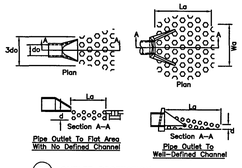
ESC BOND ESTIMATE

ITEM	QUANTITY	UNIT COST	TOTAL
CONSTRUCTION ENTRANCE	1 EA	$1,200.00 per EA	$1,200.00
SILT FENCE	520 LF	$4.00 per LF	$2,080.00
INLET PROTECTION	7 EA	$150.00 per EA	$1,050.00
CULVERT INLET PROTECTION	1 EA	$400.00 per EA	$400.00
BLANKET MATTING	3,000 SF	$0.25 per SF	$750.00
TEMPORARY SEEDING	104,000 SF	$0.04 per SF	$4,160.00
PERMANENT SEEDING	45,000 SF	$0.05 per SF	$2,250.00
SEDIMENT TRAP	1 EA	$1,500.00 per EA	$1,500.00
DIVERSION DIKE	520 LF	$5.00 per LF	$2,600.00
OUTLET PROTECTION	1 EA	$250.00 per EA	$250.00
CHECK DAMS	2 EA	$200.00 per EA	$400.00
		SUB-TOTAL	$16,640.00
		10% CONTINGENCY	$1,664.00
		ESTIMATED TOTAL =	$18,304.00

THIS ESTIMATE IS FOR BONDING PURPOSES ONLY. ACTUAL QUANTITIES AND COSTS MAY VARY, BASED ON ACTUAL FIELD CONDITIONS AND CURRENT ECONOMIC CONDITIONS.



(OP) OUTLET PROTECTION

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

OUTLET PROTECTION DATA:

OUTLET PROTECTION – (STR. #12)
Q10=21.42 CFS; V10=14.06 FPS
EC-1 CLASS 2 RIP-RAP
DEPTH = 36"
LENGTH OF APRON=13'
WIDTH @ OUTLET=6'
WIDTH @ END=WIDTH OF DITCH
MIN. D50 SIZE=6"

EROSION AND SEDIMENT CONTROL NARRATIVE

PROJECT DESCRIPTION: THE PURPOSE OF THIS PROJECT IS FOR THE CONSTRUCTION OF A CONVENIENCE STORE/FAST FOOD BUILDING WITH FUEL CANOPIES AND PARKING AND UTILITY IMPROVEMENTS. FALLBROOKE DRIVE WILL BE IMPROVED TO PROVIDE APPROPRIATE ACCESS FOR THE DEVELOPMENT. THE LIMITS OF DISTURBANCE IS 2.40 ACRES AND A VSMP PERMIT AND SWPPP HAVE BEEN PREPARED FOR THE PROJECT.

EXISTING SITE CONDITIONS: THE EXISTING SITE IS VACANT AND CONSISTS OF MANAGED TURF. FALLBROOKE DRIVE IS A NARROW PAVED DRIVE THAT PROVIDES ACCESS TO THE PROPERTY. THE SITE GENERALLY DRAINS TO THE SOUTH TO AN EXISTING DITCHLINE THAT CONVEYS RUNOFF TO AN EXISTING CULVERT UNDER FALLBROOKE DRIVE.

ADJACENT PROPERTY: THE PROPERTY IS BOUNDED BY FALLBROOKE DRIVE TO THE SOUTH, ROUTE 460 TO THE EAST, DOW HOLLOW ROAD TO THE NORTH, AND VACANT, RESIDENTIAL PROPERTY TO THE WEST.

OFF-SITE AREAS: THE G.C. SHALL NOTIFY ROANOKE COUNTY OF ANY FILL OR BORROW AREAS ASSOCIATED WITH THE PROJECT PRIOR TO TRANSPORT OF ANY MATERIAL. AN ESC PLAN OR MEASURES MAY BE REQUIRED FOR THESE AREAS.

SOILS: THE "SOIL SURVEY OF ROANOKE COUNTY AND THE CITIES OF ROANOKE AND SALEM, VIRGINIA" AS PREPARED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE IDENTIFIES THE ON-SITE SOILS AS 49C-TUMBLING LOAM, 7 TO 15 PERCENT SLOPES, WHICH IS A HYDROLOGIC SOIL GROUP B.

