



AGENDA

REGULAR MEETING OF PLANNING COMMISSION

THURSDAY, AUGUST 7, 2025 - 4:00 PM

Greenville City Hall, Council Chambers, 206 S. Main Street

1. Call to Order
2. Welcome and Opening Remarks from the Chair
3. Roll Call
4. Approval of Minutes
 - A. Approval of Minutes for the following meetings:
 - A. June 5, 2025 Public Hearing
 - B. June 13, 2025 Special Called Workshop
5. Call for Public Notice Affidavit from Applicants
6. Acceptance of Agenda
7. Conflict of Interest Statement
8. PUBLIC HEARING ITEMS (Public Hearing Required)

A. **AX-17-2025**

Application by City of Greenville for a 75% Method **ANNEXATION**, submitted under the provisions of S.C. Code §5-3-150(1), and **REZONE** of approximately 17.96 acres located on **KITSON STREET, WHITIN STREET, CALDER STREET, PETTEE STREET, ABNEY STREET, DRAPER STREET, JONES STREET, WACO STREET, BENNETT STREET, HATCH STREET, LEDBETTER STREET, BALDWIN STREET, AND BRYANT STREET** from C-2, Commercial district, R-7.5, Single-family residential district, O-D, Office district, NC, Neighborhood Commercial district, PD, Planned development district, and I-1, Industrial district, in Greenville County to RH-D, House D District, RNX-B, Neighborhood Flex B District, RNX-C, Neighborhood Flex C District, MX-5, Mixed Use 5 District, IX, Industrial Flex District, and IG, Industrial General District, in the City of Greenville. (TM# 0121001000500, 0121001000600, 0121002100600, 0118001200200, 0118001200300, 0118001200800, 0121002100300, 0121002200100, 0121002200106, 0121002200107, 0121002000200, 0121002200104, 0121002200103, 0117000701300, 0117000701200, 0117000901700, and 0117000901600)

B. **AX-18-2025**

Application by the City of Greenville for **ANNEXATION** and **REZONE** of approximately 1.35 acres located at **DRAPER STREET AND MELROSE AVENUE** from S-1, Services district, in Greenville County to PK, Park District, in the City of Greenville. (TM# 0121002400200)

- C. **AX-19-2025**
Application by Toll Southeast LP Company, Inc for **ANNEXATION** and **REZONE** of approximately 0.89 acre located on **REDLAND WAY** from R-20, Single-family residential district, in Greenville County to RH-C, House C District, in the City of Greenville. (TM# 0543150100300, 0543150100900, 0543150101000, and 0543150101500)
- D. **AX-20-2025**
Application by C. Daniel Hathaway for **ANNEXATION** and **REZONE** of approximately 9.2 acres located at **1000 WATER TOWER CIRCLE** from FRD, Flexible review district, in Greenville County to RC-5, Community 5 District, in the City of Greenville. (TM# 0140000100100 and 0140000100200)
- E. **AX-21-2025**
Application by Wes McAdams for **ANNEXATION** and **REZONE** of approximately 13.04 acres located at **HAMPTON AVENUE EXTENSION, HUFF LINE, CEDAR LANE COURT, PETE HOLLIS BOULEVARD, AND BUNCOMBE ROAD** from FRD, Flexible review district, in Greenville County to IX, Industrial Flex District, in the City of Greenville. (TM# 0139000100100, 0139000100300, 0149000800200, and 0149000800100)
- F. **AX-22-2025**
Application by Simon Tuohy for **ANNEXATION** and **REZONE** of approximately 4.94 acres located at **HAMPTON AVENUE EXTENSION, CEDAR LANE COURT, AND KELLY AVENUE** from FRD, Flexible review district, in Greenville County to RC-3, Community 3 District, in the City of Greenville. (TM# 0139000601800, 0139000600301, 0139000600300, 0139000600400, 0139000600500, 0139000600501, 0139000600700, 0139000600900, 0139000601000, 0139000601100, 0139000601200, 0139000601300, 0139000601400, 0139000500100, and 0139000500200)
- G. **AX-23-2025**
Application by Greater Greenville Sanitation District for **ANNEXATION** and **REZONE** of approximately 0.73 acre located at **1501 WEST WASHINGTON STREET** from R-6, Single-family residential district, in Greenville County to MX-3, Mixed Use 3 District, in the City of Greenville. (portion of TM# 0025000401000)
- H. **AX-24-2025**
Application by Greater Greenville Sanitation District for **ANNEXATION** and **REZONE** of approximately 6.55 acres located on **WEST WASHINGTON STREET, EAST BRAMLETT ROAD, AND BARTONS ALLEY** from R-7.5, Single-family residential district, and I-1, Industrial District, in Greenville County to MX-3, Mixed Use 3 District, in the City of Greenville. (TM# 0139001000300, 0139000900200, 0139000900300, 0139000900400, 0139000701500, 0139000701600, and 0139000701700)
- I. **AX-25-2025**
Application by Andrew Butcher for **ANNEXATION** and **REZONE** of approximately

28.66 acres located at **2000, 2006 WADE HAMPTON BOULEVARD** from O-D, Office district, and C-2, Commercial District, in Greenville County to RC-3, Community 3 District, and MX-3, Mixed Use 3 District, in the City of Greenville. (TM# 0276000200303 and 0276000200107)

J. **AX-26-2025**

Application by Ryan Anderson for **ANNEXATION** and **REZONE** of approximately 0.28 acre located at **301 PROSPERITY AVENUE** from R-10, Single-family residential district, in Greenville County to RH-C, House C District, in the City of Greenville. (portion of TM# 0367000100200)

K. **AX-27-2025**

Application by Sheila Dogan for **ANNEXATION** and **REZONE** of approximately 0.12 acre located at **31 YOUNG STREET** from R-M20, Multifamily residential district, in Greenville County to RN-A, Neighborhood A District, in the City of Greenville. (TM# 0112000800700)

L. **Z-12-2025**

Application by the City of Greenville for a **TEXT AMENDMENT** to Chapter 19 - Greenville Development Code of the Code of Ordinances, City of Greenville, South Carolina for the means of the 24-month update.

M. **Z-13-2025**

Application by the City of Greenville to amend the **GREENVILLE ENGINEERING DESIGN AND SPECIFICATIONS MANUAL** for a required review.

9. PUBLIC MEETING ITEMS (No Public Hearing)

A. **Z 34-2021 FDP Phase 1**

Application by Marcus McCall for a **FINAL DEVELOPMENT PLAN** for **PHASE 1** of the **ENCLAVE LAURENS** Planned Development located at **LAURENS ROAD, PLEASANTBURG DRIVE, AND AIRPORT ROAD**. (TM#'s 0256000600100, 0256000600101, 0256000600102, 0256000601201, & 0256000600200)

10. OTHER BUSINESS

A. Staff Updates on Planning Projects and Initiatives

B. Upcoming Dates:

- September 4, 2025- Planning Commission Public Hearing
- October 2, 2025- Planning Commission Public Hearing
- November 6, 2025- Planning Commission Public Hearing

11. Executive Session, if required

12. Adjournment



Planning Staff Report to
Greenville Planning Commission
for the August 7, 2025 Public Hearing

PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: AX-17-2025

Applicant(s): City of Greenville

Property Owner(s): Multiple – see petition

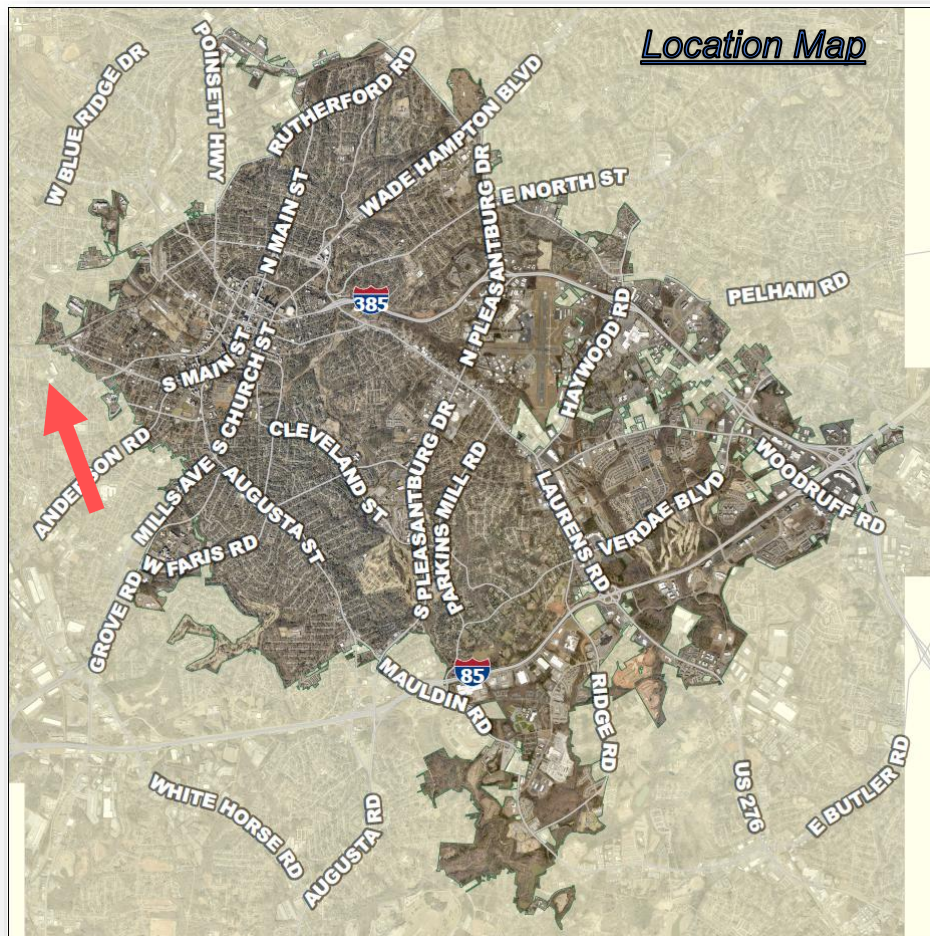
Property Location: Kitson Street, Whitin Street, Calder Street, Pettee Street, Abney Street, Draper Street, Jones Street, Waco Street, Bennett Street, Hatch Street, Ledbetter Street, Baldwin Street, and Bryant Street.

