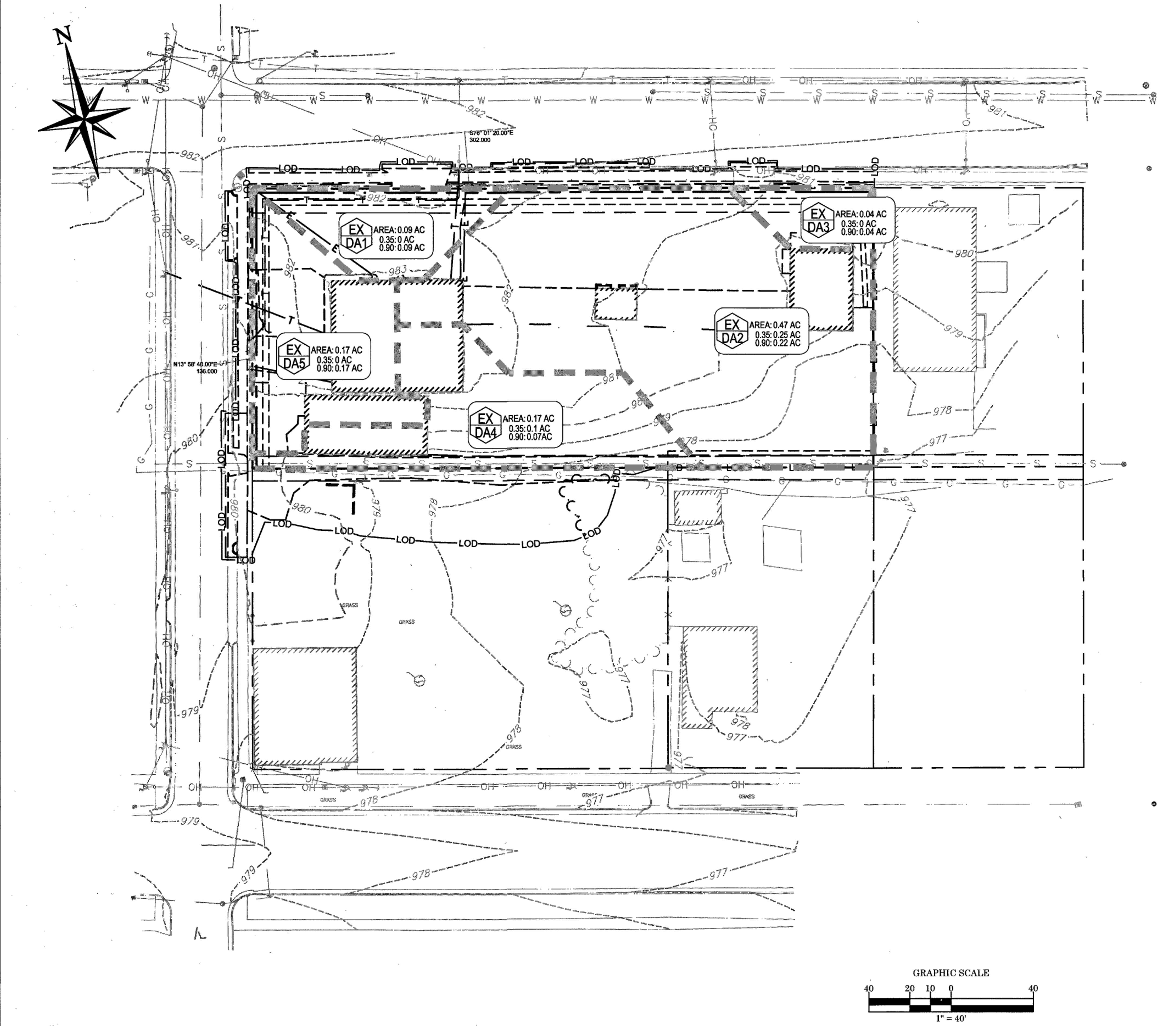

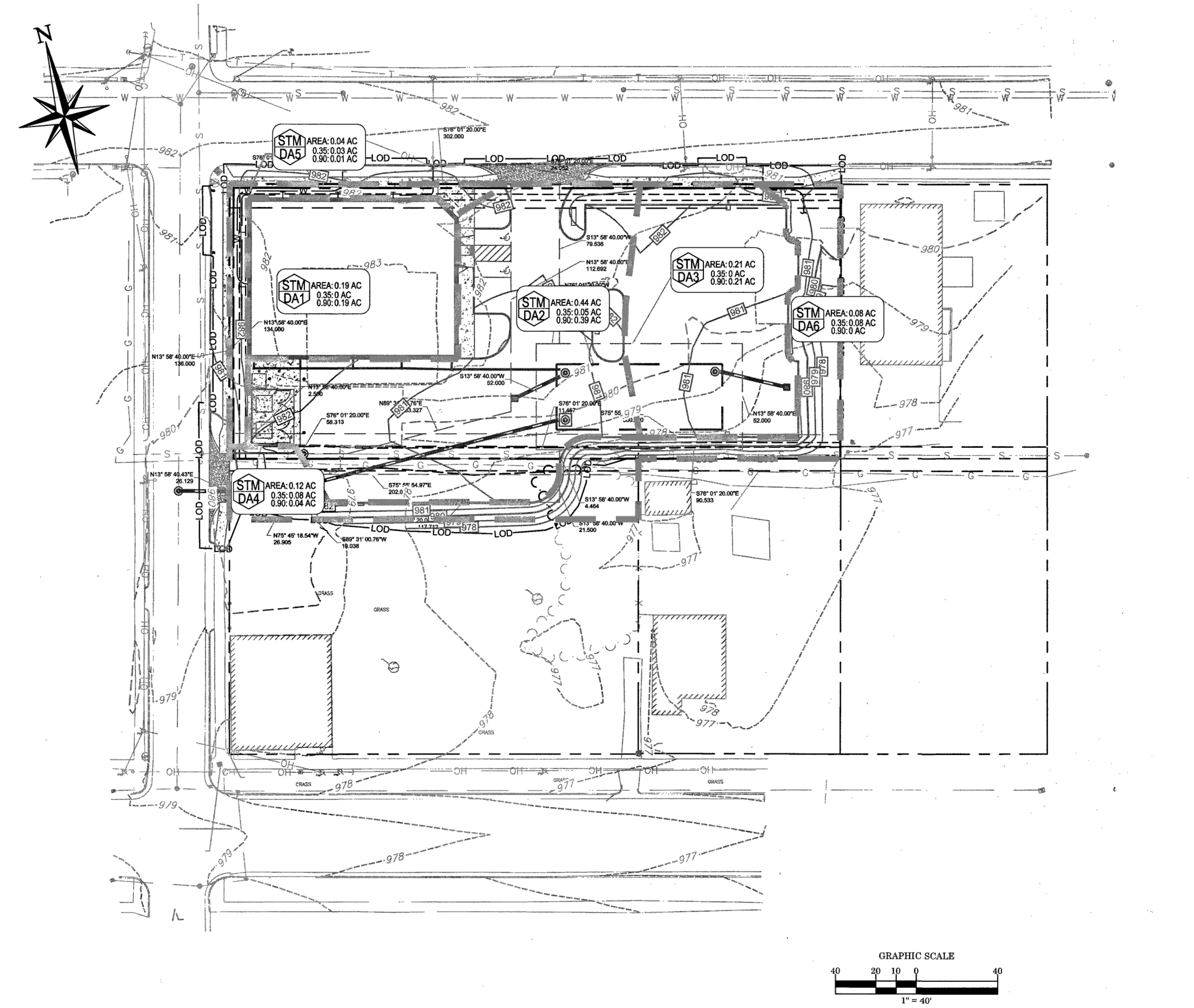

I. INTRODUCTION & PROJECT DESCRIPTION

The purpose of this report is to explain how the proposed development will satisfy the City of Roanoke stormwater management requirements. This Stormwater Management Report was prepared in accordance with City of Roanoke Stomwater Ordinance 11.6-300 and the quality requirements are determined by the Virginia State Code 9VAC25-870-66 Water Quantity. The project consists of constructing an approximate 8,320 SF retail building with associated site improvements that will drain to and be treated by an on-site underground infiltration basin.

