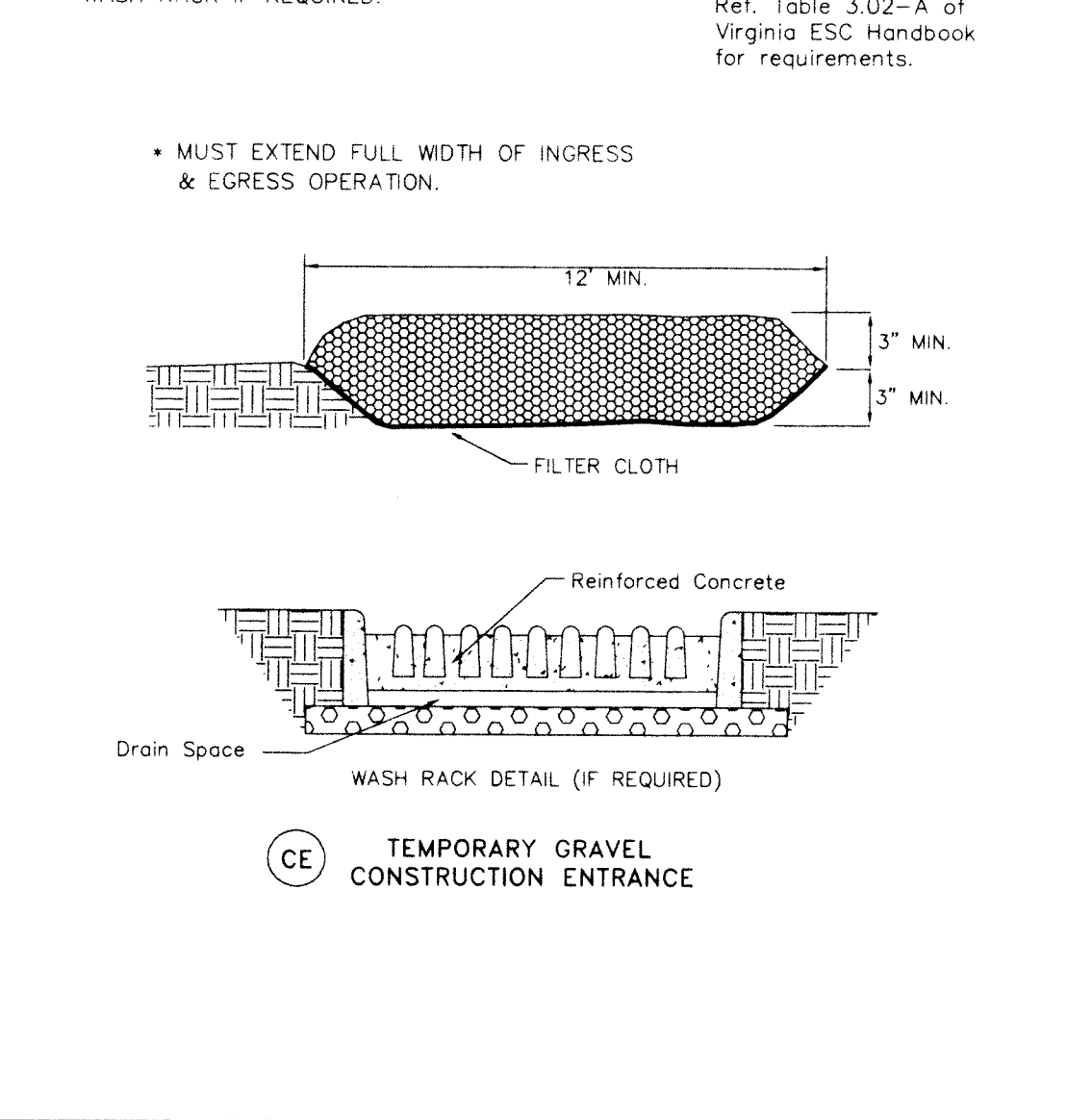
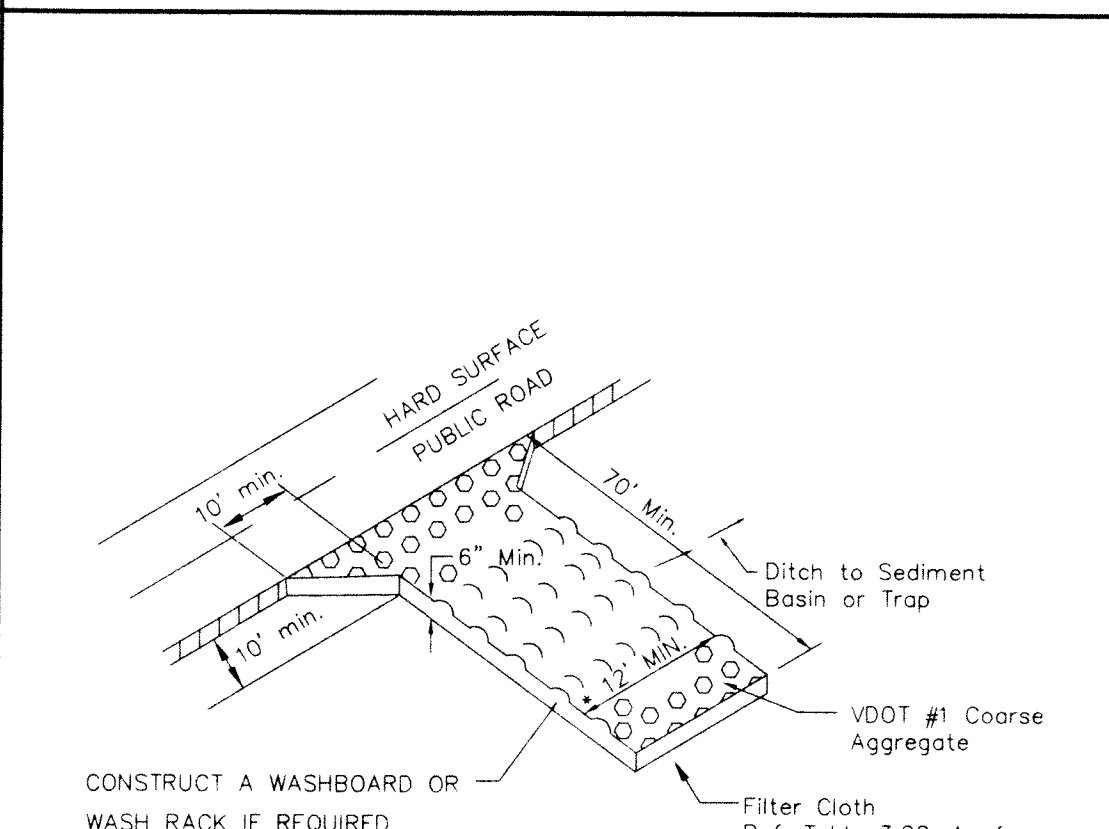
