402 CLAY STREET

PLANNED RESIDENTIAL DISTRICT REZONING

Located in:

Town of Blacksburg, Virginia

Prepared For:

Fort Worth Holdings, Inc.
3899 Maple Ave., Suite 300
Dallas, TX 75219

Project Number: 2803.0

Date: March 1, 2018
Revised: April 1, 2018

25 YEARS GAY AND NEEL, INC.
ENGINEERING LAND PLANNING SURVEYING
1260 Radford Street • Christiansburg, Virginia 24073
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Planned Residential District Rezoning for 402 Clay Street

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APPLICATION

OFFICE USE ONLY DATE RECEIVED_____ RZN NUMBER_____
PRESUBMITTAL MEETING DATE_____

TOWN OF BLACKSBURG
CHANGE OF ZONING CLASSIFICATION APPLICATION (REZONE)

This application and all accompanying information must be submitted in full before the Rezoning Request can be accepted by Town staff. Once the Planning and Building Department accepts the application, it will be referred to the Planning Commission and Town Council for consideration. The application and all accompanying information will become conditions of approval. Proffered conditions of approval are binding. Please contact the Planning and Building Department at (540) 961-1126 for application deadline or questions, or to schedule the **required** pre-submittal meeting.

The following items **MUST** accompany this application for the Town of Blacksburg to accept this application for processing and review. Any items submitted cannot be larger than 11x17 in size:

1) Written, signed consent of the property owner. If the applicant is the contract purchaser, the written consent of the property owner is required
2) One copy of a site plan with surveyed boundaries for the property showing the lot, existing and proposed structures, site improvements, parking areas and spaces, and any other information necessary to determine the ability to meet the Zoning Ordinance site development standards, Use & Design standards and physical compatibility with the neighborhood
3) Building elevations for all proposed buildings -or- elevations showing any changes to existing buildings
4) Vicinity map (may be included on the site plan) showing surrounding uses, zoning districts, buildings and other improvements within 300' of the property
5) Legal description of the property
6) Completed VDOT 527 (Traffic Impact Analysis) Form
7) A list of adjacent property owners (including properties across a street) and their addresses, plus the cost of CERTIFIED FIRST CLASS postage for notifying each adjacent property owner (no stamps, please)
8) Fee of $100 for the Town of Blacksburg to post all public hearing signs. **Please note**: The applicant may choose to post the property, using signs provided by Town Staff, and not be subject to the posting fee
9) Fee of $1500 for Rezoning, or $2000 for Planned Residential Rezoning, or $1000 for amendment to existing Planned Residential District. Please make your check or money order payable to the TOWN OF BLACKSBURG
10) Proof of pre-submittal meeting between Town staff and applicant/agent
11) Prior to the initiation of an application for Rezoning, or prior to the issuance of final approval, the applicant shall produce satisfactory evidence that any delinquent real estate taxes owed, which have been properly assessed against the subject property, have been paid (§ 1150)
12) Any applicant for a Rezoning shall make complete disclosure of the equitable ownership of the real estate to be affected including, in the case of corporate ownership, the names of stockholders, officers and directors, and in any case the names and addresses of all of the real parties of interest. The requirement of listing names of stockholders shall not apply to a corporation whose stock is traded on a national or local stock exchange, and which corporation has more than 500 shareholders (§ 1110)
13) Proffer statements that meet the requirements as stated below
14) Digital copies (PDF) of all application materials are required at the time of submittal, or within 10 working days of the submittal date.

SIGNATURE OF APPLICANT/CONTACT PERSON + PRINTED NAME:

Levi A. Wild **DATE:** 2-28-18

By signing this application, I affirm that this application is complete and all required items are included

SIGNATURE OF PROPERTY OWNER + PRINTED NAME:

LAWMAC, LLC
By: Keith W. Kennedy Manager **DATE:** 2/28/18

By signing this application, I affirm that this application is complete and all required items are included

REVISED 04-10-14 KJO

OFFICE USE ONLY DATE RECEIVED_____ RZN NUMBER_____
PRESUBMITTAL MEETING DATE_____

Location or Address of Property for Rezoning:
402 Clay Street SE, Blacksburg, VA 24060

Tax Parcel Number(s): 020133

Acreage: 1.700

Present Zoning District: R-5

Proposed Zoning District: PRD

Present Use of Property: Vacant

Proposed Use of Property: Multi-Family Dwelling (Age Restricted)

Is this request for an amendment to an existing Conditional Zoning or Planned Residential District? No

Previous Rezoning Ordinance Number N/A

APPLICANT/MAIN CONTACT PERSON (Contract Purchaser if applicable)

NAME: Levi Wild, Fort Worth Holdings Inc.

ADDRESS: 3899 Maple Avenue, Suite 300
Dallas, TX 75219

PHONE: 214-220-4912 EMAIL: Levi.Wild@wildldc.com

PROPERTY OWNER(s) (If property is held in an LLC or other corporation, names of all partners must be disclosed. All names of members or beneficiaries of a trust must also be disclosed. Signature blocks for multiple property owners may be obtained on separate sheets if needed)

NAME: LawMac LLC C/O Keith Kennedy

ADDRESS: 2911 Turtle Creek Boulevard, Suite 450
Dallas, Texas 75219

PHONE: _____ EMAIL: _____

ENGINEER/ARCHITECT (optional)

NAME: Gay & Neel, Inc. - John Neel

ADDRESS: 1260 Radford Street
Christiansburg, VA 24073

PHONE: 540-381-6011 EMAIL: jneel@gayandneel.com

REVISED 04-10-14 KJO

OFFICE USE ONLY DATE RECEIVED_____ RZN NUMBER_____
PRESUBMITTAL MEETING DATE_____

DESCRIPTION OF REZONING REQUEST

Section 15.2-2286(A)(7) of the State Code of Virginia states that, " Whenever the public necessity, convenience, general welfare, or good zoning practice requires, the governing body may, by ordinance, amend, supplement, or change the regulations, district boundaries, or classifications of property. **It is the applicant's responsibility to provide a narrative outlining the following information in order to assess the public necessity, convenience, general welfare, or good zoning practice of the request** (attach additional pages if necessary).

Need and justification for the change in zoning classification

See attached submittal package

Identify any anticipated effect of the proposed change on public services and facilities

See attached submittal package

Justify appropriateness of the property for the proposed changed, as it relates to the intent of the zoning district requested and applicable use and design standards for all proposed uses

See attached submittal package

Relationship of the proposed change to the Comprehensive Plan (Include FLU designation)

See attached submittal package

Way in which the proposed change will further the purposes of the Zoning Ordinance and general welfare of the community

See attached submittal package

OFFICE USE ONLY DATE RECEIVED_____ RZN NUMBER_____
PRESUBMITTAL MEETING DATE_____

PROFFERED CONDITIONS
Potential proffers can be discussed as part of the presubmittal meeting, and should also be a part of the discussions with staff early in the review process.

PROFFERED CONDITIONS, IF ANY, MUST:

1) Be prepared by an attorney and be completed and accepted by the Town prior to the advertising for the Planning Commission Public Hearing;
2) Have a reasonable relationship to the rezoning;
3) Not include a cash contribution to the Town;
4) Not include mandatory dedication of property; and
5) Not include payment for construction of off-site improvements. The rezoning must give rise to the need for the conditions and the conditions must be related to the physical development or physical operation of the property and be in conformity with the Comprehensive Plan

Attach proffer statement with application.

OWNER CONSENT STATEMENT
I/We the owner(s)/applicant/contract purchaser(s) of the property described on this application do hereby apply for a change of zoning district classification described on this application.

I/We state that no application for a change in zoning district classification, substantially the same as this request, has been considered by the Town Council for the above-referenced property, or any part thereof, within one year prior to the date of this application.

LAWMAC, LLC
By: Keith W. Kennedy
Manager

SIGNATURE OF OWNER/APPLICANT

2/28/18

DATE

TOWN OF BLACKSBURG
CHANGE OF ZONING CLASSIFICATION APPLICATION (REZONE)

DESCRIPTION OF REZONING REQUEST

Section 15.2-2286(A)(7) of the State Code of Virginia states that, "Whenever the public necessity, convenience, general welfare, or good zoning practice requires, the governing body may, by ordinance, amend, supplement, or change the regulations, district boundaries, or classifications of property. **It Is the applicant's responsibility to provide a narrative outlining the following information in order to assess the public necessity, convenience, general welfare, or good zoning practice of the request (attach additional pages if necessary).**

Need and justification for the change in zoning classification

Currently, 402 Clay Street is a vacant lot that once housed a Fraternity House. To the West is a large parcel currently in the re-zoning process. It is unknown what the outcome of this process will be, but should it be approved, there will be significant development on the property for a number of years to come impacting the viewshed, traffic patterns, and a general quality of life in the immediately adjacent vicinity. Should a change be warranted in the current zoning, now is the time to consider it. Additionally, of the other six immediately adjacent parcels, only two of the owners have a mailing address in Blacksburg, and of those two, neither of those are owner occupied. The mailing addresses for the other four parcels are Fredericksburg, Fredericksburg, Leesburg, and Newport. Two of the immediately adjacent properties have what appears to be two rental units each on them.

This currently undeveloped property sits less than ½ mile as the crow flies from the intersection of College Avenue and N. Main Street. It is less than a 1,500 foot walk to S. Main Street. The R-5 zoning district allows for up to 20 bedrooms per acre. Additionally, the existing zoning district allows for up to three unrelated individuals. This zoning, accompanied with the high cost of real estate in Blacksburg along with the close location to campus, provides substantial encouragement to develop student housing on the parcel via maximizing the number of bedrooms on the parcel or doing a minimal cost project to maximize the return provided through student housing.

This parcel needs a different future. The Town of Blacksburg deserves a different future. One opportunity that will serve this need while also serving some goals of the comprehensive plan is to provide additional restricted density on the parcel. 402 Clay Street is proposed to be an age-restricted development. We would propose both the option for an Independent Living Facility or an Assisted Living Facility. At this time, both options should remain open and will generally fit within the same concept plan as is shown on the Master Plans provided.

The need for this change is provided globally in the changing demographics of the United States, but also specifically in the Town of Blacksburg's Comprehensive Plan. Within the Jobs & Housing Chapter, Senior Housing Options, a strong case is made for Senior Housing; however, several sentences speak directly to the need for this rezoning: "Either way, these housing options should be located near public transportation and commercial services. Many retirees are especially interested in Downtown living amenities."

This can also be seen in the Comprehensive Plan's acknowledgment of the demographic trends of both Blacksburg and the United States. This development will help serve the need of both the aging population and the trend in more single person households. See the Portrait of Blacksburg Chapter of the Comprehensive Plan. Aging single person households have less purchasing power and less ability to keep up single family homes. Providing these households with an opportunity to be close to community is an important aspect of the need for this development.

At the same time, a minimum threshold of services will be required on site to serve the target population. Providing these services requires an investment of space and resources. To do this requires a certain number of residents contributing to the whole of the project. The proposal at this time is for a maximum of 50 Units (70 bedrooms) of Independent living or 93 Units (93 bedrooms) of Assisted living.

This project further meets this requirement as noted below:

Approval of the Plan for 402 Clay Street is being requested and will be in the public interest and is justified for the following reasons outlined below:

1. A Planned Residential Development (PRD) designation is being sought to provide the Town of Blacksburg with an enforceable device for the implementation of the proposed development plan, proffers, and guidelines.
2. The Plan meets an important need of the community, through provision of age-restricted multifamily housing close to Downtown Blacksburg.
3. 402 Clay Street will feature a mixture of housing types from 1BR-2BR, and will have the very latest in modern features and amenities.
4. 402 Clay Street will increase the tax base for the Town of Blacksburg.
5. 402 Clay Street will appeal to its target market due to its proximity to amenities and public features, such as the public library, the Moss Arts Center, and Downtown restaurants and shops.
6. Walking/biking proximity to downtown Blacksburg provides the opportunity to promote an active senior lifestyle.
7. The architectural design offers privacy and personal space while enhancing the character of the area with high-quality design and attention to architectural detail.
8. The project will have professional property management to provide community maintenance and resident assistance.
9. The development will have and maintain community restrictions, which serve to maintain an appropriate living environment for both residents and neighbors.

Identify any anticipated effect of the proposed change on public services and facilities

1. It is anticipated that some of the residents will utilize Blacksburg Transit and board from existing stops located on South Main Street.
2. Meetings with the Town Engineer have been held to discuss any impact on the Sanitary Sewer Mains. It is proposed that conventional sanitary sewer gravity lines will connect to the adjacent public main. The lines will be constructed in accordance with all local and state requirements to serve the project and will be dedicated as necessary to the Town of Blacksburg for ownership and maintenance. Capacity and connection viability approval from the Town of Blacksburg is anticipated, but has not yet been received.
3. The Town engineer has been consulted regarding capacity of the existing public water mains to serve the proposed development with domestic water service and fire water service. Capacity, adequate pressure, and connection viability approval from the Town of Blacksburg is anticipated, but has not yet been received.
4. Storm Water Management on this site shall be in conformance with DEQ and Town of Blacksburg standards, with any quality/quantity standards to be met as required.
5. A pre-application meeting was held on January 12, 2018, with Anne McClung and Chris Lawrence of the Town of Blacksburg.

Justify appropriateness of the property for the proposed changed, as it relates to the intent of the zoning district requested and applicable use and design standards for all proposed uses

This Section should be referenced directly to 'Section 3110 – Purpose' of the Town of Blacksburg Zoning Ordinance.

- It should be noted that the parcel size is 1.70 acres in size and is directly adjacent to the proposed Old Blacksburg Middle School redevelopment. While this parcel cannot provide a variety of housing options directly, we would propose to provide one piece of that variety with a senior housing option close to Downtown. Looking at likely high-end housing to the West, aging student housing to the East, high-end single family housing to the South, existing single family housing to the southwest, and Condominiums/Private School to the north, this project is able to provide housing to a different demographic than exists within the neighborhood.

- Building Orientation: Orienting buildings toward the street contributes to a pedestrian-friendly street environment and provides street edge, and contributes to resident safety by placing "eyes-on-the-street." The layout of the property addresses Clay Street SE with an attractive building front that includes front porches, landscaping, and sidewalks. These architectural features will further enhance the streetscape.

- Setback: Consistent front building setbacks create a uniform appearance along the street. The design of the project does create a street frontage that not only addresses the street in an inviting way, but also contributes to the Clay Street neighborhood.

- Building Frontage/Entries: Landscaping in front of buildings and entry features, such as porches or steps, create visual interest and give the neighborhood an identifiable character. The project promotes ADA-accessibility, and provides an attractive porte cochere for resident/visitor drop-off. Greenspace and landscaping shall be provided, both along the frontage of the building, and along Clay Street SE to further promote an inviting community feature.

- Off‑street Parking: Parking for residential areas that plays down the visual impact of development, and creates pedestrian‑friendly streetscape. All off‑street parking is behind the front building line with limited visibility from the Clay Street SE right of way. The spaces located on the site are aligned to minimize visual impact. Underground parking has also been provided to ensure adequate parking for residents, but also to further hide parking within the landscape.

- Screening/Landscaping: Hedges, trees, and shrubs will provide privacy, a transition between spaces, and will help buffer pedestrians from vehicle traffic. Due to this being a small scale residential project, little pedestrian/vehicular conflicts are anticipated.

- This property is located adjacent to Clay Street SE, an urban collector within the Town of Blacksburg's street network, where development is anticipated and planned. Additionally, this property is in close proximity to Downtown Blacksburg and Virginia Tech.

- The property is located within an existing developed corridor that contains all the needed services that a Planned Residential Development will utilize including:
    a. Public Water
    b. Public Sewer
    c. Transportation Network
    d. Transit Service
    e. Electric Service
    f. Gas Service
    g. Telecommunications Service

Relationship of the proposed change to the Comprehensive Plan (Include FLU designation)

1. See the Section entitled Comprehensive Plan Analysis.

Way in which the proposed change will further the purposes of the Zoning Ordinance and general welfare of the Community

This Section should be referenced directly to 'Section 1102 – Purpose' of the Town of Blacksburg Zoning Ordinance.

1. Section 1102 of the Town of Blacksburg Zoning Ordinance specifically states that the general purpose of the zoning code is for 'implementing the comprehensive plan'. Furthermore to promote the health, safety, and general welfare of the public.

    a. 402 Clay Street will provide housing for a demographic specifically called out within the comprehensive plan.
    b. The location of the development is adjacent to existing services, the transportation network, and amenities.
    c. It will be a welcome infill project to the neighborhood.

2. 402 Clay Street will be constructed as a development evoking a sense of community within the development and existing neighborhood.
3. The net density of approximately 55 bedrooms per acre is below recently approved and constructed infill projects.
4. The investment will add to the Town of Blacksburg's tax base.

PROFFER STATEMENT

Proffer Statement for the Application
To Rezone Tax Parcel 257-A188 from R-5 (Transitional Residential) to PRD (Planned Residential)

Pursuant to Section 15.2-2298 of the Code of Virginia (1950) as amended, and Section 1160 of the Town of Blacksburg Zoning Ordinance, Town Code Appendix A, the undersigned owner (LawMac, LLC) seeks to amend the zoning of Tax parcel 257-A188 (the "Property") from the existing zoning of R-5 (Transitional Residential) to PRD (Planned Residential) zoning classification, subject to the following proffered conditions:

1. The Property shall be developed in substantial conformance with the submitted rezoning package entitled "Planned Residential District Rezoning for 402 Clay Street" rezoning package dated March 1, 2018, prepared by Gay and Neel, Inc. This includes the site concept plan and architectural schematics.

2. *(A)(i)* It is the intent of the parties that the Property, as developed in accordance with the approved rezoning, shall be age restricted to persons fifty-five (55) years of age or older as set forth herein. The Development will meet the federal standards for age-restricted housing as defined in the Fair Housing Amendments Act (42 U.S.C. 3601, et seq.) and the exemption provided by 42 3607 (b) (2) (c), the Housing for Older Persons Act of 1995 (46 U.S.C. 3601, et seq.), as well as the Virginia Fair Housing Act (Virginia Code 36-96.1 et seq., and any amendments thereto) Subject to applicable federal, state, and local laws, at least one resident of each unit shall be 55 years of age or older.

   (ii) Community rules and regulations may permit occupancy of a unit by a spouse under the age of fifty-five (55). If the age qualified spouse should perish, the non-age qualified surviving spouse who had occupied the dwelling unit shall be granted approval to live in the unit indefinitely with all other restrictions to remain in place.

   (B) No other permanent or temporary resident of the unit may be under the age of 55 years old except as follows:

   - A person under the age of 18 years may reside temporarily in the unit, but not for an aggregate of more than sixty (60) days in any calendar year)
   - Any other person over the age of 18, but under the age of 55 years, may reside temporarily in the unit, but not for an aggregate of more than one hundred eighty (180) days in any calendar year.
   - A disabled person who is a relative of a resident of a unit may live with the resident, if under the care of the resident, with the approval of the community, if they are under 55 years of age. Additionally, should a resident of a unit become disabled, a person who is a relative of a resident of a unit may live with the resident if they are under 55 years of age and providing care to the resident with the approval of the community.

   (C) No unit shall be used or rented for transient, or home-stay purposes.

(D) These restriction described above and provisions for their enforcement shall be set forth in the community rules and regulations.

3. The maximum building height for any structure within the Development shall be 50 feet, measured from the grade at the front door of any structure to the peak of the roof.

4. The applicant shall develop a parking policy and shall (i) issue parking permits/stickers to residents and (ii) implement parking enforcement measures such as signage and towing as necessary. The number of permits/stickers shall be limited to the number of parking spaces as shown on the plan.

5. For unrelated persons, occupancy of the units within this Development shall be restricted to one person per bedroom. This shall not apply to the occupancy of any unit by a family, as defined in the Zoning Ordinance.

The undersigned hereby warrants that all of the owners of a legal interest in the subject property have signed this proffer statement, that they have full authority to bind the property to these conditions, that the proffers contained in this statement are not "unreasonable" as that term is defined by Virginia Code§ 15.2-2303.4, and that the proffers are entered into voluntarily. An analysis and justification for each proffered item is attached as Exhibit A.

Should any provision of this proffer statement be determined to be invalid by a court of competent jurisdiction, that determination shall not affect the validity of the remainder of the provisions in this document.

LawMac, LLC

By: _____

Printed Name: _____

Title: _____

Commonwealth of Virginia
County of Montgomery

The foregoing instrument was acknowledged before me this _____ day of _____, _____, by _____of _____.

_____ My commission expires:_____
Notary Public

VDOT TIA APPLICATION

January 1, 2012

OFFICE USE ONLY
Date Received: _____
RZN# _____
CUP# _____

TOWN OF BLACKSBURG
VDOT TRAFFIC IMPACT ANALYSIS (TIA) SUPPLEMENTAL APPLICATION

This application, appropriate fee, and accompanying documentation must be submitted in conjunction with the corresponding rezoning, conditional use permit, or comprehensive plan amendment before any application can be reviewed by staff. If you have any questions, please contact the Planning and Building Department.

Name of Development: 402 Clay Street

Address/Location: 402 Clay Street SE, Blacksburg, VA 24060

Tax Map Parcel: 020133

Size of Site: 1.700

Proposed Use: Multi-Family Dwelling (Age Restricted)

Current Zoning District: R-5

Existing Future Land Use Classification: Medium Density Residential

This application is submitted in conjunction with a

☒ Rezoning Application. Proposed Zoning District: PRD

☐ Conditional Use Permit Application. Proposed Conditional Use: _____

☐ Comprehensive Plan Amendment. Proposed Future Land Use: _____

This is the ☑ first, ☐ second, ☐ third or subsequent submission of the TIA for review by VDOT.

A traffic impact analysis ☐ *is* ☑ *is not required* for the proposed project:

1. ☐ ***Yes or*** ☑ ***No***, the site is located _____ feet along the vehicle path of traffic which is less than 3,000 feet from VDOT maintained roadways, or is within 3,000 feet of a non-limited access state controlled highway, or is within 3,000 feet of a connection to a state limited access highway.
2. ***If the answer to question #1 is Yes, complete the following:***
   a. ☐ ***Yes or*** ☑ ***No***, the proposed development generates 293 *vpd* which is greater than the VDOT requirement of 5,000 vehicles per day.
3. ☐ ***Yes or*** ☑ ***No***, the proposed comprehensive plan amendment results in substantial impact of 5,000 additional vehicle trips per day or results in substantial changes to the existing transportation network and infrastructure of state controlled highways.
4. ☑ ***No***, a new TIA study is not required because a previously submitted TIA is still applicable for the project site. *(Note: the appropriate documentation must be attached to this application)*
5. ☐ ***Yes or*** ☑ ***No***, a VDOT Scope of work meeting has been held.

If a TIA is required, please provide the following information:

Name of Property Owner(s): _____

Address: _____

Phone: _____ Fax: _____

Email address: _____

Applicant to whom review comments will be sent:_____
Address: _____
Phone: _____ Fax: _____
Email address: _____

Project Engineer who prepared TIA (*if different from applicant*):_____
Address: _____
Phone: _____ Fax: _____
Email address: _____

Please check all applicable boxes of information submitted with this application:

1. **Review Fee Check made payable to VDOT for**
   First, Second or Third review by VDOT
   - ☐ Rezoning or Conditional Use Permit request
     - ☐ Low volume road submission 24VAC30-155-40 A 3: $250
     - ☐ All other submissions: $1000
   - ☐ Comprehensive Plan Amendments: $1000
2. **For the Town of Blacksburg, please provide a *digital submission of the following:***
   a. ☐ **One signed copy** of the Town's VDOT Supplemental TIA application.
   b. ☐ **One complete copy** of the TIA submitted to VDOT including a completed checklist of information and signed scope of work meeting agreement.
   c. ☐ **One copy** of the VDOT review fee check.
   d. ☐ **One copy** of letter and supporting information documenting why a new or updated TIA is not required for this project.
3. ☐ **For VDOT, three paper copies** of the complete Traffic Impact Analysis. Forms and additional information can be found at http://www.virginiadot.org/projects/chapter527/default.asp

By signing below, I acknowledge that all information on this application and included in the supporting documentation is correct and accurate, and has been prepared by an appropriate licensed professional.

SIGNATURE OF APPLICANT: _____ **Date:** 2.29.18
Levi A. Will

For Staff Use Only:

☐ First Submission ☐ Second Submission ☐ Third or Subsequent Submission

Reviewed and Accepted as complete by _____ Date _____
TIA forwarded to VDOT by _____ Date _____

Rejected by _____ Date _____
Reason for rejection: _____
_____

Town of Blacksburg, Planning & Building Department
300 South Main Street • PO Box 90003, Blacksburg, VA 24060-9003
Phone: (540) 951-1126 • Fax: (540) 951-0672 • www.blacksburg.gov

Planned Residential District Rezoning for 402 Clay Street

PLANNED RESIDENTIAL DISTRICT

1. **Purpose**

   The purpose of this district is to provide for the development of planned residential communities that incorporate a variety of housing options as well as certain limited commercial and office uses designed to serve the inhabitants of the district. This district is intended to allow greater flexibility than is generally possible under conventional zoning district regulations by encouraging ingenuity, imagination and high-quality design to create a superior living environment for the residents of the planned community. The PR district is particularly appropriate for parcels which contain a number of constraints to conventional development. In addition to an improved quality of design, the PR district creates an opportunity to reflect changes in the technology of land development, provide opportunities for new approaches to home ownership and occupancy, and provide for an efficient use of land which can result in reduced development costs.

2. **Use-Type Definitions**

   AGE-RESTRICTED MULTI-FAMILY DWELLING – A building or portion thereof which contains three (3) or more dwelling units for permanent occupancy, regardless of the method of ownership. Included in the use type would be garden apartments, low and high-rise apartments, apartments for the elderly and condominiums. No residents within the dwelling shall be less than 55 years of age. The property manager may live on-site and may be less than 55 years of age.

   LIFE CARE FACILITY - A residential facility primarily for the continuing care of the elderly, providing for transitional housing progressing from independent living in various dwelling units, with or without kitchen facilities, and culminating in nursing home type care where all related uses are located on the same lot. Such facility may include other services integral to the personal and therapeutic care of the residents. An Assisted Living facility would be included in this definition.

3. **Permitted Uses**

   The following uses are permitted in the Planned Residential district and are hereby approved for inclusion in the Development Plan for 402 Clay Street.

   Residential

   Age-Restricted Multi-Family Dwelling

   Civic

   Life Care Facility
   Community Recreation, Active and Passive
   Open Space
   Utility Services, Minor

   Miscellaneous

   Associated trash and recycling facilities

4. Site Development Regulations

402 Clay Street shall be subject to the following site development standards:

- Minimum district size: 1.700 acre, or final development area based on survey.

- Open space criteria.

  - Due to the proximity to downtown, close walking distance to services and transit, sidewalk construction, and small size of the parcels as stated in subsection b. (3113), a minimum of 10% open space shall be required within the development. 50% of the open space may be in the form of indoor recreation, meetings, or activity space.

- Minimum setback requirements:

  - Front = Ten (10) feet
  - Side = Zero (0) feet
  - Rear = Zero (0) feet

- Floor Area Ratio: The floor area ratio for the development will be a maximum of 1.5. Final FAR shall be in general conformance with concept plan and architectural drawings, or reduced pending final engineering.

- Lot Coverage: Lot coverage for the development will be as shown on the concept plan, or reduced pending final engineering.

- Parking:

  - Vehicular Parking - A minimum of 0.69 spaces per bedroom within the PRD district will be provided.
  - Bicycle Parking - A minimum of 0.25 spaces per bedroom within the PRD district will be required. A minimum of 24 bike parking spaces will be provided.

- Height: The maximum height of structures shall be fifty (50) feet.

- All utility lines, electric, telephone, cable television lines, etc., and shall be placed underground.

5. Occupancy

For unrelated persons, occupancy of the units within this development shall be restricted to one person per bedroom. This shall not apply to the occupancy of any unit by a family, as defined in the Zoning Ordinance.

6. Public Service and Utilities

Public Water

All improvements will be designed in accordance with the Town's Water System Specifications. Designs will be submitted to and approved by the Town Staff prior to any installations. The proposal is for a development with a maximum of 93 units. With the existing public waterline in the vicinity, water pressure and demand has been discussed with the Town of Blacksburg Staff, with final approval anticipated, but not yet received.

Sanitary Sewer

Public Sanitary Sewer Service will serve the development. All improvements will be designed in accordance with the Town of Blacksburg's "Wastewater Specifications." Designs will be submitted to and approved by the Town staff prior to any installations. The proposal is for a development with a maximum of 93 bedrooms. With the existing service lines in the vicinity, capacity in the lines has been discussed with the Town of Blacksburg Staff, with final approval anticipated, but not yet received.

Project Location: This project is located directly adjacent to existing Town of Blacksburg conventional sewer lines.

Domestic Water and Sewer Demands

Based on Virginia Department of Health Standards, an average daily flow is estimated for the proposed uses below. VDH states that "For all dwelling units the design shall be based on two persons per bedroom." Due to the project being an age-restricted housing development, Town regulations dictating occupancy, and this PRD limiting occupancy, 1.5 person per bedroom has been used in this analysis.

Multi-Family Residential: Maximum of 93 bedrooms
100 gal/day per person = 13,950 gallons/day

TOTAL ESTIMATED WATER/SEWER USAGE BY PROPOSED DEVELOPMENT = 13,950 gallons per day

Applicant will construct or cause to be constructed at no expense to the Town all water/sewer mains and appurtenances on the Property and will connect the water/sewer mains to publicly owned water/sewer mains. All water mains and sewer mains will be constructed to the standards of the Town and/or the building code, will comply with the regulations and standards of the Town and will comply with the regulations and standards of all other applicable regulatory authorities. All water mains and appurtenances and sewer mains will be dedicated to public use unless otherwise directed by the Town of Blacksburg.

Stormwater Management

A stormwater management plan shall incorporate (to the maximum extent possible) underground storage to address stormwater quantity and quality requirements. Rainwater harvesting with cistern storage shall be incorporated into this project as well, allowing for reduced site discharge, reduced on-site public water usage, and mitigation of stormwater discharge impacts downstream of the development. A preliminary design is attached as Appendix P through Z of this rezoning package. A final design, to be submitted with future construction plans, will more precisely define the methodology, however this preliminary design is intended to show the feasibility of the project to meet DEQ and Town of Blacksburg requirements for both stormwater quantity and quality. The final design is subject to change, pending final engineering. The developer shall reserve the right to purchase nutrient credits to meet any BMP requirements that exceed that which is achieved through onsite underground storage.

Solid Waste Collection/Recycling

A private company will provide collection for the development. A single dumpster with accompanying recycling containers shall be located adjacent to the rear of the property, and generally out of view from the road.

Electric, Telephone, Cable Television

Utility services such as electric, telephone, and cable television, will be kept underground. Every effort will be made so appurtenances such as transformers, junction boxes, and pedestals are minimally visible.

7. Transportation Circulation

Vehicular Circulation

A full Traffic Impact Analysis is not required or necessary. The development will generate a maximum of approximately 293 trips per day.

8. Alternative Transportation Planning

The proposed development will provide multiple options for the resident who desires to utilize non-vehicular modes of transportation. 402 Clay Street is located in close proximity to existing BT transit stops. Uber and Hooptieride are also well established in this area, and would be a reliable form of local transportation.

9. Maintenance

The development will be managed by a professional management company to handle unit and ground maintenance. All common space elements including the structures and exterior elements such sidewalks and parking lots will be under the developer's ownership and will be maintained at no cost to the general taxpayer or the Town.

10. Signs

Signage for the project will be in accordance with the existing Town of Blacksburg signage regulations for residential zoning districts. Square footage and height requirements will be in accordance with the signage requirements as specified in Section 5532 of the Town of Blacksburg Zoning Ordinance.

11. Community Rules and Regulations

The property will be subject to Community Rules and Regulations established by the Owner/Developer. The Community Rules and Regulations may be amended from time to time, as deemed necessary by the property owner provided, however, that the property owner shall not eliminate Community Rules and Regulations in their entirety.

12. Legal Description

See attached survey document, Appendix "I".

