GENERAL SITE NOTES:

1. A PORTION OF THIS SITE LIES WITHIN THE FEMA FLOOD ZONES X AND AE. COMMUNITY PANEL NUMBER 51161C0048D 0130 51770.

2. TOPOGRAPHIC INFORMATION FROM CITY OF ROANOKE PLANIMETRICS. THE BOUNDARY IS FROM A PLAT RECORDED IN MB.1 PG. 1058-1061.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS.

4. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION TO ELIMINATE THE POSSIBILITY OF ANY DISTURBANCE OR DAMAGE TO PUBLIC OR PRIVATELY OWNED UTILITIES, STRUCTURES, OTHER FACILITIES OR OBSTRUCTION RESULTING FROM HIS ACTIVITIES. TO THIS END, CONTRACTOR SHALL, AT NO ADDITIONAL COST TO THE OWNER, TAKE ALL MEASURES NECESSARY TO PROVIDE, AND SHALL BE SOLELY RESPONSIBLE FOR, TEMPORARY SUPPORT AND SHORING, ADEQUATE PROTECTION, AND MAINTENANCE OF CONTINUOUS OPERATION OF ALL UNDER AND ABOVE GROUND UTILITY SERVICES. THE CONTRACTOR SHALL CALL MISS UTILITY AT 1- 800- 552-7001 48 HOURS PRIOR TO DIGGING. ALL UTILITY TIE-INS ARE TO BE COORDINATED WITH THE APPROPRIATE PUBLIC OR PRIVATE UTILITY AUTHORITY BEFORE COMMENCING WORK ON EXISTING UTILITIES. THE CONTRACTOR SHALL SUPPLY ALL UTILITY COMPANIES WITH APPROVED PLAN COPIES FOR COORDINATION OF EXTENSION AND TIE-IN EFFORTS.

5. SITE CONDITIONS MAY NECESSITATE SLIGHT DEVIATIONS IN ALIGNMENT, GRADE, AND/OR LOCATION OF NEW FACILITIES FROM THE PLAN ALIGNMENT. THE CONTRACTOR SHALL CONSTRUCT THE NEW FACILITIES TO SUCH DEVIATIONS AS DIRECTED BY THE ENGINEER WITHOUT ADDITIONAL COST OR FINE TO THE OWNER. SHOULD PLAN DEVIATIONS BE REQUIRED, THE CONTRACTOR SHALL NOTIFY THE ENGINEER PRIOR TO UNDERTAKING ANY REVISION.

6. ALL CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE CURRENT BOCA AND/OR STATE AND LOCAL BUILDING CODES AS WELL AS THE CONSTRUCTION STANDARDS AND SPECIFICATIONS OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION.

7. THE CONTRACTOR SHALL MAINTAIN THE CONSTRUCTION AREA IN A SAFE AND ACCEPTABLE MANNER AND SHALL BE RESPONSIBLE FOR REMEDIATING ANY DAMAGES RESULTING FROM HIS FAILURE TO DO SO.

8. THE CONTRACTOR SHALL MAINTAIN LIMITS OF CONSTRUCTION WITHIN THE PROPERTY BOUNDARIES OR EASEMENTS AS INDICATED.

9. AN APPROVED SET OF PLANS SHALL BE KEPT ON THE SITE AT ALL TIMES.

10. ALL CONSTRUCTION DEBRIS SHALL BE CONTAINERIZED IN CONFORMANCE WITH THE VIRGINIA LITTER CONTROL ACT AND DISPOSED OF IN A MANNER AND LOCATION ACCEPTABLE TO THE GOVERNING JURISDICTION. AT LEAST ONE TRASH RECEPTACLE SHALL BE ONSITE DURING CONSTRUCTION.