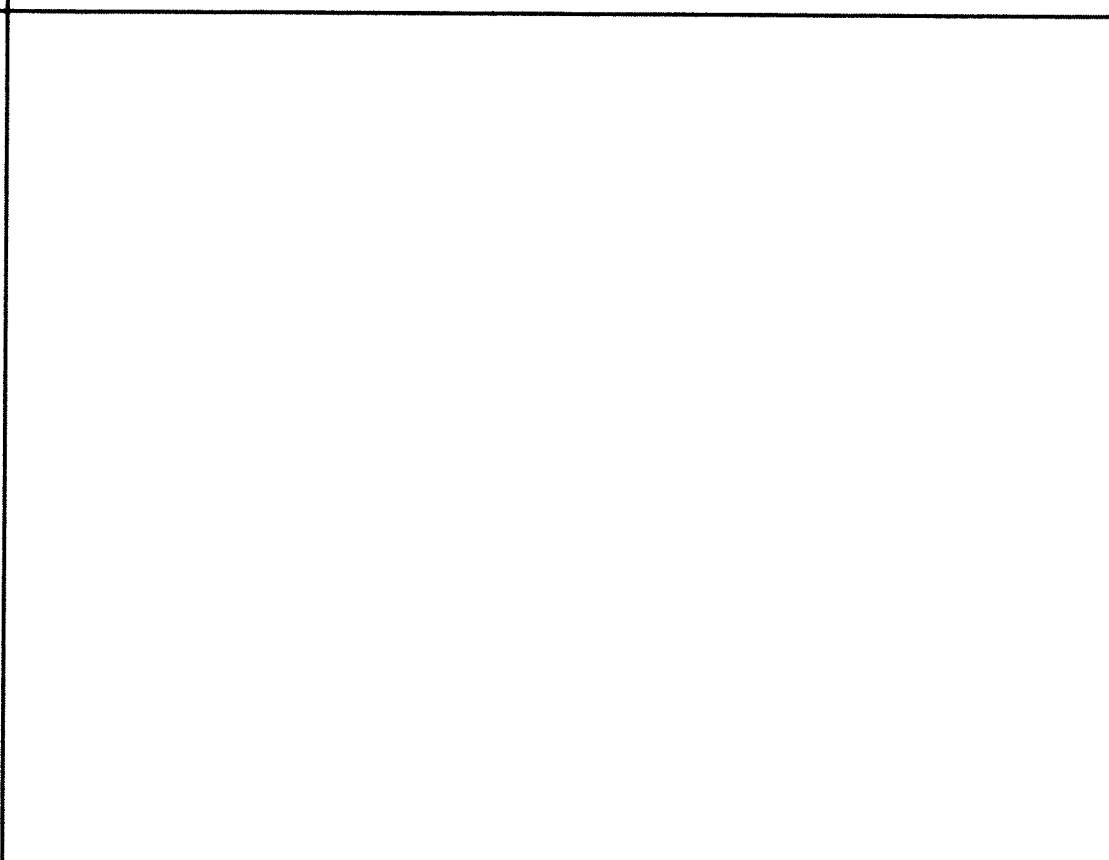
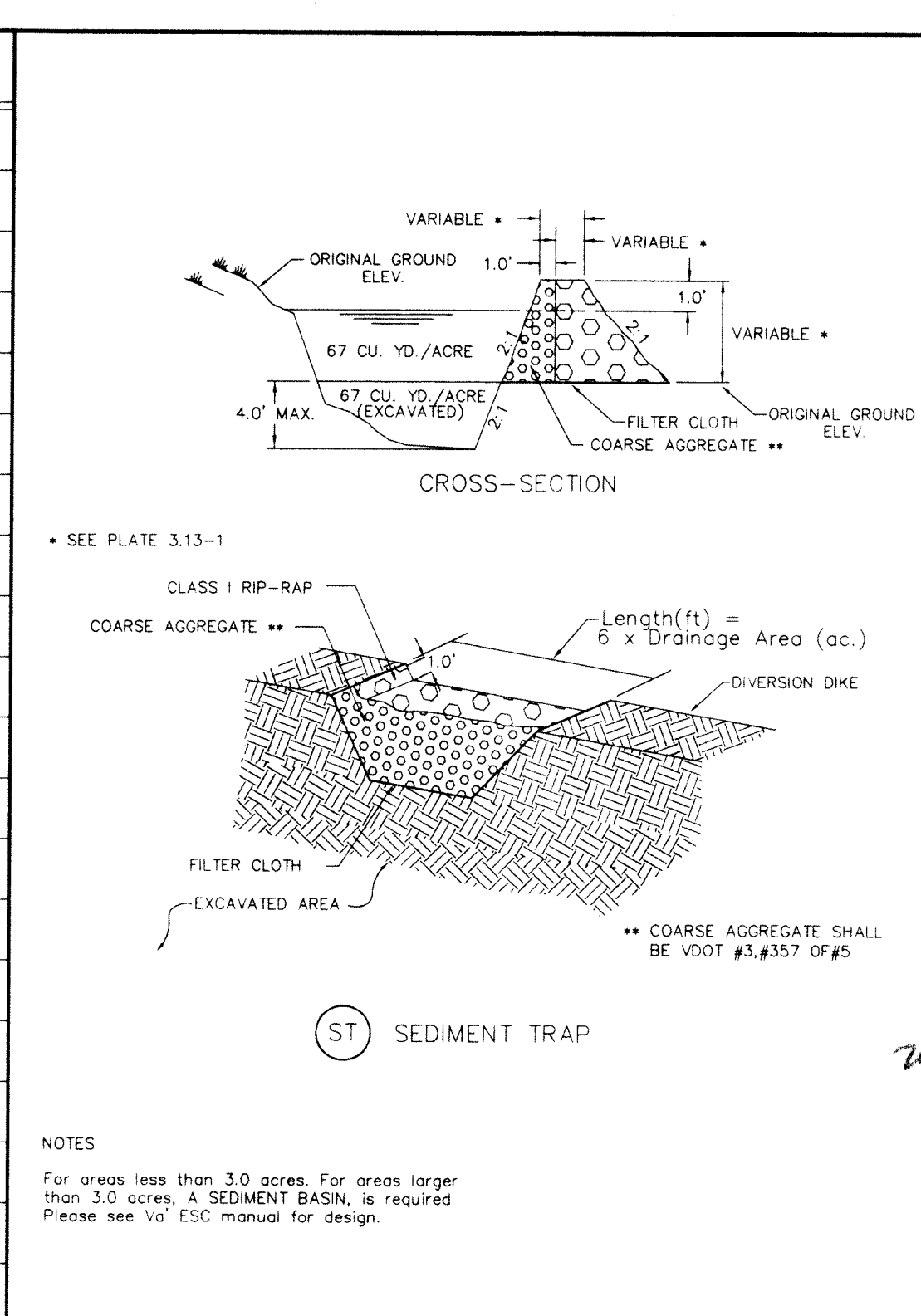