Planned Residential District Rezoning for 402 Clay Street

COMPREHENSIVE PLAN ANALYSIS

I. Introduction

Any development within the Town of Blacksburg is viewed by the Town Council, Planning Commission, Town Staff, and Citizens through the prism of the comprehensive plan. The following narrative and analysis will address points within the comprehensive plan and discuss how the proposed development aligns with the vision, goals, and objectives of the comprehensive plan. Please note that below are excerpts from the adopted 2012 Comprehensive Plan and one should refer to the Plan for the full text.

The subject property is identified in the Comprehensive Plan as having a future land use of Medium Density Residential. The text below is from the Comprehensive Plan, with the bold text demonstrating how the proposal meets the guidelines.

II. Policy Chapters

Community Character Principles

CCP 1. Well-designed pedestrian and bicycle friendly routes and facilities are essential to the Town's identity as a walkable and bikeable community.

Discussion – The development will have a Clay Street frontage sidewalk within the development, which will allow for future connection.

CCP 2. Lifestyle conflicts are inherent in a college town, where neighborhoods may have a mix of students and non-students.

Discussion -- The development will provide opportunities to senior citizens. Based on the existing neighborhood and adjacent properties, limited conflicts are projected and anticipated. Introducing Seniors to the Downtown Neighborhood will serve to have a positive impact by providing a demographic that has been lacking in the neighborhood.

CCP 16. Responsible site design and development practices will minimize environmental impacts within the Town. Any residential, commercial, industrial, or agricultural development or redevelopment should meet and exceed federal, state, or local regulations to minimize impacts of soil erosion, stormwater run-off, and non-point source pollution.

Discussion – The final stormwater management plan shall adhere to all local and state regulations and will protect downstream tributaries. This development will meet today's standards that require both SWM from a quantity and quality standpoint unlike developments of the past.

CCP 18. Minimize light pollution, balancing dark skies with a safe pedestrian and vehicular experience at night. The design and placement of new lighting for buildings, parking areas, or streets should have minimum impact of light spillover and glare on surrounding uses with special attention given to lighting when transitioning from higher intensity to lower intensity uses. Lighting should be the minimum necessary to have a safe environment.

Discussion -- The dwelling units will have entry lights on the Clay Street frontage, and along the front face of the building. In addition, parking lot lighting will be located within and around the parking lot. The lighting will be full cutoff and will strive to have superior uniformity.

CCP 19. For safety, appearance, and maintenance reasons, new developments are required to place utilities underground. Where feasible and financially possible through developer contribution, Town subsidization, or other financial sources, existing above-ground utilities should be relocated underground.

Discussion -- All proposed utilities will be located underground and any necessary utilities to be relocated, will be relocated underground, where feasible.

Environment Objectives and Policies

EN.27. Implement the BMPs required in the MS4 Program Plan.

Discussion -- The proposed storm water management facilities will provide for both water quantity and quality BMP's and will provide additional measures to protect downstream channels.

Jobs and Housing Objectives and Policies

J&H.1. Recognize and grow economic development as part of a Sustainable Community

Discussion – This development will add to the adjacent customer base for Downtown Merchants.

J&H.31. Support implementation of the Old Blacksburg Middle School Master Plan as an anchor to the south end of Downtown.

Discussion – This proposed development sits immediately adjacent to the Old Blacksburg Middle School property.

J&H.48. Plan for the housing demands of a changing and diversifying population.

Discussion – The development would provide an age-restricted community to benefit local seniors. This meets an important community need to ensure seniors are cared for within a quickly growing community and also allows them to be active within the Downtown neighborhood.

J&H.51. Promote varying types of housing types needed, including:

- Rental …
- …
- …
- …
- Housing with universal design features to allow for aging in place.

Discussion – The development would allow for seniors to live in a purpose built development catering to their needs while also providing a sense of community among the residents.

J&H.52. As the active adult, retiree, and senior citizen population increases, promote varying types of housing needed. For example, provide smaller homes that retirees can downsize to such as townhomes or condos, as well as retirement communities and nursing home facilities.

Discussion – The development would meet this important community need, allowing seniors to downsize their homes, remain near the community center, and have the availability to continue an active lifestyle.

Transportation Objectives and Policies

T.10. Complete the construction of a connected sidewalk system:

Discussion – The development of the project will provide an unconnected portion of sidewalk along the frontage of the property, which will allow for future interconnection reaching to Downtown Blacksburg.

T.11. Minimize pedestrian and vehicular conflicts by:

- Maintaining sidewalks and streets
- Ensuring appropriate signage, lighting, markings, and other physical improvements are made.

Discussion – The development of the project will include necessary signage and VDOT standard entrance designs that will minimize conflicts. All public sidewalks will be maintained by the Town of Blacksburg and all private sidewalks will be maintained by the Owner.

T.49. The development review process ensures:

- Surface parking facilities are landscape and appropriately lit
- New parking lots minimize impacts on stormwater

Discussion – The development will be landscaped in accordance with Town standards. Lighting will be provided to provide the necessary foot-candles and uniformity while conforming to the Town's dark sky initiative.

Land Use Objectives and Policies

LU.6. Consider the compatibility of development with surrounding uses. Utilize strategies such as landscaping or other buffering techniques along with modification of site design to minimize impacts and facilitate compatibility.

Discussion – The overall site design and architecture of the development will improve the streetscape and be pleasing to the neighborhood.

LU.11. Encourage residential infill in the Downtown area. Support the addition of a mix of and services that will attract and support a Downtown residential population.

Discussion -- While the property is not located in the main Downtown area, it is an infill project that is within walking distance to the downtown and other neighborhood services, and promotes a more diverse community through an age restriction on residents.

LU.19. Regulate the amount of noise and/or light produced by land uses to minimize impacts on nearby properties.

Discussion—The location of this project is surrounded by commercial and other residential rental units. No adverse noise or light impacts should be experienced by neighbors beyond normal residential use. Parking lot lighting may be necessary adjacent to the dumpster area. These lights will be full cutoff type fixtures and will minimize light pollution.

LU.20. Protect the integrity and quality of water resources in the Town.

Discussion – All federal, state and local stormwater quality and quantity requirements will be strictly adhered to for the development.

CONCLUSION

402 Clay Street is a development that will provide desired and needed infill within the Town, while being in close proximity to downtown and Virginia Tech. Two options have been provided, with a final determination to be made prior to construction; an assisted living facility with a maximum of 93 bedrooms, or an independent living facility with a maximum of 70 bedrooms. The project incorporates design features that provide a pleasing streetscape that is inviting, and provides on-site sidewalk for future Town of Blacksburg interconnection efforts. 402 Clay Street will be an asset to the community within the Town of Blacksburg. Downtown is in need of the additional senior demographic, and this project is poised to engage seniors in the Downtown Community.

APPENDICES

APPENDIX A – DEED

VIRGINIA LAND RECORD COVER SHEET
FORM A – COVER SHEET CONTENT

RECORDED IN
MONTGOMERY COUNTY, VA
ERICA W. WILLIAMS
CLERK OF CIRCUIT COURT
FILED Feb 08, 2018
AT 12:04 pm
INSTR # 2018000850

KNL

(Area Above Reserved For Deed Stamp Only)

Instrument Date: 2/2/2018
Instrument Type: DBS
Number of Parcels: 1 **Number of Pages:** 2
[ ] City [X] County
MONTGOMERY

TAX EXEMPT? VIRGINIA/FEDERAL LAW
[X] Grantor: 58.1-811(C)
[ ] Grantee:
Consideration: $350,000.00
Existing Debt: $0.00
Actual Value/Assumed: $114,000.00
PRIOR INSTRUMENT UNDER § 58.1-803(D):
Original Principal: $0.00
Fair Market Value Increase: $0.00

Original Book Number: **Original Page Number:** **Original Instrument Number:**

Prior Recording At: [ ] City [X] County
MONTGOMERY **Percentage In This Jurisdiction:** 100%

BUSINESS / NAME
1 [X] Grantor: VIRGINIA TECH FOUNDATION, INC.
[ ] Grantor:
1 [X] Grantee: LAWMAC LLC
[ ] Grantee:

GRANTEE ADDRESS
Name: LAWMAC LLC
Address: 2911 TURTLE CREEK BLVD. SUITE 450
City: DALLAS **State:** TX **Zip Code:** 75219
Book Number: **Page Number:** **Instrument Number:** 13008625
Parcel Identification Number (PIN): 020133 **Tax Map Number:** 257-A188
Short Property Description: MT VIEW ESTATE
TRACT 4
Current Property Address: 402 CLAY STREET SE
City: BLACKSBURG **State:** VA **Zip Code:** 24060
Instrument Prepared By: JUSTIN F. TRENT, ESQ. **Recording Paid By:** BRIDGETRUST TITLE GROUP
Recording Returned To: BRIDGETRUST TITLE GROUP
Address: ONE COLUMBUS CENTER, SUITE 400
City: VIRGINIA BEACH **State:** VA **Zip Code:** 23462

§§ 17.1-223, 17.1-227.1, 17.1-249

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Prepared by: Justin F. Trent, Esq., (VSB No. 77410)
VirginiaTech Foundation, Inc.
902 Prices Fork Road, Suite 130
Blacksburg, Virginia 24061

Return to: LAWMAC LLC
Attention: Mr. Keith W. Kennedy
2911 Turtle Creek Blvd., Suite 450
Dallas, TX 75219

Tax Map Parcel No.: 257-A188
Parcel Identification No.: 020133

Property Addresses: 402 Clay Street, Blacksburg, VA 24060
Legal Description: Parcel on southeasterly side of Clay Street
Title Insurance: Fidelity National Title Insurance Company
Consideration: $350,000.00
Assessed Value for Parcel: $114,000.00

GRANTOR'S TAX EXEMPTION PURSUANT TO VIRGINIA CODE SECTION 58.1-811 (C)

THIS DEED is made as of February 2, 2018, by and between **VIRGINIA TECH FOUNDATION, INC.**, a Virginia nonstock corporation as Grantor; and **LAWMAC LLC**, a Texas limited liability company as Grantee, whose address is 2911 Turtle Creek Blvd. Suite 450, Dallas, TX 75219.

WITNESSETH:

That for and in consideration of the sum of Ten Dollars ($10.00), cash in hand paid, and other good and valuable consideration, the receipt of which is hereby acknowledged, the Grantor does hereby grant and convey, with **SPECIAL WARRANTY**, in fee simple unto said LAWMAC, LLC, Grantee, the following described property located in the Montgomery County, Virginia, and more particularly described as follows:

ALL THAT certain parcel of land situate in the Mt. Tabor Magisterial District of Montgomery County, Virginia, in the Town of Blacksburg, adjoining the southeast side of Clay Street in said Town, bounded and described as follows, to-wit:

BEGINNING at a post on the southeast side of Clay Street, a corner to the Montgomery County School Board property; thence leaving said Clay Street and running three lines with said Montgomery County School Board property and the fence, South 38 degrees 32' East a

distance of 259.0 feet to a post at a corner of the fence, North 68 degrees 17' East a distance of 102.0 feet to a post at another corner of the fence, and south 84 degrees 15' East a distance of 171.0 feet to a post corner to the J. H. Hoge property and also with the property to the Holden Estate and the fence, North 38 degrees 00' West a distance of 406.0 feet to a post on the southeast side of Clay Street; thence with the same South 52 degrees 05' West a distance of 230.0 feet to the point of beginning, containing 1.7 acres.

Tax Map Parcel No.: 257-A188; Parcel ID No.: 020133

AND BEING the same property conveyed to the Virginia Tech Foundation, Inc. by Deed from VA Kappa Alumni Corporation of Sigma Phi Epsilon, dated July 26, 2013 and recorded in the Clerk's Office of the Circuit Court of Montgomery County, Virginia as Instrument Number: 2013008625.

This conveyance is subject to easements, conditions, and restrictions of record insofar as they may lawfully affect the property.

WITNESS the following signature and seal:

VIRGINIA TECH FOUNDATION, INC.

_____ (SEAL)
John E. Dooley
CEO and Secretary-Treasurer

COMMONWEALTH OF VIRGINIA
COUNTY OF MONTGOMERY, TO WIT:

The foregoing instrument was acknowledged before me this 2nd day of February, 2018, by John E. Dooley, in his capacity as CEO and Secretary-Treasurer of the Virginia Tech Foundation, Inc.

Rebecca A. Turman
NOTARY PUBLIC

My Commission expires: November 30, 2019
Notary Registration Number: 287658

REBECCA A. TURMAN
NOTARY PUBLIC
REG. #287658
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES NOV. 30, 2019

INSTRUMENT # 2018000850
RECORDED MONTGOMERY CIRCUIT COURT CLERK'S OFFICE
Feb 08, 2018 AT 12:04 pm
ERICA W. WILLIAMS, CLERK by KNL

APPENDIX B – ADJACENT PROPERTY OWNERS

APPENDIX B

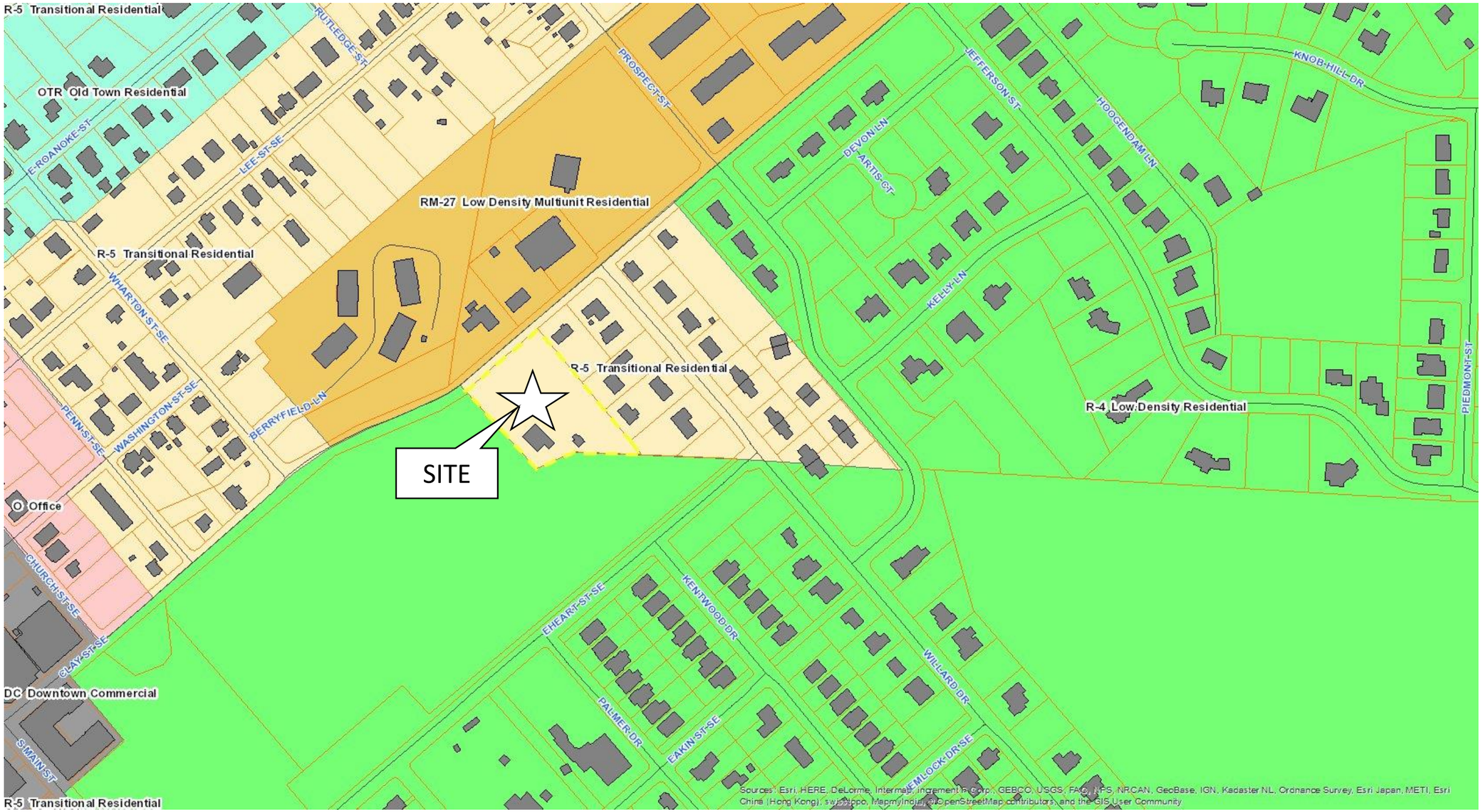
402 Clay Street
ADJACENT PROPERTY LANDOWNERS

TAX MAP #	Name of Property Owner	Mailing Address
257-A-94	MIDTOWN REDEVELOPMENT PARTNERS LLC	PO BOX 10397, BLACKSBURG, VA 24062
257-A-189	CME JME LLC	701 GRAVES AVE, BLACKSBURG, VA 24060
257-9-4	POWELL ROGER M. & POWELL VICKI S.	5527 MEDMONT CIR, ROANOKE, VA 24018
257-9-3	ASHTON GARY J. & ASHTON JOHN C III ETAL	39091 LOGANS CREEK LN, LEESBURG, VA 20175
257-9-2	NOONKESTER LYNDON SCOTT	1106 N. MAIN ST, BLACKSBURG, VA 24060
257-A-185	DENNIS K DODSON SR & DENNIS K DODSON II TRUST	9928 AVALON WAY, FREDERICKSBURG, VA 22408
257-A-186	DENNIS K DODSON SR & DENNIS K DODSON II TRUST	9928 AVALON WAY, FREDERICKSBURG, VA 22408

APPENDIX C – EXISTING ZONING MAP & EXISTING LAND USE MAP

The drawing, design, and digital files relating to this project are the property of Gay and Neel, Inc. The reproduction, copying, or other use of this drawing without GNI's written consent is prohibited.

APPENDIX C
EXISTING ZONING MAP



GAY AND NEEL, INC.
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Christiansburg, Virginia 24073
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Fax: (540) 381-2773
Email: info@gayandneel.com
Web: www.gayandneel.com

402 Clay Street
REZONING
BLACKSBURG, VIRGINIA

REVISIONS

NO.	COMMENTS	DATE

PROJECT TEAM

PIC	JOHN T NEEL, PE
PM	JOSHUA M. MACDONALD, PE
DESIGN	MRR

GNI JOB NO.	ISSUE DATE
2803.0	2/20/2018

SHEET NUMBER
APPENDIX C

Drawing1.dwg
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APPENDIX D – PROPOSED ZONING MAP

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APPENDIX D
PROPOSED ZONING MAP

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REVISIONS		
NO.	COMMENTS	DATE

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DESIGN	MRR

GNI JOB NO.	ISSUE DATE
2803.0	2/20/2018

SHEET NUMBER
APPENDIX D

Drawing1.dwg
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APPENDIX E – FUTURE LAND USE MAP

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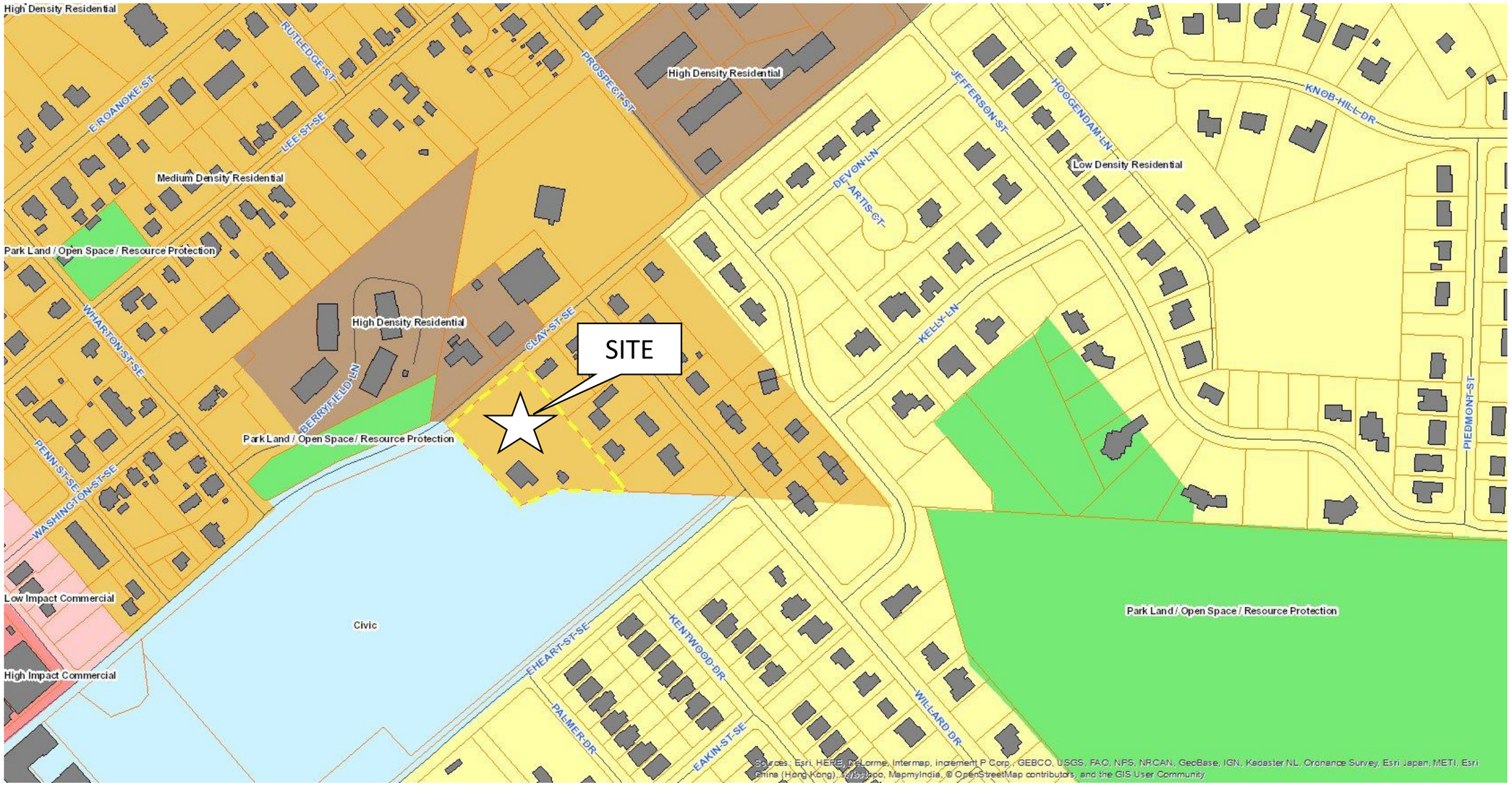
APPENDIX E
FUTURE LAND USE MAP



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SHEET NUMBER
APPENDIX E

Drawing1.dwg
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APPENDIX F – MIXED USE AREA MAP

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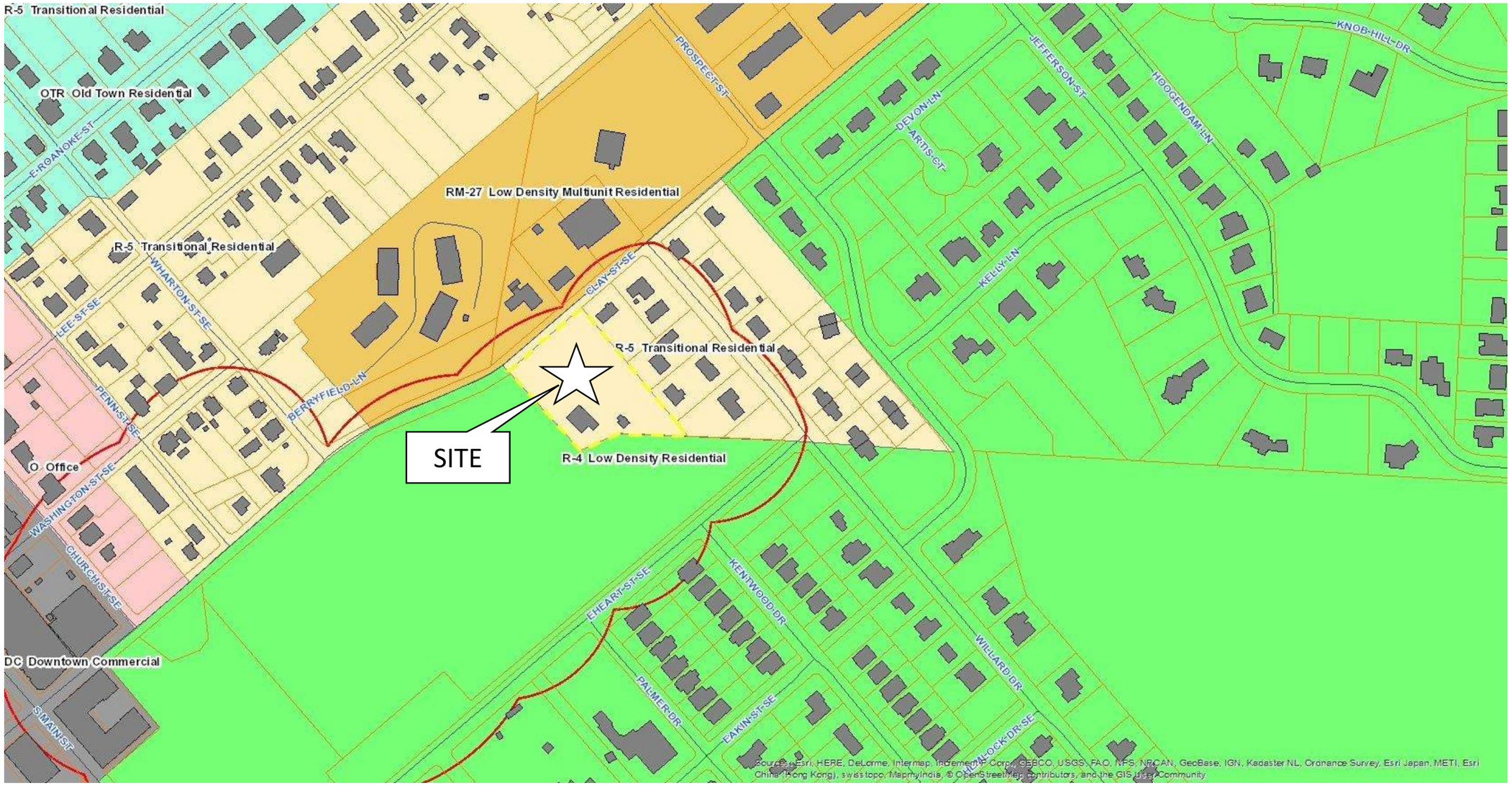
APPENDIX F
MIXED USE AREA MAP



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NO.	COMMENTS	DATE

PROJECT TEAM

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DESIGN	MRR

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2803.0	2/20/2018

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APPENDIX F

Drawing1.dwg
Model, 12/05/2016 9:20:52 AM, Tsproul, DWG To PDF.pc3, 1:1

APPENDIX G – UDA AREA MAP

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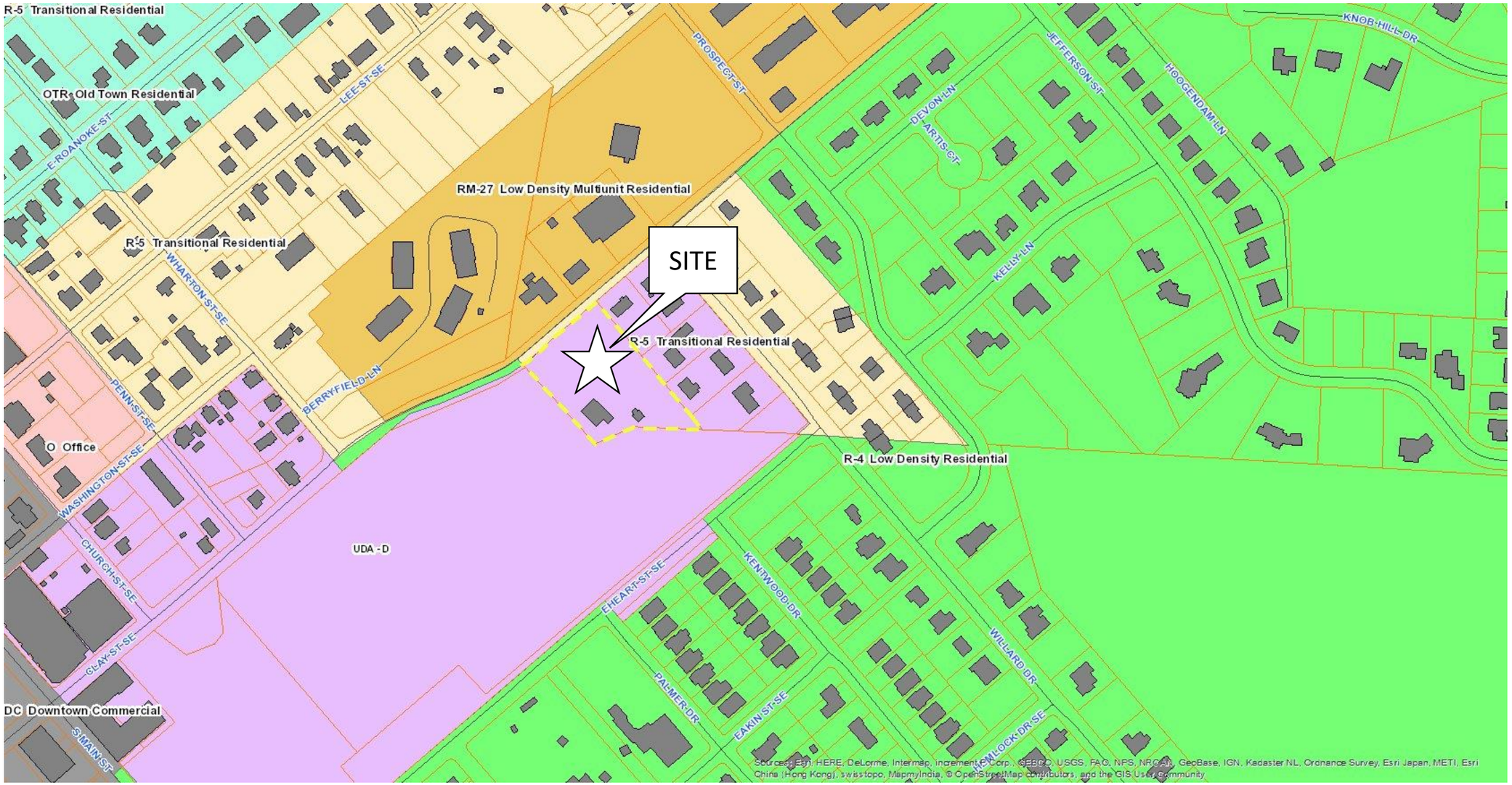
APPENDIX G
URBAN DEVELOPMENT AREA MAP



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GNI JOB NO.	ISSUE DATE
2803.0	2/20/2018

SHEET NUMBER
APPENDIX G

Drawing1.dwg
Model, 12/05/2016 9:20:52 AM, Tsproul, DWG To PDF.pc3, 1:1

APPENDIX H – BT TRANSIT STOPS

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APPENDIX H
BT TRANSIT STOPS

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2803.0	2/20/2018

SHEET NUMBER
APPENDIX H

Drawing1.dwg
Model, 12/05/2016 9:20:52 AM, Tsproul, DWG To PDF.pc3, 1:1

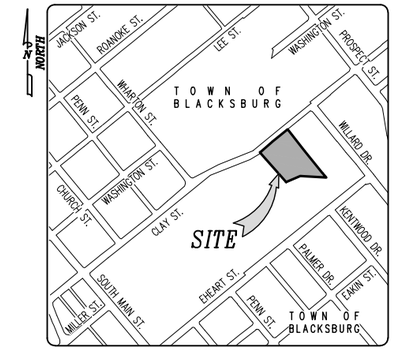
APPENDIX I – EXISTING SURVEY

BOUNDARY AND TOPOGRAPHIC SURVEY OF

TAX PARCEL 257-(A)-188

SITUATED AT #402 CLAY STREET, S.E.