11. TEMPORARY TOILETS SHALL BE PROVIDED ONSITE AT A RATIO OF ONE TOILET PER 30 WORKERS DURING THE CONSTRUCTION PERIOD.

12. GRADE STAKES SHALL BE SET FOR ROADWAY, CURB & GUTTER, CULVERTS, AND STORM SEWER.

13. THIS LOT IS SERVED BY WVWA SYSTEMS. A PERMIT MAY BE REQUIRED BY WVWA.

14. CONTRACTOR SHALL HAVE BENCHMARKS SET ONSITE BY A LICENSED LAND SURVEYOR PRIOR TO CONSTRUCTION.

15. ONSITE UTILITY LINES ARE PRIVATELY OWNED AND MAINTAINED.

16. THE EXISTING UTILITIES SHOWN HEREON ARE BASED UPON AVAILABLE RECORD INFORMATION. UTILITIES MAY EXIST WITHIN THE CONSTRUCTION AREA OF THESE PLANS THAT ARE NOT SHOWN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND DEPTH OF ALL UTILITIES BEFORE COMMENCING WORK, AND FOR ANY DAMAGES WHICH OCCUR BY HIS/HER FAILURE TO LOCATE SUCH UTILITIES. IF DURING CONSTRUCTION OPERATIONS THE CONTRACTOR SHOULD ENCOUNTER UTILITIES OTHER THAN THOSE SHOWN ON THESE PLANS, HE SHALL IMMEDIATELY NOTIFY THE ENGINEER AND TAKE NECESSARY AND PROPER STEPS TO PROTECT THE FACILITY AND ASSURE CONTINUANCE OF SERVICE. CALL MISS UTILITY AT 1-800-552-7001 (TOLL FREE) 48 HOURS BEFORE DIGGING.

CONSTRUCTION NOTES

1. SITE PREPARATION SHALL BE IN ACCORDANCE WITH THE CITY OF ROANOKE DESIGN.
2. SLOPES STEEPER THAN 3 TO 1 (HORIZONTAL TO VERTICAL) SHALL BE BENCHED OR STEPPED PRIOR TO PLACING FILL ON THEM.
3. ON-SITE FILL MATERIAL OR BORROW FILL MATERIAL MAY BE UTILIZED. FILL MATERIAL SOILS, IN GENERAL:
   A. SHALL BE COMPACTABLE
   B. SHALL BE WITHIN AN ACCEPTABLE RANGE OF MOISTURE CONTENT WHICH IS READILY CONTROLLED
   C. SHALL NOT BE HIGHLY SUSCEPTIBLE TO VOLUME CHANGE (SHRINKAGE OR SWELL) OR SETTLEMENT
4. FILL MATERIALS CONTAINING ROCKS LARGER THAN SIX (6) INCHES (15.2 CM) SHALL NOT BE USED. THE UPPERMOST TWO (2) FEET (61CM) SHALL NOT HAVE ANY ROCK LARGER THAN TWO (2) INCHES (5.1CM) IN DIAMETER.
5. 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.
6. 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.
7. 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 CITY OF ROANOKE WITH AS-BUILT PLANS AS A CONDITION OF ACCEPTANCE OF THE FACILITY BY THE CITY. 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. OWNER SHALL PROVIDE ALL REQUIRED TESTING. CONTRACTOR SHALL COORDINATE ALL TESTING WITH OWNER AND ENGINEER.
8. ALL DISTURBED AREAS SHALL BE COVERED WITH FOUR (4) INCHES OF TOPSOIL AND SEEDED.

GRADING NOTES:

1. THE GRADING CONTRACTOR SHALL OBTAIN ALL NECESSARY LAND DISTURBING PERMITS FROM THE CITY OF ROANOKE PRIOR TO COMMENCING GRADING OPERATIONS.

2. NO GEOTECHNICAL REPORT HAS BEEN PREPARED FOR THIS PROJECT. NO WARRANTIES ARE MADE BY THE OWNER OR ENGINEER FOR ANY SUBSURFACE CONDITIONS ON THE PROPERTY. IT IS NOT KNOWN IF THE OWNER WILL ENGAGE A GEOTECHNICAL ENGINEER FOR TESTING AND INSPECTION.