Tax Map Number(s): Multiple – see Exhibit A

Property Area: 17.96 acres

Rezone Request: RH-D, House D District, RNX-B, Neighborhood Flex B District, RNX-C, Neighborhood Flex C District, MX-5, Mixed Use 5 District, IX, Industrial Flex District, and IG, Industrial General District

Recommendation: Approval



Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 Function, Powers, and Duties of the Planning Commission

Sec 19-1.1.3 Purpose and Intent

Sec.19-1.3 Official Zoning Map

Sec.19-2 Zoning Districts

Sec.19-6.1.3 Planning Commission

Sec.19-6.2.2 Legislative Review

Project Overview:

This application is an annexation petition for multiple properties in the historic Brandon community including Brandon Mill, Greenville Center for Creative Arts, KM Fabrics, Brandon Baptist Church, and various others. The process of annexation necessitates property to be assigned a City of Greenville zoning designation, following the procedure for a zoning map amendment in Section 19-6.2.2. of the Greenville Development Code. The City of Greenville Planning Commission must make a recommendation on the proposed zoning classification prior to final reading of the annexation ordinance by Greenville City Council. The Planning Commission does not provide a recommendation on the annexation itself. Proposed zoning classifications for the annexed area include RH-D, House D District, RNX-B, Neighborhood Flex B District, RNX-C, Neighborhood Flex C District, MX-5, Mixed Use 5 District, IX, Industrial Flex District, and IG, Industrial General District, under the Greenville Development Code.

Land Use Review

The proposed zoning districts are RH-D, House D District, RNX-B, Neighborhood Flex B District, RNX-C, Neighborhood Flex C District, MX-5, Mixed Use 5 District, IX, Industrial Flex District, and IG, Industrial General District, as shown by parcel and address in **Exhibit A**. The current Greenville County zoning districts include C-2, Commercial district, R-7.5, Single-family residential district, O-D, Office district, NC, Neighborhood Commercial district, PD, Planned development district, and I-1, Industrial district. The GVL2040 Comprehensive Plan's Future Land Use Map provides for a land use recommendation of Corridor Mixed Use for the northeast corner of the annexation boundary. However, it does not provide a recommendation for the remainder of the annexation area; therefore, the proposed zoning districts have been aligned to reflect existing conditions and comparative zoning classifications in the county. The annexed property is not proposed to be included within a city overlay district and is not currently within a county overlay district.

RH-D, House D District

The RH-D, House D District, is proposed for two parcels with existing single-family mill-era homes. The existing county classification for these parcels is R-7.5, likewise a single-family residential district. The RH-D designation is recommended based upon the prevailing lot sizes of the residential area. The RH-D district has also been applied to other annexed Brandon-area homes in the past along Traction Street. If additional single-family residential areas of Brandon are annexed in the future, it is anticipated the RH-D designation will also be used.

RNX-B, Neighborhood Flex B District

The RNX-B, Neighborhood Flex B District, is proposed for three areas within the boundary. To the northeast, RNX-B is proposed to replace what is largely zoned as C-2, Commercial District, in the county. This will serve as a transition from the higher intensity uses found in the Village of West Greenville to the Brandon Mill Complex. Second, RNX-B is proposed for a property currently utilized as a home-based art studio to the northwest of the boundary. Third, the parking areas owned and utilized by KM Fabrics, a locally owned textile manufacturer, are likewise proposed for RNX-B to reflect their current non-residential use.

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RNX-C, Neighborhood Flex B District

The RNX-C, Neighborhood Flex C District, is proposed for the property at 20 Draper Street, which is currently zoned NC, Neighborhood commercial district, in the county. This property is permitted for a coffee shop and office space in the County, and the RNX-C District would allow these uses to remain conforming in the City. Staff has been made aware that this property is now under contract. The zoning for this parcel may need to be revisited in the future.

MX-5, Mixed Use 5 District

The MX-5, Mixed Use 5 District, is proposed for the historic, five-story Brandon Mill (constructed circa 1901). The property is the current home of the Lofts of West Greenville, a 186-unit multifamily and mixed-use redevelopment. The property is currently zoned PD, Planned development district, in the county. The City and landowner discussed several potential zoning classifications, including IX and RC-5, for the mill. Due to the types of uses allowed in the County-approved PD, the size of tenant spaces for these uses, and the height and massing of the building itself, the MX-5 District is aligned most closely to the existing PD zoning in the County.

IX, Industrial Flex District

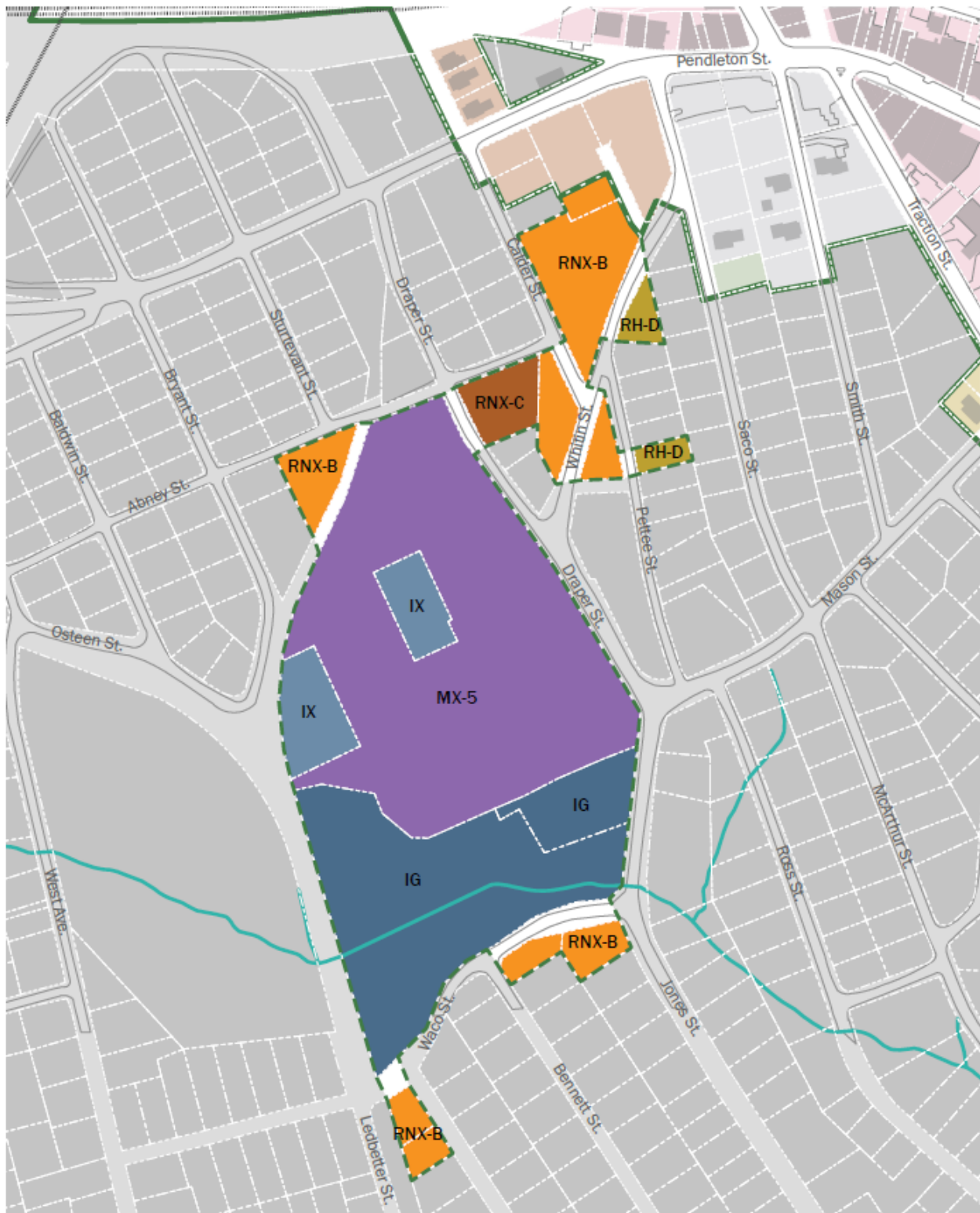
The IX, Industrial Flex District, is proposed for two other parcels within the Brandon Mill complex. The historic mill buildings contained within these properties are two stories. The parcels include the home of the Greenville Center for Creative Arts and a cotton warehouse, which awaits redevelopment.