TOWN OF BLACKSBURG
MT. TABOR_ MAGISTERIAL DISTRICT
MONTGOMERY COUNTY, VIRGINIA



VICINITY MAP:
SCALE: 1"=±500'

NOTES:

1. THIS SURVEY WAS PREPARED FOR: FORT WORTH HOLDINGS, INC.
2. CURRENT OWNERS & LEGAL REFERENCES:
   VIRGINIA TECH FOUNDATION, INC.
   INST. NO. 2013008625; TAX PARCEL NO. 257-(A)-188; P.I.D. #020133
3. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT AND THEREFORE MAY NOT INDICATE ALL ENCUMBRANCES AND EASEMENTS THAT MAY AFFECT THE SUBJECT PROPERTY.
4. THE TOPOGRAPHY, AS DEPICTED HEREON, IS THE RESULT OF AN ACTUAL FIELD SURVEY CONDUCTED BY GAY AND NEEL, INC. ON AUGUST 14, 2017 AND OCTOBER 2, 2017.
5. THIS TOPOGRAPHIC SURVEY WAS COMPLETED UNDER THE DIRECT AND RESPONSIBLE CHARGE OF RALPH O. CLEMENTS, L.S. LIC. #1864, FROM AN ACTUAL GROUND SURVEY MADE UNDER MY SUPERVISION; THE ORIGINAL FIELD DATA WAS OBTAINED DURING AUGUST, 2017 AND REVISED OCTOBER 2, 2017; AND THAT THIS PLAT, MAP OR DIGITAL GEOSPATIAL DATA USING METADATA MEETS MINIMUM ACCURACY STANDARDS UNLESS OTHERWISE NOTED.
6. ELEVATIONS AS SHOWN HEREON, ARE BASED ON NAVD 88 VERTICAL DATUM. HORIZONTAL DATUM, AS SHOWN HEREON, IS BASED ON GRID NORTH, VIRGINIA STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, NAD83(NA2011), EPOCH 2010.00. HORIZONTAL AND VERTICAL UNITS OF MEASUREMENT UTILIZED IS U.S. SURVEY FOOT.
7. CONTOUR INTERVAL=1 FT.
8. THIS MAP IS BASED ON AN ACTUAL FIELD SURVEY, USING MONUMENTS FOUND TO EXIST AND THEREFORE MAY NOT CONFORM TO PREVIOUS DEEDS OR PLATS OF RECORD. THIS SURVEY IS BASED ON LEGAL RESEARCH CONDUCTED ON AUGUST 18, 2017.
9. THE SUBJECT PROPERTY DOES NOT LIE WITHIN A F.E.M.A. DESIGNATED 100-YEAR FLOOD HAZARD ZONE. THE SUBJECT PROPERTY LIES WITHIN "UNSHADED ZONE X - OTHER AREAS", AS DEFINED BY F.E.M.A. & AS SHOWN ON F.I.R.M. MAP NO. 51121C0131C, EFFECTIVE DATE OF SEPTEMBER 25, 2009. THIS DETERMINATION HAS BEEN MADE BY GRAPHIC METHODS ONLY. NO ELEVATION STUDY HAS BEEN PERFORMED AS A PART OF THIS PROJECT.
10. NOTES REGARDING UTILITIES:

    GAY AND NEEL, INC. AND THE LAND SURVEYOR WHOSE NAME AND SEAL IS AFFIXED HERETO, ASSUMES NO LIABILITY FOR THE LOCATION , INCLUSION, OMISSION, EXISTENCE, OPERATIONS OF, INTERRUPTIONS OF OPERATIONS OR REPAIRS TO ANY UTILITY STRUCTURE OR FACILITY, ABOVE, OR BELOW GROUND, EITHER SHOWN OR NOT SHOWN ON THESE DRAWINGS. GAY AND NEEL, INC. CONTACTED MISS UTILITY'S "POSITIVE RESPONSE SYSTEM" ON 08/24/17, WAS ISSUED TICKET NO's. B723600849-00B & B723600863-00B, AND WERE GIVEN THE FOLLOWING RESULTS OF THE UTILITY MARKINGS:

    TICKET #B723600849-00B
    ACCESS MEDIA 3 (AME111) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA
    TOWN OF BLACKSBURG WATER & SEWER (BKB173) - MARKED
    COMCAST (CMC503) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA
    CITIZENS TELEPHONE (CTC291) - MARKED
    LEVEL 3 COMMUNICATIONS (LTC903) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA
    NRV REGIONAL WATER AUTHORITY (NRV259) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA
    SHENANDOAH CABLE (STC555) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA
    ATMOS ENERGY (UCB437) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA. ABANDONED UTILITY LINES MAY BE IN AREA.
    VIRGINIA TECH ELECTRIC (VAT237) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA
    VERIZON (VZN804) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA
    ZAYO - COMMUNICATIONS (ZAY828) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA

    TICKET #B723600863-00B
    ACCESS MEDIA 3 (AME111) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA
    TOWN OF BLACKSBURG WATER & SEWER (BKB173) - MARKED
    COMCAST (CMC503) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA
    CITIZENS TELEPHONE (CTC291) - MARKED
    ATMOS ENERGY (UCB437) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA.
    VIRGINIA TECH ELECTRIC (VAT237) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA
    VERIZON (VZN804) - NO CONFLICT; UTILITY IS OUTSIDE OF STATED WORK AREA

    LOCATIONS OF UNDERGROUND UTILITIES AS SHOWN HEREON ARE APPROXIMATE, BASED ON AVAILABLE SURFACE STRUCTURES, SUCH AS VALVES, MANHOLES, ETC. AND RECORD INFORMATION. VISIBLE UTILITY STRUCTURES WERE LOCATED IN ACCORDANCE WITH CI/ASCE 38-02 (CONSTRUCTION INSTITUTE OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS) QUALITY LEVEL 'C', WHICH IS DEFINED IN CI/ASCE 38-02 AS FOLLOWS:

    UTILITY QUALITY LEVEL 'C': INFORMATION OBTAINED BY SURVEYING AND PLOTTING VISIBLE ABOVE-GROUND UTILITY FEATURES AND BY USING PROFESSIONAL JUDGMENT IN CORRELATING THIS INFORMATION TO QUALITY LEVEL 'D' INFORMATION.

    ADDITIONAL UNDERGROUND UTILITY FEATURES DEPICTED HEREON MAY BE BASED ON SURFACE EVIDENCE AND/OR CI/ASCE STD. 38-02 QUALITY LEVEL 'D', DEFINED THEREIN AS FOLLOWS:

    UTILITY QUALITY LEVEL 'D': INFORMATION DERIVED FROM EXISTING RECORDS OR ORAL RECOLLECTIONS.

    SURFACE MARKINGS PROVIDED BY MISS UTILITY RESPONDERS MAY NOT CORRELATE TO CI/ASCE STD. 38-02 DEFINITIONS AND QUALITY LEVEL INDICATORS FOR THOSE MARKS ARE NOT SHOWN HEREON.

    48 HOURS PRIOR TO ANY EXCAVATION BEING CONDUCTED AS A PART OF THIS PROJECT, "MISS UTILITY" MUST BE NOTIFIED BY PHONE AT 1-800-552-7001, OR BY DIALING 811 IN VIRGINIA.

    INVERT ELEVATIONS, AS SHOWN HEREON, ARE LISTED IN A CLOCKWISE DIRECTION FROM THE OUTLET PIPE.

LEGEND:

- PROPERTY LINE
- ADJOINING PROPERTY LINE
- DISTANCE — SPECIFIC DISTANCE
- R/W — ROAD / STREET RIGHT-OF-WAY
- LINE EXTENSION
- EXISTING CENTERLINE
- TRACT LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING WALL
- OHU — OVERHEAD UTILITY LINE
- 15"S — EXISTING SANITARY SEWER
- 18"CMP — EXISTING STORM SEWER
- EXISTING FENCE LINE
- CONCRETE AREA
- G — GAS LINE PAINT MARKS
- T — TELEPHONE PAINT MARKS
- FO — FIBER OPTIC PAINT MARKS
- W — WATER LINE PAINT MARKS
- 2100 — MAJOR CONTOUR LINE
- MINOR CONTOUR LINE
- DEPRESSED CONTOUR
- PAINTED / PARKING STRIPE
- EXISTING RIP-RAP
- EXISTING SIGN
- PROPERTY CORNER
- L.P. — LIGHT POLE
- U.P. — UTILITY POLE
- WV — WATER VALVE
- F.H. — FIRE HYDRANT
- WM — WATER METER
- MANHOLE
- GUY WIRE
- C.O. — UTILITY CLEAN OUT
- BENCH MARK
- 2156.34 X — SPOT ELEVATION
- SHRUB
- TREE

ABBREVIATIONS:

(TYP.)=TYPICAL
@=AT
&=AND
±=PLUS OR MINUS
APPROX.=APPROXIMATE
ASCE=AMERICAN SOCIETY OF CIVIL ENGINEERS
AVE.=AVENUE
BLVD.=BOULEVARD
BUS.=BUSINESS
CI=CONSTRUCTION INSTITUTE
CMP=CORRUGATED METAL PIPE
CO.=COMPANY
C.O.=UTILITY CLEAN OUT
CONC.=CONCRETE
DBL.=DOUBLE
D.B.=DEED BOOK
DIR.=DIRECTION
DR.=DRIVE
E=EAST
ELEV.=ELEVATION
EOI=END OF INFORMATION
EP=EDGE OF PAVEMENT
ESMT.=EASEMENT
EX. / EXIST.=EXISTING
F.E.M.A.=FEDERAL EMERGENCY MANAGEMENT AGENCY
F.H.=FIRE HYDRANT
F.I.R.M.=FLOOD INSURANCE RATE MAP
F.O.=FIBER OPTIC
F.O.I.P.=FIBER OPTIC INDICATOR POST
FND.=FOUND
GW=GUY WIRE
HDPE=HIGH DENSITY POLYETHYLENE PIPE
INC.=INCORPORATED
INST.=INSTRUMENT
INVin=INVERT IN
INVout=INVERT OUT
L.F.=LINEAR FOOT
LLC=LIMITED LIABILITY COMPANY/CORPORATION
L.P.=LIGHT POLE / LAMP POST
L.S.=LAND SURVEYOR
LIC.=LICENSE
LOC.=LOCATION
M.P.H.=MILES PER HOUR
MH=MANHOLE
MI.=MILE(S)
MT.=MOUNT
N.F.V.=NOT FIELD VERIFIED
N/F=NOW OR FORMERLY
N=NORTH
NAD=NORTH AMERICAN DATUM
NAVD=NORTH AMERICAN VERTICAL DATUM
NO. / #=NUMBER
OHU=OVERHEAD UTILITY LINE(S)
P.B.=PLAT BOOK
P.I.D.=PARCEL IDENTIFICATION
PG. / PGS.=PAGE/PAGES
PVC=POLYVINYLCHLORIDE PIPE
R/W=RIGHT-OF-WAY
RCP=REINFORCED CONCRETE PIPE
RD.=ROAD
REG.=REGISTERED
RET.=RETAINING
S.E.=SOUTH EAST
S=SOUTH
SAN=SANITARY
ST.=STREET
STD.=STANDARD
T=UNDERGROUND TELEPHONE
TCP=TERRA-COTTA PIPE
TW=TOP OF WALL
U.P.=UTILITY POLE
VA.=VIRGINIA
VAR.=VARIABLE
VTES=VIRGINIA TECH ELECTRIC SERVICE
W/=WITH
W=WEST
WM=WATER METER
WV=WATER VALVE

GAY AND NEEL, INC.
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Email: info@gayandneel.com
Web: www.gayandneel.com

Boundary And Topographic Survey Of
Tax Parcel
257-(A)-188
Situated At
#402 Clay Street, S.E.
Town of Blacksburg
Mt. Tabor Magisterial District
Montgomery County, Va.

COMMONWEALTH OF VIRGINIA
RALPH O. CLEMENTS
Lic. No. 1864
09/14/17
LAND SURVEYOR

REVISIONS
10/02/17 - ADDED CONTOURS

PROJECT TEAM	
PM	ROC
TECH	MTM,KJD
CREW	DWS,SCL

GNI JOB NO.	ISSUE DATE
2803.00	09/14/17

SHEET NUMBER
1 OF 2

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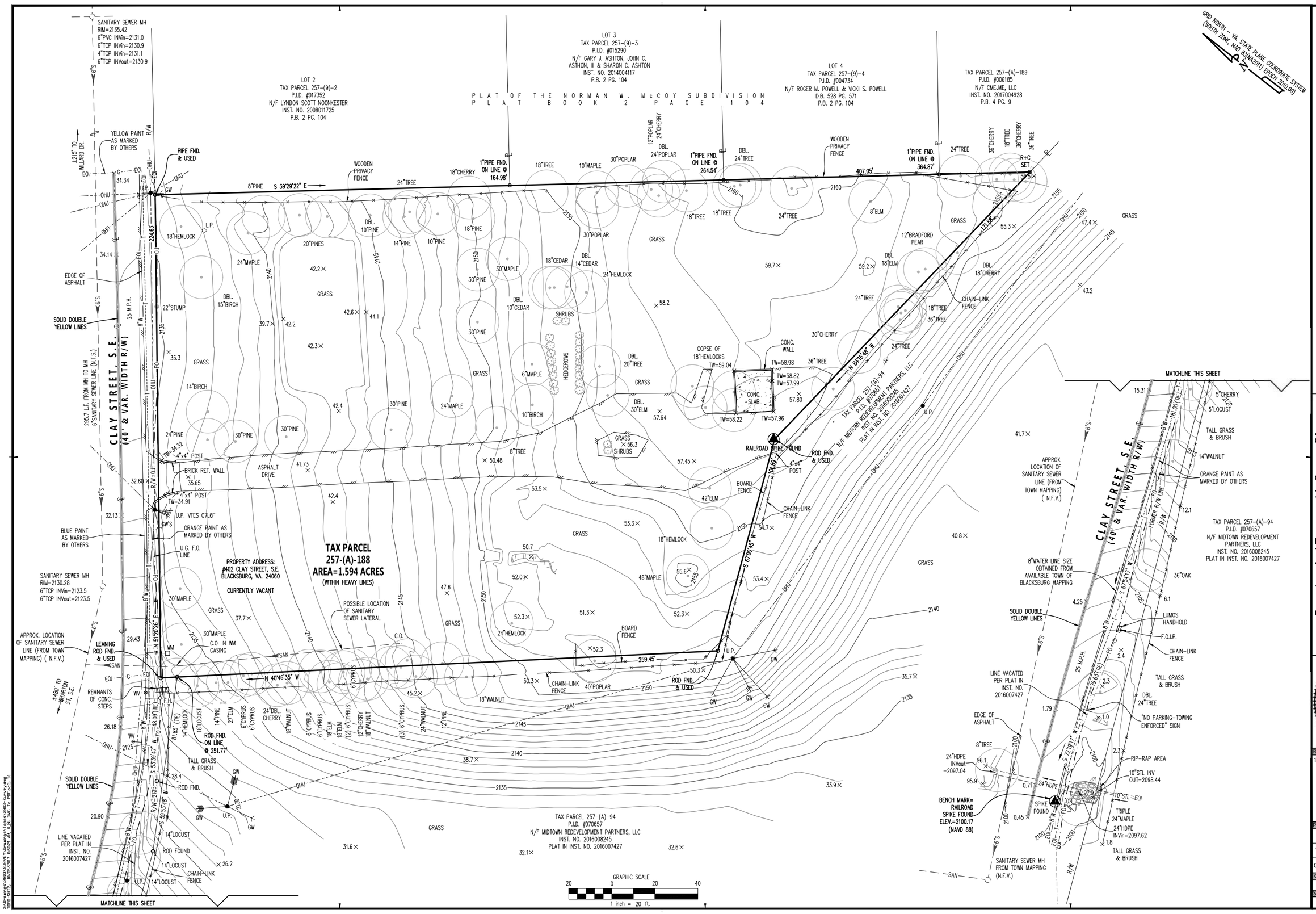

25 GAY AND NEEL, INC.
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Email: info@gayandneel.com
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Boundary And Topographic Survey Of Tax Parcel 257-(A)-188

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09/14/17
LAND SURVEYOR

REVISIONS
10/02/17 - ADDED CONTOURS

PROJECT TEAM	
PM	ROC
TECH	MTM,KJD
CREW	DWS,SCL

GNI JOB NO.	ISSUE DATE
2803.00	09/14/17

SHEET NUMBER
2 OF 2

APPENDIX J – SITE PLAN – INDEPENDENT LIVING OPTION

GAY AND NEEL, INC.
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402 CLAY STREET
REZONING
INDEPENDENT LIVING CENTER

BLACKSBURG, VA

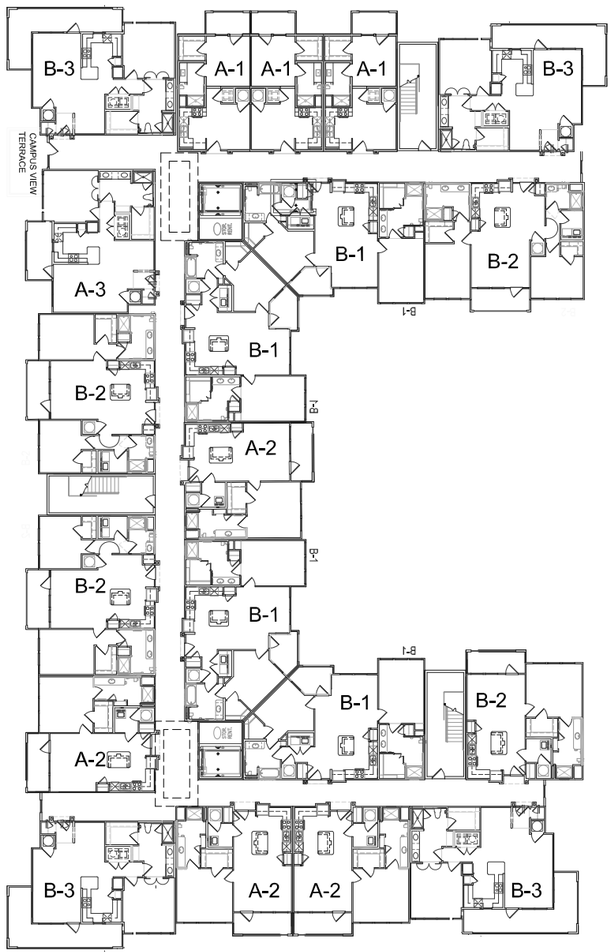
REVISIONS		
NO.	COMMENTS	DATE

PROJECT TEAM	
PIC	JOHN T NEEL, PE
PM	JOSH M MACDONALD, PE
DESIGN	MRR

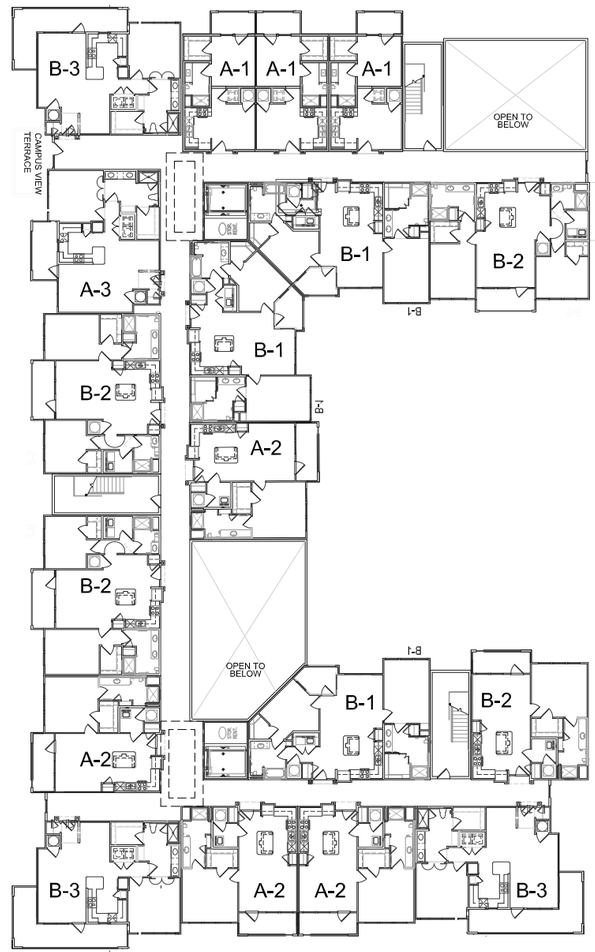
ISSUE DATE	03/01/2018
GNI JOB NO.	2803.0
SHEET TITLE	INDEPENDENT LIVING EXHIBIT
SHEET NUMBER	APPENDIX J

APPENDIX K – BUILDING PLAN – INDEPENDENT LIVING OPTION

APPENDIX K
BUILDING PLAN- INDEPENDENT LIVING OPTION



THIRD FLOOR



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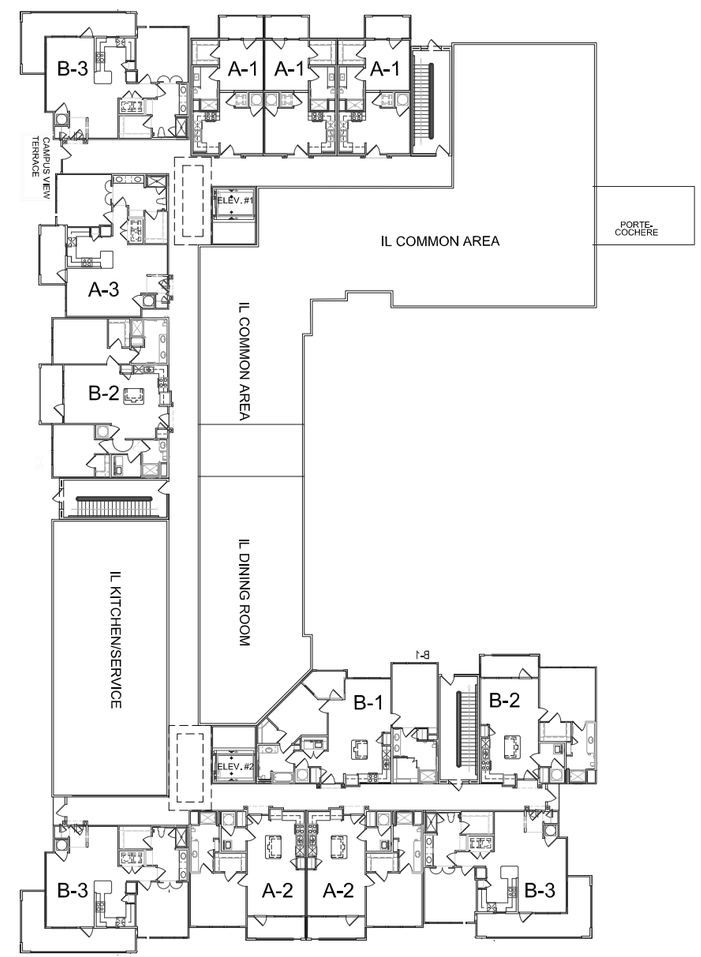

FIRST FLOOR

AGE RESTRICTED LIVING
BLACKSBURG, VIRGINIA

ARRIVE ARCHITECTURE GROUP
Architecture
Planning
Project Management
2344 Highway 121 · Suite 100 · Bedford, Texas 76021 · www.ArriveAG.com
Ph 817.514.0584 · Fx 817.514.0694

SEAL

REVISION

JOB #

DRAWN BY: LTT	CHECKED BY: TMT
ORIG. DATE: 2017	REV. DATE:
ISSUED FOR: REVIEW	SHEET NO.
SCALE: AS NOTED	

APPENDIX L – SITE PLAN – ASSISTED LIVING OPTION

GAY AND NEEL, INC.
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402 CLAY STREET
REZONING

BLACKSBURG, VA

REVISIONS

NO.	COMMENTS	DATE

PROJECT TEAM

PIC	JOHN T NEEL, PE
PM	JOSH M MACDONALD, PE
DESIGN	MRR

ISSUE DATE
03/01/2018

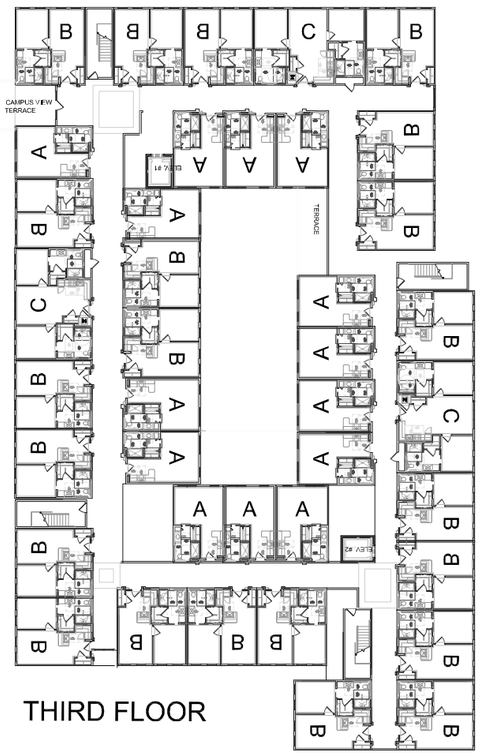
GNI JOB NO.
2803.0

SHEET TITLE
ASSISTED LIVING EXHIBIT

SHEET NUMBER
APPENDIX L

APPENDIX M – BUILDING PLAN – ASSISTED LIVING OPTION

APPENDIX M
BUILDING PLAN- ASSISTED LIVING OPTION



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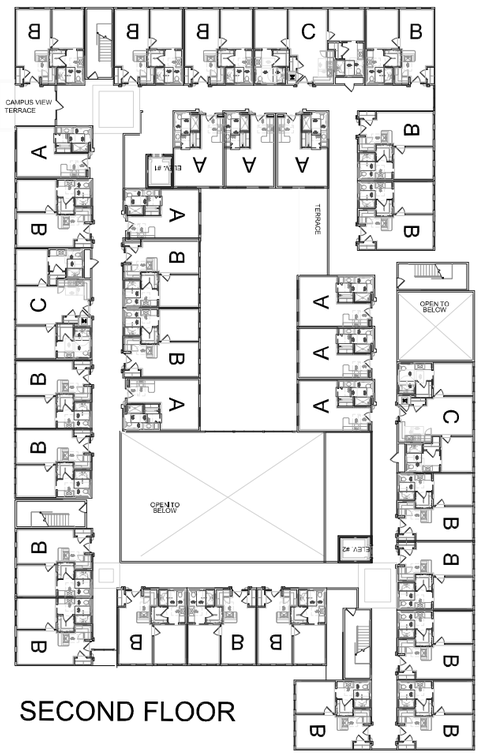

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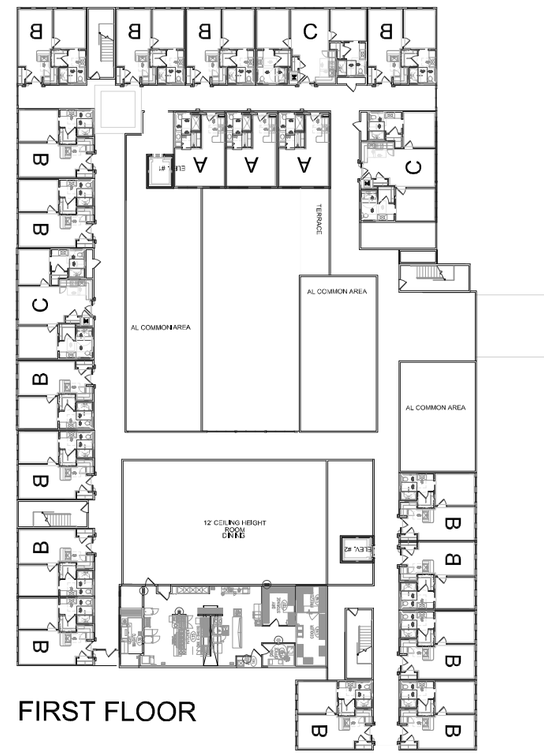
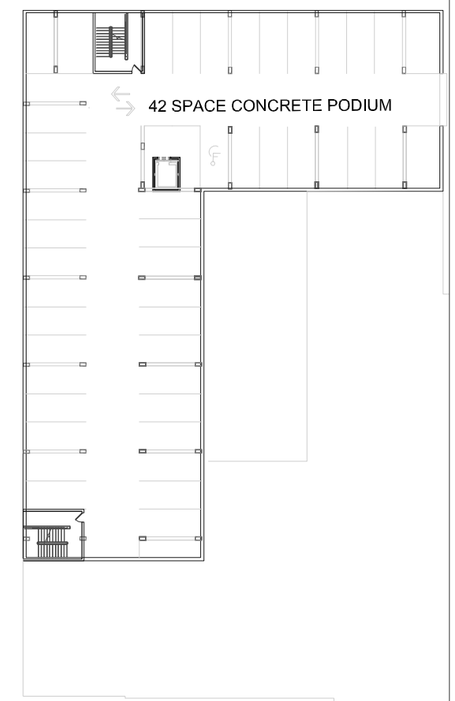


FIRST FLOOR



GROUND FLOOR

AGE RESTRICTED LIVING
BLACKSBURG, VIRGINIA

ARRIVE ARCHITECTURE GROUP
Architecture
Planning
Project Management
2344 Highway 121 - Suite 100 - Bedford, Texas 76021 - www.ArriveAG.com
Ph 817.514.0584 - Fx 817.514.0694

SEAL

REVISION

JOB #

DRAWN BY: CHTS	CHECKED BY: JMT
ORIG. DATE: 2017	REV. DATE:
ISSUED FOR: REVIEW	SHEET NO.
SCALE: AS NOTED	

APPENDIX N – CONCEPTUAL RENDERINGS

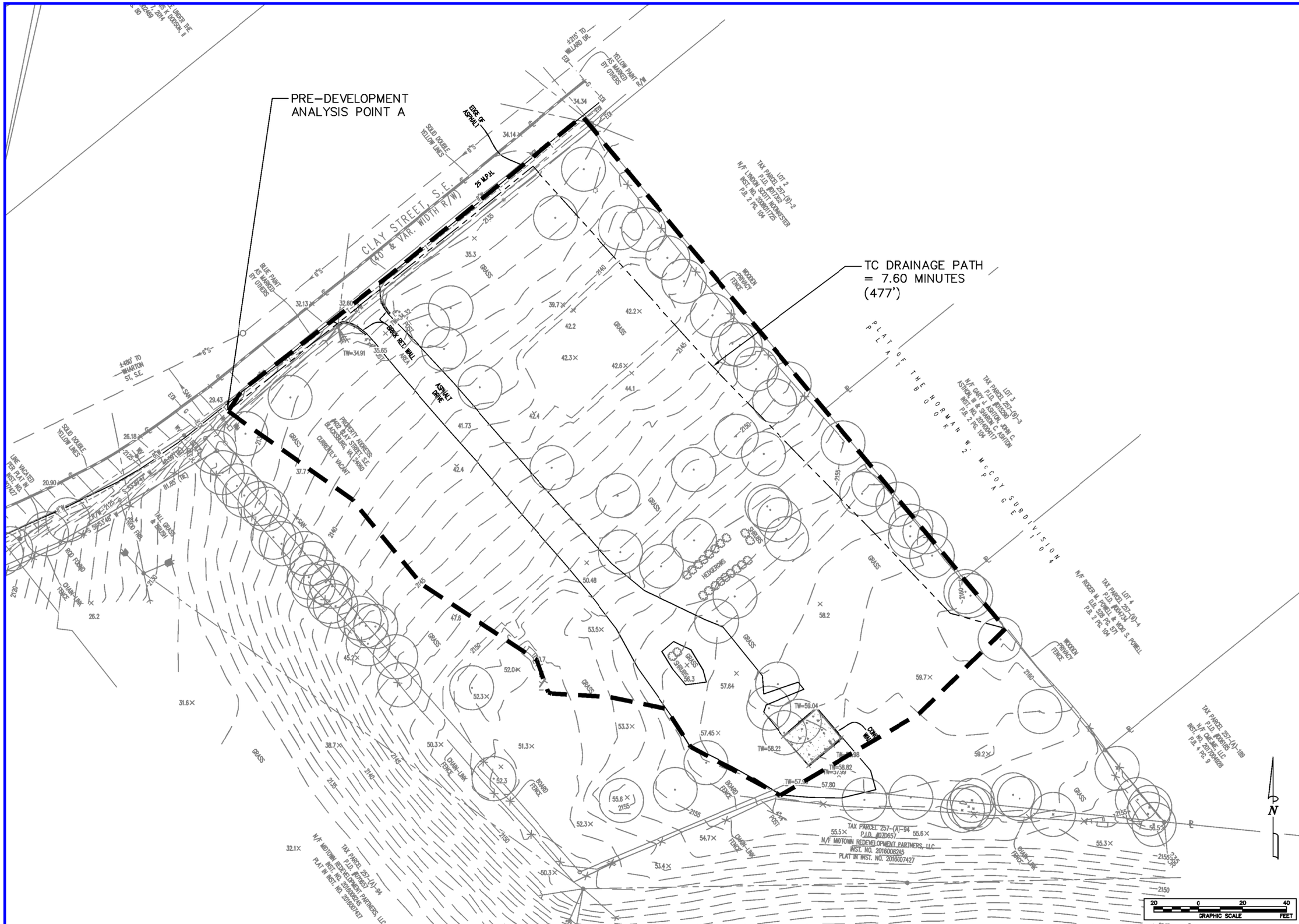
APPENDIX N
CONCEPTUAL RENDERING

APPENDIX N
CONCEPTUAL RENDERING

APPENDIX O – WATER/SEWER CALCULATIONS & CORRESPONDENCE

This has been requested from the Town and will be inserted once received.