3. FILL SHALL BE PLACED ONLY ON FIRM SUBGRADES APPROVED BY THE GEOTECHNICIAL ENGINEER. SUBGRADES SHALL BE SCARIFIED TO A DEPTH OF 4 INCHES PRIOR TO FILL PLACEMENT TO ASSURE BONDING BETWEEN THE TWO SOILS. ALL EMBANKMENT FILL SHALL BE COMPACTED TO A MINIMUM OF 95% MAXIMUM DRY DENSITY (ASTM D698).
THE COMPACTION SHALL BE ACCOMPLISHED BY PLACING FILL IN 6 TO 8 INCH LIFTS AND MECHANICALLY COMPACTING EACH LIFT TO THE REQUIRED DENSITY. THE SOILS ENGINEER SHALL PERFORM FIELD DENSITY TEST ON EACH LIFT OR AS NECESSARY TO ASCERTAIN THAT ADEQUATE COMPACTION HAS BEEN ACHIEVED. CALIFORNIA BEARING RATIO TESTS SHALL BE PERFORMED IN MATERIAL PROPOSED FOR USE BENEATH PAVEMENT WHETHER CUT OR FILL.

4. CLEAR SITE WITHIN LIMITS OF DISTURBANCE OR TO THE PROPERTY LINE.

5. REMOVE TREES, SHRUBS, GRASS AND OTHER VEGETATION, IMPROVEMENTS OR OBSTRUCTIONS AS REQUIRED TO PERMIT INSTALLATION OF NEW CONSTRUCTION. ALL UNSUITABLE MATERIAL SHALL BE DISPOSED OF IN A MANNER AND LOCATION ACCEPTABLE TO THE GOVERNING AUTHORITY. REMOVE TREES AND OTHER VEGETATION, INCLUDING STUMPS AND ROOTS, COMPLETELY IN AREAS REQUIRED FOR SUBSEQUENT SEEDING. REMOVE TREES AND STUMPS IN AREAS TO RECEIVE FILL.

6. BARRICADE OPEN EXCAVATIONS OCCURRING AS PART OF THIS WORK AND OPERATE WARNING LIGHTS AS RECOMMENDED BY AUTHORITIES HAVING JURISDICTION.

7. CUT SURFACE UNDER PAVEMENTS TO COMPLY WITH CROSS SECTIONS, ELEVATIONS, AND GRADES AS INDICATED.

8. EXCAVATE TRENCHES TO UNIFORM WIDTH CONFORMING TO VDOT STANDARD PB-1 FOR STORM DRAINAGE PIPING AND UB-1 FOR SANITARY SEWER AND WATER. BACKFILL TRENCHES WITH CONTROLLED FILL.

9. PREVENT SURFACE WATER AND SUBSURFACE OR GROUND WATER FROM FLOWING INTO EXCAVATIONS AND FROM FLOODING PROJECT SITE AND SURROUNDING AREA. DO NOT ALLOW WATER TO ACCUMULATE IN EXCAVATIONS. REMOVE WATER TO PREVENT SOFTENING OF FOUNDATION BOTTOMS, UNDERCUTTING FOOTINGS, AND SOIL CHANGES DETRIMENTAL TO STABILITY OF SUBGRADES AND FOUNDATIONS. CONVEY WATER REMOVED FROM EXCAVATIONS AND RAIN WATER TO COLLECTING OR RUNOFF AREAS. ESTABLISH AND MAINTAIN TEMPORARY DRAINAGE DITCHES AND OTHER DIVERSIONS OUTSIDE EXCAVATION LIMITS FOR EACH STRUCTURE. DO NOT USE TRENCH EXCAVATIONS AS TEMPORARY DITCHES.

10. PROTECT EXCAVATED BOTTOMS OF ALL FOOTINGS AND TRENCHES AGAINST FREEZING WHEN THE TEMPERATURE IS LESS THAN 35° F (1° C).

11. UNIFORMLY GRADE AREAS WITHIN LIMITS OF GRADING INCLUDING ADJACENT TRANSITION AREAS. SMOOTH FINISHED SURFACES WITHIN SPECIFIED TOLERANCES, COMPACT WITH UNIFORM LEVELS OR SLOPES BETWEEN POINTS WHERE ELEVATIONS ARE SHOWN, OR BETWEEN SUCH POINTS AND EXISTING GRADES. GRADE AREAS ADJACENT TO BUILDING LINES TO DRAIN AWAY FROM STRUCTURES AND TO PREVENT PONDING.