The existing project site is comprised of two (2) parcels with parcel one (1) as the primary location of work totaling approximately 0.94 acres. Working being done on the second parcel is only for a shared access driveway parcel two (2) approximately 0.14 acres. Parcel one (1) contains existing vacant buildings with paved and gravel parking areas, with the remainder of the site as grass and soil. No stormwater management facilities exist onsite. The site is bordered to the east by an existing building; to the north by Orange Avenue NW (City Street); to the west by 17th Street NW; and to the south by parcel two (2) an existing vacant commercial building and a two story residential house.

The existing grade divides the site into five (5) drainage areas as shown on the Pre Development Drainage Area Map in Appendix A. Drainage Area 1 is 0.09 acres and drains uncontrolled to the north into Orange Avenue NW. Drainage Area 2 is the majority of the site with an area of 0.49 acres and drains uncontrolled to a dense group of trees to the southeast. Drainage Area 3 is 0.04 acres and drains uncontrolled to the north into Orange Avenue NW. Drainage Area 4 is 0.17 acres and drains uncontrolled to the south. Drainage Area 5 is 0.17 acres and drains uncontrolled into 17th Street NW.

The post-development site condition will include an approximate 8,320 SF retail building, 33 parking spaces, landscaping, utilities and an underground infiltration basin for quality and quantity control. The area of proposed earth disturbance will be approximately 1.20 acres.

The project is considered a Redevelopment according to the City of Roanoke.

II. CRITERIA AND METHODOLGY

The design was created to meet and exceed the requirements of the City of Roanoke stormwater ordinance. Utilizing the Virginia, Runoff Reduction Method, Virginia BMP clearing house specifications and the Virginia state code.

The report below used the Virginia Runoff Reduction Method spreadsheet along with Storm CAD, Hydroflow and Hydroflow Express to calculate the existing flows leaving the site, the storage needed for the basin and the HGL's within the pipe system.

III. REFERENCES

All hydrological data used for the proposed storms was taken from the city of Roanoke Stormwater Management Design Manual. Revised July 1, 2014 Appendix 5C

All Topographic and pipe invert information was taken from the survey performed by US Surveyors Dated 06-20-14

IV. ASSUMPTIONS

There are no assumptions taken with the creation of this report, all calculations and information provided meets standard engineering practices.

ANALYSIS

Vi. WATER QUALITY REQUIREMENTS

The stormwater quality management design requirements for the management of stormwater quality design are based on the Virginia Runoff Reduction Method in a redevelopment condition.

The water quality requirements are:

- 20% Reduction of phosphorus below the Pre-Redevleopment Load

The existing phosphorus load according to the Runoff Reduction Spreadsheet updated June 2014, is 1.45 lb. The required phosphorus reduction is 0.31 lb.

Vii. STORMWATER QUALITY CALCULATIONS

The proposed development will encompass the entire 0.94 acre site and roughly 0.14 acres of the adjacent site to the south with the construction of a shared access driveway. The existing buildings and paved areas to be removed and replaced with a Family Dollar retail building and new parking area. The site will be graded so that 0.84 acres of the water from the impervious areas and roof of the proposed building and grass area will drain into an underground infiltration basin along the southern drive isle of the parking area. The stormwater facility is designed to infiltrate the 10-Year 24-hour storm by using Stormtech underground chambers and a 40% void stone bed.