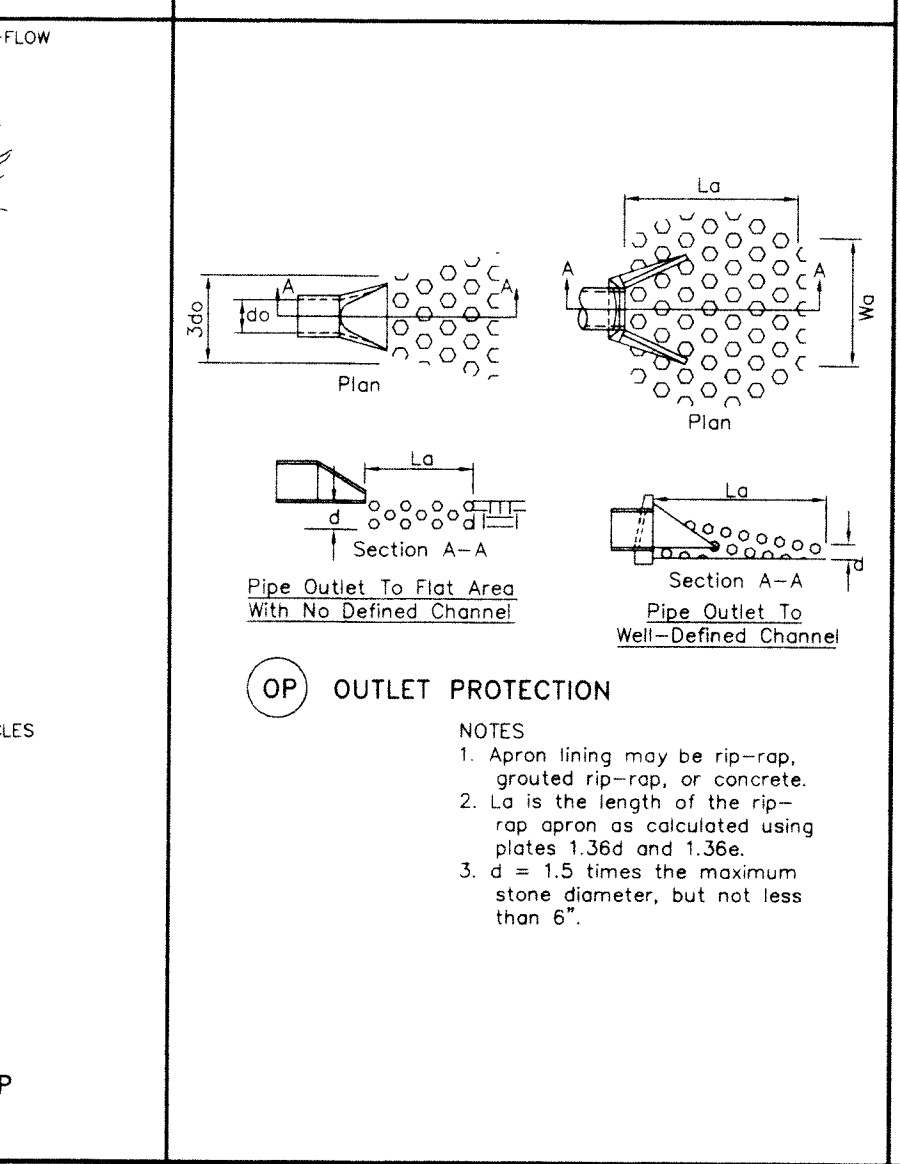
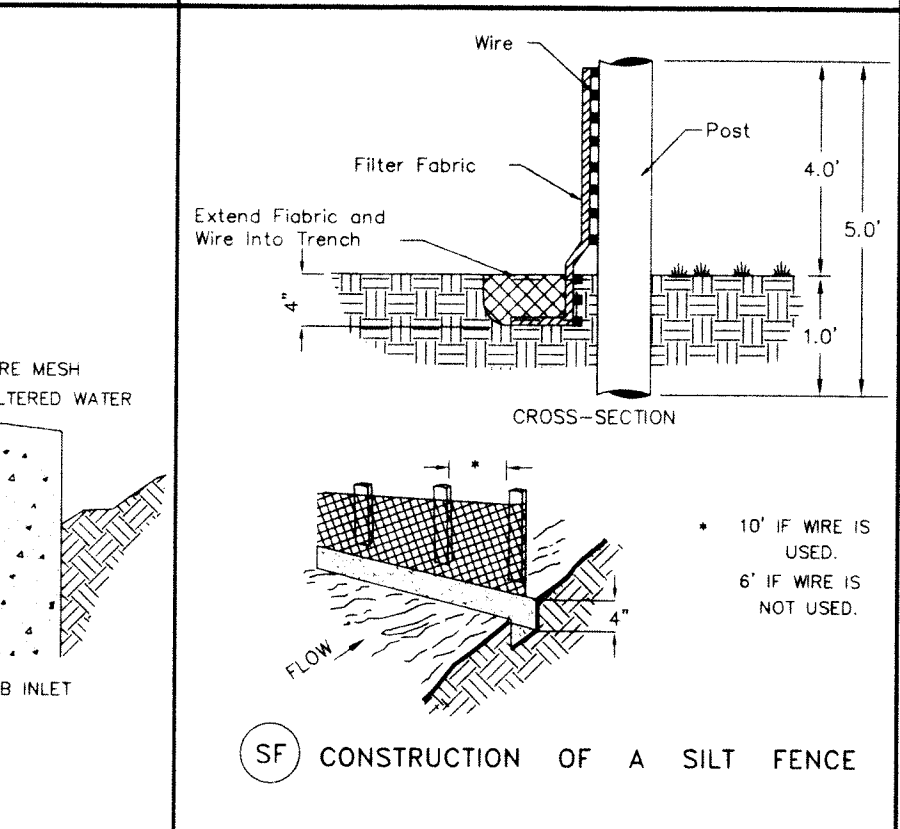
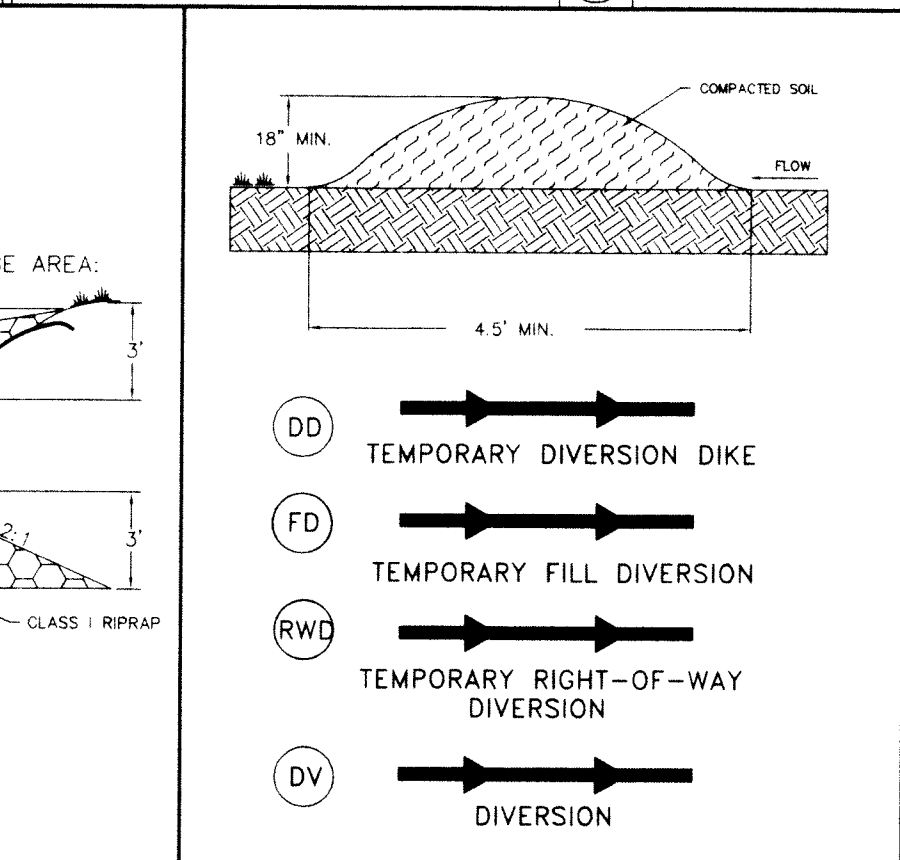
- CONSTRUCTION NOTES**
- SITE PREPARATION SHALL BE IN ACCORDANCE WITH THE COUNTY OF BOTETOURT DESIGN AND CONSTRUCTION STANDARDS FOR DETENTION PONDS, LATEST EDITION.