APPENDIX P – STORMWATER PRE-DEVELOPMENT MAP



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402 CLAY STREET
REZONING

BLACKSBURG, VA

REVISIONS		
NO.	COMMENTS	DATE

PROJECT TEAM	
PIC	JOHN T NEEL, PE
PM	JOSH M MACDONALD, PE
DESIGN	JMM
ISSUE DATE	04/01/2018
GNI JOB NO.	2803.0
SHEET TITLE	PRE-DEVELOPMENT DRAINAGE
SHEET NUMBER	APPENDIX P

APPENDIX Q – STORMWATER POST-DEVELOPMENT MAP

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402 CLAY STREET
REZONING

BLACKSBURG, VA

REVISIONS		
NO.	COMMENTS	DATE

PROJECT TEAM	
PIC	JOHN T NEEL, PE
PM	JOSH M MACDONALD, PE
DESIGN	JMM

ISSUE DATE
04/01/2018
GNI JOB NO.
2803.0
SHEET TITLE
POST-DEVELOPMENT DRAINAGE
SHEET NUMBER
APPENDIX Q

APPENDIX R – TC PRE-DEVELOPMENT COMPUTATION

GAY AND NEEL, INC.

ENGINEERING ◆ LANDSCAPE ARCHITECTURE ◆ SURVEYING

402 Clay Street	**JN:**	**2803.0**
Pre-Development Drainage Areas TC Computations	**BY:**	**JMM**
	DATE:	**04/01/18**

Pre Area A						
Seelye	$t_{Overland}$	5.31	L= 100'	H= 6.0	C'= 0.50	
Kirpich	$t_{Channel, Unpaved}$	2.33	L= 377'	H= 20.0		
Kirpich	$t_{Channel, Paved}$	0.00	L= 0'	H= 0.0		
	t_c	**7.60 min**				

Overland	
Start Elev	2161
End Elev	2155
Channel, Unpaved	
Start Elev	2155
End Elev	2135
Channel, Paved	
Start Elev	0
End Elev	0

APPENDIX S – TC POST-DEVELOPMENT COMPUTATION

GAY AND NEEL, INC.
ENGINEERING ◆ LANDSCAPE ARCHITECTURE ◆ SURVEYING

402 Clay Street	**JN:**	**2803.0**
Post-Development Drainage Areas	**BY:**	**JMM**
	DATE:	**04/01/18**

Post Area 1

Seelye	$t_{Overland}$	#DIV/0!	L= 0'	H= 0.0	C'= 0.20	
Kirpich	$t_{Channel, Unpaved}$	0.00	L= 0'	H= 0.0		
Kirpich	$t_{Channel, Paved}$	0.00	L= 0'	H= 0.0		
	t_c	**10.00 min**	(5.00 min. to StormTech System, 5.00 min. through detention chamber)			

Overland	
Start Elev	0
End Elev	0
Channel, Unpaved	
Start Elev	0
End Elev	0
Channel, Paved	
Start Elev	0
End Elev	0

APPENDIX T – CN PRE-DEVELOPMENT COMPUTATION

GAY AND NEEL, INC.
ENGINEERING ❖ LANDSCAPE ARCHITECTURE ❖ SURVEYING

402 Clay Street Rezoning

Pre-Development CN Calculations

JN 2803.0
4/1/2018

PRE		Grass			Woods			Impervious	TOTAL	
		B	C	D	B	C	D			
DRAINAGE AREA	CN	61	74	80	55	70	77	98	AREA	CN
	UNITS									
ANALYSIS POINT A	SQ FT	-	45,738	-	-	-	-	6,534	52,272	77
	AC		1.05					0.15	1.20	
ANALYSIS POINT A - FORESTED	SQ FT					45,738		6,534	52,272	74
	AC					1.05		0.15	1.20	

APPENDIX U – CN POST-DEVELOPMENT COMPUTATION

GAY AND NEEL, INC.
ENGINEERING ❖ LANDSCAPE ARCHITECTURE ❖ SURVEYING

402 Clay Street Rezoning

Post-Development CN Calculations

JN 2803.0
4/1/2018

POST		Grass			Woods			Impervious	TOTAL	
		B	C	D	B	C	D			
DRAINAGE AREA	CN	61	74	80	55	70	77	98	AREA	CN
	UNITS									
Post-Dev to Rainwater Harvesting	SQ FT	-		-	-	-	-	28,679	28,679	98
	AC							0.66	0.66	
Post-Dev to ADS System	SQ FT	-	14,810	-	-	-	-	20,979	35,789	88
	AC		0.34					0.48	0.82	
Analysis Point A - Uncontrolled	SQ FT	-	3,920	-	-	-	-	871	4,791	78
	AC		0.09					0.02	0.11	

APPENDIX V – CHANNEL PROTECTION COMPLIANCE WORKSHEET (ENERGY BALANCE)

GAY AND NEEL, INC.
ENGINEERING ♦ LANDSCAPE ARCHITECTURE ♦ SURVEYING
540.381.6011
www.gayandneel.com

402 Clay Street Rezoning
Drainage Area "A"

JN: 2803.0
BY: JMM
DATE: 04/01/18

CHANNEL PROTECTION TO A NATURAL WATERWAY CALCULATIONS - 1-YR 24 HOUR STORM

Site Area =	1.59	AC	*Limits of Disturbance (see definition in 9VAC25-870*
Improvement Factor (I.F.) =	0.8		*Based on Site Area*
$Q_{Pre\text{-}developed}$ (Qp) =	1.16	cfs	
$RV_{Pre\text{-}developed}$ (RVp) =	0.054	af	
			Input from Hydrographs
Q_{Forest} (Qf) =	0.89	cfs	
RV_{Forest} (RVf) =	0.043	af	

Target Flow Rate Determined by Pre-development Equation: I.F.*(Qp*RVp)/RVd

$RV_{Developed}$ from Hydrograph	0.075	af	*Input from Hydrographs*
Runoff Reduction from VRRM	-	cf	
$RV_{Developed}$ (RVd) =	0.075	af	

$Q_{Developed}$ Target = 0.67 cfs

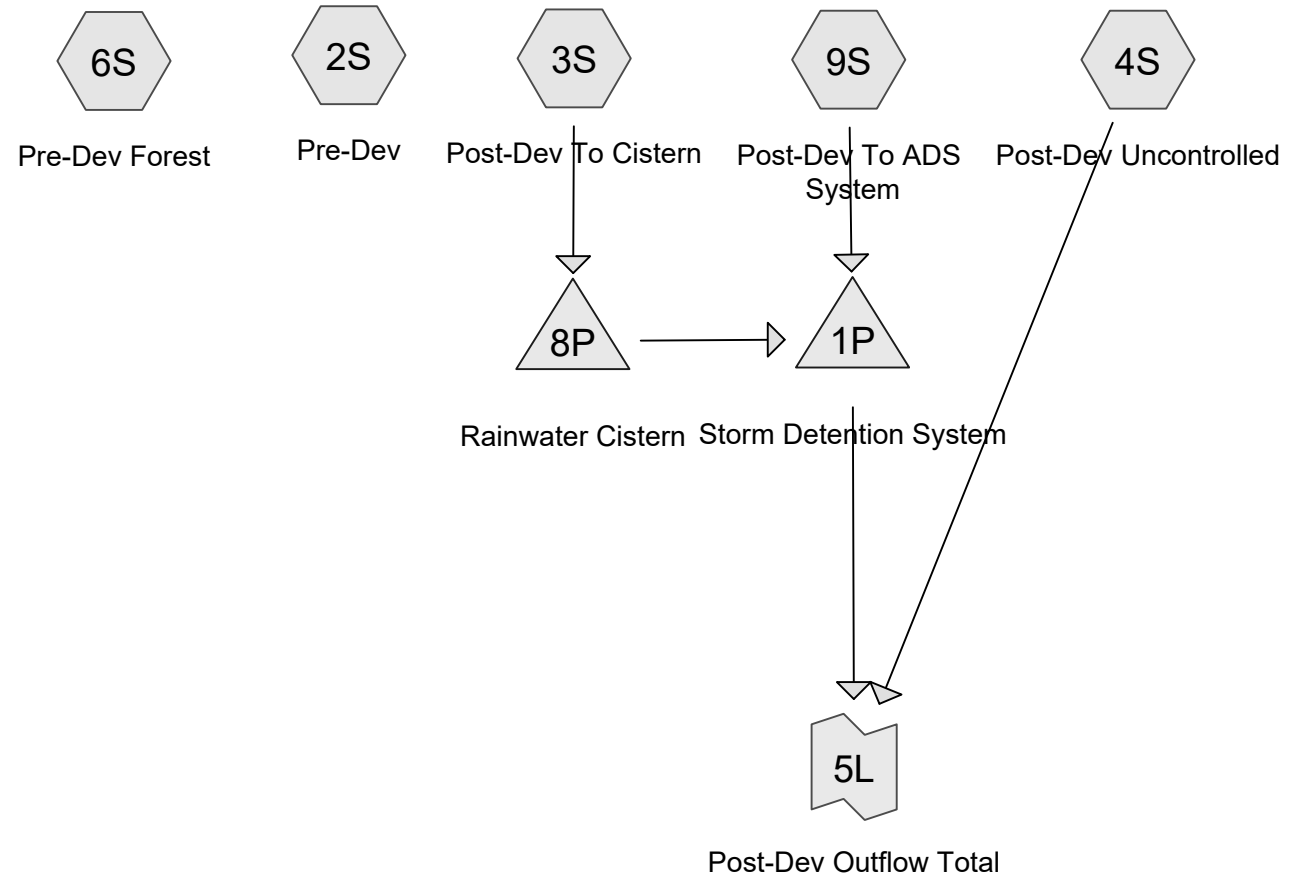
*$Q_{Developed}$ (Qd) =	0.64	cfs	*Input from Hydrographs*

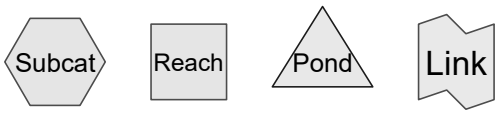
Qd	IS LESS THAN	I.F.*(Qp*RVp)/RVd
0.64		0.67

$Q_{Developed} \leq$ I.F.*($Q_{Pre\text{-}developed}$* $RV_{Pre\text{-}Developed}$)/$RV_{Developed}$
Under no condition shall $Q_{Developed}$ be greater than $Q_{Pre\text{-}Developed}$ nor shall $Q_{Developed}$ be required to be less than that calculated in the equation (Q_{Forest} * RV_{Forest})/$RV_{Developed}$; where
I.F. (Improvement Factor) equals 0.8 for sites > 1 acre or 0.9 for sites ≤ 1 acre.
$Q_{Developed}$ = The allowable peak flow rate of runoff from the developed site.
$RV_{Developed}$ = The volume of runoff from the site in the developed condition.
$Q_{Pre\text{-}Developed}$ = The peak flow rate of runoff from the site in the pre-developed condition.
$RV_{Pre\text{-}Developed}$ = The volume of runoff from the site in pre-developed condition.
Q_{Forest} = The peak flow rate of runoff from the site in a forested condition.
RV_{Forest} = The volume of runoff from the site in a forested condition; or

*Methodology from 9VAC25-870-66-B-3-a

APPENDIX W – STORMWATER OUTPUT AND HYDROGRAPHS





Routing Diagram for 2803 - Detention Comps
Prepared by Gay & Neel Inc. - JMM, Printed 4/2/2018
HydroCAD® 10.00-14 s/n 08978 © 2015 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
52,272	77	(2S)
28,750	98	(3S)
4,792	78	(4S)
35,719	88	(9S)
52,272	74	Woods, Fair, HSG C (6S)
173,804	**82**	**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment2S: Pre-Dev Runoff Area=1.200 ac 0.00% Impervious Runoff Depth>0.54"
Tc=7.6 min CN=77 Runoff=1.16 cfs 2,357 cf

Subcatchment3S: Post-Dev To Cistern Runoff Area=0.660 ac 100.00% Impervious Runoff Depth>1.91"
Tc=10.0 min CN=98 Runoff=1.83 cfs 4,573 cf

Subcatchment4S: Post-Dev Uncontrolled Runoff Area=0.110 ac 0.00% Impervious Runoff Depth>0.58"
Tc=5.0 min CN=78 Runoff=0.13 cfs 232 cf

Subcatchment6S: Pre-Dev Forest Runoff Area=1.200 ac 0.00% Impervious Runoff Depth>0.43"
Tc=7.6 min CN=74 Runoff=0.89 cfs 1,878 cf

Subcatchment9S: Post-Dev To ADS System Runoff Area=0.820 ac 0.00% Impervious Runoff Depth>1.10"
Tc=10.0 min CN=88 Runoff=1.48 cfs 3,278 cf

Pond 1P: Storm Detention System Peak Elev=2,134.77' Storage=1,030 cf Inflow=1.48 cfs 3,278 cf
Outflow=0.62 cfs 3,169 cf

Pond 8P: Rainwater Cistern Peak Elev=2,134.73' Storage=4,571 cf Inflow=1.83 cfs 4,573 cf
Outflow=0.00 cfs 0 cf

Link 5L: Post-Dev Outflow Total Inflow=0.64 cfs 3,401 cf
Primary=0.64 cfs 3,401 cf

Total Runoff Area = 173,804 sf Runoff Volume = 12,318 cf Average Runoff Depth = 0.85"
83.46% Pervious = 145,055 sf 16.54% Impervious = 28,750 sf

Summary for Subcatchment 2S: Pre-Dev

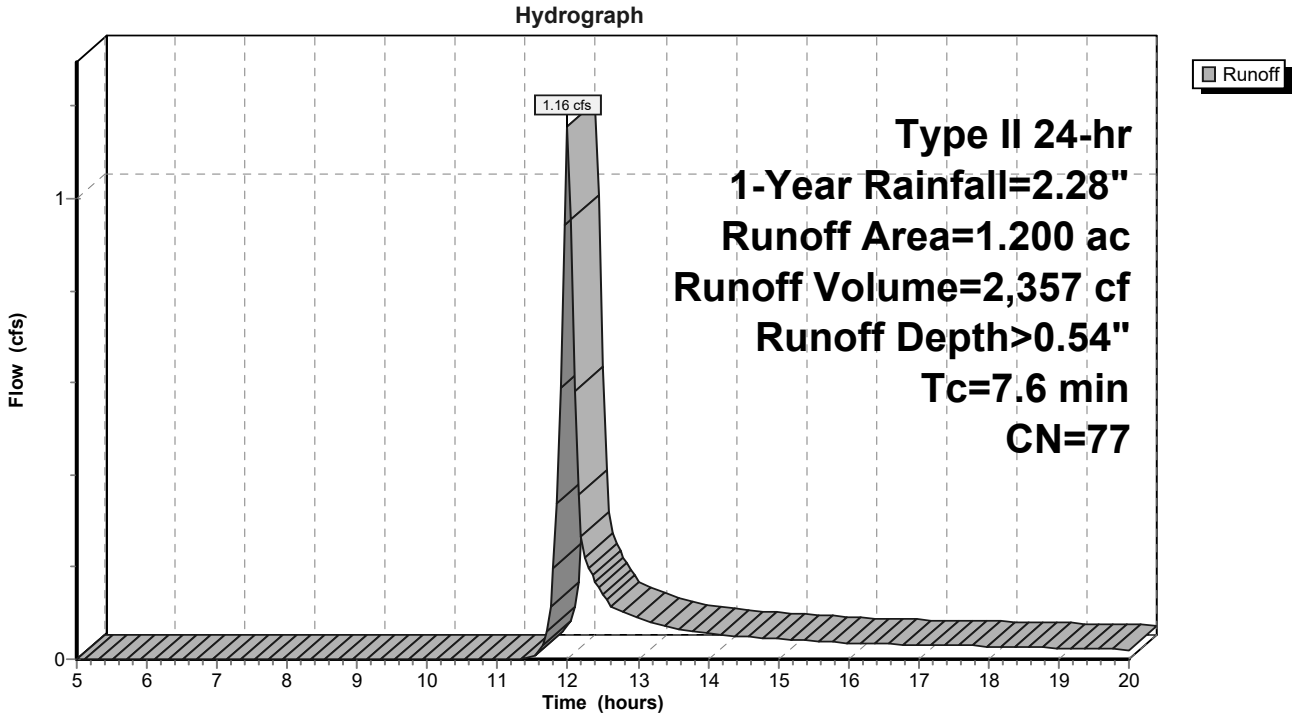
Runoff = 1.16 cfs @ 12.00 hrs, Volume= 2,357 cf, Depth> 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Year Rainfall=2.28"

	Area (ac)	CN	Description
*	1.200	77	
	1.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6					**Direct Entry,**

Subcatchment 2S: Pre-Dev



Summary for Subcatchment 3S: Post-Dev To Cistern

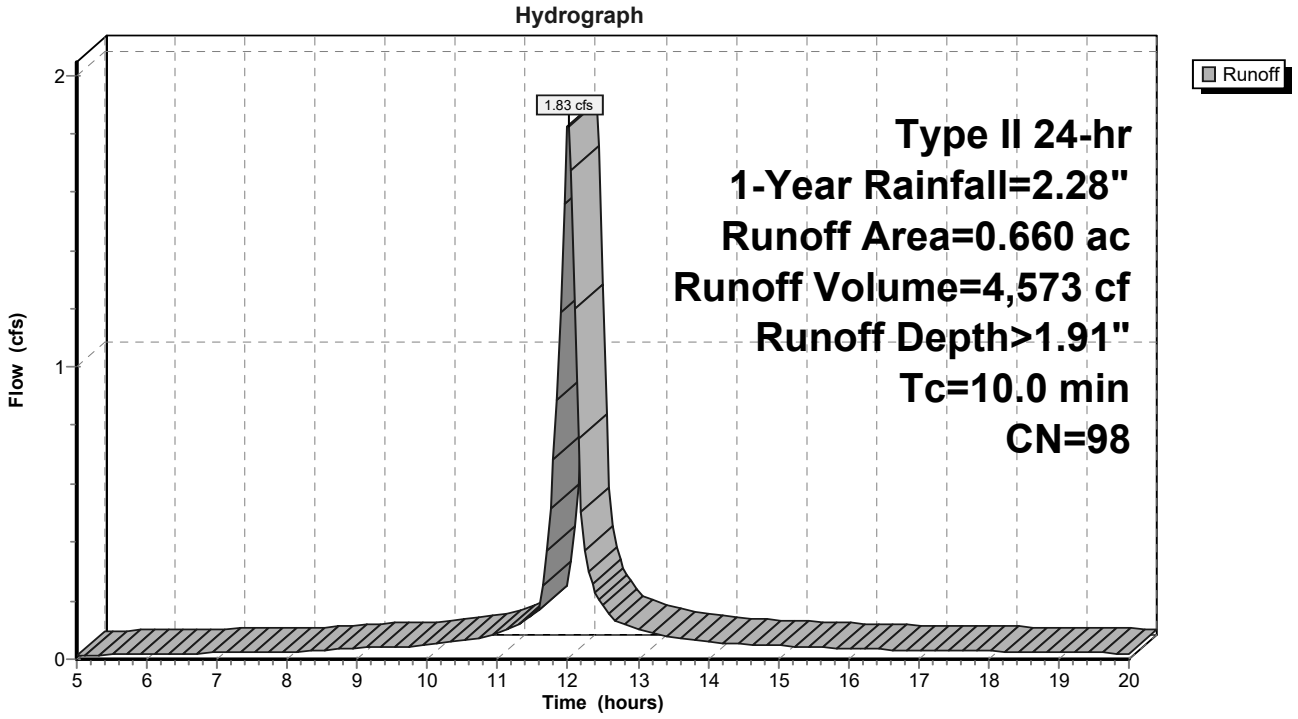
Runoff = 1.83 cfs @ 12.01 hrs, Volume= 4,573 cf, Depth> 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Year Rainfall=2.28"

	Area (ac)	CN	Description
*	0.660	98	
	0.660		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 3S: Post-Dev To Cistern



Summary for Subcatchment 4S: Post-Dev Uncontrolled

[49] Hint: Tc<2dt may require smaller dt

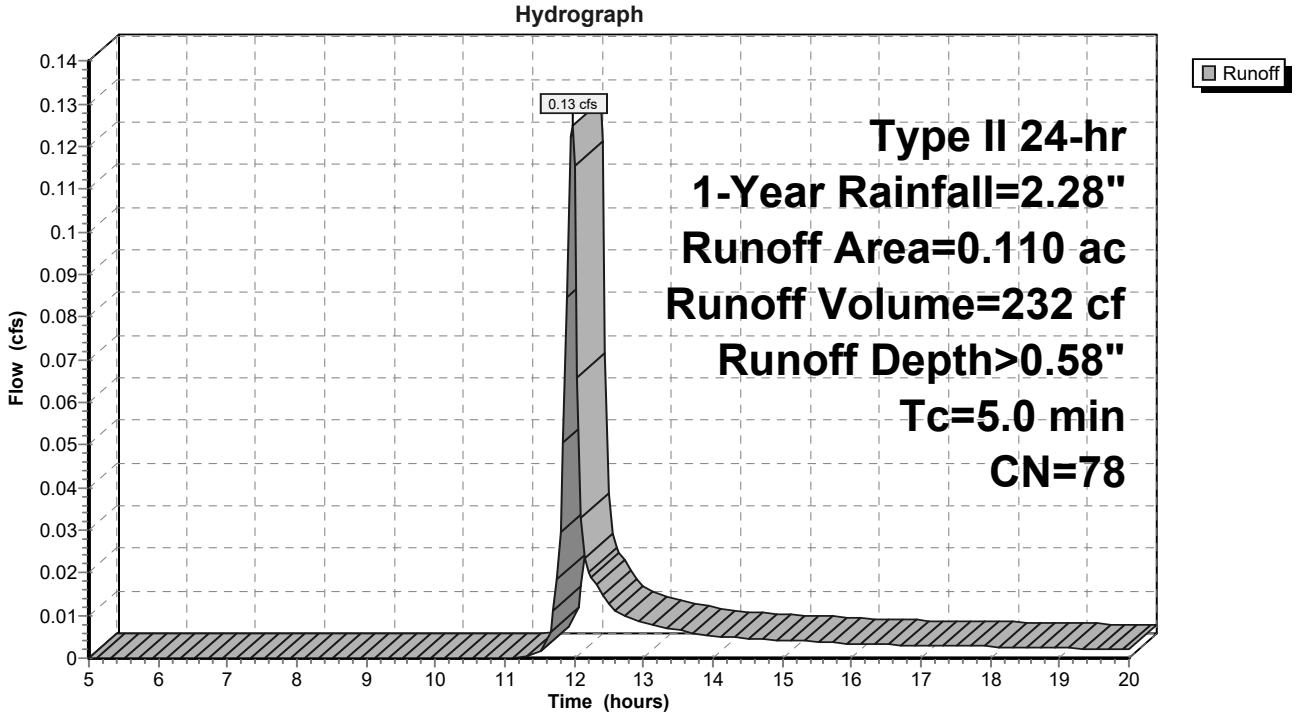
Runoff = 0.13 cfs @ 11.97 hrs, Volume= 232 cf, Depth> 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Year Rainfall=2.28"

	Area (ac)	CN	Description
*	0.110	78	
	0.110		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4S: Post-Dev Uncontrolled



Summary for Subcatchment 6S: Pre-Dev Forest

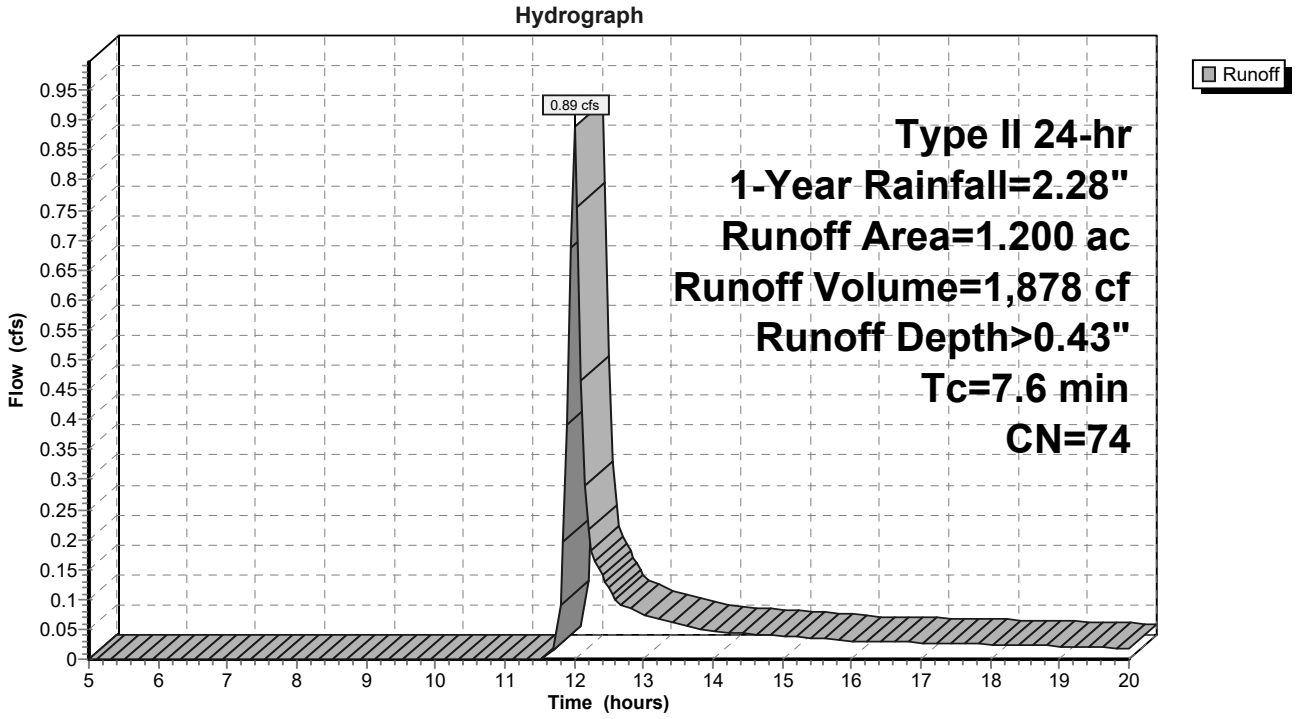
Runoff = 0.89 cfs @ 12.00 hrs, Volume= 1,878 cf, Depth> 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Year Rainfall=2.28"

	Area (ac)	CN	Description
*	1.200	74	Woods, Fair, HSG C
	1.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6					**Direct Entry,**

Subcatchment 6S: Pre-Dev Forest



Summary for Subcatchment 9S: Post-Dev To ADS System

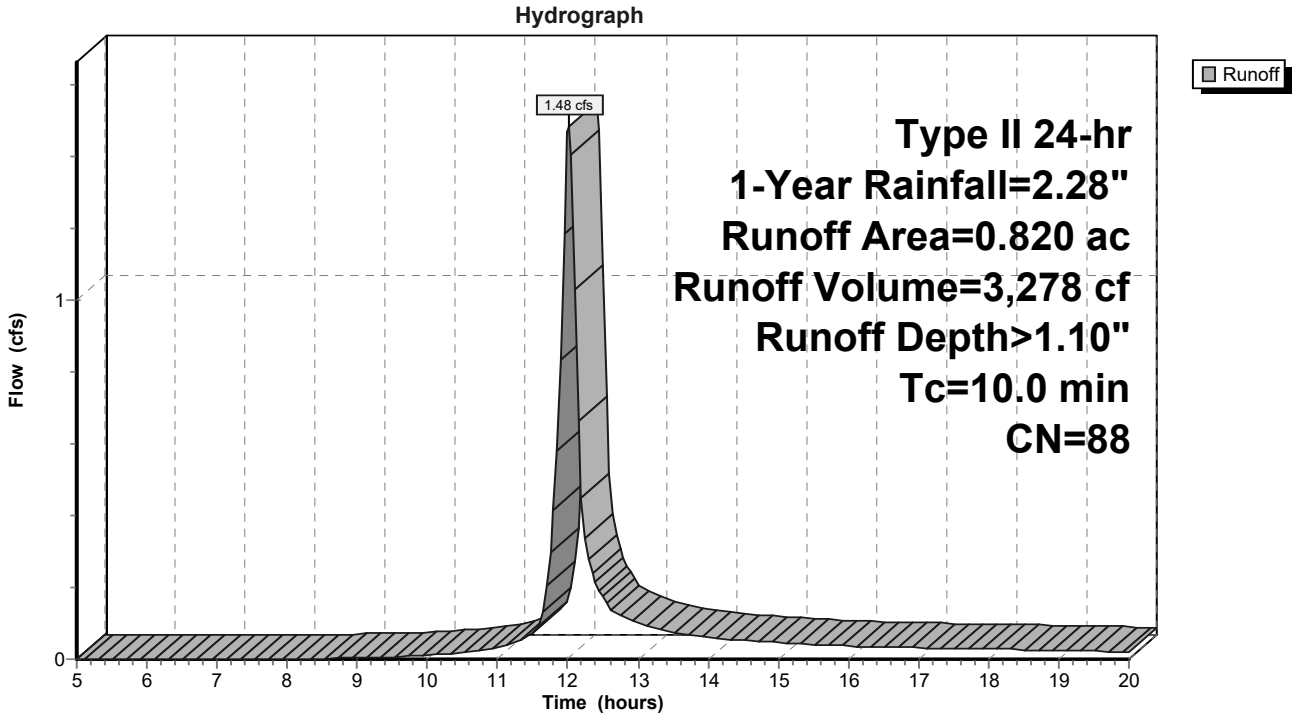
Runoff = 1.48 cfs @ 12.02 hrs, Volume= 3,278 cf, Depth> 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Year Rainfall=2.28"

	Area (ac)	CN	Description
*	0.820	88	
	0.820		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 9S: Post-Dev To ADS System



Summary for Pond 1P: Storm Detention System

Inflow Area = 64,469 sf, 44.59% Impervious, Inflow Depth > 0.61" for 1-Year event
Inflow = 1.48 cfs @ 12.02 hrs, Volume= 3,278 cf
Outflow = 0.62 cfs @ 12.16 hrs, Volume= 3,169 cf, Atten= 58%, Lag= 8.9 min
Primary = 0.62 cfs @ 12.16 hrs, Volume= 3,169 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2,134.77' @ 12.17 hrs Surf.Area= 0 sf Storage= 1,030 cf

Plug-Flow detention time= 37.4 min calculated for 3,158 cf (96% of inflow)
Center-of-Mass det. time= 24.8 min (813.1 - 788.3)