12. FINISH LAWN AREAS TO WITHIN ONE INCH ABOVE OR BELOW REQUIRED SUBGRADE ELEVATIONS. SHAPE SURFACE UNDER WALKS AND PAVEMENTS TO LINE, GRADE, AND CROSS SECTION, WITH NOT MORE THAN 1/2" ABOVE OR BELOW REQUIRED SUBGRADE ELEVATION.

13. PROTECT GRADED AREAS FROM TRAFFIC AND EROSION. REPAIR AREAS WHICH HAVE SETTLED, ERODED, OR BECOME DAMAGED DUE TO CONSTRUCTION ACTIVITIES AT NO ADDITIONAL COST TO OWNER.

14. UNDER SIDEWALKS, AND PAVEMENTS COMPACT EACH LAYER TO 95% MAXIMUM DRY DENSITY ASTM D698 (STANDARD PROCTOR).

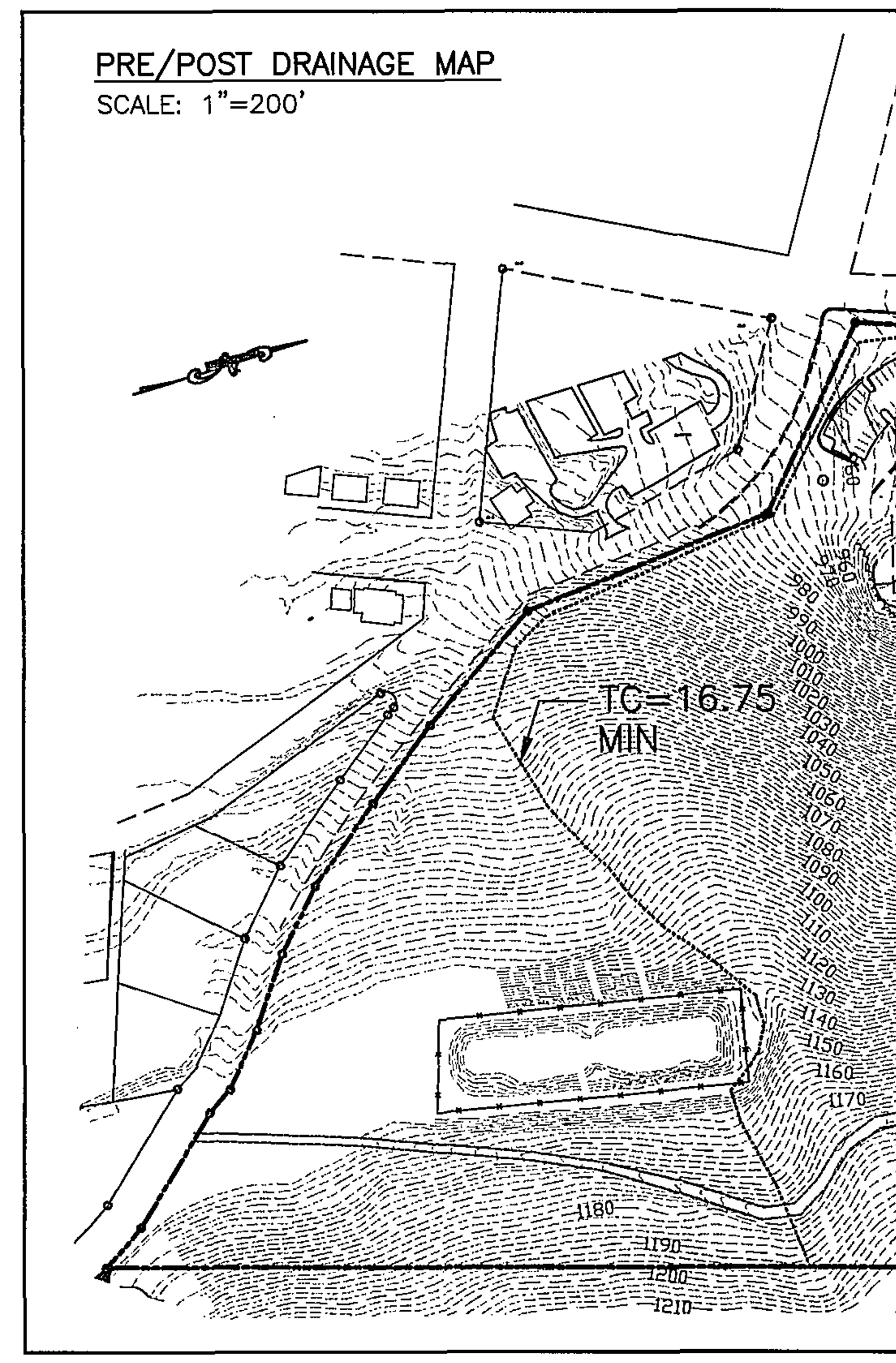
15. UNDER LAWN OR UNPAVED AREAS, COMPACT SUBGRADE AND EACH LAYER TO 85% MAXIMUM DRY DENSITY (STANDARD PROCTOR).