  - SLOPES STEEPER THAN 3 TO 1 (HORIZONTAL TO VERTICAL) SHALL BE BENCHED OR STEPPED PRIOR TO PLACING FILL ON THEM.
  - ON-SITE FILL MATERIAL OR BORROW FILL MATERIAL MAY BE UTILIZED. FILL MATERIAL SOILS, IN GENERAL:
    - SHALL BE COMPACTABLE
    - SHALL BE WITHIN AN ACCEPTABLE RANGE OF MOISTURE CONTENT WHICH IS READILY CONTROLLED
    - SHALL NOT BE HIGHLY SUSCEPTIBLE TO VOLUME CHANGE (SHRINKAGE OR SWELL) OR SETTLEMENT
  - FILL MATERIALS CONTAINING ROCKS LARGER THAN SIX (6) INCHES (15.2 CM) SHALL NOT BE USED. THE UPPERMOST TWO (2) FEET (61 CM) SHALL NOT HAVE ANY ROCK LARGER THAN TWO (2) INCHES (5.1 CM) IN DIAMETER.
  - THE APPROVED FILL SHALL BE PLACED IN EIGHT (8) INCH (20 CM) LOOSE LIFTS. EACH LIFT SHALL BE SPREAD IN UNIFORM LAYERS. FILL SOIL SHALL BE UTILIZED ONLY WITHIN A MOISTURE RANGE OF +/- 5% OF THE OPTIMUM MOISTURE CONTENT. COMPACTION OF THE FILL SHALL BE PERFORMED WITH APPROVED EQUIPMENT. COMPACTION OF THE LAYERS SHALL BE CONTINUOUS AND UNIFORM.
  - EMBANKMENT MATERIAL IN FILL AREAS SHALL BE PLACED IN LIFTS NOT EXCEEDING EIGHT (8) INCHES AND SHALL BE COMPACTED TO A MINIMUM 95% DENSITY IN ACCORDANCE WITH SECTION 303 OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE SPECIFICATIONS.
  - FIELD DENSITY TESTS ARE TO BE CONDUCTED BY AN INDEPENDENT SOILS TESTING LABORATORY UNDER THE DIRECTION OF A QUALIFIED GEOTECHNICAL ENGINEER. THE RESULTS OF THESE TESTS SHALL BE SUBMITTED TO THE COUNTY OF BOTETOURT WITH AS-BUILT PLANS AS A CONDITION OF ACCEPTANCE OF THE FACILITY BY THE COUNTY. FIELD DENSITY TESTS, AS DIRECTED BY THE ENGINEER SHALL BE PERFORMED PERIODICALLY TO DETERMINE THE DEGREE OF COMPACTION. ANY AREAS FAILING TO MEET THE ABOVE REQUIREMENTS SHALL BE REWORKED AND/OR RECOMPACTED UNTIL THE REQUIRED DEGREE OF COMPACTION IS ACHIEVED.
  - ANTI-SLEEP COLLARS SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION.
  - ALL DISTURBED AREAS SHALL BE COVERED WITH FOUR (4) INCHES OF TOPSOIL AND SEED.
  - THE MINIMUM SLOPE OF THE BASIN FLOOR SHALL BE ONE (1) PERCENT GRADED TO DRAIN TO THE PRINCIPAL SPILLWAY.