CRITICAL EROSION AREAS: CRITICAL AREAS FOR THIS PROJECT INCLUDE THE FALLBROOKE DRIVE RIGHT-OF-WAY. THE G.C. SHALL ENSURE THAT SEDIMENT IS NOT TRANSPORTED OFF-SITE.

EROSION AND SEDIMENT CONTROL MEASURES:
UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE "VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, THIRD EDITION" (VESCH). THE MINIMUM STANDARDS OF THE VESCH SHALL BE ADHERED TO UNLESS OTHERWISE DIRECTED BY THE LOCAL PROGRAM ADMINISTRATOR.

STRUCTURAL –

CONSTRUCTION ENTRANCE–STD. 3.02.....A STONE PAD, LOCATED AT POINTS OF VEHICULAR INGRESS AND EGRESS TO THE CONSTRUCTION SITE, TO REDUCE THE SOIL TRANSPORTED ONTO PUBLIC ROADS AND OTHER PAVED AREAS.

SILT FENCE–STD. 3.05.....A TEMPORARY BARRIER CONSTRUCTED ALONG THE PERIMENTER OF THE DISTURBED AREA AS REQUIRED TO INTERCEPT AND DETAIN SEDIMENT.

INLET PROTECTION–STD. 3.07.....A SEDIMENT FILTER TO PREVENT SEDIMENT FROM ENTERING, ACCUMULATING IN AND BEING TRANSFERRED INTO AN INLET AND ASSOCIATED DRAINAGE SYSTEM PRIOR TO PERMANENT STABILIZIATION OF A DISTURBED PROJECT AREA.

CULVERT INLET PROTECTION–STD. 3.08.....A SEDIMENT FILTER LOCATED AT THE INLET TO STORM SEWER CULVERTS TO PREVENT SEDIMENT FROM ENTERING, ACCUMULATING IN AND BEING TRANSFERRED BY A CULVERT.

TEMPORARY DIVERSION DIKE–STD. 3.09.....A RIDGE OF SOIL COMPACTED SOIL CONSTRUCTED AT THE TOP OR BASE OF A SLOPING DISTURBED AREA WHICH DIVERTS RUNOFF OFF-SITE RUNOFF AWAY FROM UNPROTECTED SLOPES AND TO A STABILZED OUTLET, OR TO DIVERT SEDIMENT-LADEN RUNOFF TO A SEDIMENT TRAPPING STRUCTURE.

TEMPORARY SEDIMENT TRAP–STD. 3.13.....A TEMPORARY PONDING AREA FORMED BY CONSTRUCTING AN EARTHEN EMBANKMENT WITH A STONE OUTLET TO DETAIN SEDIMENT-LADEN RUNOFF FROM SMALL DISTURBED AREAS LONG ENOUGH TO ALLOW THE MAJORITY OF SEDIMENT TO SETTLE OUT.

OUTLET PROTECTION–STD. 3.18.....STRUCTURALLY LINED APRONS OR OTHER ACCEPTABLE ENERGY DISSIPATING DEVICES PLACED AT OUTLETS OF PIPES OR PAVED CHANNELS TO PREVENT SCOUR AT STORMWATER OUTLETS.

ROCK CHECK DAMS–STD. 3.20.....SMALL TEMPORARY STONE DAMS CONSTRUCTED ACROSS A SWALE OR DRAINAGE DITCH TO REDUCE THE VELOCITY OF CONCENTRATED STORMWATER FLOWS, THEREBY REDUCING EROSION OF THE SWALE OR DITCH.

VEGETATIVE –

TEMPORARY SEEDING–STD. 3.31.....ESTABLISHMENT OF A TEMPORARY VEGETATIVE COVER ON DISTURBED AREAS THAT WILL NOT BE BROUGHT TO FINAL GRADE FOR PERIODS OF 30 DAYS TO 1-YEAR BY SEEDING WITH AN APPROPRIATE RAPIDLY GROWING SEED MIXTURE.

PERMANENT SEEDING–STD. 3.32.....ESTABLISHMENT OF A VEGETATIVE COVER BY PLANTING SEED ON ALL FINAL GRADED AREAS THAT WILL NOT RECEIVE AN IMPERVIOUS COVER OR RECEIVE TOPSOIL MATERIAL TO PROVIDE A STABILIZED SITE AFTER THE PROJECT IS COMPLETE.