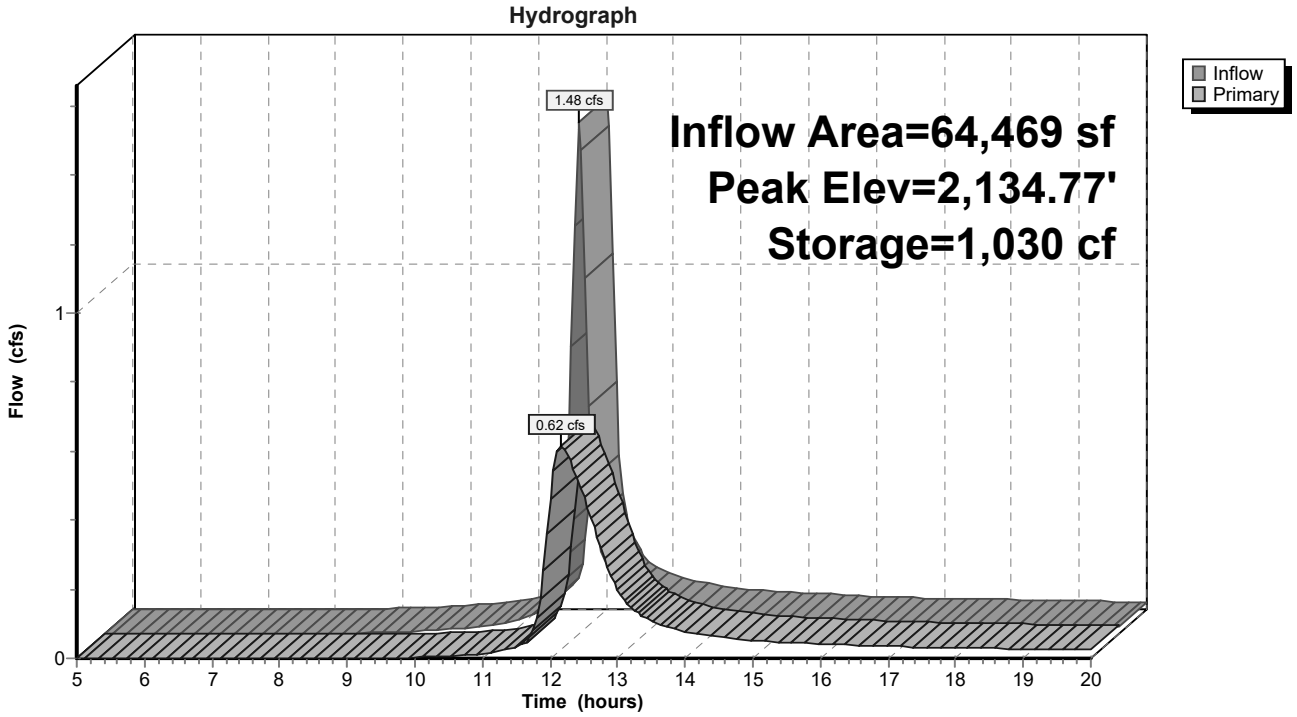
Volume	Invert	Avail.Storage	Storage Description
#1	2,134.00'	4,000 cf	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (cubic-feet)
2,134.00	0
2,137.00	4,000

Device	Routing	Invert	Outlet Devices
#1	Primary	2,134.00'	**24.0" Round Culvert** L= 200.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 2,133.00' / 2,134.00' S= -0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	2,134.00'	**5.0" Vert. Orifice/Grate** C= 0.750
#3	Device 1	2,134.77'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.750
#4	Primary	2,135.19'	**24.0' long 2137** 2 End Contraction(s)

Primary OutFlow Max=0.61 cfs @ 12.16 hrs HW=2,134.77' (Free Discharge)
- **1=Culvert** (Passes 0.61 cfs of 2.93 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.61 cfs @ 4.50 fps)
  - **3=Orifice/Grate** (Controls 0.00 cfs)
- **4=2137** (Controls 0.00 cfs)

Pond 1P: Storm Detention System



Summary for Pond 8P: Rainwater Cistern

[82] Warning: Early inflow requires earlier time span

Inflow Area = 28,750 sf,100.00% Impervious, Inflow Depth > 1.91" for 1-Year event
Inflow = 1.83 cfs @ 12.01 hrs, Volume= 4,573 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2,134.73' @ 20.00 hrs Surf.Area= 0 sf Storage= 4,571 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

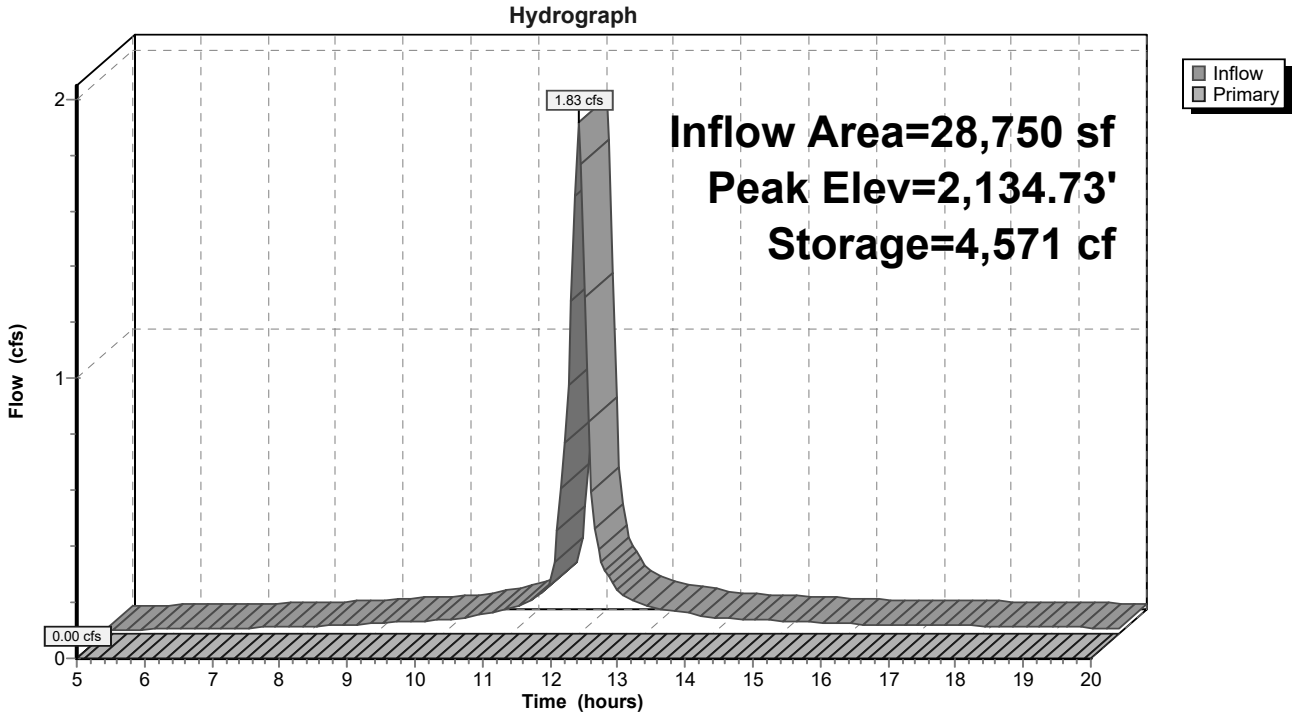
Volume	Invert	Avail.Storage	Storage Description
#1	2,134.00'	25,100 cf	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (cubic-feet)
2,134.00	0
2,138.00	25,000
2,139.00	25,100

Device	Routing	Invert	Outlet Devices
#1	Primary	2,137.00'	**30.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=2,134.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Rainwater Cistern

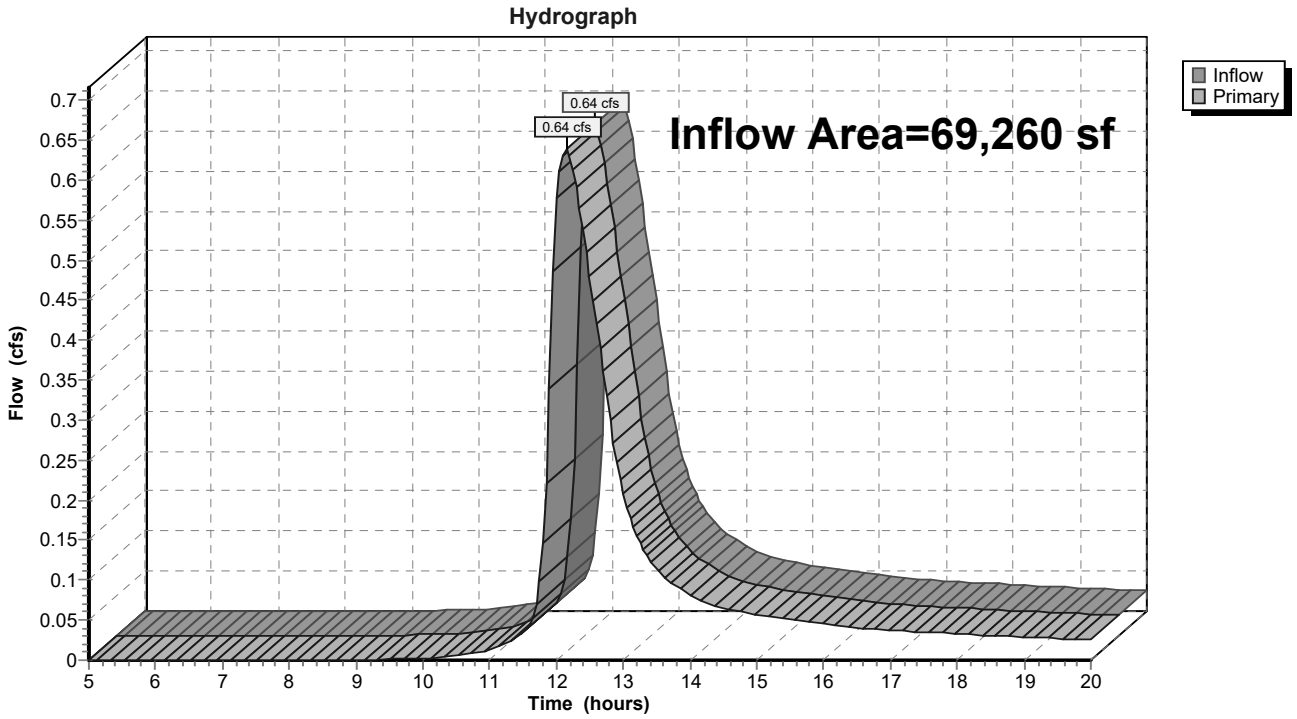


Summary for Link 5L: Post-Dev Outflow Total

Inflow Area = 69,260 sf, 41.51% Impervious, Inflow Depth > 0.59" for 1-Year event
Inflow = 0.64 cfs @ 12.15 hrs, Volume= 3,401 cf
Primary = 0.64 cfs @ 12.15 hrs, Volume= 3,401 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 5L: Post-Dev Outflow Total



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment2S: Pre-Dev Runoff Area=1.200 ac 0.00% Impervious Runoff Depth>1.73"
Tc=7.6 min CN=77 Runoff=3.77 cfs 7,548 cf

Subcatchment3S: Post-Dev To Cistern Runoff Area=0.660 ac 100.00% Impervious Runoff Depth>3.56"
Tc=10.0 min CN=98 Runoff=3.34 cfs 8,525 cf

Subcatchment4S: Post-Dev Uncontrolled Runoff Area=0.110 ac 0.00% Impervious Runoff Depth>1.81"
Tc=5.0 min CN=78 Runoff=0.39 cfs 722 cf

Subcatchment6S: Pre-Dev Forest Runoff Area=1.200 ac 0.00% Impervious Runoff Depth>1.52"
Tc=7.6 min CN=74 Runoff=3.33 cfs 6,630 cf

Subcatchment9S: Post-Dev To ADS System Runoff Area=0.820 ac 0.00% Impervious Runoff Depth>2.63"
Tc=10.0 min CN=88 Runoff=3.42 cfs 7,836 cf

Pond 1P: Storm Detention System Peak Elev=2,135.20' Storage=1,594 cf Inflow=3.42 cfs 7,836 cf
Outflow=3.05 cfs 7,681 cf

Pond 8P: Rainwater Cistern Peak Elev=2,135.36' Storage=8,521 cf Inflow=3.34 cfs 8,525 cf
Outflow=0.00 cfs 0 cf

Link 5L: Post-Dev Outflow Total Inflow=3.22 cfs 8,403 cf
Primary=3.22 cfs 8,403 cf

Total Runoff Area = 173,804 sf Runoff Volume = 31,261 cf Average Runoff Depth = 2.16"
83.46% Pervious = 145,055 sf 16.54% Impervious = 28,750 sf

Summary for Subcatchment 2S: Pre-Dev

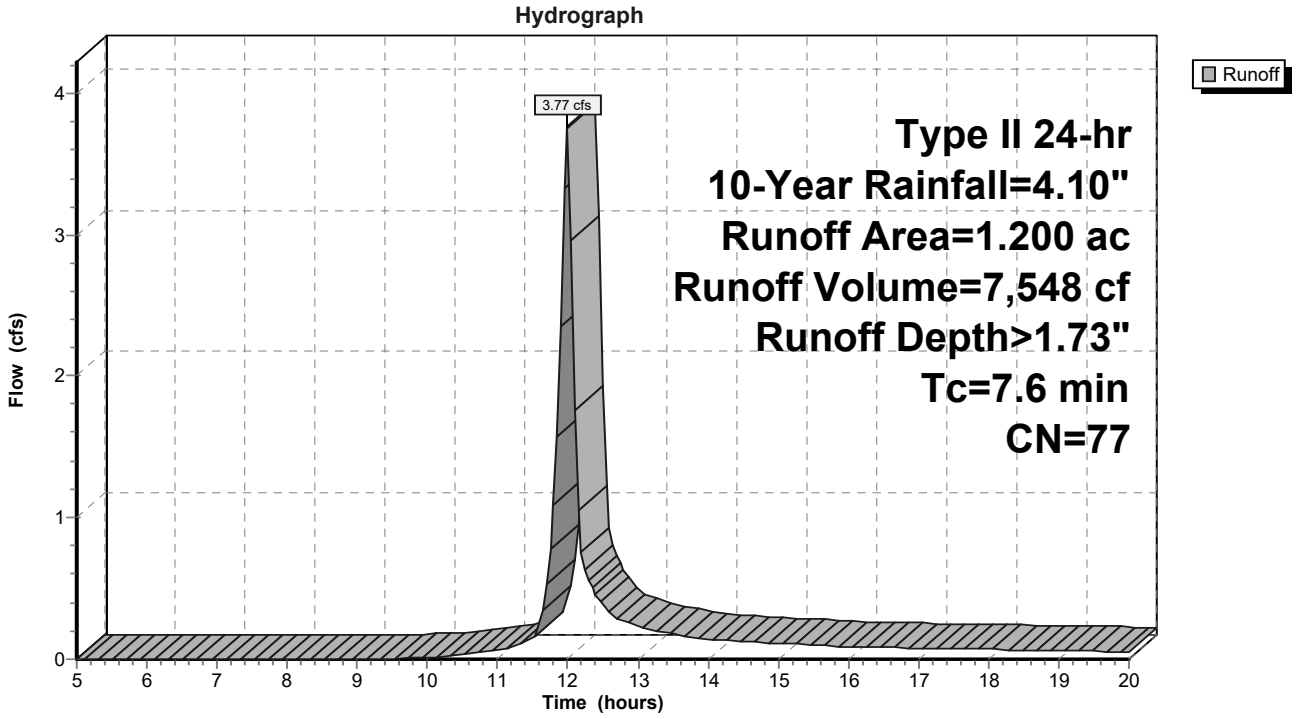
Runoff = 3.77 cfs @ 11.99 hrs, Volume= 7,548 cf, Depth> 1.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=4.10"

	Area (ac)	CN	Description
*	1.200	77	
	1.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6					**Direct Entry,**

Subcatchment 2S: Pre-Dev



Summary for Subcatchment 3S: Post-Dev To Cistern

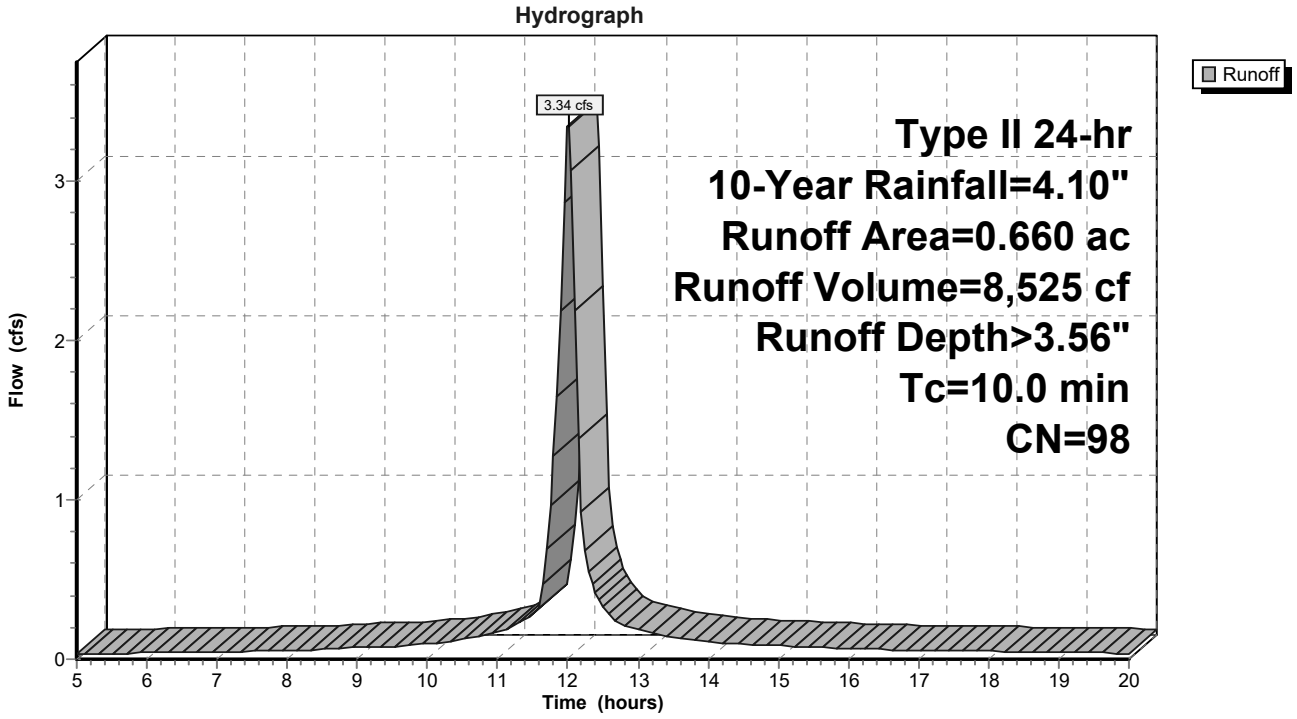
Runoff = 3.34 cfs @ 12.01 hrs, Volume= 8,525 cf, Depth> 3.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=4.10"

	Area (ac)	CN	Description
*	0.660	98	
	0.660		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 3S: Post-Dev To Cistern



Summary for Subcatchment 4S: Post-Dev Uncontrolled

[49] Hint: Tc<2dt may require smaller dt

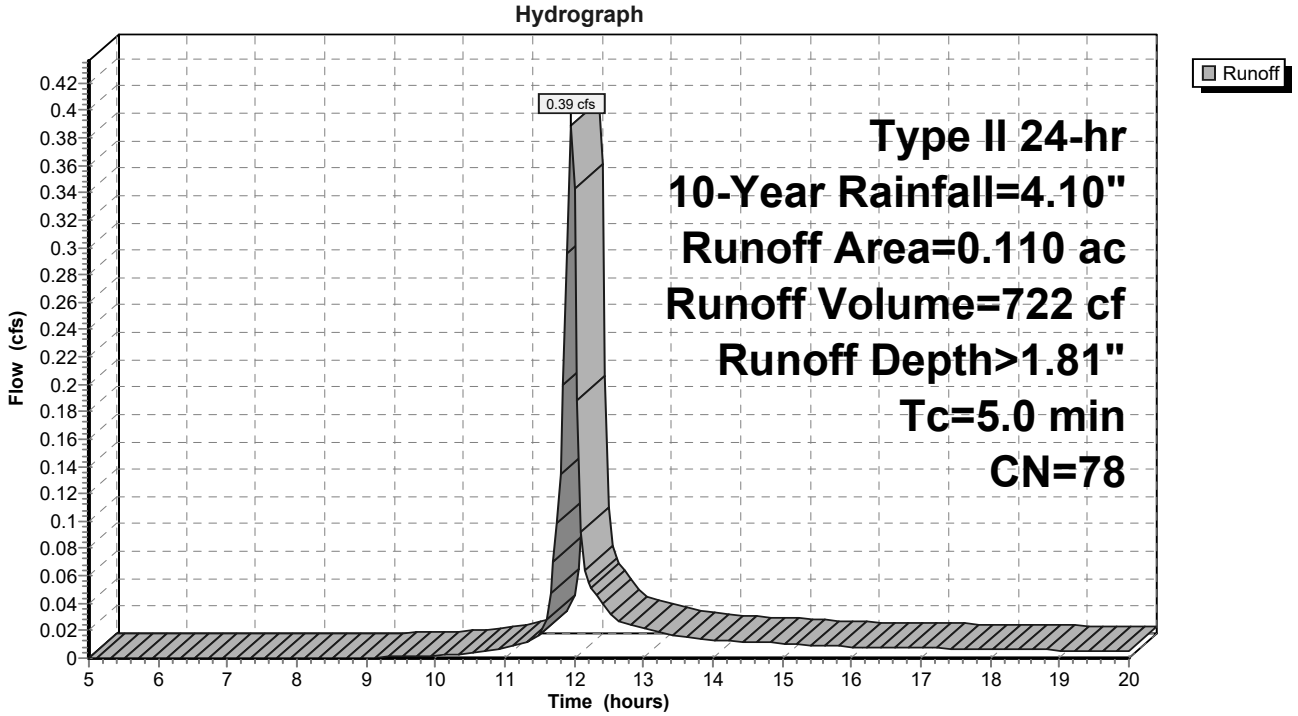
Runoff = 0.39 cfs @ 11.96 hrs, Volume= 722 cf, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=4.10"

	Area (ac)	CN	Description
*	0.110	78	
	0.110		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4S: Post-Dev Uncontrolled



Summary for Subcatchment 6S: Pre-Dev Forest

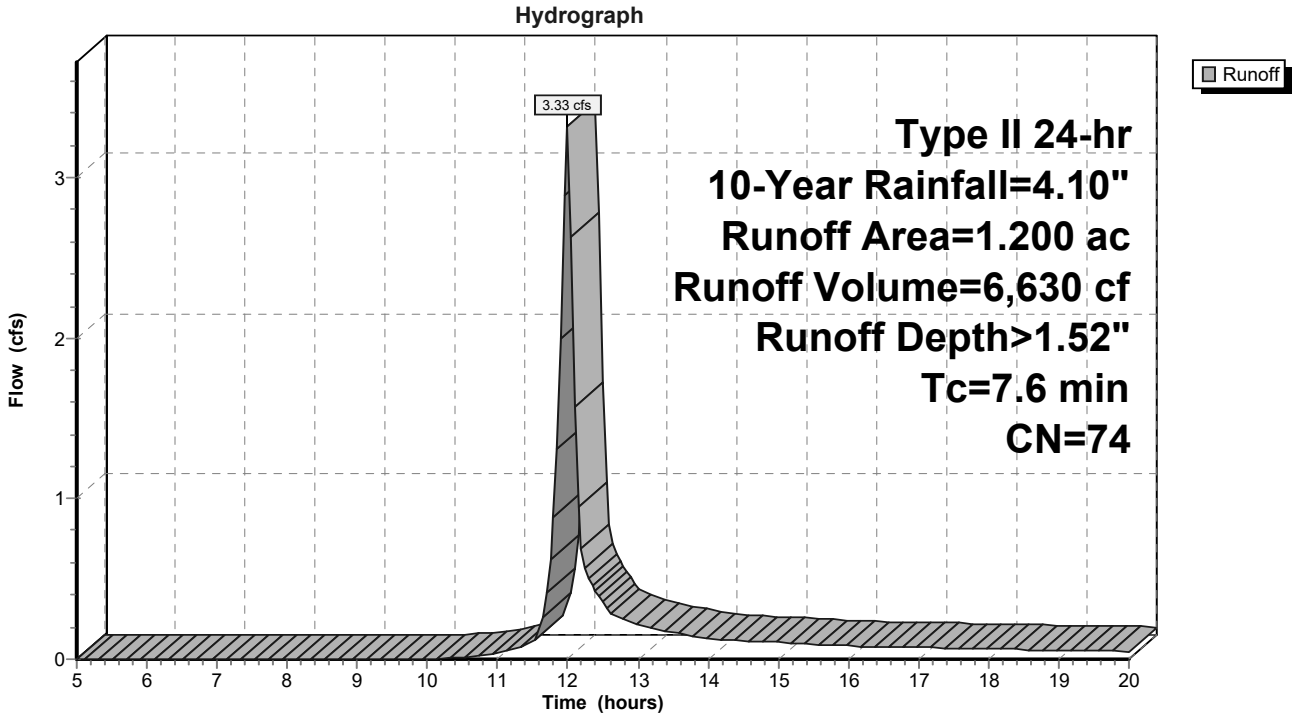
Runoff = 3.33 cfs @ 11.99 hrs, Volume= 6,630 cf, Depth> 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=4.10"

	Area (ac)	CN	Description
*	1.200	74	Woods, Fair, HSG C
	1.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6					**Direct Entry,**

Subcatchment 6S: Pre-Dev Forest



Summary for Subcatchment 9S: Post-Dev To ADS System

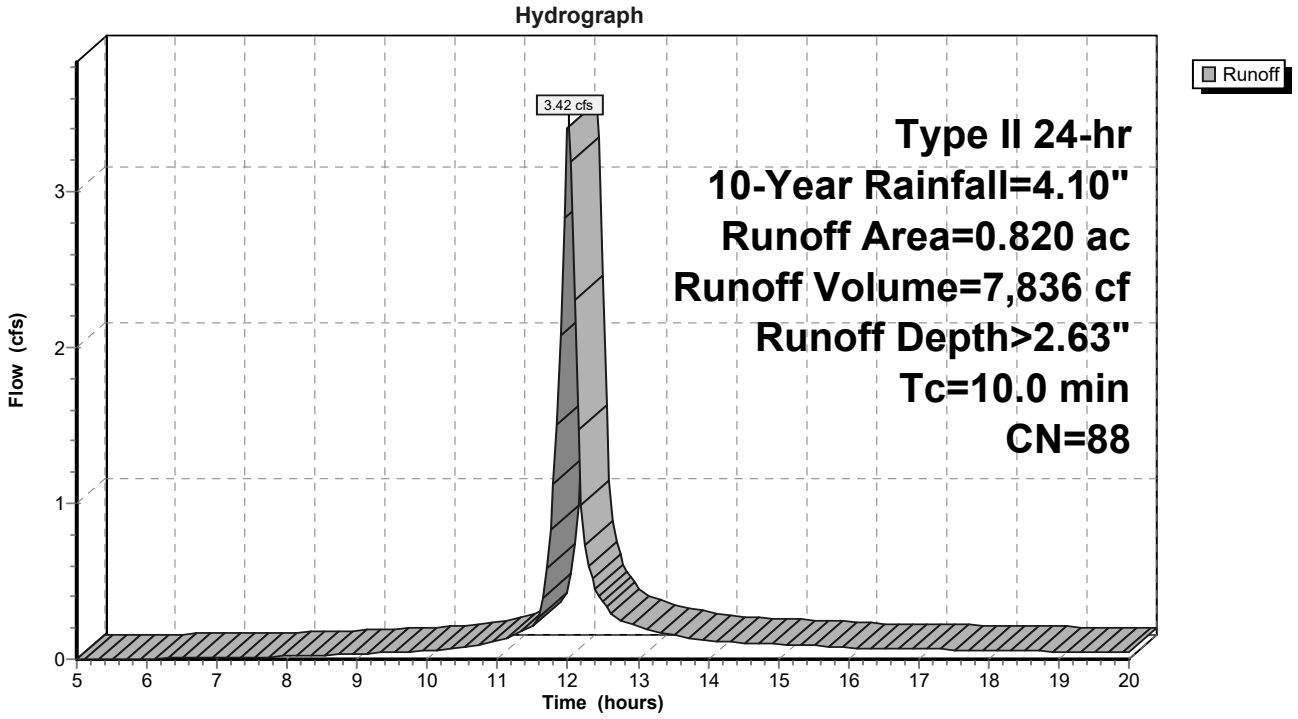
Runoff = 3.42 cfs @ 12.01 hrs, Volume= 7,836 cf, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=4.10"

	Area (ac)	CN	Description
*	0.820	88	
	0.820		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 9S: Post-Dev To ADS System



Summary for Pond 1P: Storm Detention System

Inflow Area = 64,469 sf, 44.59% Impervious, Inflow Depth > 1.46" for 10-Year event
Inflow = 3.42 cfs @ 12.01 hrs, Volume= 7,836 cf
Outflow = 3.05 cfs @ 12.06 hrs, Volume= 7,681 cf, Atten= 11%, Lag= 3.1 min
Primary = 3.05 cfs @ 12.06 hrs, Volume= 7,681 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2,135.20' @ 12.06 hrs Surf.Area= 0 sf Storage= 1,594 cf

Plug-Flow detention time= 26.7 min calculated for 7,655 cf (98% of inflow)
Center-of-Mass det. time= 18.8 min (787.6 - 768.8)

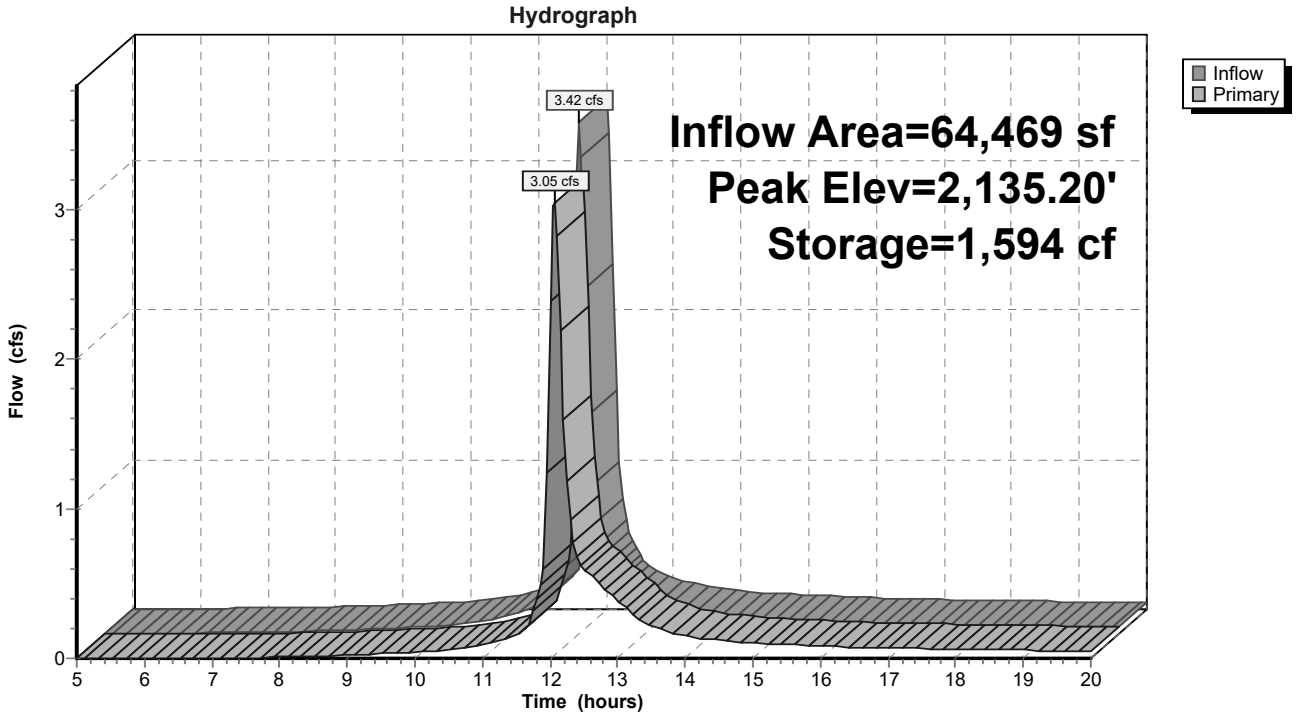
Volume	Invert	Avail.Storage	Storage Description
#1	2,134.00'	4,000 cf	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (cubic-feet)
2,134.00	0
2,137.00	4,000