16. ALL SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE CAPPED AND PIPED TO THE NEAREST STORM SEWER SYSTEM OR NATURAL WATERCOURSE. THE PIPE SHALL BE A MINIMUM OF 6" DIAMETER AND CONFORM TO V.D.O.T. STANDARD SB-1.

17. ALL ONSITE SURPLUS EXCAVATION, TOPSOIL AND ROOT MATTING SHALL BE DISPOSED OF IN A MANNER AND LOCATION ACCEPTABLE TO THE CITY OF ROANOKE.

18. ADHERE TO THE STANDARDS IN THE CITY OF ROANOKE ROCK EXCAVATION AND RESTORATION STANDARDS FOR ALL WORK IN THE RIGHTS-OF-WAYS. CITY OF ROANOKE ENGINEERING 540-853-2953.

PRE/POST DRAINAGE MAP
SCALE: 1"=200'



HYDROLOGY WORKSHEET

$C_{impervious}$ = 0.90
$C_{pervious}$ = 0.45
C_{soil} = 0.30
C_{woods} = 0.25
I_2 = 3.22
I_5 = 3.95
I_{10} = 4.50 [Based on Tc = 16.75 Roanoke City]

Structure	$A_{impervious}$	$A_{pervious}$	A_{woods}	A_{soil}	A_{total}	$C_{weighted}$	Q_2	Q_{10}
pre	1.76	3.77	21.60	0.60	27.73	0.32	35.00	39.87
POST	1.86	3.67	21.60	0.60	27.73	0.32	35.18	40.07

TIME OF CONCENTRATION SUMMARY

OVERLAND FLOW TIME
LENGTH = 200.00'
C VALUE=0.35
PERCENT OF SLOPE = 10%
CONCENTRATION TIME IN MINUTES=10.75

TRAVEL TIME FOR CHANNEL FLOW
HEIGHT OF MOST REMOTE POINT ABPVE OUTLET=255.00'
LENGTH OF TRAVEL=1800.00'
TIME OF CONCENTRATION =6.00 MINUTES