The infiltration test results prepared by Terracon. Dated March 24, 2015, are provided in Appendix G, including results from the tests conducted from four (4) infiltration samples along the southern parking area drive aisle. Three (3) of the four (4) results were averaged together to calculate an infiltration rate of 0.65 in/hr. For design purposes a safety factor of two (2) was used for the design calculations; therefore, the design infiltration rate used is 0.33 in/hr. The fourth infiltration test was removed from the calculations due to its low infiltration rate and the Infiltration basin is not proposed in the location of this test.

The basin design is considered an offline design with the two forms of pre treatment being handled by the Flexstorm Pure insert for each inlet and the isolation rows within the basin itself that are wrapped in filter fabric and hold the first flush from the site (2 year storm). The isolation rows are separated from the rest of the basin by a weir inside the inflow manholes on both sides of the basin.

Required quality volume calculation:

Please see the Runoff Reduction Spreadsheet in Appendix D for detailed calculations. The Total Load Reduction Required is 0.31 lbs which is approximately a treatment volume of 3,115 cf.

Using the Runoff Reduction Spreadsheet and the Virginia BMP Clearinghouse an underground infiltration basin was selected to meet the required phosphorus removal.

According to the Virginia BMP Clearinghouse an infiltration basin #1 spec #8 has a removal rate of 25%.

The proposed method of infiltration is through an underground basin designed in accordance with the Virginia BMP Clearinghouse. Stormwater will drain into the basin through a pipe system collecting water in the parking area through grate inlets and from the building via roof drains. This pipe system will drain into the underground infiltration basin under the drive aisle of the southern parking spaces. For basin sizing and detail please see the Stormtech Chamber details in Appendix E.

The Stormtech chamber system provides 3,415 cf of storage.

Total storage provided for quality control in the underground infiltration basin exceeds the required amount of storage = 3,415 cf > 3,115 cf.

Viii. DEWATERING / ADEQUATE OUTFALL

Virginia BMP Clearinghouse requires that the infiltration basin empties within 48 hours of filling. The basin has been designed to hold up to the 10 year storm. The elevation of the weir to the bottom of the basin is 1.11 ft. The infiltration basin is calculated to fully infiltrate in 40 hours

1.11 ft * 12 in / 0.33 in/hr = 40 hours < 48 hours

The proposed condition infiltrates the 10 year storm over all the proposed impervious surface and infiltrates that volume within the 48 hour requirement; therefore, the basin is compliant with the Virginia BMP Clearinghouse regulations. Due to there not being any flow leaving the basin for the 10 year storm an adequate outfall analysis of the existing storm system is not required.

The 1.11 ft height of the outfall control structure weir was generated through the use of the stormwater modeling software Hydroflow. Based on the drainage areas (shown on the drainage area maps) and the C factors along with the IDF curve data for the 10 year 24 hour storm event the amount of water that is collected inside the underground basin reaches a height of 1.11 ft. The 1.11 ft storage is also able to be infiltrated within the 48 hour dewatering requirement. The infiltration of the entire 10 year 24 hour storm was chosen to reduce any potential negative impact of the proposed site on the existing drainage system.

Viv. STORMWATER QUANTITY CONTROL REQUIREMENT

The City of Roanoke refers to Section 9VAC25-870-66 of the Virginia State Code for the stormwater control requirements. The following stormwater quantity controls are required:

- Channel Protection:
  - Manmade stormwater conveyance systems. When stormwater from a development is discharged to a manmade stormwater conveyance system following the land-disturbing activity.
  - The manmade stormwater conveyance system shall convey the post development peak flow rate from the two-year 24-hour storm event without causing erosion of the system. Detention of stormwater or downstream improvements may be incorporated into the approved land-disturbing activity to meet this criterion, at the discretion of the VSMP authority.
- Flood Protection:
  - Concentrated stormwater flow to stormwater conveyance systems that currently do not experience localized flooding during the 10-year 24-hour storm event: The point of discharge releases stormwater into a stormwater conveyance system that, following the land-disturbing activity, confines the post development peak flow rate from the 10-year 24-hour storm event within the stormwater conveyance system. Detention of stormwater or downstream improvements may be incorporated into the approved land-disturbing activity to meet this criterion, at the discretion of the VSMP authority.