Device	Routing	Invert	Outlet Devices
#1	Primary	2,134.00'	**24.0" Round Culvert** L= 200.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 2,133.00' / 2,134.00' S= -0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	2,134.00'	**5.0" Vert. Orifice/Grate** C= 0.750
#3	Device 1	2,134.77'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.750
#4	Primary	2,135.19'	**24.0' long 2137** 2 End Contraction(s)

Primary OutFlow Max=2.96 cfs @ 12.06 hrs HW=2,135.19' (Free Discharge)
- **1=Culvert** (Passes 2.96 cfs of 6.34 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.81 cfs @ 5.95 fps)
  - **3=Orifice/Grate** (Orifice Controls 2.15 cfs @ 2.59 fps)
- **4=2137** (Controls 0.00 cfs)

Pond 1P: Storm Detention System



Summary for Pond 8P: Rainwater Cistern

[82] Warning: Early inflow requires earlier time span

Inflow Area = 28,750 sf,100.00% Impervious, Inflow Depth > 3.56" for 10-Year event
Inflow = 3.34 cfs @ 12.01 hrs, Volume= 8,525 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2,135.36' @ 20.00 hrs Surf.Area= 0 sf Storage= 8,521 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

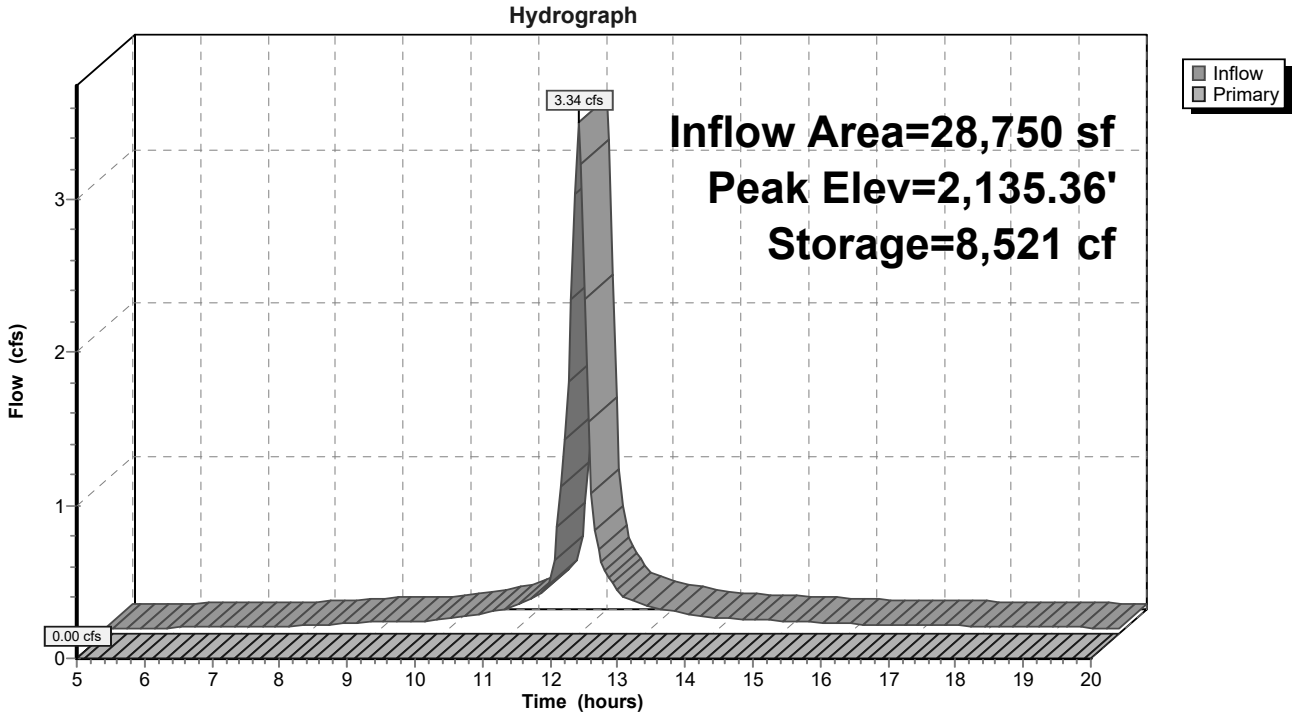
Volume	Invert	Avail.Storage	Storage Description
#1	2,134.00'	25,100 cf	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (cubic-feet)
2,134.00	0
2,138.00	25,000
2,139.00	25,100

Device	Routing	Invert	Outlet Devices
#1	Primary	2,137.00'	**30.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=2,134.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Rainwater Cistern

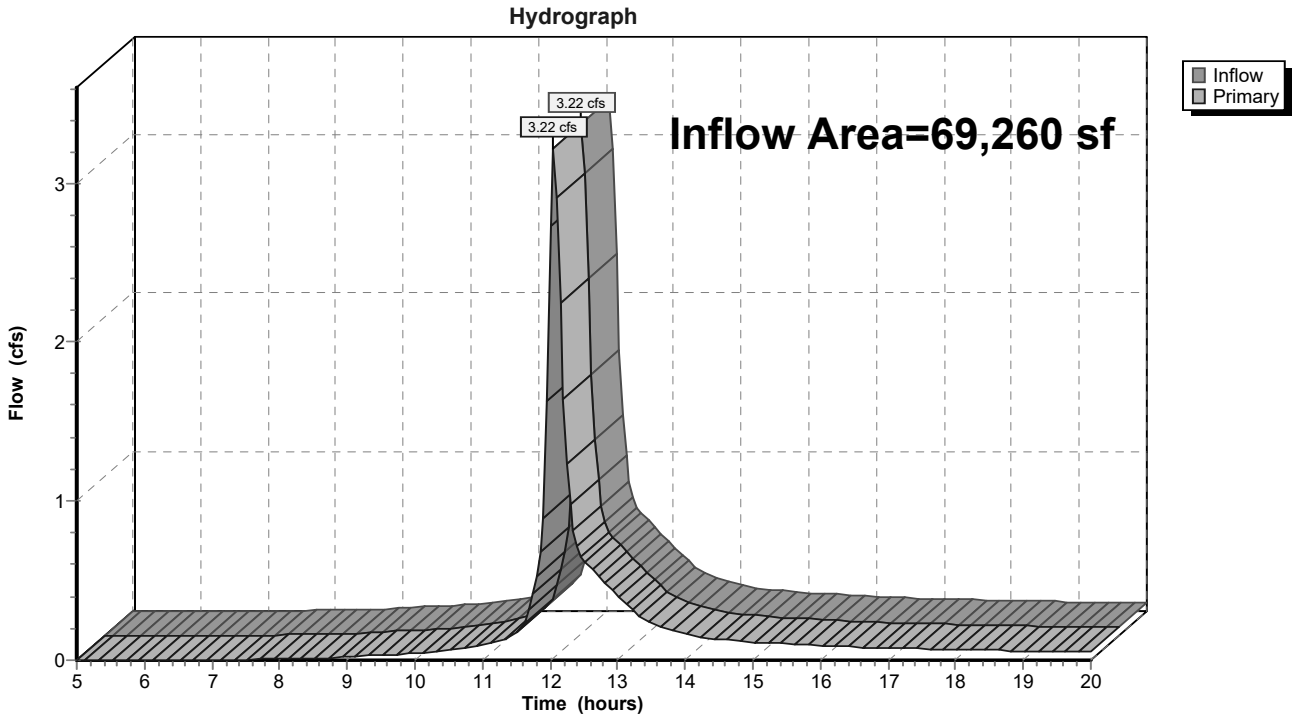


Summary for Link 5L: Post-Dev Outflow Total

Inflow Area = 69,260 sf, 41.51% Impervious, Inflow Depth > 1.46" for 10-Year event
Inflow = 3.22 cfs @ 12.06 hrs, Volume= 8,403 cf
Primary = 3.22 cfs @ 12.06 hrs, Volume= 8,403 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 5L: Post-Dev Outflow Total



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment2S: Pre-Dev Runoff Area=1.200 ac 0.00% Impervious Runoff Depth>3.65"
Tc=7.6 min CN=77 Runoff=7.72 cfs 15,878 cf

Subcatchment3S: Post-Dev To Cistern Runoff Area=0.660 ac 100.00% Impervious Runoff Depth>5.73"
Tc=10.0 min CN=98 Runoff=5.33 cfs 13,719 cf

Subcatchment4S: Post-Dev Uncontrolled Runoff Area=0.110 ac 0.00% Impervious Runoff Depth>3.75"
Tc=5.0 min CN=78 Runoff=0.78 cfs 1,497 cf

Subcatchment6S: Pre-Dev Forest Runoff Area=1.200 ac 0.00% Impervious Runoff Depth>3.34"
Tc=7.6 min CN=74 Runoff=7.16 cfs 14,571 cf

Subcatchment9S: Post-Dev To ADS System Runoff Area=0.820 ac 0.00% Impervious Runoff Depth>4.80"
Tc=10.0 min CN=88 Runoff=6.01 cfs 14,276 cf

Pond 1P: Storm Detention System Peak Elev=2,135.28' Storage=1,711 cf Inflow=6.01 cfs 14,276 cf
Outflow=6.01 cfs 14,074 cf

Pond 8P: Rainwater Cistern Peak Elev=2,136.19' Storage=13,714 cf Inflow=5.33 cfs 13,719 cf
Outflow=0.00 cfs 0 cf

Link 5L: Post-Dev Outflow Total Inflow=6.63 cfs 15,571 cf
Primary=6.63 cfs 15,571 cf

Total Runoff Area = 173,804 sf Runoff Volume = 59,941 cf Average Runoff Depth = 4.14"
83.46% Pervious = 145,055 sf 16.54% Impervious = 28,750 sf

Summary for Subcatchment 2S: Pre-Dev

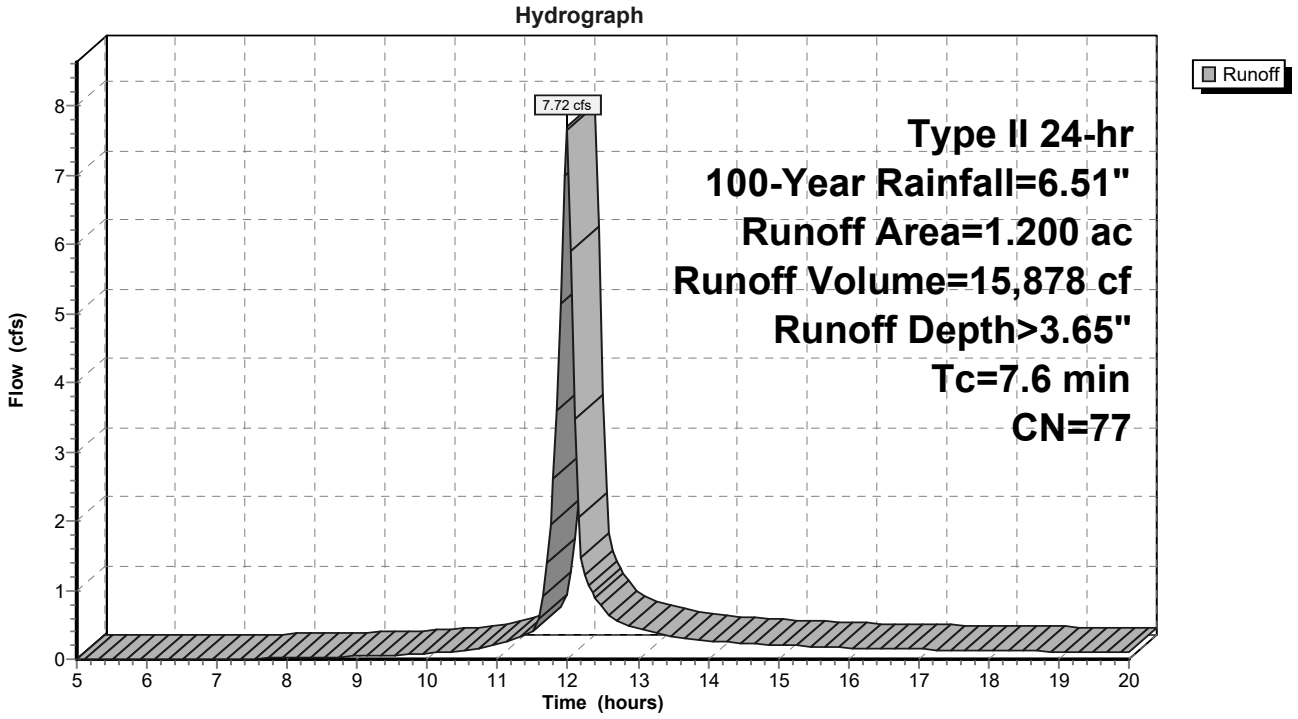
Runoff = 7.72 cfs @ 11.99 hrs, Volume= 15,878 cf, Depth> 3.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.51"

	Area (ac)	CN	Description
*	1.200	77	
	1.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6					**Direct Entry,**

Subcatchment 2S: Pre-Dev



Summary for Subcatchment 3S: Post-Dev To Cistern

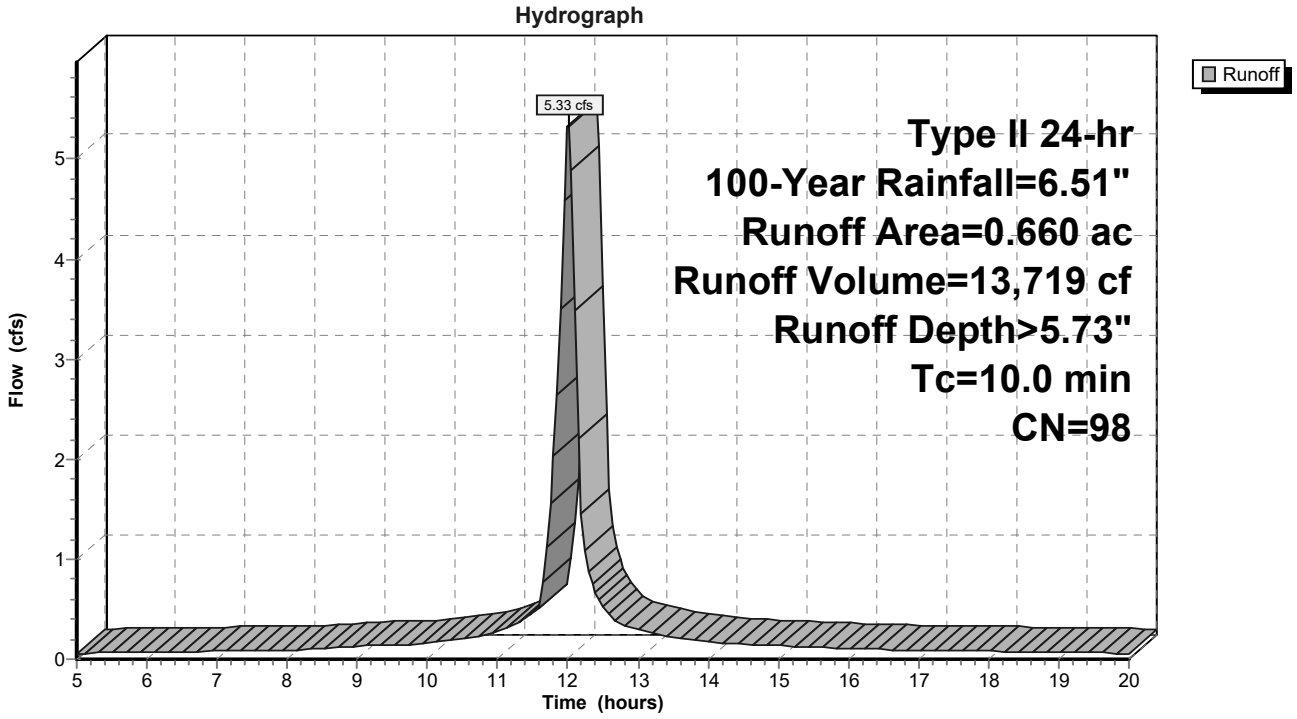
Runoff = 5.33 cfs @ 12.01 hrs, Volume= 13,719 cf, Depth> 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.51"

	Area (ac)	CN	Description
*	0.660	98	
	0.660		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 3S: Post-Dev To Cistern



Summary for Subcatchment 4S: Post-Dev Uncontrolled

[49] Hint: Tc<2dt may require smaller dt

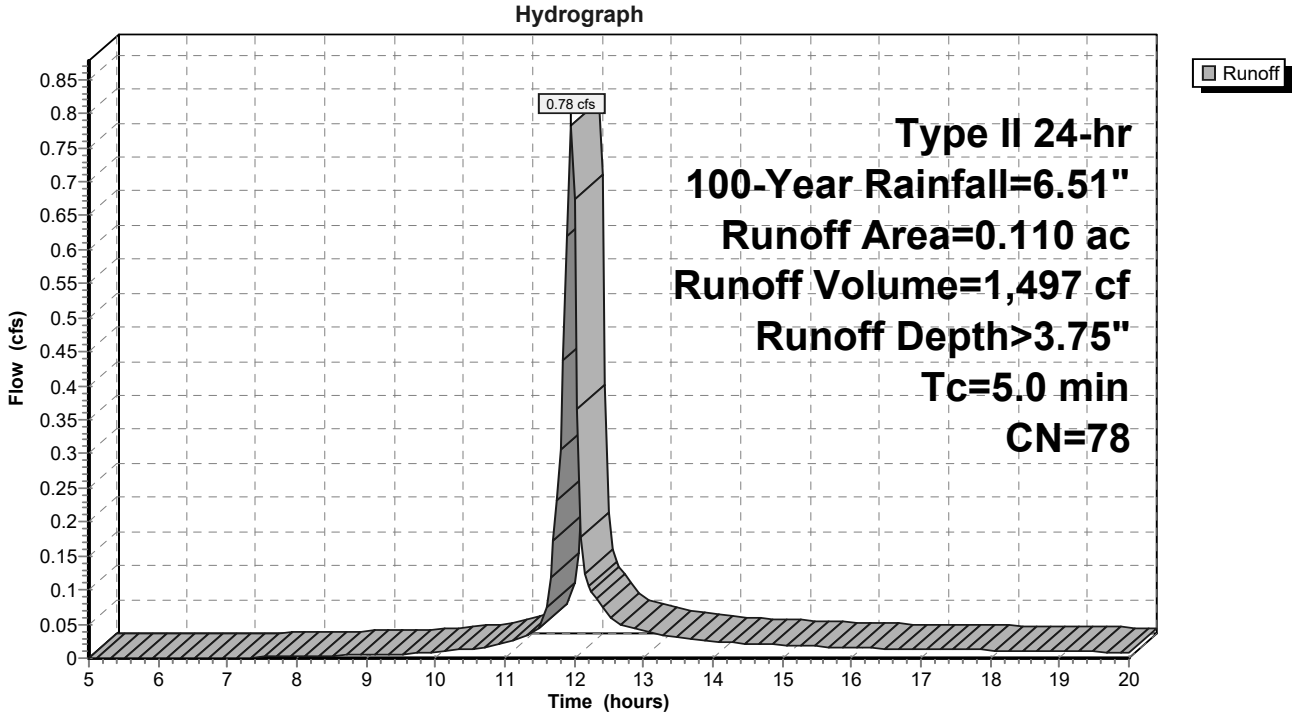
Runoff = 0.78 cfs @ 11.96 hrs, Volume= 1,497 cf, Depth> 3.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.51"

	Area (ac)	CN	Description
*	0.110	78	
	0.110		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4S: Post-Dev Uncontrolled



Summary for Subcatchment 6S: Pre-Dev Forest

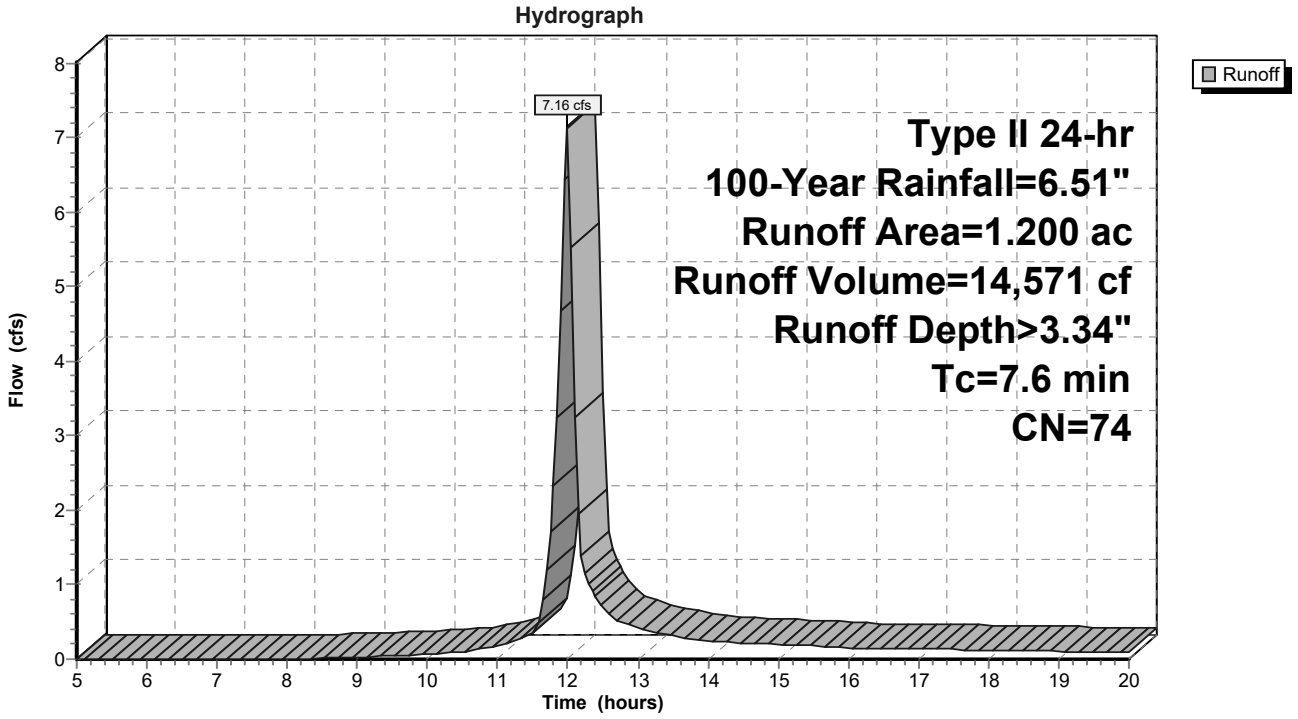
Runoff = 7.16 cfs @ 11.99 hrs, Volume= 14,571 cf, Depth> 3.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.51"

	Area (ac)	CN	Description
*	1.200	74	Woods, Fair, HSG C
	1.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6					**Direct Entry,**

Subcatchment 6S: Pre-Dev Forest



Summary for Subcatchment 9S: Post-Dev To ADS System

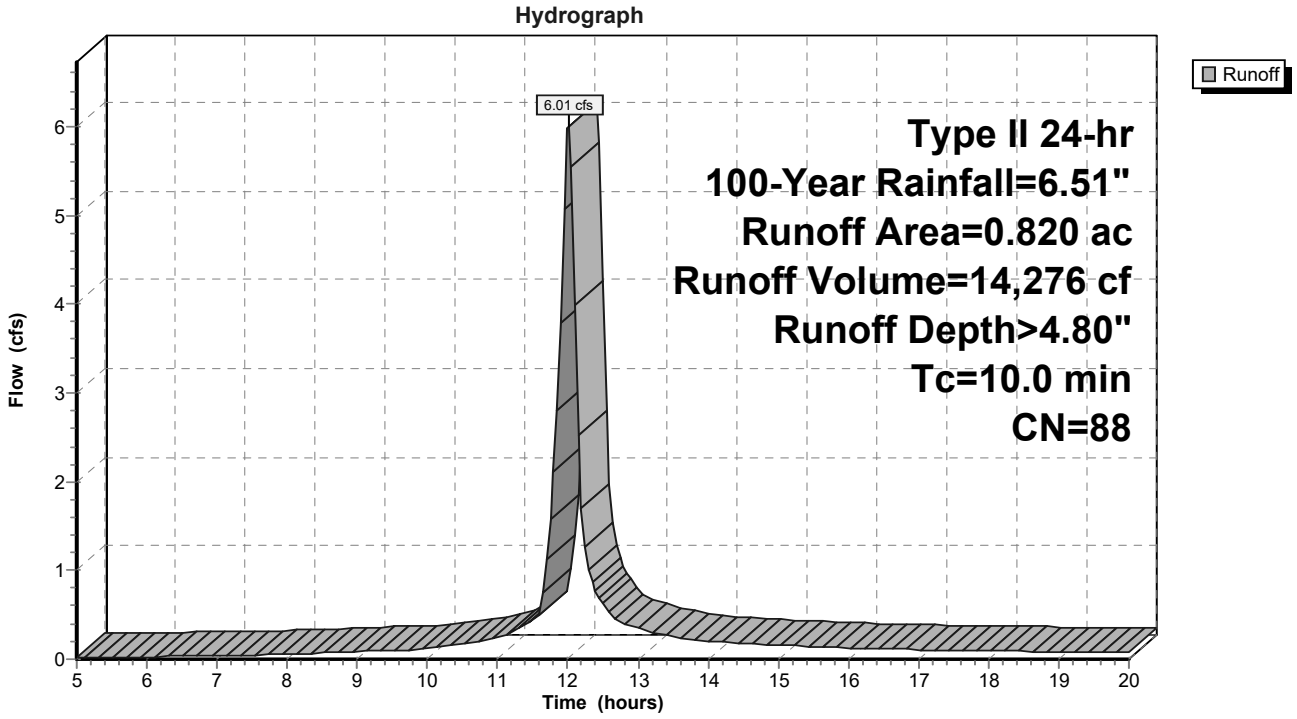
Runoff = 6.01 cfs @ 12.01 hrs, Volume= 14,276 cf, Depth> 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.51"

	Area (ac)	CN	Description
*	0.820	88	
	0.820		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 9S: Post-Dev To ADS System



Summary for Pond 1P: Storm Detention System

[82] Warning: Early inflow requires earlier time span
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area =	64,469 sf, 44.59% Impervious, Inflow Depth > 2.66" for 100-Year event				
Inflow =	6.01 cfs @	12.01 hrs,	Volume=	14,276 cf	
Outflow =	6.01 cfs @	12.02 hrs,	Volume=	14,074 cf,	Atten= 0%, Lag= 0.5 min
Primary =	6.01 cfs @	12.02 hrs,	Volume=	14,074 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2,135.28' @ 12.02 hrs Surf.Area= 0 sf Storage= 1,711 cf

Plug-Flow detention time= 21.0 min calculated for 14,026 cf (98% of inflow)
Center-of-Mass det. time= 15.0 min (770.5 - 755.5)

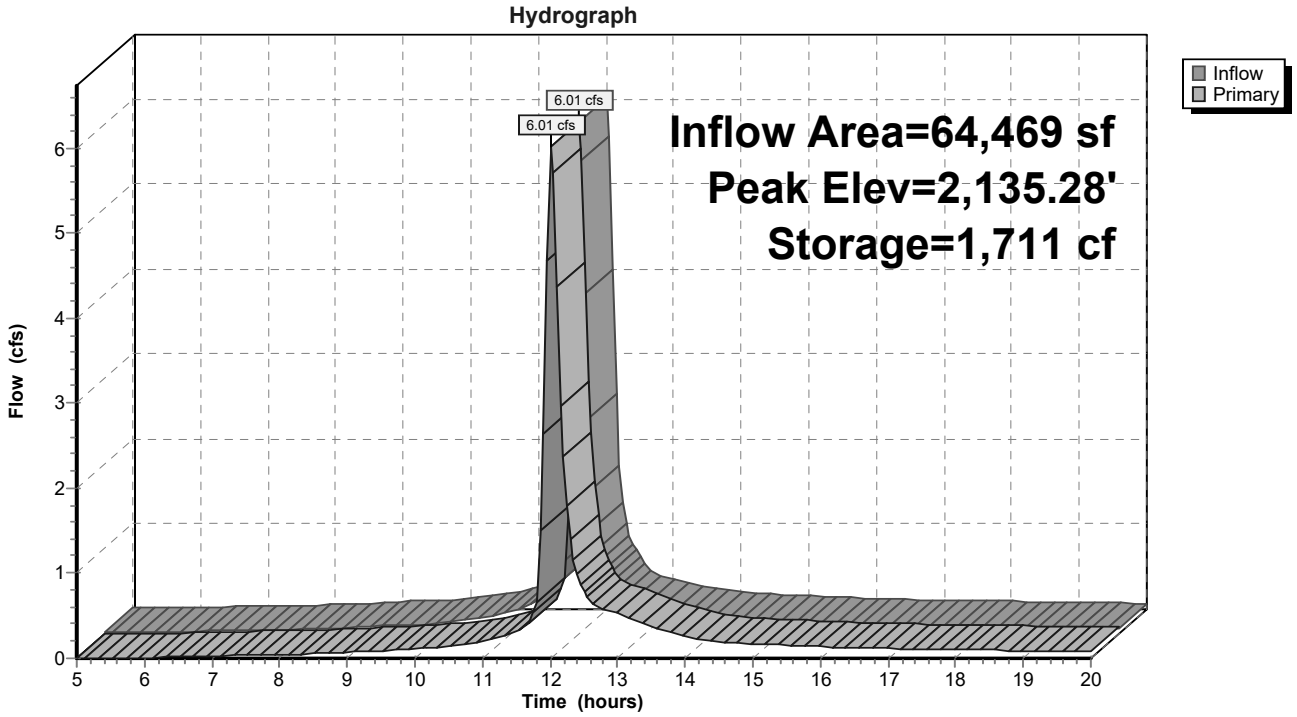
Volume	Invert	Avail.Storage	Storage Description
#1	2,134.00'	4,000 cf	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (cubic-feet)
2,134.00	0
2,137.00	4,000

Device	Routing	Invert	Outlet Devices
#1	Primary	2,134.00'	**24.0" Round Culvert** L= 200.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 2,133.00' / 2,134.00' S= -0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	2,134.00'	**5.0" Vert. Orifice/Grate** C= 0.750
#3	Device 1	2,134.77'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.750
#4	Primary	2,135.19'	**24.0' long 2137** 2 End Contraction(s)

Primary OutFlow Max=5.83 cfs @ 12.02 hrs HW=2,135.28' (Free Discharge)
- **1=Culvert** (Passes 3.75 cfs of 7.21 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.85 cfs @ 6.23 fps)
  - **3=Orifice/Grate** (Orifice Controls 2.91 cfs @ 2.91 fps)
- **4=2137** (Weir Controls 2.07 cfs @ 0.97 fps)

Pond 1P: Storm Detention System



Summary for Pond 8P: Rainwater Cistern

[82] Warning: Early inflow requires earlier time span

Inflow Area = 28,750 sf,100.00% Impervious, Inflow Depth > 5.73" for 100-Year event
Inflow = 5.33 cfs @ 12.01 hrs, Volume= 13,719 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2,136.19' @ 20.00 hrs Surf.Area= 0 sf Storage= 13,714 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