MULCHING–STD. 3.35.....MULCH SHALL BE APPLIED TO ALL TEMPORARY AND PEMANENT SEEDING OPERATIONS TO PROMOTE THE GROWTH OF VEGETATION AND TO PROTECT THE SOIL SURFACE FROM RAINDROP IMPACTS.

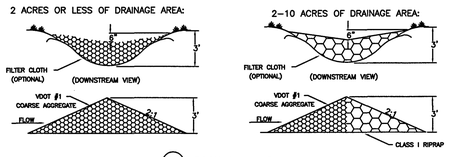
SOIL STABILIZATION BLANKETS & MATTING–STD. 3.36.....THE INSTALLATION OF A PROTECTIVE COVERING (BLANKET) OR A SOIL STABILIZATION MAT ON A PREPARED PLANTING AREA OF A STEEP SLOPE.

MANAGEMENT STRATEGIES:
A) CONSTRUCTION WILL BE SEQUENCED SO THAT GRADING OPERATIONS CAN BEGIN AND END AS QUICKLY AS POSSIBLE.
B) SEDIMENT TRAPPING MEASURES WILL BE INSTALLED AS A FIRST STEP IN GRADING.
C) THE LOCAL PROGRAM ADMINISTRATOR RESERVES THE RIGHT TO ADD TO, DELETE OR OTHERWISE CHANGE THE EROSION CONTROL MEASURES AS DEEMED NECESSARY DUE TO ACTUAL FIELD CONDITIONS BY WRITTEN NOTIFICATION TO THE CONTRACTOR.
D) ALL FILL AND CUT SLOPES SHALL BE SEEDED WITHIN SEVEN (7) DAYS OF ACHIEVING FINAL GRADE.
E) ONLY AFTER INSPECTION AND APPROVAL FROM THE LOCAL PROGRAM ADMINISTRATOR MAY ITEMS BE REMOVED FOLLOWING THE STABILIZATION OF THE CONTRIBUTING AREAS.

INSPECTIONS:
THE GENERAL CONTRACTOR SHALL INSPECT DISTURBED AREAS OF THE SITE THAT HAVE NOT BEEN FINALLY STABILIZED, AND AREAS USED FOR STORAGE OF MATERIALS THAT ARE EXPOSED TO PRECIPITATION, STRUCTURAL CONTROL MEASURES, AND THE AREA OF CONSTRUCTION VEHICLE ACCESS AT LEAST EVERY FOURTEEN (14) CALENDAR DAYS, AND WITHIN 48 HOURS OF THE END OF A STORM EVENT PRODUCING 1/2" OR GREATER OF PRECIPITATION. WHERE AREAS HAVE BEEN FINALLY OR TEMPORARILY STABILIZED OR RUNOFF IS UNLIKELY DUE TO WINTER CONDITIONS (SITE IS COVERED WITH SNOW, ICE, OR FROZEN GROUND EXISTS) SUCH INSPECTIONS SHALL BE CONDUCTED AT LEAST ONCE EVERY MONTH.
A) INSPECT DISTURBED AREAS AND AREAS OF MATERIALS STORAGE THAT ARE EXPOSED TO PRECIPITATION FOR EVIDENCE OF, OR THE POTENTIAL FOR SEDIMENT ENTERING THE STORM DRAIN SYSTEM. INSPECT E&S CONTROLS IN ACCORDANCE WITH REQUIREMENTS STATED HEREIN, AND INSPECT POINTS OF STORM DRAIN DISCHARGE FOR EXCESSIVE SEDIMENTATION. CORRECT SITE CONTROLS AS REQUIRED TO REDUCE SEDIMENTATION OF STORM DRAINS, CULVERTS, AND RECEIVING CHANNELS.
B) IF CONTROLS OR SEDIMENT PREVENTION AREAS ARE FOUND TO BE IN NEED OF REPAIR OR MODIFICATION, THE GENERAL CONTRACTOR SHALL PROVIDE ADDITIONAL MEASURES OR MODIFICATIONS TO EXISTING MEASURES AS REQUIRED. ANY ADDITIONAL MEASURES OR MODIFICATIONS TO EXISTING MEASURES SHALL BE RECORDED AS FIELD REVISIONS TO THESE PLANS. IN THE EVENT THAT ADDITIONAL CONTROLS ARE FOUND TO BE REQUIRED, THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING THESE CONTROLS BEFORE THE NEXT ANTICIPATED STORM EVENT. IF IMPLEMENTATION BEFORE THE NEXT STORM EVENT IS IMPRACTICAL, THEY SHALL BE IMPLEMENTED AS SOON AS PRACTICAL.
C) A REPORT SUMMARIZING THE SCOPE OF INSPECTIONS, NAME OF INSPECTOR, INSPECTOR'S QUALIFICATIONS, DATES OF INSPECTIONS, MAJOR OBSERVATIONS PERTAINING TO THE IMPLEMENTATION OF THESE EROSION CONTROL PLANS, AND ACTIONS TAKEN SHALL BE MADE AND RETAINED AS A PART OF THESE PLANS. MAJOR OBSERVATIONS OF THESE REPORTS SHALL INCLUDE: THE LOCATIONS OF EXCESSIVE SEDIMENTATION FROM THE SITE; LOCATIONS OF CONTROLS IN NEED OF REPAIR; LOCATIONS OF FAILED OR INADEQUATE CONTROLS; AND LOCATIONS WHERE ADDITIONAL CONTROLS ARE NEEDED.