TOTAL TIME OF CONCENTRATION = 16.75 MINUTES

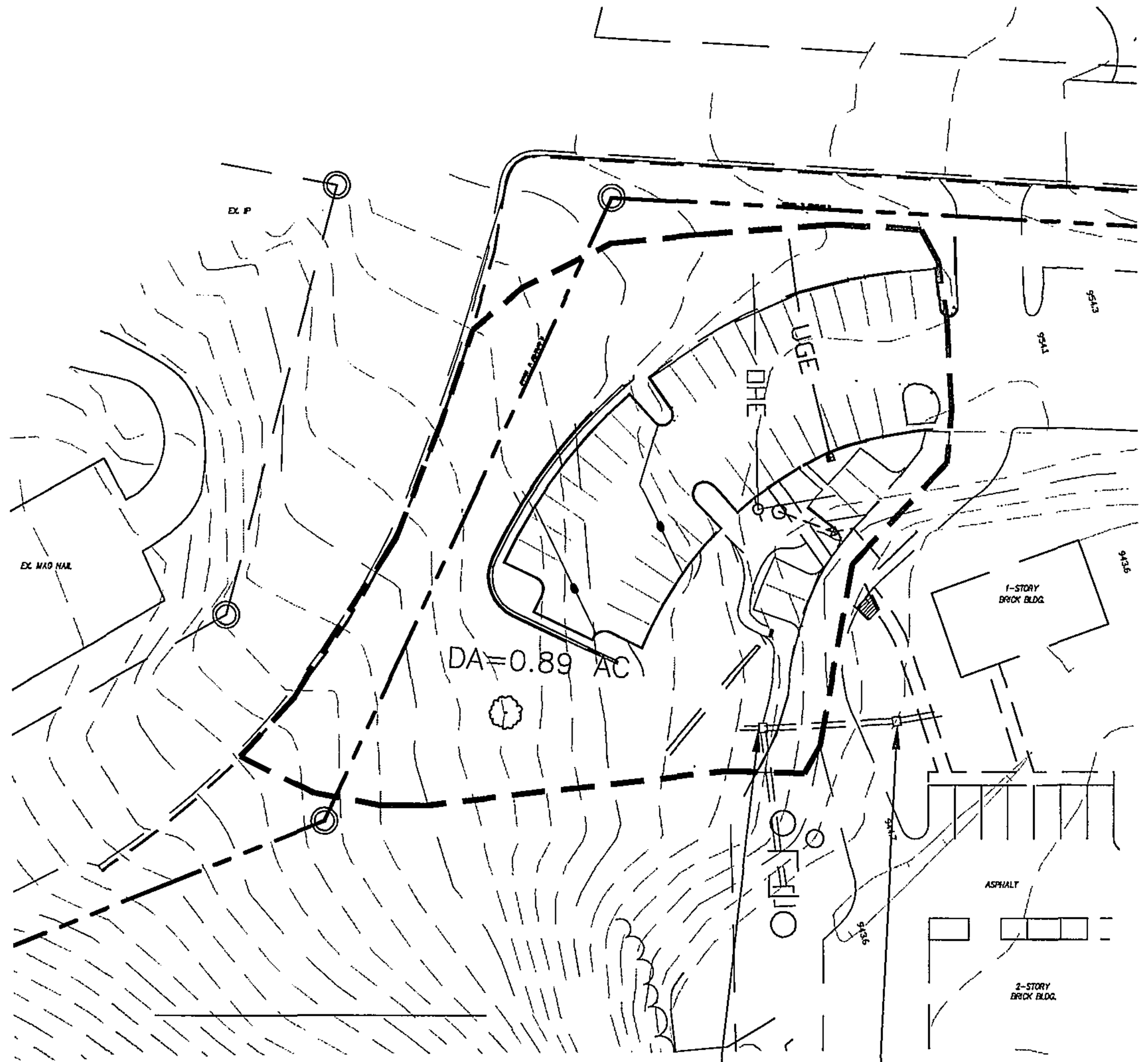
RAINFALL INTENSITIES

2 YR= 3.22 IN/HR
5 YR= 3.95 IN/HR
10 YR = 4.5 IN/HR
25 YR = 5.2 IN/HR

$C_{impervious}$ = 0.90
$C_{pervious}$ = 0.45
I_2 = 5.20
I_{10} = 6.80 [Based on Tc = 5.0 Roanoke City]

Structure	$A_{impervious}$	$A_{pervious}$	A_{total}	$C_{weighted}$	Q_2	Q_{10}
Ex DI pre	0.19	0.70	0.89	0.55	2.53	3.30
Ex DI Post	0.31	0.58	0.89	0.61	2.81	3.67