IG, Industrial General District

The IG District is applied to the KM Fabrics site, which is an existing textile manufacturing facility located at 2 Jones Street and 2 Waco Street. The IG District is designed to accommodate manufacturing and industrial sites with appropriate permitted uses. The properties are currently zoned I-1, Industrial district, and have been continuously operated as industrial since c.1920 as a part of the Brandon Mill Complex.

The Brandon Mill Complex has acted as a workforce, social, and historical node for the Brandon community since the early 1900s. Though uses within the complex have changed over the years, the proposed zoning designations will allow the complex to continue as a node in the future given new redevelopment and use opportunities.

AX 17-2025 Zoning Districts



Definitions:

Please see the attachments for the **RH-D, RNX-B, RNX-C, MX-5, IX, and IG District** general provisions.

Other Site Information:

The properties located within the Brandon Mill complex at 25 Draper Street, 101 Abney Street, and 107 Abney Street are on the National Register of Historic Places. As such, future exterior or site modifications will require a certificate of appropriateness from either the Historic Review Board or staff, depending on whether the modification is determined to be major or minor.

The property is not within a County special emphasis neighborhood. Natural features within the area proposed to be rezoned include the headwaters of Brushy Creek, which runs underneath the KM Fabrics facility.

Staff Analysis:

The proposed annexation boundary contains a mix of zoning designations reflecting the existing land use patterns, the built form of development, and existing or approved businesses. The proposed zoning districts follow a thorough evaluation of the existing uses, rights vested through the County PD zoning, and potential uses allowable under the Greenville Development Code to ensure any potential nuisance is negated or minimized.

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	YES
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Comments: The Future land Use Map (FLUM) recommendation for the northeast corner of the annexation boundary is Corridor Mixed-Use. This designation reflects the predominance of the commercial area of West Greenville. The proposed RNX-B District in this area of the annexation boundary reflects the need for a transition between the more intensive uses and built-form along Pendleton Street and the Brandon Mill Complex.

The Comprehensive Plan calls for the City to have a greater percentage of the Greenville County population than in 2020. The annexation of multifamily complexes, such as the Lofts of West Greenville, helps accomplish this goal.

(b) Consistent with Applicable Plans and Studies.	N/A
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Comments: The City has not conducted a plan or study that includes the subject property.

(c) Compatible with Surrounding Uses.	YES
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Comments: These proposed zoning districts reflect the existing uses and built form of the annexation boundary and surrounding community. For many surrounding properties that will remain unincorporated, if annexed in the future, it is anticipated that comparable districts will be utilized.

(d) Provide logical and orderly Development Pattern.	YES
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Comment: The rezonings would allow for development consistent with existing surrounding uses and development patterns. All future development must comply with the Greenville Development Code. The code includes transition requirements between zoning districts *and* allows the Administrator to require transitions, when appropriate, to help protect established residential areas even outside the city limits.

STAFF RECOMMENDATION:

APPROVE rezone to RH-D, House D District, RNX-B, Neighborhood Flex B District, RNX-C, Neighborhood Flex C District, MX-5, Mixed Use 5 District, IX, Industrial Flex District, and IG, Industrial General District, as shown in the attached Exhibit A.

Staff Comments

Planning Comments

Recommend: Approve w/ Comments

Comment: The properties located at 25 Draper Street, 101 Abney Street, and 107 Abney Street are on the National Register of Historic Places. As such, any future exterior or site modifications will require a certificate of appropriateness from either the Historic Review Board or staff, depending on whether the modification is determined to be major or minor.

Addressing Comments

Recommend: Approve w/ Comments

Comments:

1. NEW PARCELS
2. ASSIGNED Address(es) and PIN:
 - a. 3 Kitson Street (TM#012100100500)
 - b. 16 Calder Street (TM#0121001000600)
 - c. Calder Street (TM#0121002100600)
 - d. Whitin Street (TM#0118001200200)
 - e. 2 Pettee Street (TM#0118001200300)
 - f. 12 Pettee Street (TM#0118001200800)
 - g. 20 Draper Street (TM#0121002100300)
 - h. 25 Draper Street (TM#0121002200100)
 - i. 101 Abney Street (TM#0121002200106)
 - j. 107 Abney Street (TM#0121002200107)
 - k. 201 Abney Street (TM#0121002000200)
 - l. 2 Jones Street (TM#0121002200104)
 - m. Waco Street (TM#0121002200103)
 - n. Hatch Street (TM#0117000701300)
 - o. Hatch Street (TM#0117000701200)
 - p. Jones Street (TM#0117000901600)
 - q. Waco Street (TM#0117000901700)
3. Addresses subject to change with administrative review of future permit application submittals for E-911 servicing and response. If necessary, please contact Jordan Harris in Planning (jpharris@greenvillesc.gov) for E-911 address verification.

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

*1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

Civil Engineer Comments

Recommend: Approve w/ Comments

Comments:

All streets in this annexation will be classified as "Neighborhood" streets.

Environmental Engineer Comments

Recommend: Approve w/ Comments

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Comments:

*1. Sewer service in this area is provided by Metro.

Fire Department Comments

Recommend: Approve w/ Comments

Comments:

GCFD will be responding to the annexed areas, as well as completing required business inspections. GCFD will update Knox boxes with business owners to ensure code compliance. GCFD will continue to evaluate response data to ensure adequate coverage is provided

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. The project site is currently developed and would not likely require tree removal for any future redevelopment. A full tree inventory per 19-5.2.2.A will be required with all future site permit submittals and mitigation for tree removals will be required.
2. Street trees will be required along all public rights-of-way with any major site disturbance.
3. All plant selections in future plans must comply with Div. 19-4.10.

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EXHIBIT A

Address	TMS#	Acreage	County Zoning District	Proposed City Zoning District
3 Kitson Street	0121001000500	0.15	C-2, Commercial District	RNX-B, Neighborhood Flex B District
16 Calder Street	0121001000600	1.09	R-7.5, Single-family Residential District/ C-2, Commercial District	RNX-B, Neighborhood Flex B District
0 Calder Street	0121002100600	0.34	O-D, Office District	RNX-B, Neighborhood Flex B District
0 Whiten Street	0118001200200	0.19	O-D, Office District	RNX-B, Neighborhood Flex B District
2 Pettee Street	0118001200300	0.18	R-7.5, Single-family Residential District	RH-D, House D District
12 Pettee Street	0118001200800	0.14	R-7.5, Single-family Residential District	RH-D, House D District
20 Draper Street	0121002100300	0.46	NC, Neighborhood Commercial District	RNX-C, Neighborhood Flex C District
25 Draper Street	0121002200100	8.313	PD, Planned Development District	MX-5, Mixed Use 5 District
101 Abney Street	0121002200106	0.47	PD, Planned Development District	IX, Industrial Flex District
107 Abney Street	0121002200107	0.637	PD, Planned Development District	IX, Industrial Flex District
201 Abney Street	0121002000200	0.41	R-7.5, Single-family Residential District	RNX-B, Neighborhood Flex B District
2 Jones Street	0121002200104	0.6	I-1, Industrial District	IG, Industrial General District
2 Waco Street	0121002200103	4.2	I-1, Industrial District	IG, Industrial General District
0 Hatch Street	0117000701300	0.15	R-7.5, Single-family Residential District	RNX-B, Neighborhood Flex B District
0 Hatch Street	0117000701200	0.14	R-7.5, Single-family Residential District	RNX-B, Neighborhood Flex B District
0 Waco Street	0117000901700	0.16	R-7.5, Single-family Residential District	RNX-B, Neighborhood Flex B District
0 Jones Street	0117000901600	0.25	R-7.5, Single-family Residential District	RNX-B, Neighborhood Flex B District



city of greenville

APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	City of Greenville	See attached petition
*Title:		
*Address:	206 S. Main Street	
*City, State:	Greenville, SC	
*Zip:	29601	
*Phone:	864-467-2273	
*Email:	planning@greenvillesc.gov	

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) see attached petition

*TOTAL ACREAGE 17.88

*CURRENT ZONING DESIGNATION (County) see attached petition

*PROPOSED ZONING DESIGNATION (City) see attached petition

TYPE OF ANNEXATION

*Please select one (1) type: ☐ 100% ☒ 75% ☐ 25%

For 100% and 75% Annexations, please include the corresponding **Annexation Petition** with the application submittal.