NO.	TITLE	KEY	SYMBOL	NO.	TITLE	KEY	SYMBOL
3.01	SAFETY FENCE	SAF		3.20	ROCK CHECK DAMS	CD	
3.02	TEMPORARY GRAVEL CONSTRUCTION ENTRANCE STABILIZATION	CE		3.21	LEVEL SPREADER	LS	
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3.05	SILT FENCE	SF		3.24	TEMPORARY VEHICULAR STREAM CROSSING	VSC	
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3.07	STORM DRAIN INLET PROTECTION	IP		3.26	DEWATERING STRUCTURE	DS	
3.08	CULVERT INLET PROTECTION	CIP		3.27	TURBIDITY CURTAIN	TC	
3.09	TEMPORARY DIVERSION DIKE	DD		3.28	SUBSURFACE DRAIN	SD	
3.10	TEMPORARY FILL DIVERSION	FD		3.29	SURFACE ROUGHENING	SR	
3.11	TEMPORARY RIGHT-OF-WAY DIVERSION	RWD		3.30	TOPSOILING	TO	
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				3.39	DUST CONTROL	DC	

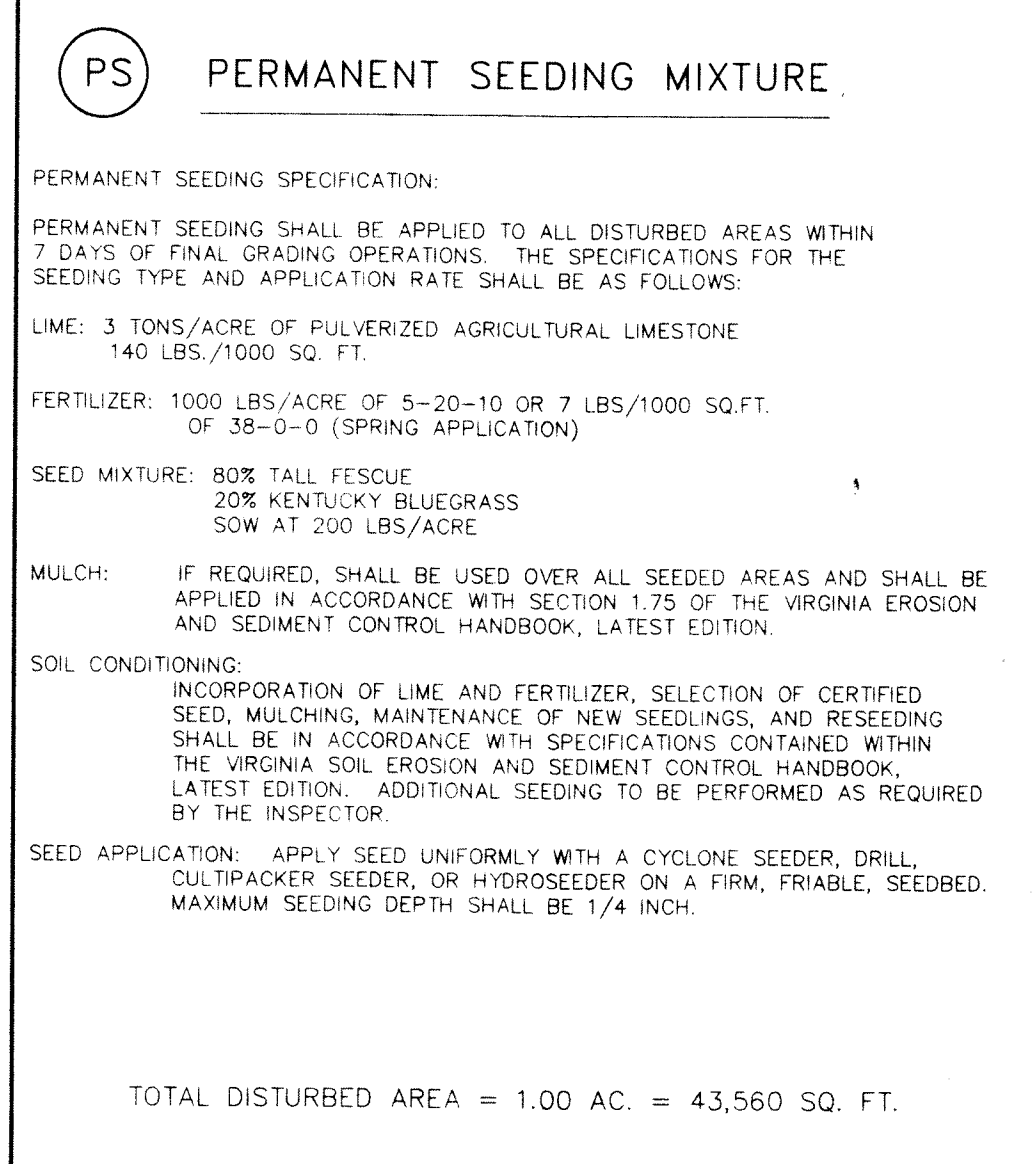
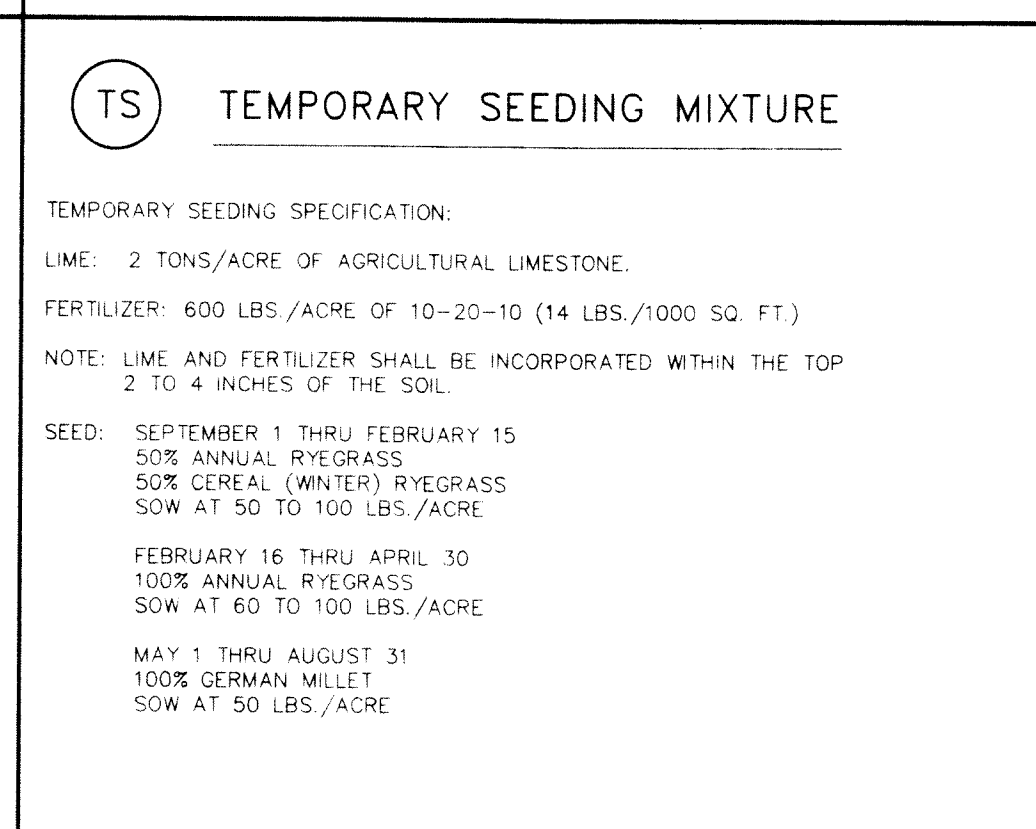


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				3.39	DUST CONTROL	DC	



EROSION-SILTATION CONTROL COST ESTIMATE				
ALL COSTS GIVEN ARE COMPLETE IN PLACE				
DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
CONSTRUCTION ENTRANCE	EA	1	200.00	200.00
CONSTRUCTION ROAD STABILIZATION	SY	400	1.50	600.00
SILT FENCE	LF	395	2.25	888.75
PERMANENT SEEDING	1000 SF	12	30.00	360.00