VivA. PRE-DEVELOPMENT CONDITIONS

The five (5) individual existing drainage areas with the existing surface C-factors was placed into Hydroflow to determine the existing site release rate using the Rational Method. (Calculations sheets in Appendix A):

Rainfall amounts taken from the City of Roanoke stormwater design manual.

2 YR Pre	–	3.11 CFS
5 YR Pre	–	3.78 CFS
10 YR Pre	–	4.28 CFS
25 YR Pre	–	4.80 CFS
50 YR Pre	–	5.22 CFS
100 YR Pre	–	5.72 CFS

VivB. POST-DEVELOPMENT CONDITIONS

The post development area draining to the infiltration basin then through a storm pipe into the 17th Street NW storm system is 0.84 acres the proposed stormwater runoff to 17th Street NW was calculated by routing the proposed storm through the infiltration basin using the Rational Method and Hydroflow (calculations sheets in Appendix B):

Infiltration Basin Release

2 YR Post	–	0.00 CFS
5 YR Post	–	0.00 CFS
10 YR Post	–	0.00 CFS
25 YR Post	–	0.05 CFS
50 YR Post	–	0.14 CFS
100 YR Post	–	0.28 CFS

Total Site Release

2 YR Post	–	0.45 CFS
5 YR Post	–	0.55 CFS
10 YR Post	–	0.62 CFS
25 YR Post	–	0.70 CFS
50 YR Post	–	0.76 CFS
100 YR Post	–	0.83 CFS

VI. SUMMARY AND CONCLUSION

Through the use of an underground infiltration basin, the site is able to infiltrate 3,415 cf of water within 40 hours which is larger and faster than the 3,115 cf and 48 hours required, respectively by the Virginia BMP Clearinghouse. The resultant flows leaving the project site are also less than the State of Virginia Code 9VAC25-870-66 requirements

2 YR Pre	–	3.11 CFS	>	2 YR Post	–	0.45 CFS
5 YR Pre	–	3.78 CFS	>	5 YR Post	–	0.55 CFS
10 YR Pre	–	4.28 CFS	>	10 YR Post	–	0.62 CFS
25 YR Pre	–	4.80 CFS	>	25 YR Post	–	0.70 CFS
50 YR Pre	–	5.22 CFS	>	50 YR Post	–	0.76 CFS
100 YR Pre	–	5.72 CFS	>	100 YR Post	–	0.83 CFS

Based on the above, the site meets all City of Roanoke criteria for Stormwater Management.

APPROVED
NOV 10 2015

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Ambler, PA 19002
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Fax (215) 809-2124
Abodenschatz@core-eng.com

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Know what's below. Call before you dig.

THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON DESIGN DRAWINGS, RECORDS OF THE VARIOUS UTILITY COMPANIES, AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. CORE STATES, INC DOES NOT GUARANTEE THAT LOCATIONS SHOWN ARE EXACT. THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANIES AT LEAST 72 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF UTILITIES.

REVISIONS

REV	DATE	COMMENT	BY
1	06-01-15	PER CITY COMMENTS	MV
2	07-15-15	PER CITY COMMENTS	DP/MV

DOCUMENT
COMPREHENSIVE DEVELOPMENT PLAN
CP150014

PROJECT
FAMILY DOLLAR IN ROANOKE, VA

CLIENT
BOOS DEVELOPMENT GROUP
FAMILY DOLLAR

SITE LOCATION
1626 ORANGE AVENUE NW
ROANOKE, VA 24017

ENGINEER SEAL
COMMONWEALTH OF VIRGINIA
AARON BODENSCHATZ
Lic. No. 041362
PROFESSIONAL ENGINEER

SHEET TITLE
DRAINAGE AREA MAP & STORMWATER NARRATIVES

JOB #:	FAM-16430
DATE:	04-10-15
SCALE:	1" = 40'
DRAWN BY:	KF
CHECKED BY:	AB

SHEET NO.
C9