INSTRUCTIONS

1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
2. Staff will review the application for "completeness" pursuant to **Section 19-6.2.1.B.3. Completeness Determination**. If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
3. Please refer to **Sections 19-6.1.3. Planning Commission** for additional information.
4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
5. **Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.**
6. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.

Mary Douglas Hirsch **APPLICANT SIGNATURE**
7/7/25 **DATE**

7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initial: MCH

*Signatures	
Applicant	Mary Douglas Hirsch
Date	7/7/25
Property Owner/Authorized Agent	see attached petition
Date	

Address	TMS#	Acreage	County Zoning District	Proposed City Zoning District
3 Kitson Street	0121001000500	0.15	C-2, Commercial District	RNX-B, Neighborhood Flex B District
16 Calder Street	0121001000600	1.09	R-7.5, Single-family Residential District/ C-2, Commercial District	RNX-B, Neighborhood Flex B District
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0 Jones Street	0117000901600	0.25	R-7.5, Single-family Residential District	RNX-B, Neighborhood Flex B District



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

75% Percent
PETITION FOR ANNEXATION

The person(s) whose signatures appear below are at least 75% of the freeholders owning at least 75% of the assessed value for real estate in an area which is contiguous to the City of Greenville, and which is proposed to be annexed into the City.

In general, the area can be described as the parcels within that area bounded by Kitson Street, Whitin Street, Calder Street, Pettee Street, Abney Street, Draper Street, Jones Street, Waco Street, Bennett Street, Hatch Street, Ledbetter Street, Baldwin Street, Bryant Street, and railroad right-of-way, and is identified by the tax map parcel number(s) provided below, attached Annexation Map, attached Property Description(s), and the attached Annexation Plat(s) which are being provided to the City of Greenville Planning Commission in conjunction with this petition. The attached plat(s) are incorporated by reference as a description of the area. By their signatures, the freeholder(s) petition(s) the City Council of the City of Greenville to annex the entire area shown as being annexed in the Annexation map, including adjoining rights-of-way (if any).

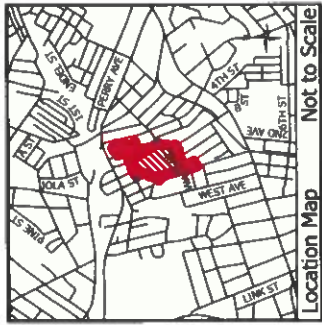
This petition is submitted under the provisions of S.C. Code §5-3-150(1), authorizing the City Council to annex an area when presented with a petition signed by the freeholders owning at least 75% real property and at least 75% of the assessed value in the area proposed to be annexed. This petition and all signatures thereto shall be open for public inspection on demand at the City Hall, located at the address set forth above. If the original of the petition is still in circulation for signatures, or otherwise not available at the time demand is made, then the original shall be made available as soon thereafter as reasonably practical and in the interim a copy shall be made available. Any person who seeks to challenge the annexation, and who has standing to do so, should act in accord with the requirements of Chapter 3 of Title 5 of the South Carolina Code. All zoning processes will be in accordance with state statutes and city ordinance otherwise existing.

The first signature was affixed on this Petition on February 20, 2025.



In general, the area can be described as:

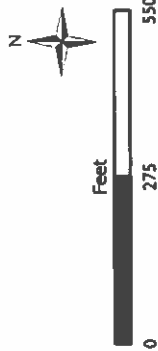
Address(es)	Acreage	TMS#
3 Kitson Street	0.15	0121001000500
16 Calder Street	1.09	0121001000600
0 Calder Street	0.34	0121002100600
0 Whiten Street	0.19	0118001200200
2 Pettee Street	0.18	0118001200300
12 Pettee Street	0.14	0118001200800
20 Draper Street	0.46	0121002100300
25 Draper Street	8.313	0121002200100
101 Abney Street	0.47	0121002200106
107 Abney Street	0.637	0121002200107
201 Abney Street	0.41	0121002000200
2 Jones Street	0.6	0121002200104
2 Waco Street	4.2	0121002200103
0 Hatch Street	0.15	0117000701300
0 Hatch Street	0.14	0117000701200
0 Jones Street	0.25	0117000901600
0 Waco Street	0.16	0117000901700



ANNEXATION MAP

-  Total Annexation Area
-  Greenville City Limits

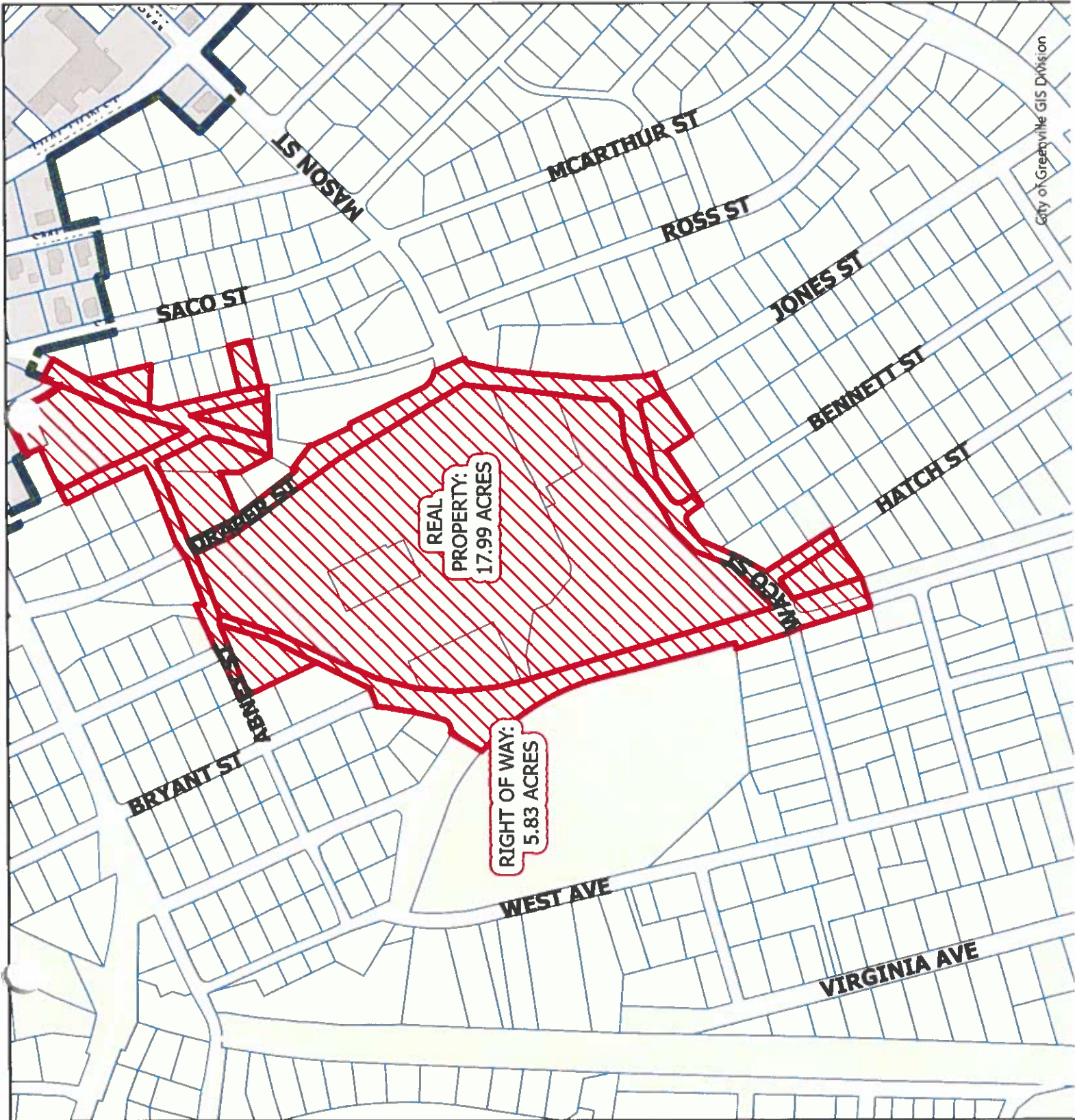
Total Area of Annexation:
1,037,599.2 Sq. Ft.
Total Acreage of Annexation:
23.82 Acres



This map is a product of the City of Greenville, SC and was compiled from plats and other available information. No actual field survey was performed. Reasonable efforts have been made to ensure the accuracy of this map. The City of Greenville expressly disclaims any responsibility or liability with regard to the use of this map.
Copyright: The City of Greenville, SC