STORMWATER MANAGEMENT:
CHANNEL PROTECTION AND FLOOD PROTECTION REQUIREEMENTS ARE BEING MET BY IMPROVING THE EXISTING MANMADE PIPE AND CHANNEL ON THE ADJACENT PROPERTY TO THE CREEK, WHICH HAS A DRAINAGE AREA OF +/-2,000 ACRES AND REPRESENTS THE POINT OF ANALYSIS. THE DEVELOPER HAS REACHED AN AGREEMENT WITH THE ADJACENT PROPERTY OWNER FOR A PUBLIC DRAINAGE EASEMENT TO BE PROVIDED FROM FALLBROOKE DRIVE TO THE EXISTING CREEK.

OFF-SITE NUTRIENT CREDITS ARE BEING PURCHASED TO ADDRESS STORMWATER QUALITY FOR THE SITE.



(CD) ROCK CHECK DAM

MINIMUM STANDARDS

THE FOLLOWING STANDARDS ARE TO BE PROVIDED OR ADDRESSED ON EVERY DEVELOPMENT PROJECT EXCEEDING 5000 S.F. IN AREA OF DISTURBANCE THESE STANDARDS ARE CONSIDERED A MINIMUM AND MAY REQUIRE ADDITIONAL MEASURES AS DEEMED NECESSARY BY THE LOCAL APPROVING AUTHORITY OR THE CONSULTING ENGINEER.