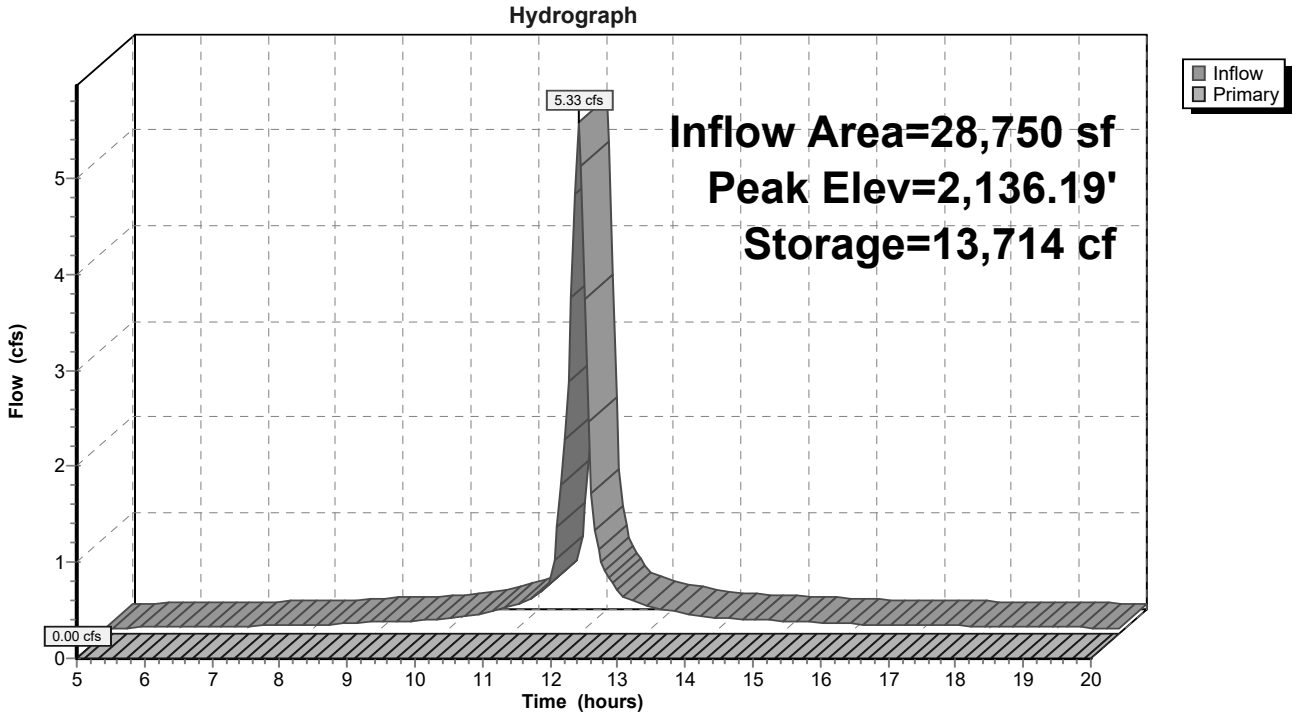
Volume	Invert	Avail.Storage	Storage Description
#1	2,134.00'	25,100 cf	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (cubic-feet)
2,134.00	0
2,138.00	25,000
2,139.00	25,100

Device	Routing	Invert	Outlet Devices
#1	Primary	2,137.00'	**30.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=2,134.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Rainwater Cistern

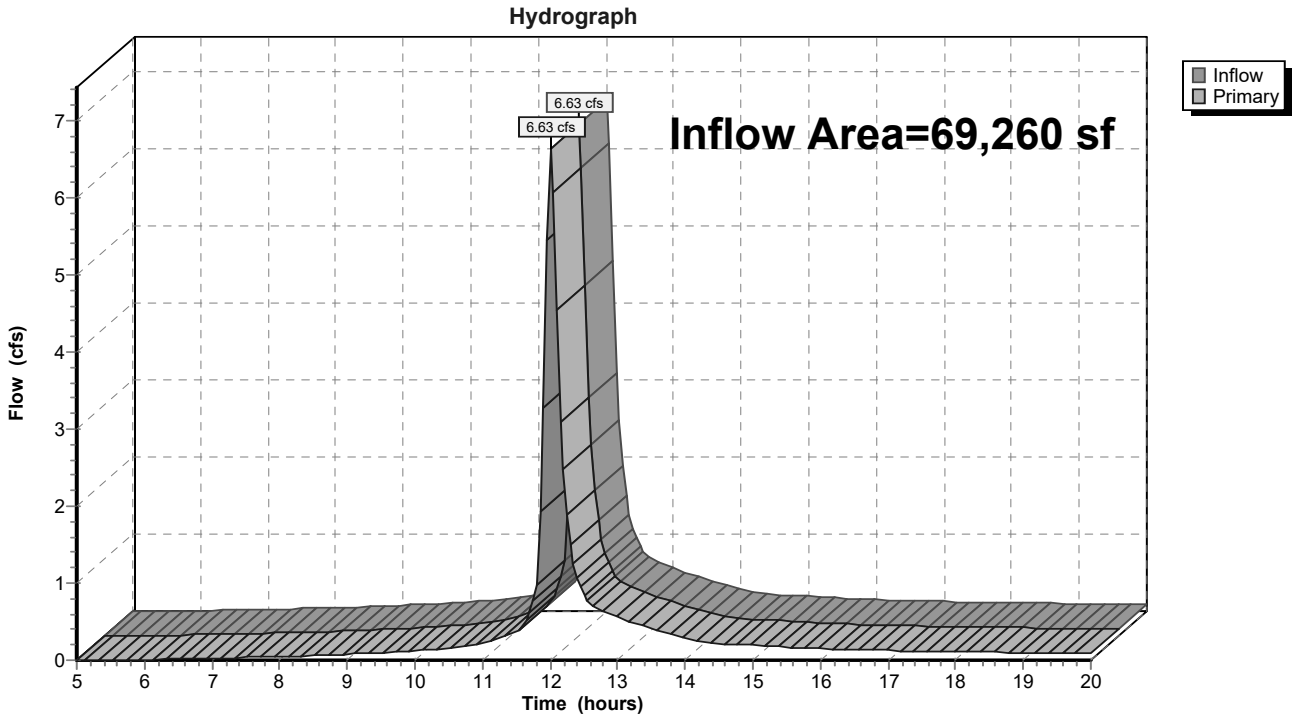


Summary for Link 5L: Post-Dev Outflow Total

Inflow Area = 69,260 sf, 41.51% Impervious, Inflow Depth > 2.70" for 100-Year event
Inflow = 6.63 cfs @ 12.01 hrs, Volume= 15,571 cf
Primary = 6.63 cfs @ 12.01 hrs, Volume= 15,571 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 5L: Post-Dev Outflow Total



APPENDIX X – VIRGINIA CISTERN DESIGN SPREADSHEET (RAINWATER HARVESTING)

VIRGINIA CISTERN DESIGN SPREADSHEET

Input

v. March 2013

REGIONAL LOCATION

What region will the rainwater harvesting system be located closest to? **(click drop down menu in turquoise cell on the right for directions to appear)**	4
Target Storm (inches)	1

ROOF AREA CAPTURED

How big is the roof footprint area to be captured (square feet)?	28,679

INDOOR DEMAND - FLUSHING TOILETS/URINALS

Water closet and urinal use (if only toilets are used, set urinals = 0)

How many people will use the building? (# people)	140
How much water does each urinal use? (gallons/flush) (set to '0' if no urinal)	0.00
How much water will each toilet use? (gallons/flush)	1.60
Calculated daily water closet and urinal demand (gallons/day)	0

NOTE: If toilet/urinal water usage has already been calculated, use this entry instead of the rows above.

Select the first day of the week this water will typically be used (e.g. Monday).	Monday
Select the last day of the week this water will typically be used (e.g. Friday).	Sunday
Hours per day the building is used (e.g. 8 for a 9-5 office building; 24 for a shift-work factory)	16
Total daily water closet and urinal demand (gallons/day)	1,344

INDOOR DEMAND - LAUNDRY

Laundry use (use either loads per day, pounds per day or calculated demand)

How many loads of laundry will be done each day? (# loads/day)	47
How much water does each load of laundry use in gallons? (gallons/load)	30
Calculated daily laundry demand (gallons/day)	0

NOTE: If laundry water usage has already been calculated, use this entry instead of the rows above.

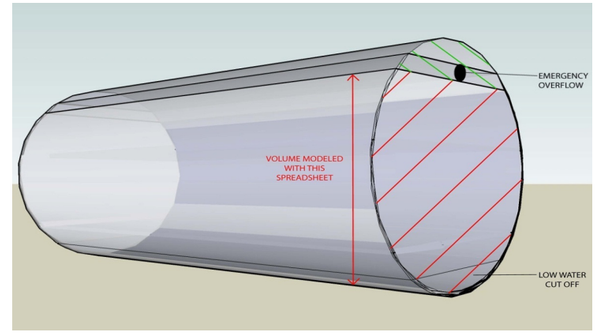
Select the first day of the week this water will typically be used (e.g. Monday).	Monday
Select the last day of the week this water will typically be used (e.g. Friday).	Sunday
Total daily laundry demand (gallons/day)	1,410

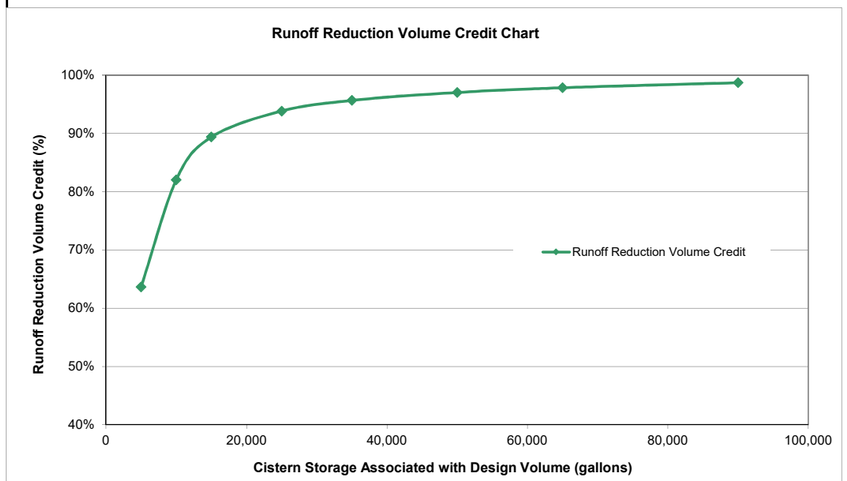
RUNOFF REDUCTION VOLUME: RESULTS FOR PRECIP <=1" WITH YEAR-ROUND USE

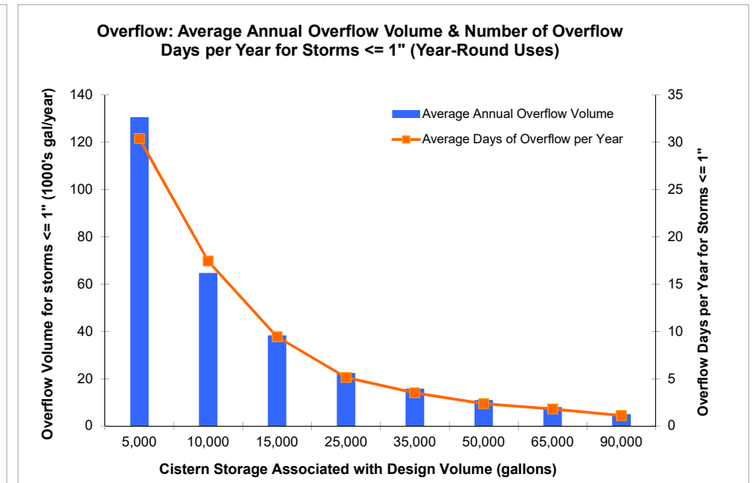
Cistern Storage Associated with Design Volume (gallons)	Average Annual Overflow days for storms <=1" (days/year)*	Average Annual Overflow Volume for storms <= 1" (1000's gal/year)*	Runoff Reduction Volume Credit
5,000	30	130	64%
10,000	17	64	82%
15,000	9	38	89%
25,000	5	22	94%
35,000	3	16	96%
50,000	2	11	97%
65,000	2	8	98%
90,000	1	5	99%

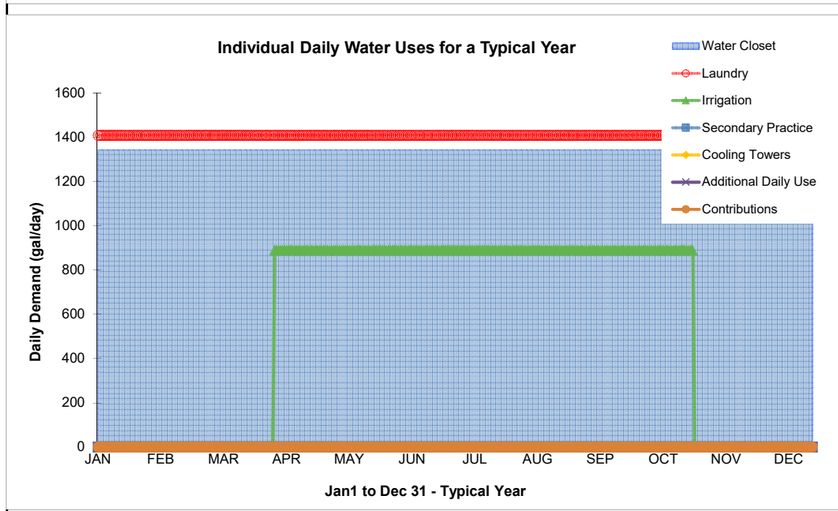
Total Annual Volume contributed to cistern inlet by storms <=1" (1000's gal/year) = 359

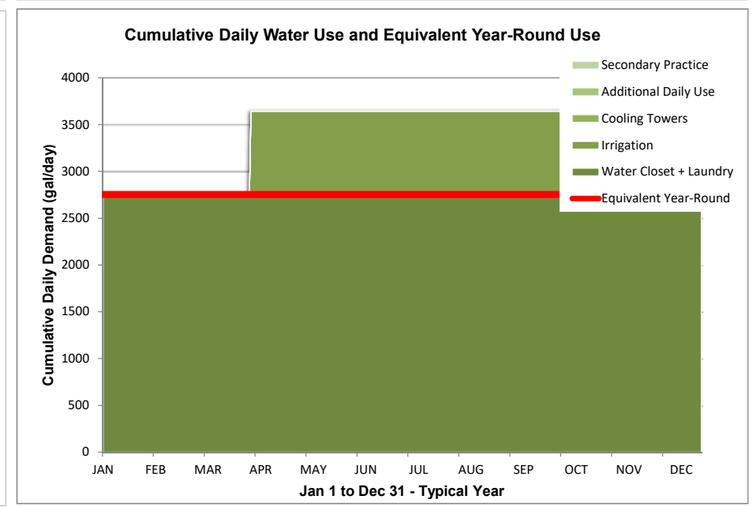
* NOTE: Calculations on this sheet exclude overflow for storms > 1" and only considers real and equivalent year-round uses.









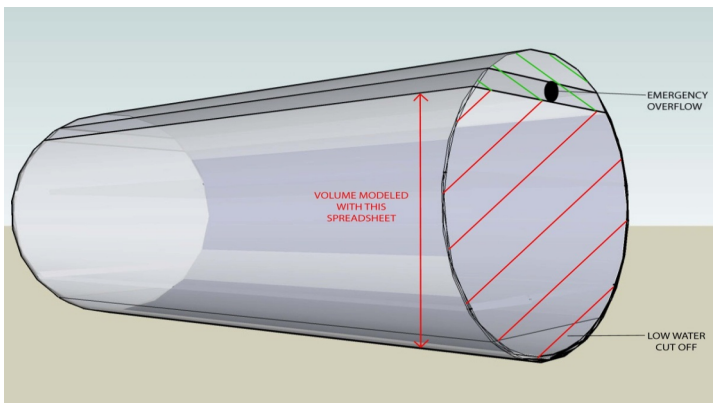


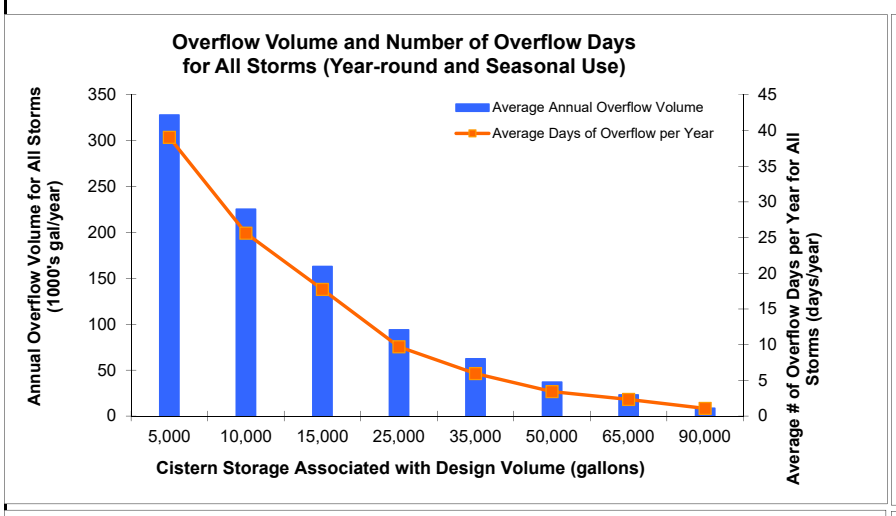
NOTE: Chart is an approximation of cumulative and equivalent year-round uses, actual values may vary; contributions from other sources not shown.

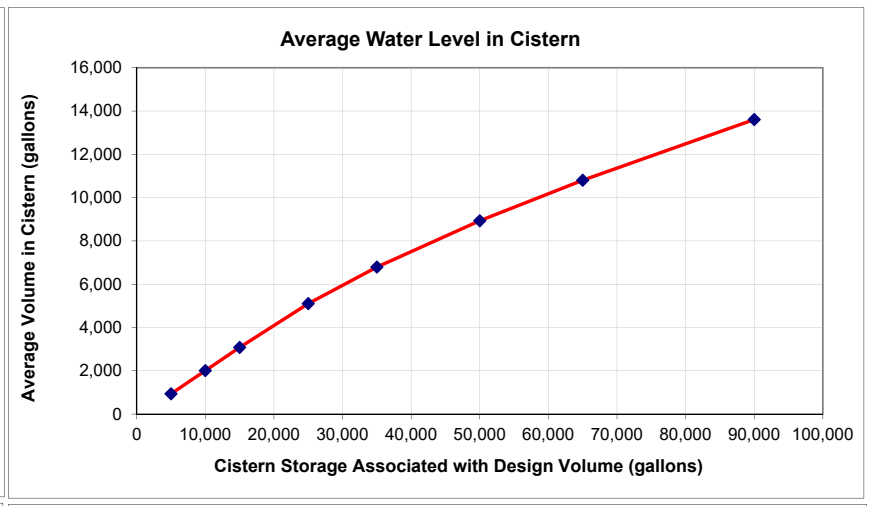
RESULTS: USING PRECIP DATA FROM ALL STORMS WITH YEAR-ROUND AND SEASONAL USES

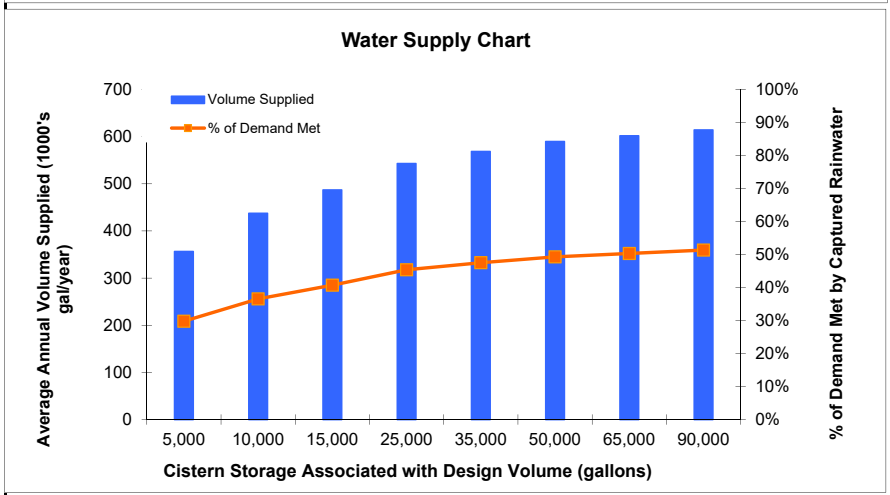
Cistern Storage Associated with Design Volume (gallons)	Average Annual Overflow days for all storms (days/year)	Average Annual Overflow Volume for all storms (1000's gal/year)	Average Annual "Dry" days (days/year)	Average Cistern Volume	% of Demand Met by Captured Rainwater	Annual Volume Supplied, Demand Met (1000's gal/year)
5,000	39	328	282	937	30%	356
10,000	26	225	255	2,008	37%	437
15,000	18	163	238	3,079	41%	487
25,000	10	94	218	5,103	45%	543
35,000	6	62	209	6,792	48%	568
50,000	3	37	203	8,930	49%	590
65,000	2	23	199	10,802	50%	602
90,000	1	8	194	13,607	51%	614

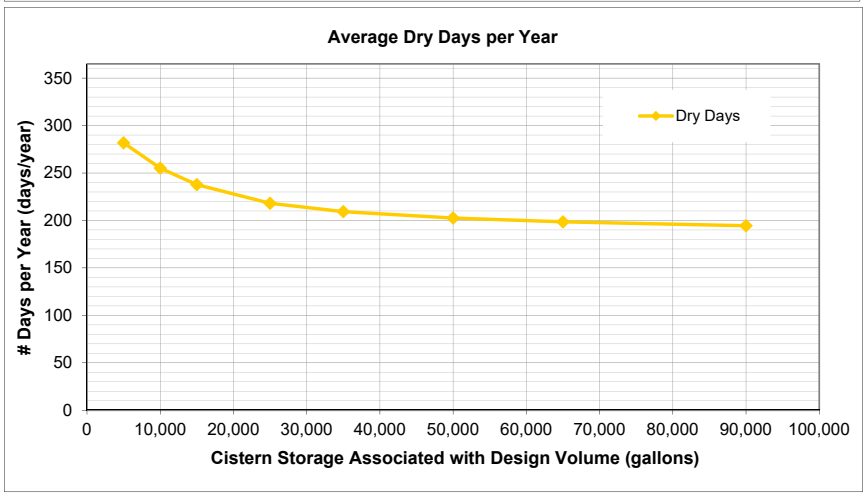
NOTE: Calculations on this sheet include all precipitation events and all water uses (year-round and seasonal)









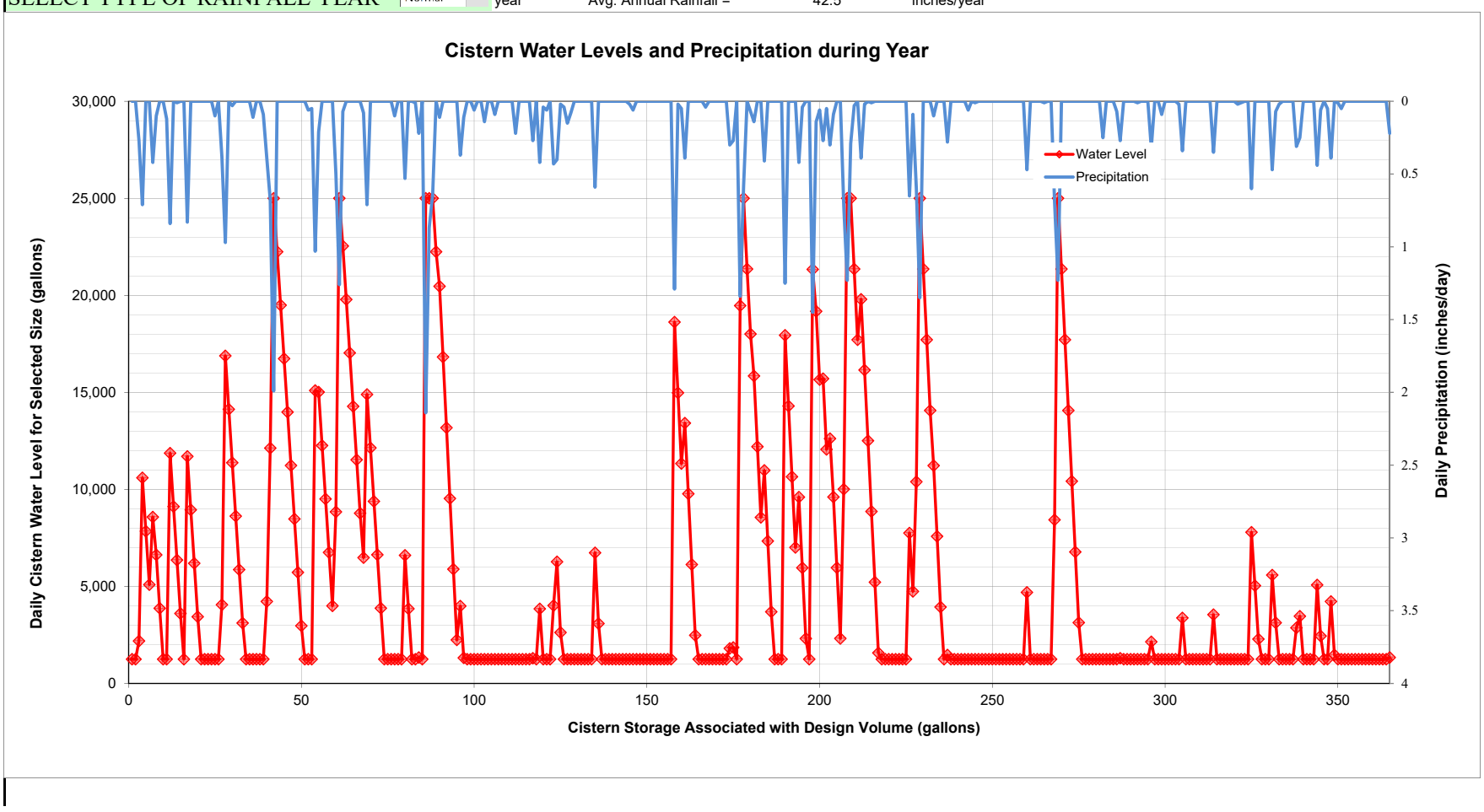


SELECT THE CISTERN SIZE 25,000 gallons

SELECT TYPE OF RAINFALL YEAR Normal year

SELECT SIZE MULTIPLIER: 1

Avg. Annual Rainfall = 42.5 inches/year



APPENDIX Y – VRRM REDEVELOPMENT SPREADSHEET

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - **Version 3.0**

☐ 2011 BMP Standards and Specifications ☐ 2013 Draft BMP Standards and Specifications

Project Name:	402 Clay Street Rezoning
Date:	4/1/2018
Linear Development Project?	No

CLEAR ALL

data input cells
constant values
calculation cells
final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* → 1.59

Maximum reduction required:	*20%*
The site's net increase in impervious cover (acres) is:	*0.99*
Post-Development TP Load Reduction for Site (lb/yr):	*1.86*

Check:	
BMP Design Specifications List:	2013 Draft Stds & Specs
Linear project?	No
Land cover areas entered correctly?	✔
Total disturbed area entered?	✔

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed			1.42		1.42
Impervious Cover (acres)			0.17		0.17
					1.59

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed			0.43		0.43
Impervious Cover (acres)			1.16		1.16
Area Check	**OK.**	**OK.**	**OK.**	**OK.**	1.59

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre		
Pre-ReDevelopment	**Listed**	**Adjusted[1]**
Forest/Open Space Cover (acres)	0.00	0.00
Weighted Rv(forest)	0.00	0.00
% Forest	0%	0%
Managed Turf Cover (acres)	1.42	0.43
Weighted Rv(turf)	0.22	0.22
% Managed Turf	89%	72%
Impervious Cover (acres)	0.17	0.17
Rv(impervious)	0.95	0.95
% Impervious	11%	28%
Total Site Area (acres)	**1.59**	**0.60**
Site Rv	**0.30**	**0.43**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final)	
Post ReDev. & New Impervious	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	0.43
Weighted Rv (turf)	0.22
% Managed Turf	27%
Impervious Cover (acres)	1.16
Rv(impervious)	0.95
% Impervious	73%
Final Site Area (acres)	**1.59**
Final Post Dev Site Rv	**0.75**

Land Cover Summary-Post	
Post-ReDevelopment	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	0.43
Weighted Rv (turf)	0.22
% Managed Turf	72%
ReDev. Impervious Cover (acres)	0.17
Rv(impervious)	0.95
% Impervious	28%
Total ReDev. Site Area (acres)	**0.60**
ReDev Site Rv	**0.43**

Land Cover Summary-Post	
Post-Development New Impervious	
New Impervious Cover (acres)	0.99
Rv(impervious)	0.95

Treatment Volume and Nutrient Load

Pre-ReDevelopment Treatment Volume (acre-ft)	0.0395	0.0213
Pre-ReDevelopment Treatment Volume (cubic feet)	1,720	930
Pre-ReDevelopment TP Load (lb/yr)	**1.08**	**0.58**
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	0.68	0.97
Baseline TP Load (lb/yr) (**0.41 lbs/acre/yr** applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		*0.25*

Treatment Volume and Nutrient Load

Final Post-Development Treatment Volume (acre-ft)	0.0997
Final Post-Development Treatment Volume (cubic feet)	4,344
Final Post-Development TP Load (lb/yr)	**2.73**
Final Post-Development TP Load per acre **(lb/acre/yr)**	1.72

Post-ReDevelopment Treatment Volume (acre-ft)	0.0213
Post-ReDevelopment Treatment Volume (cubic feet)	930
Post-ReDevelopment Load (TP) (lb/yr)*	**0.58**
Post-ReDevelopment TP Load per acre **(lb/acre/yr)**	0.97
Max. Reduction Required (Below Pre-ReDevelopment Load)	**20%**
TP Load Reduction Required for Redeveloped Area (lb/yr)	**0.12**

Post-Development Treatment Volume (acre-ft)	0.0784
Post-Development Treatment Volume (cubic feet)	3,414
Post-Development TP Load (lb/yr)	**2.15**
TP Load Reduction Required for New Impervious Area (lb/yr)	**1.74**

[1] Adjusted Land Cover Summary:
Pre ReDevelopment land cover minus pervious land cover (forest/open space or managed turf) acreage proposed for new impervious cover.

Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).

Column I shows load reduction requriement for new impervious cover (based on new development load limit, 0.41 lbs/acre/year).