City Attorney

Date

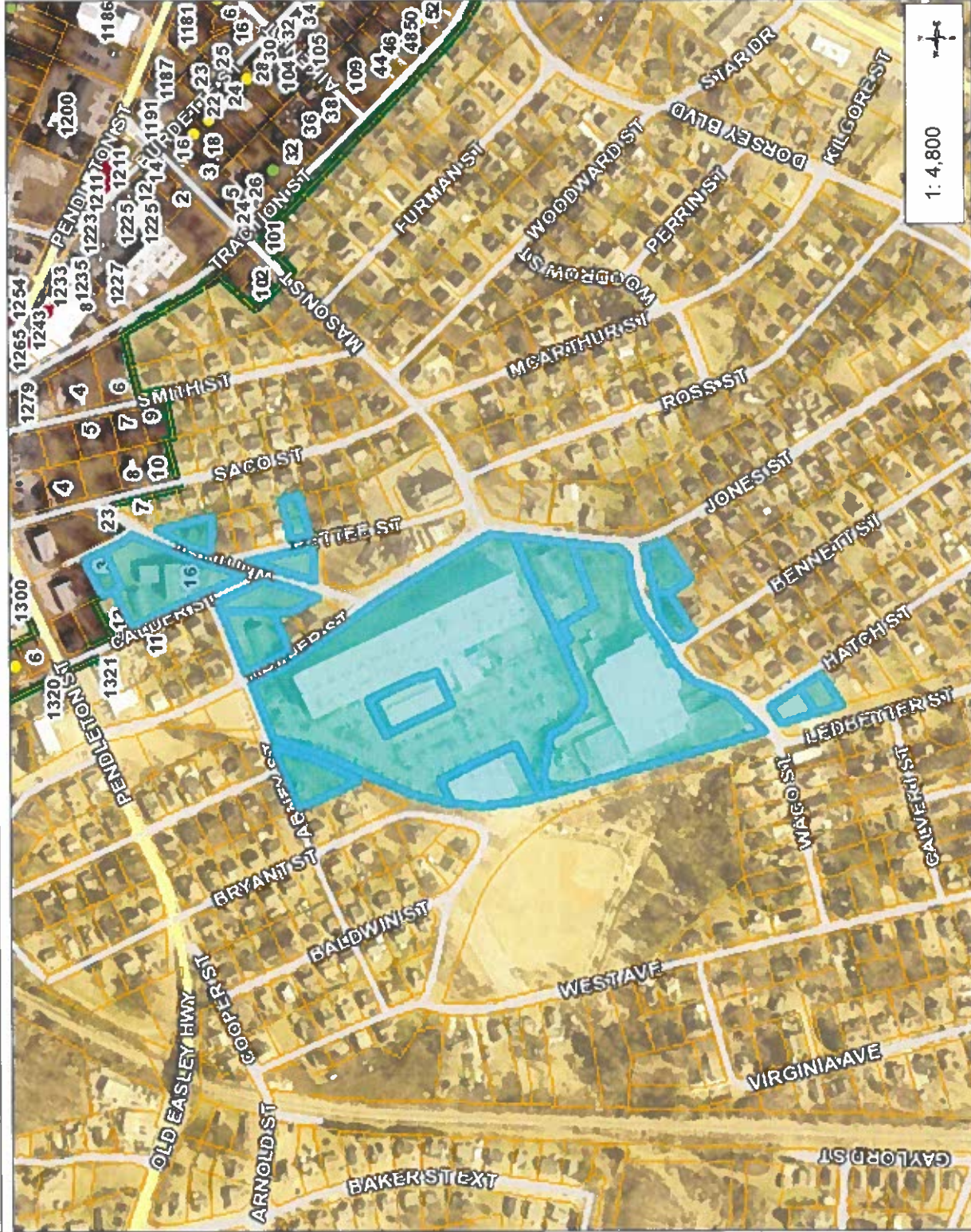


City of Greenville GIS Division

Annexation Map



- Legend**
- Address Points**
- Comm/Industrial
 - Residential - SFD
 - Residential - SFA
 - Residential - Multi
 - Mixed Use
 - Parking Lot or Structure
 - School
 - City Park
 - Under Construction
 - Accessory Structure
 - Other
- Parcels with Ownership**
- City of Greenville Limits
 - County Background



1: 4,800

Notes

This map is user generated from the City of Greenville's MapIT 2.0 intranet mapping site and is for general reference only. Data layers that appear on this map may not be accurate, current, or otherwise reliable and should be appropriately used with caution. Contact the GIS Division for all questions pertaining to the MapIT 2.0 program and data.

800 400 800 Feet

NAD_1983_HARN_StatePlane_South_Carolina_FIPS_3900_Feet_Int
© City of Greenville, SC Date Created: 3/1/2024



Property Owner(s)*: Brandon Hawkins

Property Address(es): 3 Kitson Street

TMS#(s): 0121001000500

Acreage: 0.15

Proposed Zoning: RNX-B, Neighborhood Flex B District

Owner Signature*: Brandon L. Hawkins

Date: 3-21-2025

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete the **Certificate of Petition Signature** attached.



Property Owner(s)*: Brandon Baptist Church Inc

Property Address(es): 16 Calder Street, 0 Calder Street, 0 Whiten Street

TMS#(s): 0121001000600, 0121002100600, and 0118001200200

Acreage: 1.62

Proposed Zoning: RNX-B, Neighborhood Flex B District

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete the **Certificate of Petition Signature** attached.



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

CERTIFICATION OF PETITION SIGNATURE*

I, _____, have this _____ day of _____, 20____, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I am the legal representative by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

0121001000600, 0121002100600, 0118001200200

Signature

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete.

Property Owner(s)*: Heather Lynn Esposito

Property Address(es): 2 Pettee Street

TMS#(s): 0118001200300

Acreage: 0.18

Proposed Zoning: RH-D, House D District

Owner Signature*: 

Date: 2/24/2025

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete the **Certificate of Petition Signature** attached.



Property Owner(s)*: Ronald Esposito

Property Address(es): 12 Pettee Street

TMS#(s): 0118001200800

Acreage: 0.14

Proposed Zoning: RH-D, House D District

Owner Signature*: *Ronald Esposito*

Date: 2-26-2025

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete the **Certificate of Petition Signature** attached.



Property Owner(s)*: Draper Creative LLC

Property Address(es): 20 Draper Street

TMS#(s): 0121002100300

Acreage: 0.46

Proposed Zoning: RNX-C, Neighborhood Flex C District

Owner Signature*: Amanda Felton

Date: 3/27/2025

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete the **Certificate of Petition Signature** attached.



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

CERTIFICATION OF PETITION SIGNATURE*

I, Amanda Felton, have this 27th day of March, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I am the legal representative by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

0121002100300

Amanda Felton

Signature

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete.



Property Owner(s)*: Big Brandon Mill SC LLC

Property Address(es): 25 Draper Street

TMS#(s): 0121002200100

Acreage: 8.313

Proposed Zoning: MX-5, Mixed Use 5 District

Owner Signature*: 

Date: 5/13/2025

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete the **Certificate of Petition Signature** attached.



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

CERTIFICATION OF PETITION SIGNATURE*

I, Dennis Narlinger, have this 13th day of May, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I am the legal representative by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

0121002200100

Dennis Narlinger
Signature

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete.



Property Owner(s)*: Greenville Center for Creative Arts

Property Address(es): 101 Abney Street

TMS#(s): 0121002200106

Acreage: 0.47

Proposed Zoning: IX, Industrial Flex District

Owner Signature*: *Jess Abbott*

Date: 2/20/2025

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete the **Certificate of Petition Signature** attached.



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

CERTIFICATION OF PETITION SIGNATURE*

I, Jess Abbott, CEO, have this 20 day of February, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I am the legal representative by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

0121002200106

Jess Abbott
Signature

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete.



Property Owner(s)*: Big Cotton Warehouse SC LLC

Property Address(es): 107 Abney Street

TMS#(s): 0121002200107

Acreage: 0.637

Proposed Zoning: IX, Industrial Flex District

Owner Signature*: 

Date: 5/13/2025

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete the **Certificate of Petition Signature** attached.



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

CERTIFICATION OF PETITION SIGNATURE*

I, Dennis Narlinger, have this 13th day of May, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I am the legal representative by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

0121002200107

Signature 

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete.



Property Owner(s)*: Abney Art LLC

Property Address(es): 201 Abney Street

TMS#(s): 0121002000200

Acreage: 0.41

Proposed Zoning: RNX-B, Neighborhood Flex B District

Owner Signature*: *Danielle Fontaine*

Date: 02/24/2025

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete the **Certificate of Petition Signature** attached.