No.	CRITERIA, TECHNIQUE OR METHOD	PRACTICES PROVIDED
1	PERMANENT OR TEMPORARY SOIL STABILIZATION SHALL BE APPLIED TO DENUDED AREAS WITHIN SEVEN (7) DAYS AFTER FINAL GRADE HAS BEEN REACHED ON ANY PORTION OF THE SITE. TEMPORARY SOIL STABILIZATION SHALL BE APPLIED WITHIN SEVEN (7) DAYS TO DENUDED AREAS THAT MAY BE AT FINAL GRADE BUT WILL REMAIN DORMANT (UNDISTURBED) FOR LONGER THAN FOURTEEN (14) DAYS. PERMANENT STABILIZATION SHALL BE APPLIED TO AREAS THAT ARE TO BE LEFT DORMANT FOR MORE THAN ONE (1) YEAR.	(TS) (PS) (MU)
2	DURING CONSTRUCTION OF THE PROJECT, SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. THE CONTRACTOR IS RESPONSIBLE FOR THE TEMPORARY PROTECTION AND PERMANENT STABILIZATION OF ALL SOIL STOCKPILES ON SITE AS WELL AS SOIL INTENTIONALLY TRANSPORTED FROM THE PROJECT SITE.	(SF) (TS) (PS) (MU)
3	A PERMANENT VEGETATIVE COVER SHALL BE ESTABLISHED ON DENUDED AREAS NOT OTHERWISE PERMANENTLY STABILIZED. PERMANENT VEGETATION SHALL NOT BE CONSIDERED ESTABLISHED UNTIL A GROUND COVER IS ACHIEVED THAT, IN THE OPINION OF THE LOCAL PROGRAM ADMINISTRATOR OR DESIGNATED AGENT, IS UNIFORM, MATURE ENOUGH TO SURVIVE AND WILL INHIBIT EROSION.	(TS) (PS) (MU)
4	SEDIMENT BASINS AND TRAPS, PERIMETER DIKES, SEDIMENT BARRIERS AND OTHER MEASURES INTENDED TO TRAP SEDIMENT SHALL BE CONSTRUCTED AS A FIRST STEP IN ANY LAND-DISTURBING ACTIVITY AND SHALL BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE.	(SF) (DD) (CIP) (ST)
5	STABILIZATION METHODS SHALL BE APPLIED TO EARTHEN STRUCTURES SUCH AS DAMS, DIKES AND DIVERSIONS IMMEDIATELY AFTER INSTALLATION.	(TS) (PS) (MU)
6	SEDIMENT TRAPS AND BASINS SHALL BE DESIGNED AND CONSTRUCTED BASED UPON THE TOTAL DRAINAGE AREA TO BE SERVED BY THE TRAP OR BASIN.	(ST)
7	CUT AND FILL SLOPES SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION. SLOPES THAT ARE FOUND TO BE ERODING EXCESSIVELY WITHIN ONE (1) YEAR OF PERMANENT STABILIZATION SHALL BE PROVIDED WITH ADDITIONAL SLOPE STABILIZATION MEASURES UNTIL THE PROBLEM IS CORRECTED.	(TS) (PS) (MU)
8	CONCENTRATED RUNOFF SHALL NOT FLOW DOWN CUT OR FILL SLOPES UNLESS CONTAINED WITHIN AN ADEQUATE TEMPORARY OR PERMANENT CHANNEL, FLUME OR SLOPE DRAIN STRUCTURE.	NOT APPLICABLE
9	WHENEVER WATER SEEPS FROM A SLOPE FACE, ADEQUATE DRAINAGE OR OTHER PROTECTION SHALL BE PROVIDED.	SHOULD SEEPS OCCUR IN ANY EXISTING OR NEW CUT OR FILL SLOPE, THE CONTRACTOR SHALL FIRST ENSURE THAT THERE ARE NOT AREAS OF PONDED WATER AT THE TOPS OF THE SLOPES, AND THEN SHALL CONTACT BOTH THE DESIGN ENGINEER AND THE PROJECT GEOTECHNICAL ENGINEER FOR ON-SITE EVALUATION OF THE AREAS OF SEEPAGE.
10	ALL STORM SEWER INLETS THAT ARE MADE OPERABLE DURING CONSTRUCTION SHALL BE PROTECTED SO THAT SEDIMENT-LADEN WATER CANNOT ENTER THE CONVEYANCE SYSTEM WITHOUT FIRST BEING FILTERED OR OTHERWISE TREATED TO REMOVE SEDIMENT.	(IP)
11	BEFORE NEWLY CONSTRUCTED STORMWATER CONVEYANCE CHANNELS ARE MADE OPERATIONAL, ADEQUATE OUTLET PROTECTION AND ANY REQUIRED TEMPORARY OR PERMANENT CHANNEL LINING SHALL BE INSTALLED IN BOTH THE CONVEYANCE CHANNEL AND RECEIVING CHANNEL.	(OP) (CD)