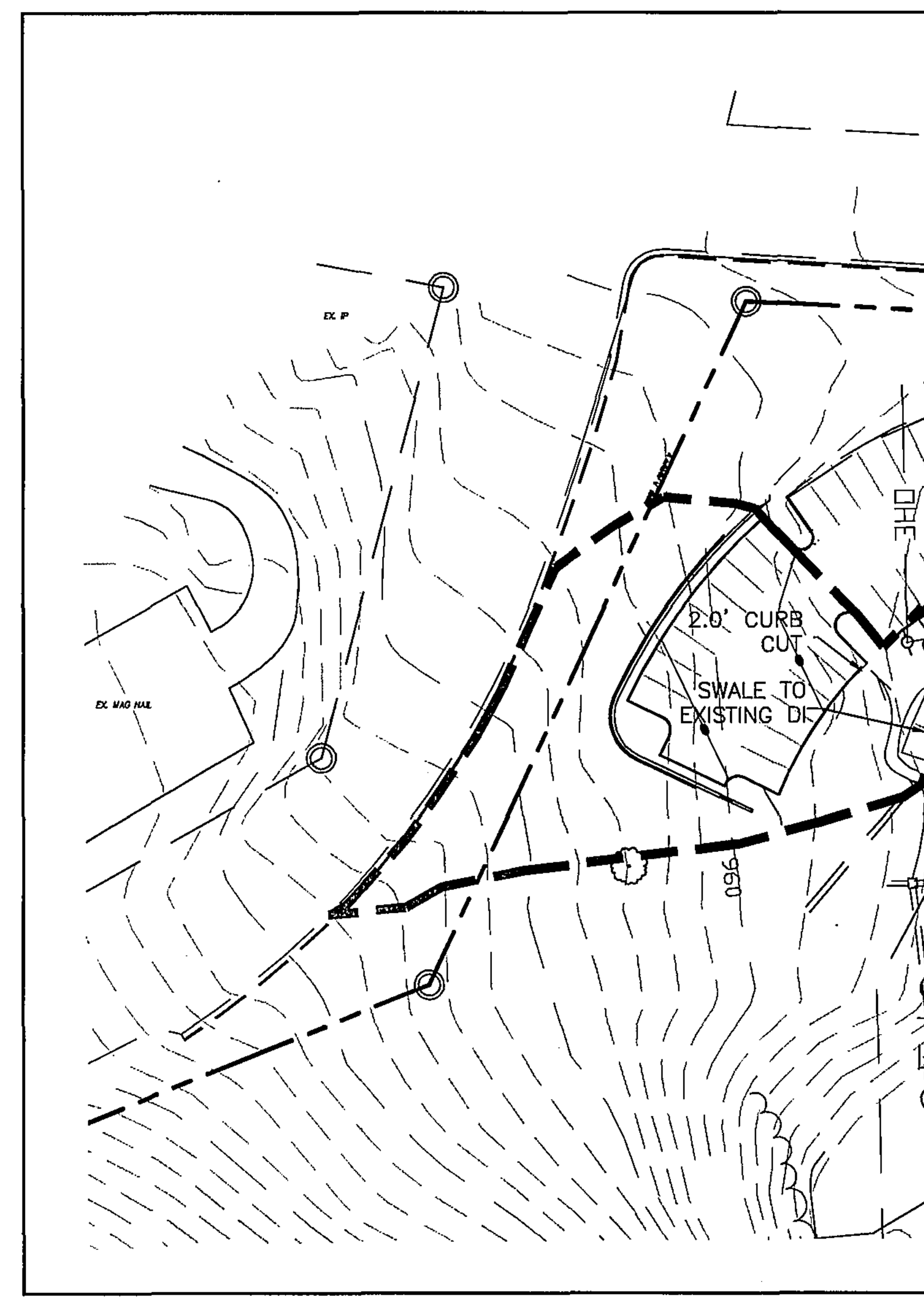
Project Description		Project Description	
Worksheet	EX24" RCP	Worksheet	EX24" RCP 10 YEAR
Flow Element	Circular Channel	Flow Element	Circular Channel
Method	Manning's Formula	Method	Manning's Formula
Solve For	Channel Depth	Solve For	Channel Depth
Input Data		**Input Data**	
Mannings Coefficient	0.013	Mannings Coefficient	0.013
Channel Slope	0.0097 ft/ft	Channel Slope	0.00971 ft/ft
Diameter	11.1 in	Diameter	24 in
Discharge	2.82 cfs	Discharge	3.69 cfs
Results		**Results**	
Depth	0.76 ft	Depth	0.55 ft
Flow Area	0.6 ft²	Flow Area	0.7 ft²
Wetted Perimeter	2.09 ft	Wetted Perimeter	2.21 ft
Top Width	0 ft	Top Width	0 ft
Critical Depth	0.73 ft	Critical Depth	0.67 ft
Percent Full	82 %	Percent Full	27.5 %
Critical Slope	0.010271 ft/ft	Critical Slope	0.004472 ft/ft
Velocity	4.82 ft/s	Velocity	5.25 ft/s
Velocity Head	0.36 ft	Velocity Head	0.43 ft
Specific Energy	1.12 ft	Specific Energy	0.98 ft
Froude Number	0.94	Froude Number	1.48
Maximum Discharge	3.03 cfs	Maximum Discharge	23.98 cfs
Discharge Full	2.82 cfs	Discharge Full	22.29 cfs
Slope Full	0.0097 ft/ft	Slope Full	0.000266 ft/ft
Flow Type	Subcritical	Flow Type	Supercritical