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

CERTIFICATION OF PETITION SIGNATURE*

I, Danielle Fontaine, have this 24th day of February, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I am the legal representative by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

0121002000200

Danielle Fontaine
Signature

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete.



Property Owner(s)*: K M Fabrics Inc

Property Address(es): 2 Jones Street, 2 Waco Street, 0 Hatch Street, 0 Hatch Street, 0 Waco Street, 0 Jones Street

TMS#(s): 0121002200104, 0121002200103, 0117000701300, 0117000701200, 0117000901700, 0117000901600

Acreage: 5.5

Proposed Zoning: IG, Industrial General District for 0121002200104, 0121002200103

RNX-B, Neighborhood Flex B District for 0117000701300, 0117000701200, 0117000901700, 0117000901600

Owner Signature*: *PO Tantillo*

Date: 4/1/2025

Owner Signature*: _____

Date: _____

Owner Signature*: _____

Date: _____

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete the **Certificate of Petition Signature** attached.



city of
greenville
South Carolina

CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

CERTIFICATION OF PETITION SIGNATURE*

I, PAUL TANTILLO, have this 15th day of APRIL, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I am the legal representative by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

0121002200104, 0121002200103, 0117000701300, 0117000701200, 0117000901700,
0117000901800

Paul Tantillo
Signature

* - If you have signed on the behalf of a Trust, as the Member(s) or Managing Member(s) of a Limited Liability Company (LLC), or the representative of a Corporation, or similar arrangement, please complete.

Property Description

TMS# 0121001000500:

All that certain piece, parcel or lot of land, with the improvements thereon, situate, lying and being in or near the city of Greenville County of Greenville, State of South Carolina, and being more particularly described as Lot No. 246, Section 2, as shown on plat entitled "Subdivision for Abney Mills, Brandon Plant, Greenville South Carolina", made by Dalton & Neves, Engineers, February, 1959 and recorded in the RMC Office for Greenville County in Plat Book QQ at Pages 56-59. According to said plat the within described lot is known as No. 3 Kitson Street and fronts thereon 59 feet. Reference to said plat is craved for a metes and bounds description.

This being the same property conveyed unto John Asher by Deed Consecro Finance Servicing Corp. dated January 21, 2003 and recorded February 12, 2003 in Deed Book 2074 at Page 1821 in the RMC Office of Greenville County, South Carolina.

TMS# 0121001000600 and 0118001200200:

ALL that certain lot of land situate in the County and State aforesaid, near the city of Greenville, and being a portion of the Brandon (now Abney) Mills property, and having the following lines, courses and distances, to-wit:

BEGINNING at an iron pin in the corner of Greene and Pettee Streets, thence with Pettee Street N. 16 degrees-34" E. 257 feet to stake near Pettee Street; thence S. 85 degrees – 58" W. 177.8 feet to stake on line of Greene Street; thence with Greene Street S. 24 E. 256 feet to the beginning corner, containing forty-eight one hundredths (.48) of an acre, more or less.

This being the identical property conveyed to the Grantor herein by deed of Abney Mills, a South Carolina corporation dated September 9, 1960 and recorded in the RMC Office for Greenville County on November 18, 1960 in Deed Book 663 at page 172.

ALSO: All that certain piece, parcel or lot of land situate, lying, and being in Greater Greenville, Greenville County and State of South Carolina, located between Greene Street and Pettee Street and adjacent to the North Boundary of the Brandon Baptist Church property, being more fully described as follows:

BEGINNING at a 1-3/4 inch steel rod situated on the East right-of-way line of Greene Street, this corner being the Northwest corner of the Brandon Baptist Church property; thence North 56 degrees – 44' East for a distance of 102.36 feet to a 1-3/4 inch steel rod; thence North 86 degrees – 42' East for a distance of 138.57 feet to a 1-3/4 inch steel rod situated at the point of intersection of the Westerly right-of-way lines of Kitson and Pettee Streets; thence South 24 degrees 27' West for a distance of 193.0 feet, this being the chord of the arc of a 7 degree-11' curve which the right-of-way line of said Pettee Street, to a cross cut in the existing concrete sidewalk; thence North 17 degrees – 30' East for a distance of 130.00 feet along the existing property line of said Brandon Baptist Church to a 1-3/4 inch steel rod; thence South 86 degrees-07' West for a distance of 183.56 feet along the existing North Property line of said Brandon Baptist Church to the point of beginning. Said property is bounded on West and North by other

lands of Abney Mills, on the East by Pettee Street and on the South by existing property of the said Brandon Baptist Church and is more fully described by a plat made by H.A. Norman L.S., April 11, 1957.

This is the identical property conveyed to the Grantor herein by deed of Abney Mills, a South Carolina corporation, dated September 9 1960, and recorded in the RMC office for Greenville County on November 18, 1960, in Deed Book 663 at Page 172.

ALSO: All that piece, parcel or lot of land, with the improvements thereon, situate, lying and being in or near Greenville, in the County of Greenville, South Carolina, and being more particularly described as Lot No. 248, Section 2, as shown on plat entitled, "Subdivision for Abney Mills, Brandon Plant, Greenville, South Carolina, made by Dalton & Neves, Engineers, Greenville S.C., February 1959, and recorded in the Office of the Register of Deeds for Greenville County in Plat Book QQ at Pages 56 to 59. Reference is hereby made to said plat for the metes and bounds thereon. According to said plat the within described lot is also known as No. 14 Green Street and fronts thereon 80.2 feet.

ALSO: All that piece, parcel or lot of land, with the improvements thereon, situate, lying and being in or near Greenville, in the County of Greenville, South Carolina, and being more particularly described as Lot No. 247, Section 2, as shown on plat entitled, "Subdivision for Abney Mills, Brandon Plant, Greenville, South Carolina, made by Dalton & Neves, Engineers, Greenville S.C., February 1959, and recorded in the Office of the Register of Deeds for Greenville County in Plat Book QQ at Pages 56 to 59. Reference is hereby made to said plat for the metes and bounds thereon. According to said plat the within described lot is also known as No. 5 Kitson Street and fronts thereon 91.4 feet.

ALSO: All that piece, parcel or lot of land, with the improvements thereon, situate, lying and being in or near Greenville, in the County of Greenville, South Carolina, and being more particularly described as Lot No. 510, as shown on plat entitled, "Plat No. 4 Property of Abney Mills, Brandon Plant, Greenville, S. C., made by Dalton & Neves, May 1959, and recorded in the Office of the Register of Deeds for Greenville County in Plat Book SS at Page 133. Reference is hereby made to said plat for the metes and bounds thereon. According to said plat said lot consists of 21/100ths of an acres and is bounded by Pettee Street, Whitin Street and an unnamed street.

TMS#: 0121002100600:

All that piece, parcel or lot of land situate, lying and being on the Western side of Green and Whitin Streets, near the City of Greenville, County of Greenville, State of South Carolina, being known and designated as a "Parking" lot as shown on a plat entitled "Section No. 2, Subdivision for Abney Mills, Brandon Plant, Greenville, S.C", prepared by Dalton & Neves, dated February, 1959, and recorded in the R.M.C. Office for Greenville County, South Carolina, in Plat Book QQ at Pages 56-59, and having, according to a more recent plat prepared by Webb Surveying & Mapping Co., dated July, 1979, entitled "Plat for Brandon Baptist Church", the following metes and bounds:

BEGINNING at an iron pin on the Western side of Whitin Street in the rear line of Lot. No. 228, Section 2, Abney Mills Subdivision, and running thence with the rear line of Lot No. 229 N. 26-23 W. 86.96 feet to an iron pin the rear line of Lot No. 227; thence with the rear line of Lots Nos. 227, 226, and 225 N. 0-54 W. 197.96 feet to an iron pin on the Southern side of Abney Street; thence with the Southern Side of Abney Street N. 67-37 E. 24.27 feet to an iron pin on at the intersection of Abney Street and Green Street; thence with the Western side of Green Street S. 25-37 E. 147.95 feet to an iron pin at the intersection of Green Street and Whitin Street; thence with the Western side of Whitin Street S. 16-37 W. 158.55 feet to the point of beginning.

The within conveyance is subject to such zoning ordinances, utility easements and rights of way as may affect the above described property.

This is a portion of the property acquired by the Grantor herein from Brandon Corporation by merger pursuant to Agreement, dated November 23, 1949, and recorded in the R.M.C. Office for Greenville County, South Carolina, in Deed Book 396 at page 399 on November 23, 1949.

TMS# 0118001200300

All that piece, parcel or lot of land, with the buildings and improvements thereon, situate, lying and being in the County of Greenville, State of South Carolina, and being more particularly described as Lot No. 252, Section 2, on plat entitled "Subdivision for Abney Mills, Brandon Plat, Greenville, South Carolina", recorded in the R/D Office for Greenville County, South Carolina, in Plat Book QQ, at pages 58-59. Said lot being further shown on a plat entitled, "Abney Mills Brandon Plant, Sec 2 - Lot 252, Survey for Heather Esposito," prepared by Freeland & Associates, Inc. and recorded in the Office of the Register of Deeds for Greenville County on June 11, 2015 in Plat Book 1210, Page 5. Reference being made to said latter plat for a complete and accurate description.