12	WHEN WORK IN A LIVE WATERCOURSE IS PERFORMED, PRECAUTIONS SHALL BE TAKEN TO MINIMIZE ENCROACHMENT, CONTROL SEDIMENT TRANSPORT AND STABILIZE THE WORK AREA TO THE GREATEST EXTENT POSSIBLE DURING CONSTRUCTION. NONERODIBLE MATERIAL SHALL BE USED FOR THE CONSTRUCTION OF CAUSEWAYS AND COFFERDAMS. EARTHEN FILL MAY BE USED FOR THESE STRUCTURES IF ARMORED BY NONERODIBLE COVER MATERIALS.	NO DISTURBANCE OF SURFACE WATERS IS PROPOSED WITH THIS PROJECT.
13	WHEN A LIVE WATERCOURSE MUST BE CROSSED BY CONSTRUCTION VEHICLES MORE THAN TWICE IN ANY SIX (6) MONTH PERIOD, A TEMPORARY STREAM CROSSING CONSTRUCTED OF NONERODIBLE MATERIAL.	
14	ALL APPLICABLE FEDERAL, STATE AND LOCAL CHAPTERS PERTAINING TO WORKING IN OR CROSSING LIVE WATERCOURSES SHALL BE MET. THE BEDS AND BANKS OF ANY WATERCOURSE SHALL BE STABILIZED IMMEDIATELY AFTER WORK IN THE WATERCOURSE IS COMPLETED.	
15	THE BEDS AND BANKS OF A WATERCOURSE SHALL BE STABILIZED IMMEDIATELY AFTER WORK IN THE WATERCOURSE IS COMPLETED.	
16	UNDERGROUND UTILITY LINES SHALL BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING STANDARDS IN ADDITION TO OTHER APPLICABLE CRITERIA: 1)NO MORE THAN 500 LINEAR FEET OF ANY TRENCH MAY BE OPENED AT ONE TIME. 2)EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES. 3)EFFLUENT FROM DEWATERING OPERATIONS SHALL BE FILTERED OR PASSED THROUGH AN APPROVED SEDIMENT TRAPPING DEVICE, OR BOTH, AND DISCHARGED IN A MANNER THAT DOES NOT ADVERSELY AFFECT FLOWING STREAMS OR OFF-SITE PROPERTY. 4)MATERIAL USED FOR BACKFILLING TRENCHES SHALL BE PROPERLY COMPACTED IN ORDER TO MINIMIZE EROSION AND PROMOTE STABILIZATION. 5)RESTABILIZATION SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THESE CHAPTERS. 6)APPLICABLE SAFETY REGULATIONS SHALL BE COMPLIED WITH.	(SF)
17	WHERE CONSTRUCTION VEHICLE ACCESS ROUTES INTERSECT PAVED OR PUBLIC ROADS, PROVISIONS SHALL BE MADE TO MINIMIZE THE TRANSPORT OF SEDIMENT BY VEHICULAR TRACKING ONTO THE PAVED SURFACE. WHERE SEDIMENT IS TRANSPORTED ONTO A PAVED OR PUBLIC ROAD SURFACE, THE ROAD SURFACE SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM THE ROADS BY SHOVELING OR SWEEPING AND TRANSPORTED TO A SEDIMENT CONTROL DISPOSAL AREA. STREET WASHING SHALL BE ALLOWED ONLY AFTER SEDIMENT IS REMOVED IN THIS MANNER.	(CE)
18	ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN THIRTY (30) DAYS AFTER FINAL SITE STABILIZATION OR AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED, UNLESS OTHERWISE AUTHORIZED BY THE VESCP AUTHORITY. TRAPPED SEDIMENT AND THE DISTURBED SOIL AREAS RESULTING FROM THE DISPOSITION OF TEMPORARY MEASURES SHALL BE PERMANENTLY STABILIZED TO PREVENT FURTHER EROSION AND SEDIMENTATION.	(TS) (PS) (MU)