OUTLET PROTECTION	EA	1	200.00	200.00
SUB-TOTAL				2248.75
10% CONTINGENCY				224.88
TOTAL PROJECT COST				2473.63

- GENERAL EROSION AND SEDIMENT CONTROL NOTES**
- ALL SOIL 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.
  - 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.
  - ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES AS SHOWN ON THE PLAN SHALL BE PLACED IN ADVANCE OF THE WORK BEING PERFORMED, AS FAR AS PRACTICAL.
  - IN NO CASE DURING CONSTRUCTION SHALL WATER RUNOFF BE DIVERTED OR ALLOWED TO FLOW TO LOCATIONS WHERE ADEQUATE PROTECTION HAS NOT BEEN PROVIDED.
  - 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.
  - FOR THE EROSION 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 CONTROL PLANS SUBMITTED TO BOTETOURT COUNTY.



DATE: MAY 21, 1997  
JOB No.: 970321  
ACAD # 970321D1

SCALE: N.T.S.  
DRAWN BY: MMB  
CHKD: RGL

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engineering co.**  
Consulting Engineers, Land Planners  
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**RECEIVED**  
MAY 22 1997  
DEVELOPMENT SERVICES

**DIAGNOSTIC IMAGING  
ESC DETAILS  
LOT 2  
BLUE RIDGE DISTRICT  
BOTETOURT COUNTY, VIRGINIA**

SHEET NO. 4  
OF 4