TMS #: 0118.00-12-003.00

This being the same property conveyed to Federal National Mortgage Association by Deed of Charles B. Simmons, Jr. as Master in Equity for Greenville County, said deed recorded April 28, 2015 in Book 2464 at Page 1308, Greenville County Recorder's Office.

TMS# 0118001200800

All that certain piece, parcel or lot of land situate, lying and being in the State of South Carolina, County of Greenville, being shown and designated as Lot 257 on a plat entitled, "Subdivision for Abney Mills, Brandon Plant, Section No. 2," dated February 1959, prepared by Dalton & Neves, and recorded in the ROD Office for Greenville County in Plat Book QQ, Pages 59-59. Reference to said plat is hereby made for a more complete description thereof.

This being the same property conveyed to Frederick W. Rucker by deed of Abney Mills, dated May 12, 1959, recorded June 17, 1959 in the ROD Office for Greenville County in Deed Book 627, Page 328. Frederick W. Rucker subsequently conveyed an undivided one-half (1/2) interest in the property to Helen D. Rucker by deed dated March 29, 1973, recorded April 3, 1973 in the ROD Office for Greenville County in Deed Book 971, Page 672. Frederick W. Rucker

subsequently passed away, devising his interest in the property to Helen D. Rucker by Last Will and Testament dated January 30, 1992. By clerical error, Lot 257 was inadvertently left off of the Deed of Distribution recorded in the ROD Office for Greenville County in Deed Book 1606, Page 17. Reference is made to Greenville County Probate File Number 94-ES-23-393 for more information.

THIS CONVEYANCE IS MADE SUBJECT TO: All covenants, restrictions, easements and rights-of-ways affecting the property.

TMS# 0121002100300

Property Description: All those pieces, parcels or lots of land being known as all of Lots 225 and 226, and part of Lot 227, as shown on a plat for Draper Creative, LLC by Freeland & Associates, Inc. dated August 8, 2022 and recorded on August 11, 2022 in Plat Book 1439 at Page 51 in the Register of Deeds Office for Greenville County, South Carolina. This being the same property conveyed to the Grantor herein by Deed of Brandon Lodge N. 279, A.F. Masons dated December 28, 2005 and recorded January 4, 2006 in Deed Book 2183 at Page 224 in the Register of Deeds Office for Greenville County, South Carolina.

TMS# 0121002200100

All that certain piece, parcel or lot of land, situate, lying and being in Greenville County, South Carolina, being shown and designated as 362,260 Sq.Ft., 8.316 Acres on a plat entitled, "Recombination Plat for Brandon Mill LLC," prepared by Site Design, Inc., dated February 11, 2020 and recorded February 21, 2020 in the Office of the Register of Deeds for Greenville County, South Carolina in Plat Book 1359 at Page 90. Reference to said plat is hereby made for a metes and bounds description thereon.

TMS# 0121002200106

The land referred to herein below is situated in the County of Greenville, State of South Carolina, and is described as follows:

FEE PARCEL:

ALL THAT CERTAIN PIECE, PARCEL OR LOT OF LAND SITUATE, LYING AND BEING IN GREENVILLE COUNTY, SOUTH CAROLINA, SHOWN AND DESIGNATED AS LOT 2, 20,467 SQ. FT., 0.47 ACRES ON THAT CERTAIN PLAT "SUMMARY PLAT" FOR PROGRESSIVE CONSULTANTS, LLC, PREPARED BY SITE DESIGN, INC., DATED MAY 21, 2015, AND RECORDED OCTOBER 7, 2015 IN THE REGISTER OF DEEDS OFFICE FOR GREENVILLE COUNTY IN PLAT BOOK 1220 AT PAGE 68. SAID PROPERTY HAVING SUCH COURSES AND DISTANCES, METES AND BOUNDS, BUTTINGS AND BOUNDINGS AS WILL BY REFERENCE TO THE SAID PLAT MORE FULLY AND AT LARGE APPEAR.

EASEMENT PARCEL:

THOSE CERTAIN APPURTENANT EASEMENTS BENEFITTING THE FEE PARCEL AS

PROVIDED UNDER THAT CERTAIN DECLARATION OF EASEMENTS, COVENANTS, CONDITIONS AND RESTRICTIONS BY BRANDON MILL, LLC RECORDED ON NOVEMBER 8, 2018 IN BOOK DE 2551, PAGE 5501 IN THE OFFICE OF THE REGISTER OF DEEDS FOR GREENVILLE COUNTY, SOUTH CAROLINA.

DERIVATION: THIS BEING A PORTION OF THE PROPERTY CONVEYED TO BRANDON MILL, LLC BY DEED OF PROGRESSIVE CONSULTANTS, LLC, RECORDED OCTOBER 30, 2015 IN BOOK 2476 AT PAGE 0713 IN THE OFFICE OF THE REGISTER OF DEEDS FOR GREENVILLE COUNTY, SOUTH CAROLINA; AND BY DEED OF 450 PARK AVENUE, LLC RECORDED OCTOBER 29, 2015, IN BOOK 2476 AT PAGE 0437 IN THE OFFICE OF THE REGISTER OF DEEDS FOR GREENVILLE COUNTY, SOUTH CAROLINA.

TMS# 0121002200107

ALL that certain piece, parcel or lot of land situate lying and being in Greenville County, South Carolina, shown as 0.637 acres, more or less, on that certain plat entitled "Recombination Plat for Brandon Mill LLC" by Justin A. McDaniel, PLS #28588, dated September 4, 2018, recorded September 25, 2018 in Plat Book 1316, Page 87, Office of the Register of Deeds for Greenville County, South Carolina.

This being the same property conveyed to Greenville Center for Creative Arts by deed of Big Brandon Mill SC Manager, LLC dated August 8, 2019, recorded August 14, 2019, in Deed Book 2573 at Page 1091 in the Office of the Register of Deeds for Greenville County.

EASEMENT PARCEL:

Those certain appurtenant easements benefiting the FEE PARCEL as provided under that certain Declaration of Easements, Covenants, Conditions and Restrictions by Brandon Mill, LLC recorded on November 8, 2018 in Deed Book 2551, Page 5501 in the Office of the Register of Deeds for Greenville County, South Carolina.

TMS# 0121002000200

ALL that piece, parcel or lot of land, with improvements thereon, situate, lying, and being in or near Greenville in the County of Greenville, State of South Carolina, being more particularly described as Lot No. 132, Section 1, as shown on plat entitled "Subdivision for Abney Mills, Brandon Plant, Greenville, South Carolina", made by Dalton & Neves Engineers, Greenville, South Carolina, February 1959, and recorded in the ROD Office for Greenville County, S.C. in Plat Book QQ at Page 56-59, inclusive. Reference is hereby made to said plat for a more detailed metes and bounds description thereof.

TMS# 0121002200104

ALL that certain piece, parcel or lot of land situate, lying and being in the State of South Carolina, County of Greenville, on the western side of Draper Street, being shown and designated on a survey entitled "Property of Insulation Services, Inc.", prepared by Kermit T. Gould, dated June 17, 1992, recorded in Plat Book 23-0 at page 32, reference to which is hereby craved for a more complete and accurate description.

This being the identical property conveyed to Clayton W. Coggins and Wanda J Coggins by deed of Brandon Mills Association dated October 6, 1992, recorded October 19, 1992, in Deed Book 1492 at page 367, in the RMC Office for Greenville County, SC

TMS# 0121002200103, 0117000701200, and 0117000701300

All that piece, parcel or tract of land, containing 4.210 acres, more or less, situate, lying and being near the City of Greenville, County of Greenville, State of South Carolina, being a portion of the property shown on a plat prepared by Dalton & Neves Co., Engineers, dated June, 1977, entitled "Property of Abney Mills, Brandon Plant", and recorded in the R.M.C. Office for Greenville County in Plat Book 6-M at page 54, and being known and designated as Tract No. 2 as shown on a more recent plat prepared by Dalton & Neves Co., Engineers, dated July, 1983, entitled "Property of KM Fabrics, Inc.", and recorded in the R.M.C. Office for Greenville County, in Plat Book 9-Q at page 50, and having, according to said plat, the following metes and bounds:

BEGINNING at an iron pin at the intersection of a Southern Industrial Siding and Grier Street, and running thence within the Northern edge of the right of way for Grier Street, the following courses and distances: N. 43-28 E. 138.05 feet to an iron pin, thence N. 21-39 E. 100 feet to an iron pin, thence N. 44-02 E. 70 feet to an iron pin, thence N. 61-17 E. 59.9 feet to a nail and cap, thence N. 55-32 E. 106 feet to an iron pin, thence N. 70-19 E. 87.4 feet to an iron pin, thence N. 84-16 E. 69.1 feet to an iron pin; thence with the curve of the intersection of Grier Street and Jones Street, the chord of which is N. 47-22 E. 30.7 feet to an iron pin on the Western edge of the right of way for Jones Street; thence with the Western edge of the said right of way for Jones Street N. 5-02 E. 138.62 feet to an iron pin; thence with the line of property now or formerly of Clarkson Brothers, Inc., the following courses and distances: S. 69-41 W. 180.58 feet to an iron pin, thence N. 30-21 W. 104.80 feet to an iron pin, thence S. 59-53 W. 45.22 feet to an iron pin, thence N. 29-30 W. 25.12 feet to an iron pin, thence S. 65-01 W. 149.37 feet to an iron pin, thence N. 89-45 W. 34.11 feet to an iron pin, thence N. 51-36 W. 77.30 feet to an iron pin, thence N. 22-47 W. 43.50 feet to an iron pin, thence N. 81-11 W. 109.73 feet to an iron pin, and thence S. 76-57 W. 57.92 feet to an iron pin on the Eastern edge of the right of way of a Southern Industrial Siding; thence with the Eastern edge of the said right of way of a Southern Industrial Siding S. 17-05 E. 610.23 feet to the point of beginning.