19	PROPERTIES AND WATERWAYS DOWNSTREAM FROM DEVELOPMENT SITES SHALL BE PROTECTED FROM SEDIMENT DEPOSITION, EROSION AND DAMAGE DUE TO INCREASES IN VOLUME, VELOCITY AND PEAK FLOW RATE OF STORMWATER RUNOFF FOR THE STATED FREQUENCY STORM OF 24-HOUR DURATION IN ACCORDANCE WITH THE FOLLOWING STANDARDS AND CRITERIA. STREAM RESTORATION AND RELOCATION PROJECTS THAT INCORPORATE NATURAL CHANNEL DESIGN CONCEPTS ARE NOT MAN-MADE CHANNELS AND SHALL BE EXEMPT FROM ANY FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS. a. CONCENTRATED STORMWATER RUNOFF LEAVING A DEVELOPMENT SITE SHALL BE DISCHARGED DIRECTLY INTO AN ADEQUATE OR MAN-MADE RECEIVING CHANNEL, PIPE OR STORM SEWER SYSTEM. FOR THOSE SITES WHERE RUNOFF IS DISCHARGED INTO A PIPE OR PIPE SYSTEM, DOWNSTREAM STABILITY ANALYSES AT THE OUTFALL OF THE PIPE OR PIPE SYSTEM SHALL BE PERFORMED. b. ADEQUACY OF ALL CHANNELS AND PIPES SHALL BE VERIFIED IN THE FOLLOWING MANNER: (1) THE APPLICANT SHALL DEMONSTRATE THAT THE TOTAL DRAINAGE AREA TO THE POINT OF ANALYSIS WITHIN THE CHANNEL IS ONE HUNDRED TIMES GREATER THAN THE CONTRIBUTING DRAINAGE AREA OF THE PROJECT IN QUESTION OR (2) (a) NATURAL CHANNELS SHALL BE ANALYZED BY THE USE OF THE TWO-YEAR STORM TO VERIFY THAT STORMWATER WILL NOT OVERTOP CHANNEL BANKS NOR CAUSE EROSION OF CHANNEL BED OR BANKS; AND (b) ALL PREVIOUSLY CONSTRUCTED MAN-MADE CHANNELS SHALL BE ANALYZED BY THE USE OF THE 10-YEAR STORM TO VERIFY THAT STORMWATER WILL NOT OVERTOP ITS BANKS AND BY THE USE OF A 2-YEAR STORM TO DEMONSTRATE THAT STORMWATER WILL NOT CAUSE EROSION OF CHANNEL BED OR BANKS; AND (c) PIPES AND STORM SEWER SYSTEMS SHALL BE ANALYZED BY THE USE OF A TEN-YEAR STORM TO VERIFY THAT STORMWATER WILL BE CONTAINED WITHIN THE PIPE SYSTEM c. IF EXISTING NATURAL RECEIVING CHANNELS OR PREVIOUSLY CONSTRUCTED MAN-MADE CHANNELS OR PIPES ARE NOT ADEQUATE, THE APPLICANT SHALL: (1) IMPROVE THE CHANNEL TO A CONDITION WHERE A 10-YEAR STORM WILL NOT OVERTOP THE BANKS AND A 2-YEAR STORM WILL NOT CAUSE EROSION TO THE CHANNEL BED OR BANKS; OR (2) IMPROVE THE PIPE OR PIPE SYSTEM TO A CONDITION WHERE THE 10-YEAR STORM IS CONTAINED WITHIN THE APPURTANCES; OR (3) DEVELOP A SITE DESIGN THAT WILL NOT CAUSE THE PRE-DEVELOPMENT PEAK RUNOFF RATE FROM A TWO-YEAR STORM TO INCREASE WHEN RUNOFF OUTFALLS INTO A NATURAL CHANNEL OR WILL NOT CAUSE THE PRE-DEVELOPMENT PEAK RUNOFF RATE FROM A 10-YEAR STORM TO INCREASE WHEN RUNOFF OUTFALLS INTO A MAN-MADE CHANNEL; OR (4) PROVIDE A COMBINATION OF CHANNEL IMPROVEMENT, STORMATER DETENTION OR OTHER MEASURES WHICH IS SATISFACTORY TO THE VESCP AUTHORITY TO PREVENT DOWNSTREAM EROSION. d. THE APPLICANT SHALL PROVIDE EVIDENCE OF PERMISSION TO MAKE THE IMPROVEMENTS e. ALL HYDROLOGIC ANALYSES SHALL BE BASED ON THE EXISTING WATERSHED CHARACTERISTICS AND THE ULTIMATE DEVELOPMENT CONDTION OF THE SUBJECT PROJECT. f. IF THE APPLICANT CHOOSES AN OPTION THAT INCLUDES STORMWATER DETENTION, HE SHALL OBTAIN APPROVAL FROM THE VESCP OF A PLAN FOR MAINTENANCE OF THE DETENTION FACILITIES. THE PLAN SHALL SET FORTH THE MAINTENANCE REQUIREMENTS OF THE FACILITY AND THE PERSON RESPONSIBLE FOR PERFORMING THE MAINTENANCE. g. OUTFALL FROM A DETENTION FACILITY SHALL BE DISCHARGED TO A RECEIVING CHANNEL, AND ENERGY DISSIPATORS SHALL BE PLACED AT THE OUTFALL OF ALL DETENTION FACILITIES AS NECESSARY TO PROVIDE A STABILIZED TRANSITION FROM THE FACILITY TO THE RECEIVING CHANNEL. h. ALL ON-SITE CHANNELS MUST BE VERIFIED TO BE ADEQUATE. i. INCREASED VOLUMES OF SHEET FLOWS THAT MAY CAUSE EROSION