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	**1.86**

Nitrogen Loads (Informational Purposes Only)

Pre-ReDevelopment TN Load (lb/yr)	7.73	Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr)	19.52

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

BMP Design Specifications List: **2013 Draft Stds & Specs**

Site Summary

Total Rainfall (in):	43
Total Disturbed Acreage:	1.59

Site Land Cover Summary

Pre-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	1.42	0.00	1.42	89
Impervious Cover (acres)	0.00	0.00	0.17	0.00	0.17	11
					1.59	100

Post-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.43	0.00	0.43	27
Impervious Cover (acres)	0.00	0.00	1.16	0.00	1.16	73
					1.59	100

Site Tv and Land Cover Nutrient Loads

	Final Post-Development (Post-ReDevelopment & New Impervious)	Post-ReDevelopment	Post-Development (New Impervious)	Adjusted Pre-ReDevelopment
Site Rv	0.75	0.43	0.95	0.43
Treatment Volume (ft^3)	4,344	930	3,414	930
TP Load (lb/yr)	2.73	0.58	2.15	0.58

Pre-ReDevelopment TP Load per acre (lb/acre/yr)	Final Post-Development TP Load per acre (lb/acre/yr)	Post-ReDevelopment TP Load per acre (lb/acre/yr)
0.97	**1.72**	**0.97**

Total TP Load Reduction Required (lb/yr)	**1.86**	0.12	1.74

	Final Post-Development Load (Post-ReDevelopment & New Impervious)	Pre-ReDevelopment
TN Load (lb/yr)	19.52	7.73

Site Compliance Summary

Maximum % Reduction Required Below Pre-ReDevelopment Load	20%

Total Runoff Volume Reduction (ft^3)	2,048
Total TP Load Reduction Achieved (lb/yr)	1.83
Total TN Load Reduction Achieved (lb/yr)	9.20
Remaining Post Development TP Load (lb/yr)	0.90
Remaining TP Load Reduction (lb/yr) Required	**0.03**

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.34	0.00	0.00	0.00	0.00	0.34
Impervious Cover (acres)	1.14	0.00	0.00	0.00	0.00	1.14
Total Area (acres)	**1.48**	**0.00**	**0.00**	**0.00**	**0.00**	**1.48**

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	1.83	0.00	0.00	0.00	0.00	1.83
TN Load Reduced (lb/yr)	9.20	0.00	0.00	0.00	0.00	9.20

Drainage Area A Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.34	0.00	0.34	23
Impervious Cover (acres)	0.00	0.00	1.14	0.00	1.14	77
					1.48	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed
2.h. To Rainwater Harvesting (Spec #6)		0.66	2,276.01	0.00	1.43	1.29	0.14	14.c. MTD - Generic
14.c. Manufactured Treatment Device-Generic	0.34	0.48	2,154.41	0.14	1.21	0.54	0.81	

Total Impervious Cover Treated (acres)	1.14
Total Turf Area Treated (acres)	0.34
Total TP Load Reduction Achieved in D.A. (lb/yr)	1.83
Total TN Load Reduction Achieved in D.A. (lb/yr)	9.20

Runoff Volume and CN Calculations

	1-year storm	2-year storm	10-year storm
Target Rainfall Event (in)	2.29	2.77	4.12

Drainage Areas	RV & CN	Drainage Area A	Drainage Area B	Drainage Area C	Drainage Area D	Drainage Area E
CN		92	0	0	0	0
RR (ft^3)		2,048	0	0	0	0
1-year return period	RV wo RR (ws-in)	1.50	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	1.12	0.00	0.00	0.00	0.00
	CN adjusted	87	0	0	0	0
2-year return period	RV wo RR (ws-in)	1.94	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	1.56	0.00	0.00	0.00	0.00
	CN adjusted	87	0	0	0	0
10-year return period	RV wo RR (ws-in)	3.23	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	2.85	0.00	0.00	0.00	0.00
	CN adjusted	88	0	0	0	0

APPENDIX Z – SAMPLE ADS STORMTECH DETAILS (FOR REFERENCE ONLY)

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER:	JIMMY STEWART 804-387-5510 JIMMY.STEWART@ADS-PIPE.COM
ADS SALES REP:	DAVID CAMDEN 434-238-4751 DAVID.CAMDEN@ADS-PIPE.COM
PROJECT NO:	

ADVANCED DRAINAGE SYSTEMS, INC.

SAMPLE DETAILS
(FOR REFERENCE ONLY)

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740 OR SC-310.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418-16 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

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PROPOSED LAYOUT

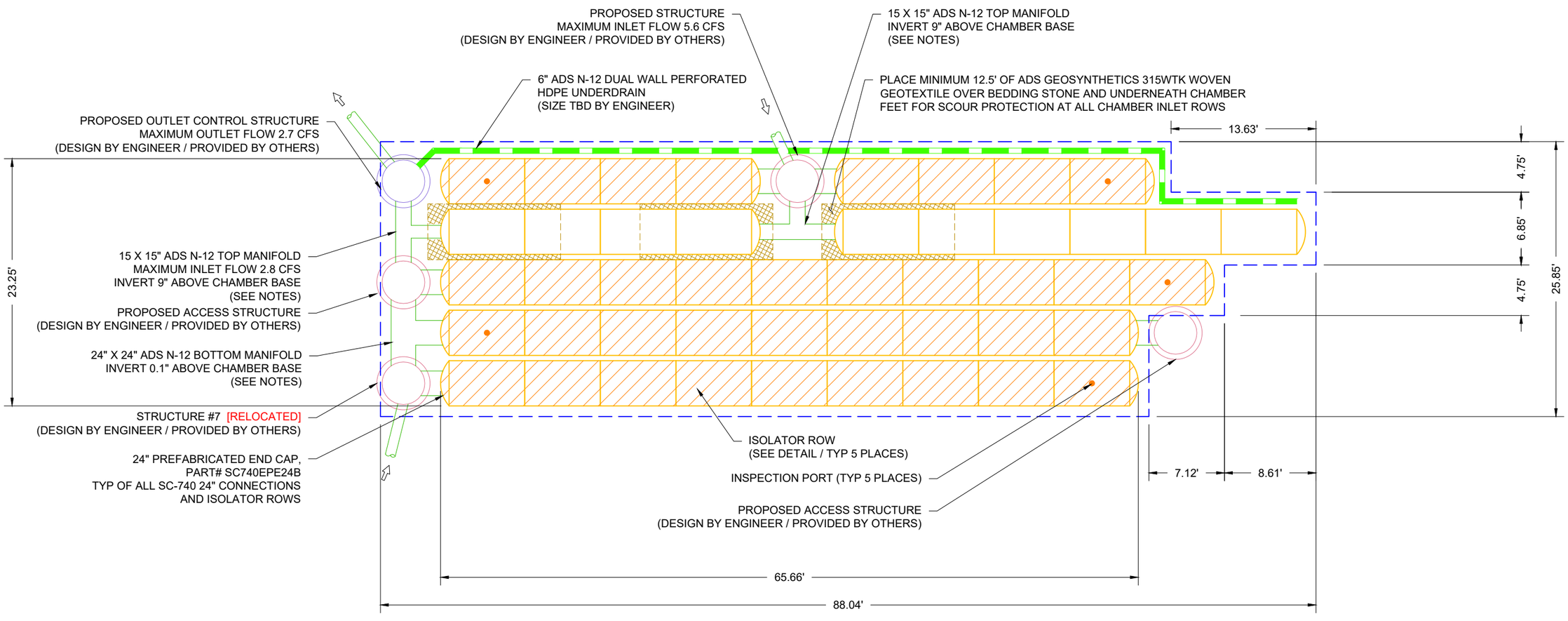
46	STORMTECH SC-740 CHAMBERS
14	STORMTECH SC-740 END CAPS
6	STONE ABOVE (in)
6	STONE BELOW (in)
40	% STONE VOID
4,098	**INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED)**
1,652	**ISOLATOR ROW VOLUME (CF)**
2,021	SYSTEM AREA (ft²)
228	SYSTEM PERIMETER (ft)

PROPOSED ELEVATIONS

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	2067.00
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	2061.00
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	2060.50
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	2060.50
MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT):	2060.50
TOP OF STONE:	2059.50
TOP OF SC-740 CHAMBER:	2059.00
15" TOP MANIFOLD INVERT:	2057.25
24" BOTTOM MANIFOLD INVERT:	2056.51
24" ISOLATOR ROW INVERT:	2056.51
BOTTOM OF SC-740 CHAMBER:	2056.50
UNDERDRAIN INVERT:	2056.00
BOTTOM OF STONE:	2056.00

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH SHEET #7 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.



SAMPLE DETAILS
(FOR REFERENCE ONLY)

REV	DWN	CKD	DESCRIPTION

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Detention•Retention•Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026

ADS® ADVANCED DRAINAGE SYSTEMS, INC.

0 10' 20'

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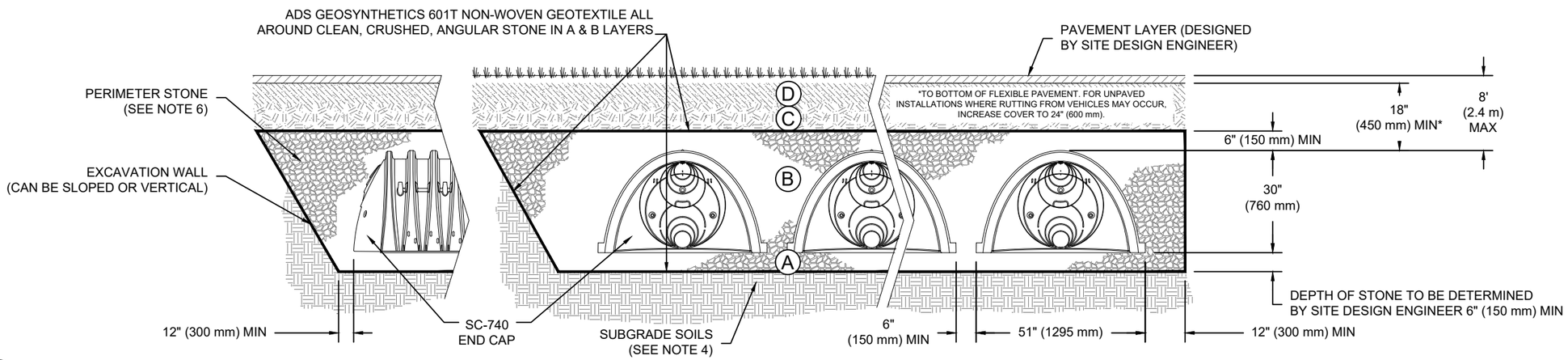
ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2] [3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. SC-740 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922 "STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
5. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
6. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

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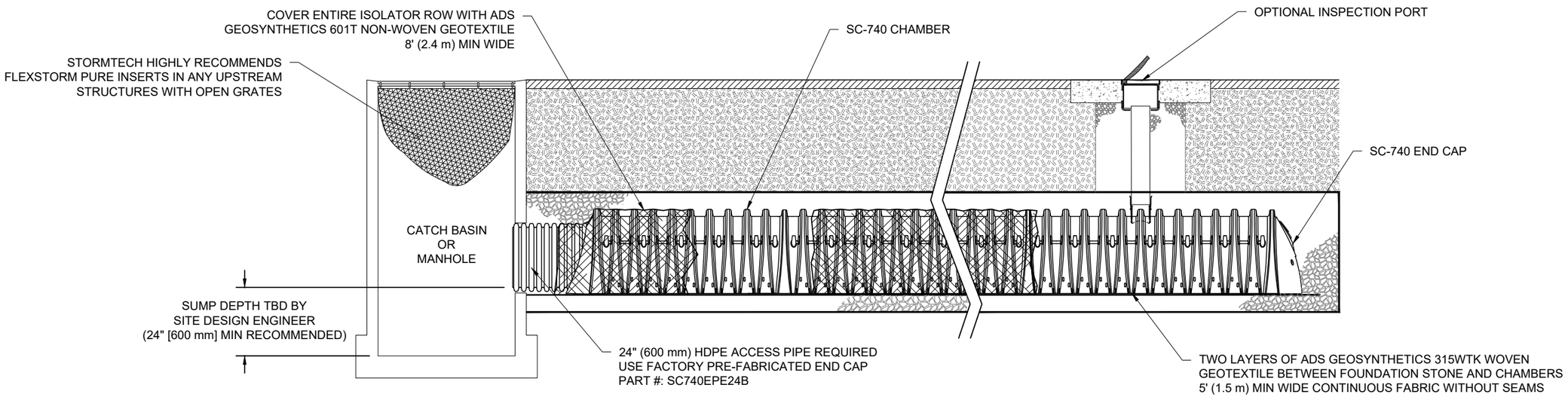


SC-740 ISOLATOR ROW DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

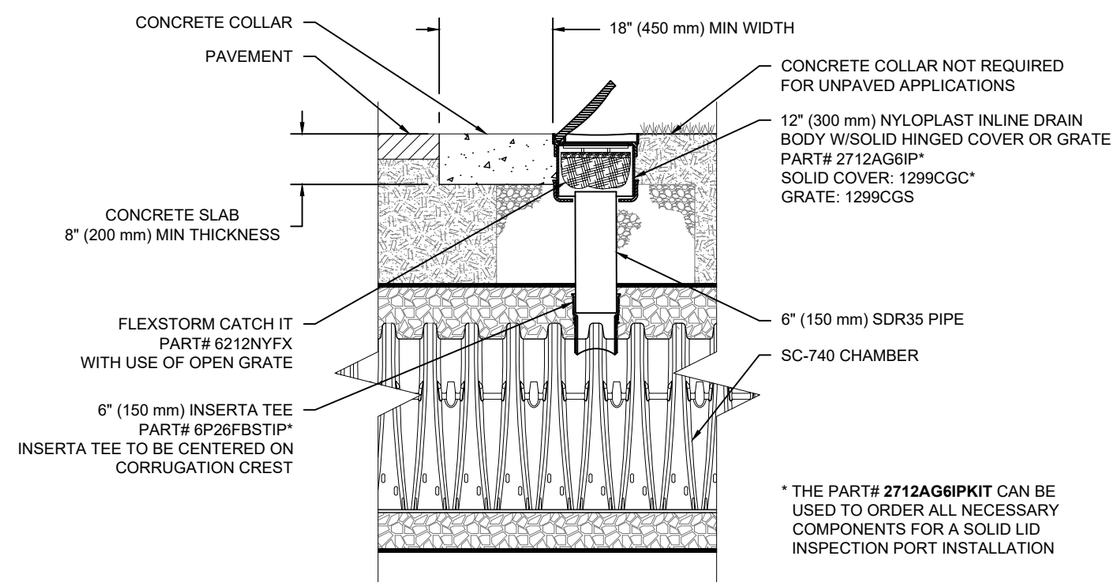
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



SC-740 6" INSPECTION PORT DETAIL

NTS

SAMPLE DETAILS (FOR REFERENCE ONLY)

REV	DWN	CKD	DESCRIPTION

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4640 TRUEMAN BLVD HILLIARD, OH 43026

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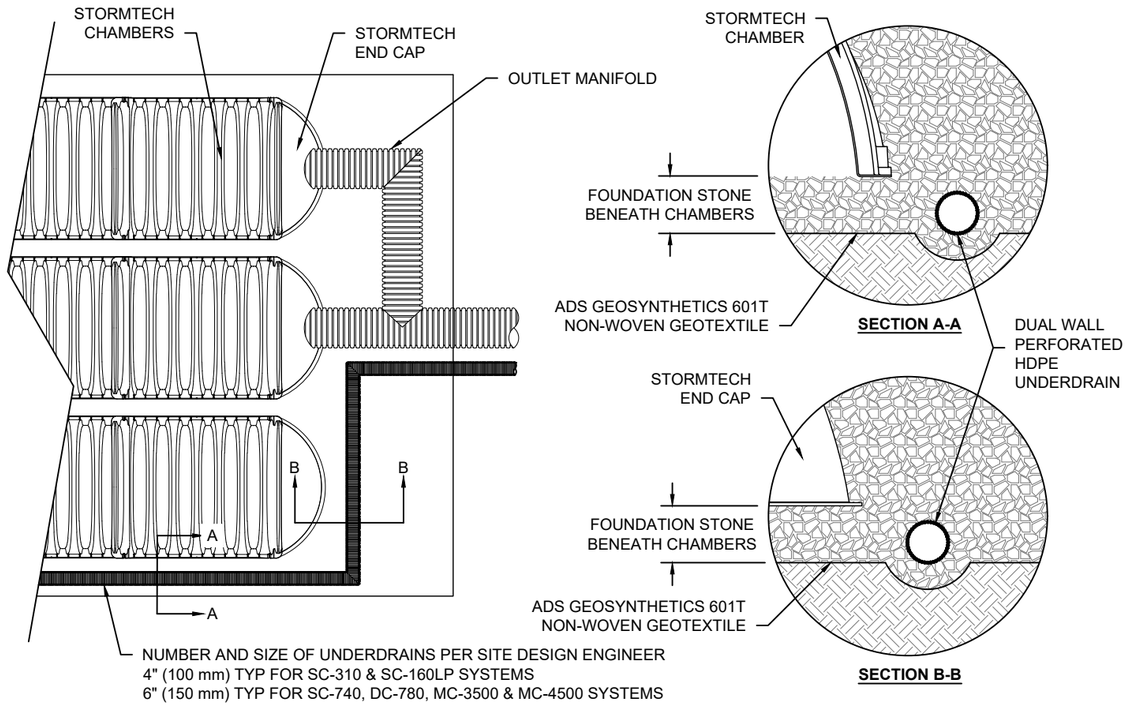
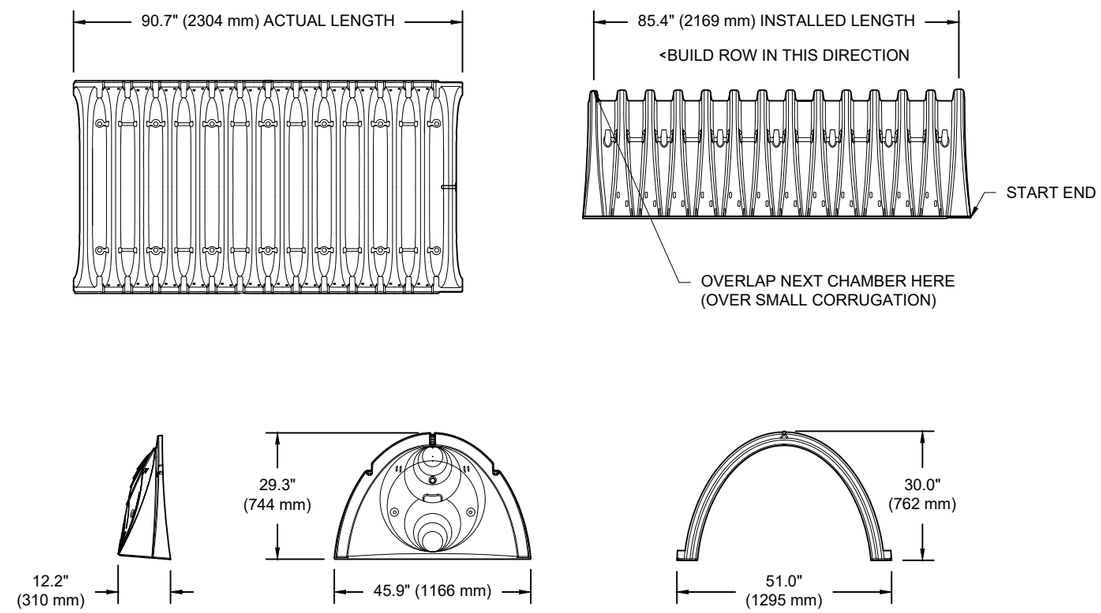
UNDERDRAIN DETAIL

NTS



SC-740 TECHNICAL SPECIFICATION

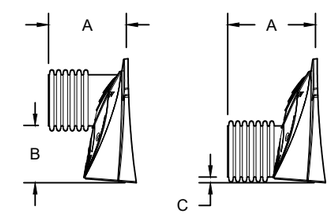
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE-CORED END CAPS END WITH "PC"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740EPE24B*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

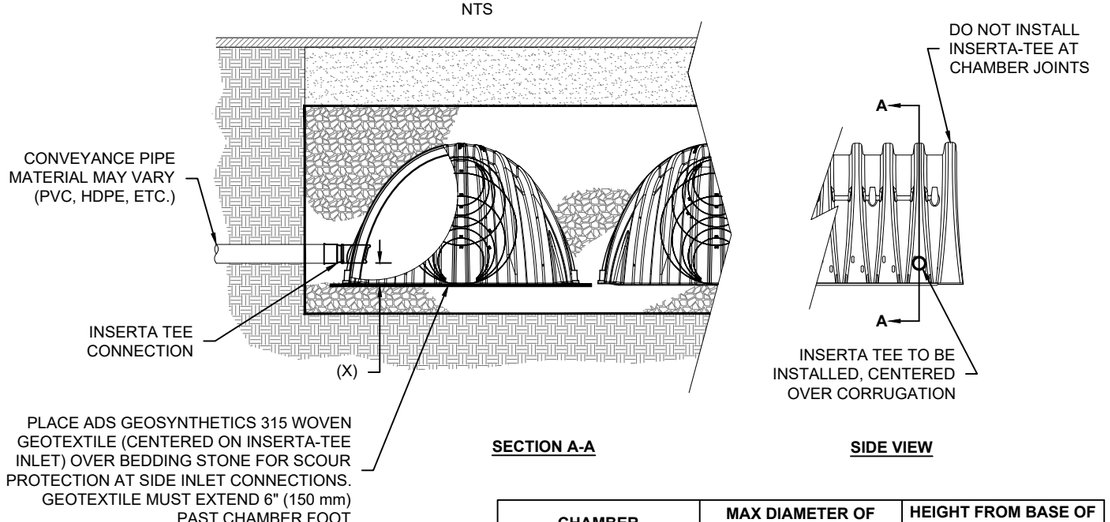
ALL STUBS, EXCEPT FOR THE SC740EPE24B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740EPE24B THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

INSERTA TEE DETAIL

NTS



CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

SAMPLE DETAILS
(FOR REFERENCE ONLY)

REV	DWN	CKD	DESCRIPTION

StormTech®
Detention•Retention•Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS®
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026

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APPENDIX AA – TURN LANE & TAPER ANALYSIS

GAY AND NEEL, INC.
ENGINEERING ◆ LAND PLANNING ◆ SURVEYING
1260 Radford Street • Christiansburg, Virginia 24073
540.381.6011 office • 540.381.2773 fax
www.gayandneel.com • info@gayandneel.com

SHEET NO. 1 OF 1
JOB NO. 2803.0
BY JMM DATE 3/30/2018

PROJECT TURN LANE WARRANT FOR 402 CLAY STREET REZONING

CLAY STREET: US-460 TO ECL BLACKSBURG; 60-1235 FLOYD ST.

AADT = 2700
DIR FACTOR = 0.63
K FACTOR = 0.1006

VPH OPPOSING VOLUME = 2700(1-0.63)(.1006) = 100 VPH
VPH ADVANCING VOLUME = 2700(0.63)(.1006) = 171 VPH

ITE 10th ED, PG 353

INDEPENDENT LIVING PEAK ENTERS = (3.70 TRIPS/DWELLING)(50 DWELLINGS)(0.50)
PEAK = 93 TRIPS (WEEKDAY)

ITE 10th ED, PG 395

ASSISTED LIVING PEAK ENTERS = (3.15 TRIPS/BED)(93 BEDS)(0.50)
PEAK = 147 TRIPS (SUNDAY)

VDOT AADT COUNTS ARE BASED ON WEEKDAY TRAFFIC FLOW, AND TRAFFIC ON CLAY STREET IS SUBSTANTIALLY HEAVIER ON A WEEKDAY. FOR THESE REASONS, THE 93 TRIPS ASSOCIATED WITH THE INDEPENDENT LIVING OPTION SHALL BE CONSIDERED.

BASED ON LOCAL KNOWLEDGE OF THE AREA, 85% RIGHT TURN ENTRIES ARE ANTICIPATED:
PEAK RIGHT TURN ENTRIES = (93 TRIPS)(85%) = 79 TRIPS
PEAK LEFT TURN ENTRIES = (93 TRIPS)(15%) = 14 TRIPS

WARRANT FOR LEFT-TURN STORAGE LANES ON TWO-LANE HIGHWAY

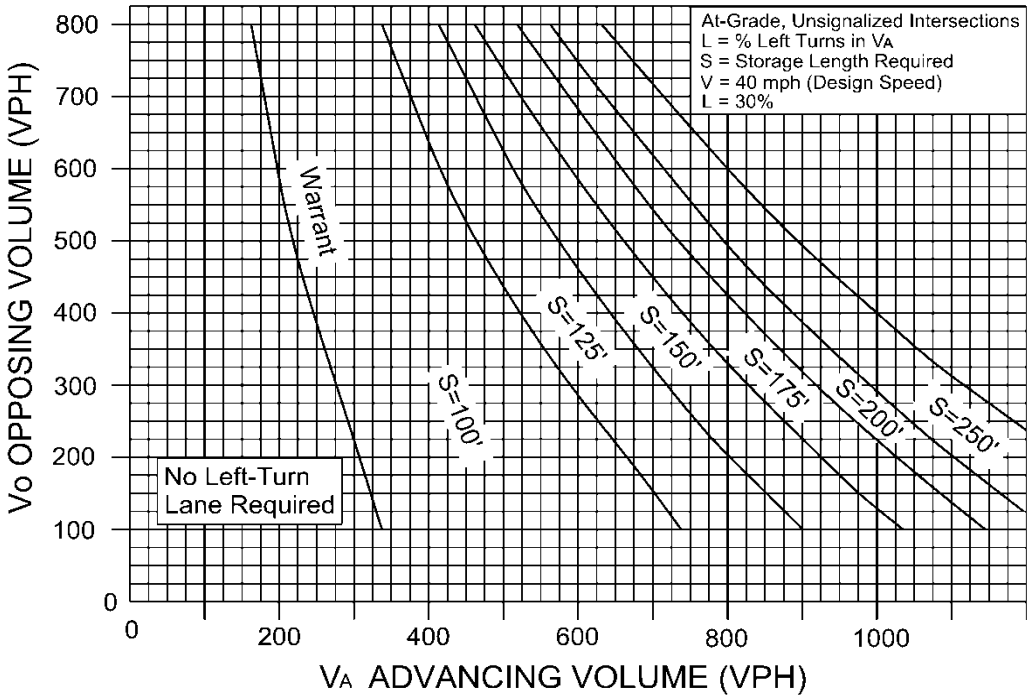


FIGURE 3-9

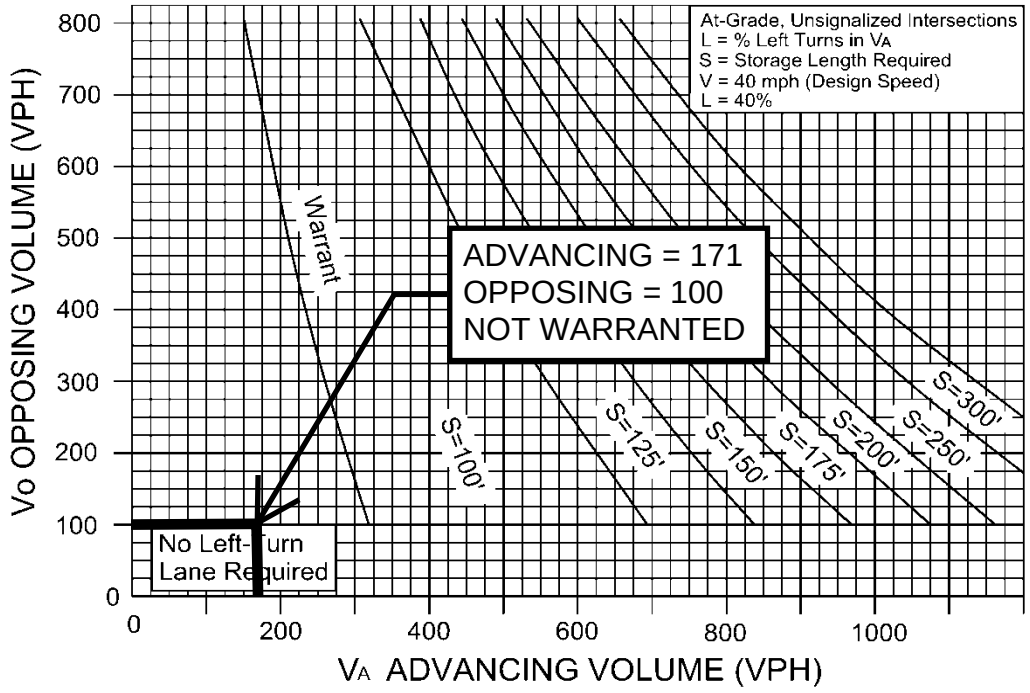
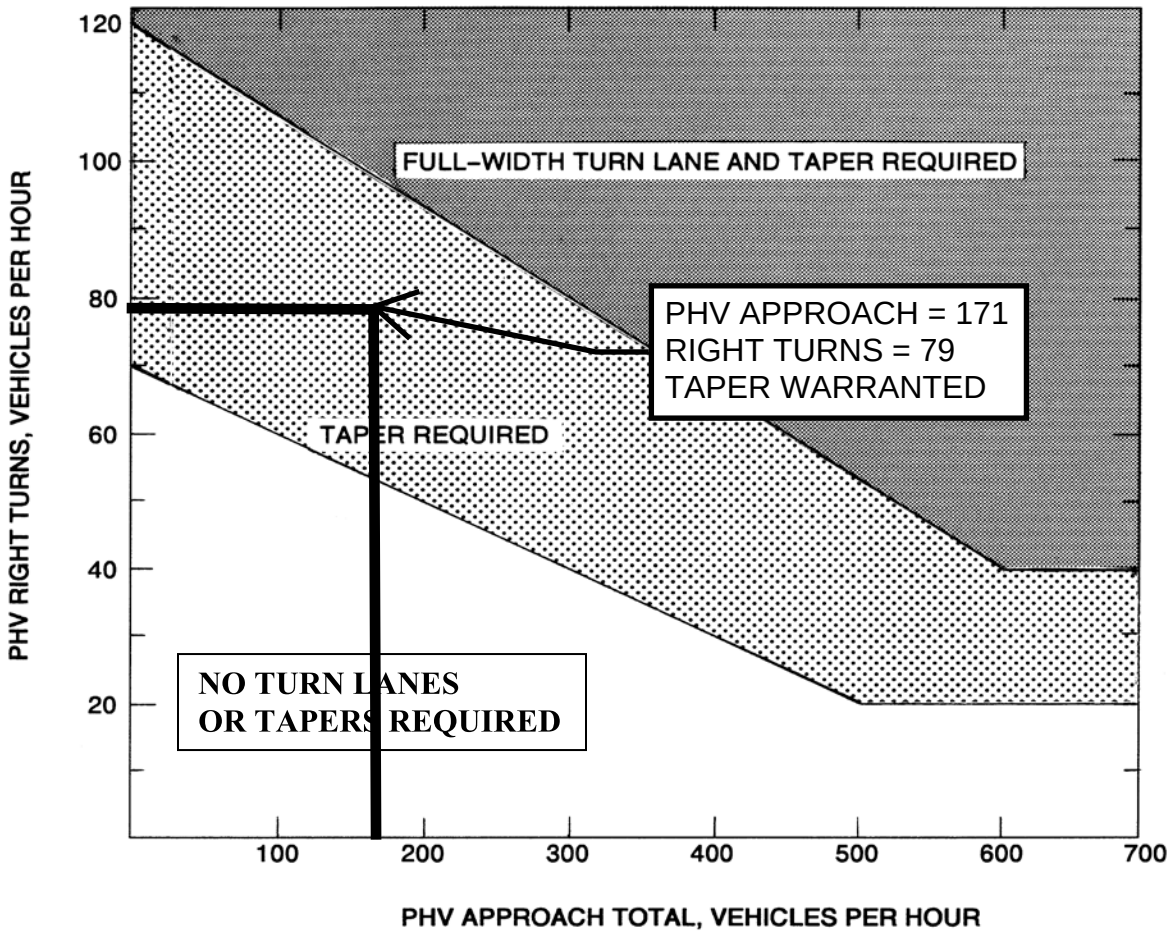


FIGURE 3-10



Appropriate Radius required at all Intersections and Entrances (Commercial or Private).

LEGEND

PHV - Peak Hour Volume (also Design Hourly Volume equivalent)

Adjustment for Right Turns

For posted speeds at or under 45 mph, PHV right turns > 40, and PHV total < 300.
Adjusted right turns = PHV Right Turns - 20
If PHV is not known use formula: PHV = ADT x K x D

K = the percent of AADT occurring in the peak hour
D = the percent of traffic in the peak direction of flow

Note: An average of 11% for K x D will suffice.

When right turn facilities are warranted, see Figure 3-1 for design criteria.*

FIGURE 3-26 WARRANTS FOR RIGHT TURN TREATMENT (2-LANE HIGHWAY)

* Rev. 1/15

Virginia Department of Transportation
Traffic Engineering Division
2016
Annual Average Daily Traffic Volume Estimates By Section of Route
Town of Blacksburg

Link ID	Route Prefix	Route Number	Route Label	Route Alias	End Label	AADT	K Factor	Direction Factor	AAWDT	Data Date
796414	**150**	**00005**	**150-5**	**Clay St**	**ECL Blacksburg; 60-1235, Floyd St**	**2700**	**0.1006**	**0.6300**	**2900**	**2016**