DRAINAGE MAP FOR EXISTING DROP INLET
SCALE: 1"=50'

EXISTING GRATE INLET
TOP=945.8
INV IN 18" HDPE = 935.1
INV IN 24' RCP = 932.2
INV OUT 24" RCP = 933.00

EXISTING GRATE INLET
TOP=945.6
INV IN 24" RCP = 932.5
INV OUT 24" RCP = 932.4



$C_{impervious}$ = 0.90
$C_{pervious}$ = 0.35
I_2 = 5.20
I_{10} = 6.80 [Based on Tc = 5 min.]

Structure	$A_{impervious}$	$A_{pervious}$	A_{total}	$C_{weighted}$	Q_2	Q_{10}
scc	0.10	0.28	0.38	0.49	0.98	1.28

Project Description		Project Description	
Worksheet	Stormwater Conveyance Channel	Worksheet	Stormwater Conveyance Channel
Flow Element	Triangular Channel	Flow Element	Triangular Channel
Method	Manning's Formula	Method	Manning's Formula
Solve For	Channel Depth	Solve For	Channel Depth
Input Data		**Input Data**	
Mannings Coefficient	0.03	Mannings Coefficient	0.03
Channel Slope	0.09 ft/ft	Channel Slope	0.09 ft/ft
Left Side Slope	3 H : V	Left Side Slope	3 H : V
Right Side Slope	3 H : V	Right Side Slope	3 H : V
Discharge	0.97 cfs	Discharge	1.27 cfs
Results		**Results**	
Depth	0.29 ft	Depth	0.32 ft
Flow Area	0.2 ft²	Flow Area	0.3 ft²
Wetted Perimeter	1.81 ft	Wetted Perimeter	2.01 ft
Top Width	1.72 ft	Top Width	1.91 ft
Critical Depth	0.37 ft	Critical Depth	0.41 ft
Critical Slope	0.02482 ft/ft	Critical Slope	0.023954 ft/ft
Velocity	3.93 ft/s	Velocity	4.2 ft/s
Velocity Head	0.24 ft	Velocity Head	0.27 ft
Specific Energy	0.53 ft	Specific Energy	0.59 ft
Froude Number	1.83	Froude Number	1.86
Flow Type	Supercritical	Flow Type	Supercritical

WVWA ID# 6L6GUJ

ENGINEERING CONCEPTS, INC.
3433 BRAMBLETON AVENUE, SUITE 200B
ROANOKE, VIRGINIA 24018
540.776.5715 FAX: 540.776.8543

COMMONWEALTH OF VIRGINIA
JACK DURRELL ELLINWOOD
No. 001107
LANDSCAPE ARCHITECT
6/29/05

No.	Revision	By	Appd.	Date
1	REV PER CITY COMMENTS 7/5/05	DRB	JDE	8/1/05

Drawn	DRB
Designed	JDE
Checked	JDE
Approved	JDE

WESTERN VIRGINIA WATER AUTHORITY
PARKING LOT EXPANSION

NOTES AND CALCULATIONS
ROANOKE, VIRGINIA

AS SHOWN
JUNE 29, 2005
PROJECT: 05052

2