OR SEDIMENTATION ON ADJACENT PROPERTY SHALL BE DIVERTED TO A STABLE OUTLET, ADEQUATE CHANNEL, PIPE OR PIPE SYSTEM, OR TO A DETENTION FACILITY. j. IN APPLYING THESE STORMWATER MANAGEMENT CRITERIA, INDIVIDUAL LOTS OR PARCELS IN A RESIDENTIAL, COMMERCIAL OR INDUSTRIAL DEVELOPMENT SHALL NOT BE CONSIDERED TO BE SEPARATE DEVELOPMENT PROJECTS. INSTEAD, THE DEVELOPMENT, AS A WHOLE, SHALL BE CONSIDERED TO BE A SINGLE DEVELOPMENT PROJECT. HYDROLOGIC PARAMETERS THAT REFLECT THE ULTIMATE DEVELOPMENT CONDITION SHALL BE USED IN ALL ENGINEERING CALCULATIONS. k. ALL MEASURES USED TO PROTECT PROPERTIES AND WATERWAYS SHALL BE EMPLOYED IN A MANNER WHICH MINIMIZES IMPACTS ON THE PHYSICAL, CHEMICAL AND BIOLOGICAL INTEGRITY OF RIVERS, STREAMS AND OTHER WATERS OF THE STATE. l. ANY PLAN APPROVED PRIOR TO JULY 1, 2014, THAT PROVIDES FOR STORMWATER MANAGEMENT THAT ADDRESSES ANY FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS SHALL SATISFY THE FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS IF THE PRACTICES ARE DESIGNED TO (I) DETAIN THE WATER QUALITY VOLUME AND TO RELEASE IT OVER 48 HOURS; (II) DETAIN AND RELEASE OVER A 24-HOUR PERIOD THE EXPECTED RAINFALL RESULTING FROM THE ONE YEAR, 24-HOUR STORM; AND (III) REDUCE THE ALLOWABLE PEAK FLOW RATE RESULTING FROM THE 1.5, 2, AND 10-YEAR, 24-HOUR STORMS TO A LEVEL THAT IS LESS THAN OR EQUAL TO THE PEAK FLOW RATE FROM SITE ASSUMING IT WAS IN A GOOD FORESTED CONDITION, ACHIEVED THROUGH MULTIPLICATION OF THE FORESTED PEAK RATE BY A REDUCTION FACTOR THAT IS EQUAL TO THE RUNOFF VOLUME FROM THE SITE WHEN IT WAS IN A GOOD FORESTED CONDITION DIVIDED BY THE RUNOFF VOLUME FROM THE SITE IN ITS PROPOSED CONDITION, AND SHALL BE EXEMPT FROM ANY FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS AS DEFINED IN ANY REGULATIONS PROMULGATED PURSUANT TO 10.1-562 OR 10.1-570 OF THE ACT. FOR PLANS APPROVED ON AND AFTER JULY 1, 2014, THE FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS OF 10.1-561 A OF THE ACT AND THIS SUBSECTION SHALL BE SATISFIED BY COMPLIANCE WITH WATER QUANTITY REQUIREMENTS IN THE STORMWATER MANAGEMENT ACT (10.1-603.2 ET SEQ. OF THE CODE OF VIRGINIA) AND ATTENDANT REGULATIONS, UNLESS SUCH LAND-DISTURBING ACTIVITIES ARE IN ACCORDANCE WITH 4VAC50-60-48 OF THE VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSMP) PERMIT REGULATIONS. m. COMPLIANCE WITH THE WATER QUANTITY MINIMUM STANDARDS SET OUT IN 4VAC50-60-66 OF THE VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSMP) PERMIT REGULATIONS SHALL BE DEEMED TO SATISFY THE REQUIREMENTS OF MINIMUM STANDARD 19.	SEE SUPPLEMENTAL CALCULATIONS FOR FLOOD AND CHANNEL PROTECTION REQUIREMENTS FOR THE PROPOSED DEVELOPMENT.

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COMMONWEALTH OF VIRGINIA
CHRISTOPHER P. BURNS
Lic. No.047338
9/11/17
PROFESSIONAL ENGINEER

CAVERN MARKET
5721 FALLBROOKE DRIVE

ESC NOTES

CATAWBA DISTRICT
ROANOKE COUNTY, VIRGINIA

DRAWN BY CPB
DESIGNED BY CPB
CHECKED BY BTC
DATE 12/14/2016
SCALE N/A

REVISIONS:
2/22/2017
3/4/2017
3/20/2017
9/11/2017

APPROVED

SHEET NO.
C7

JOB NO. 04160069.00