This is a portion of the property conveyed to the Grantor herein by deed of Abney Mills, dated May 25, 1978, and recorded in the R.M.C. Office for Greenville County, South Carolina, in Deed Book 1080 at page 123, on May 31, 1978.

ALSO:

All those pieces, parcels or lots of land situate, lying and being on the Southwestern side of Hatch Street, near the City of Greenville, County of Greenville, State of South Carolina, being known and designated as Lots Nos. 105 and 106 as shown on a plat entitled "Section No. 1, Subdivision for Abney Mills, Brandon Plant, Greenville, S.C.", prepared by Dalton & Neves, dated February, 1959, and recorded in the R.M.C. Office for Greenville County in Plat Book QQ at page 56-59, inclusive, and being known and designated as Tract No. 3 as shown on a more recent plat prepared by Dalton & Neves Co., Engineers, dated July, 1983, entitled "Property of KM Fabrics, Inc.", and recorded in the R.M.C. Office for Greenville County in Plat Book 9-Q at page 50, and having, according to said plat, the following metes and bounds:

BEGINNING at an iron pin on the Southwestern edge of the right of way for Hatch Street at the joint front corner of Lots Nos. 104 and 105, and running thence with the line of Lot No. 104 S. 56-33 W. 98.3 feet to an iron pin on the Northeastern edge of the right of way for the Southern Industrial Siding; thence with the Northeastern edge of the said right of way N. 17-22 W. 173 feet to an iron pin on the Southern edge of the right of way for Grier Street; thence with the Southern edge of the said right of way for Grier Street N. 56-07 E. 51.37 feet to an iron pin on the Southwestern edge of the right of way for Hatch Street; thence with the Southwestern edge of the right of way for Hatch Street S. 33-06 E. 166.61 feet to the point of beginning.

This is the identical property conveyed to the Grantor herein by deed of Abney Mills, dated August 7, 1978, and recorded in the R.M.C. Office for Greenville County, South Carolina, in Deed Book 1085 at page 594, on August 18, 1978.

This is the identical property conveyed to the Grantor herein by deed of Abney Mills, dated August 7, 1978, and recorded in the R.M.C. Office for Greenville County, South Carolina, in Deed Book 1085 at page 594, on August 18, 1978.

The within conveyance is subject to such restrictions, setback lines, zoning ordinances, utility easements and rights of way, if any, as may affect the above described property.

Rider to Deed from Clarkson Brothers, Inc, to KM Fabrics, Inc.

The Grantor herein reserves unto itself, its successors and assigns:

1. An easement for the operation and maintenance of a pump, as located on the plat referred to above situate in Tract No. 3, said easement to be of sufficient dimensions for the maintenance and operation of said pump;
2. An easement for ingress to and egress from the aforesaid pump to other property to the Grantor herein;
3. Easements for pipes, fittings and electrical power for the operation and maintenance of said pump; and
4. The right to use water from the stream (indicated on plat as "Drainage Easement") at the location of said pump
5. The right to discharge rainwater and any overflow from the pond on property of the Grantor into the "Drainage Easement"

TOGETHER with an easement for ingress to and egress from Tract. No. 2 hereinabove described, being known and designated as "Ingress-Egress Easement" as shown on the plat hereinabove referred to and having such metes and bounds as appear thereon.

ALL easements granted herein or retained by the Grantor shall be deemed to run with the land and shall inure to the benefit of and bind the Grantor herein, the Grantee herein, their respective successors and assigns.

TMS# 0117000901600 and 0117000901700

All those pieces, parcels or lots of land situate, lying and being at the Southeastern corner of the intersection of Bennett Street and Grier Street, near the City of Greenville, County of Greenville, State of South Carolina, being known and designated as Lots Nos. 49 and 50 as shown on a plat entitled "Section No. 1, Subdivision for Abney Mills, Brandon Plant, Greenville, S.C", prepared

by Dalton & Neves, dated February, 1959, and recorded in the R.M.C. Office for Greenville County, South Carolina, in Plat Book QQ at pages 56-59, and having, in the aggregate, the following metes and bounds:

BEGINNING at an iron pin at the Southeastern corner of the intersection of Bennett Street and Grier Street, and running thence with the Southern side of Grier Street N. 56-17 E. 86 feet to an iron pin; thence continuing with the Southern side of Grier Street N. 78-24 E. 187 feet to an iron pin at the Southwestern corner of the intersection of Grier Street and Jones Street; thence with the Western side of Jones Street S. 16-22 E. 65 feet to an iron pin at the joint front corner of Lots Nos. 48 and 49; thence with the line of Lot No. 48 S. 58-27 W. 121 feet to an iron pin at the joint rear corner of Lots Nos. 51 and 52; thence with the rear line of Lot No. 51 N. 33-13 W. 70 feet to an iron pin; thence with the line of Lot No. 51 S. 56-47 W. 120 feet to an iron pin on the Eastern side of Bennett Street; thence with the Eastern side of Bennet Street N. 33-13 W. 57 feet to the point of beginning.

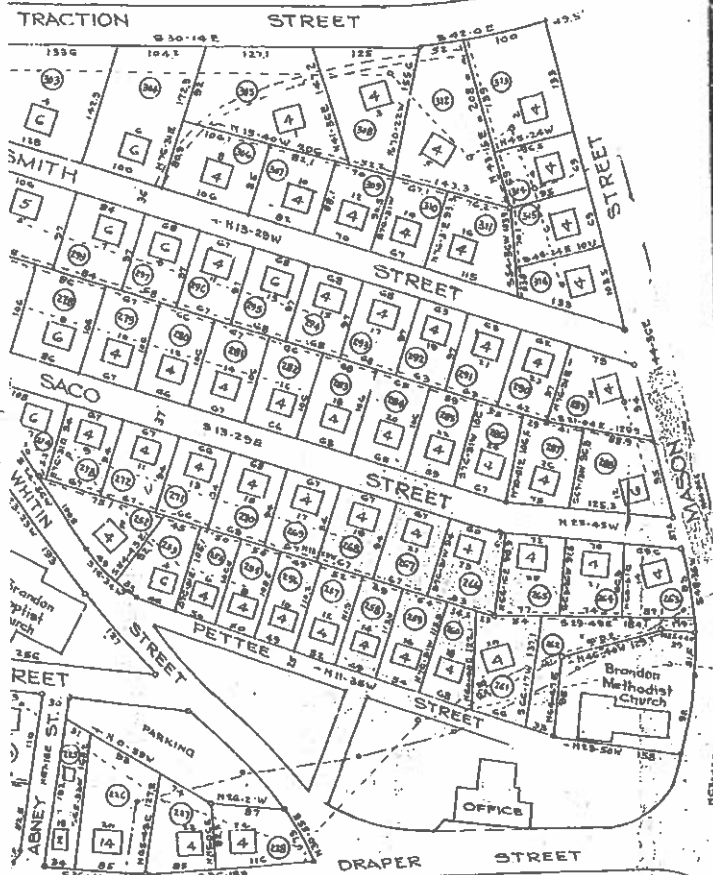
The within conveyance is subject to such zoning ordinances, utility easements and rights of way as may affect the above described property.

This is a portion of the property acquired by the Grantor herein from Brandon Corporation by merger pursuant to Agreement, dated November 23, 1949, and recorded in the R.M.C. Office for Greenville County, South Carolina, in Deed Book 396 at page 3999 on November 23, 1949.



SECTION NO. 2.
 SUBDIVISION FOR
 ABNEY MILLS
 BRANDON PLANT
 GREENVILLE S. C.
 Scale 1"=100' Feb. 1959

DALTON & NEVILL
 GREENVILLE S. C.



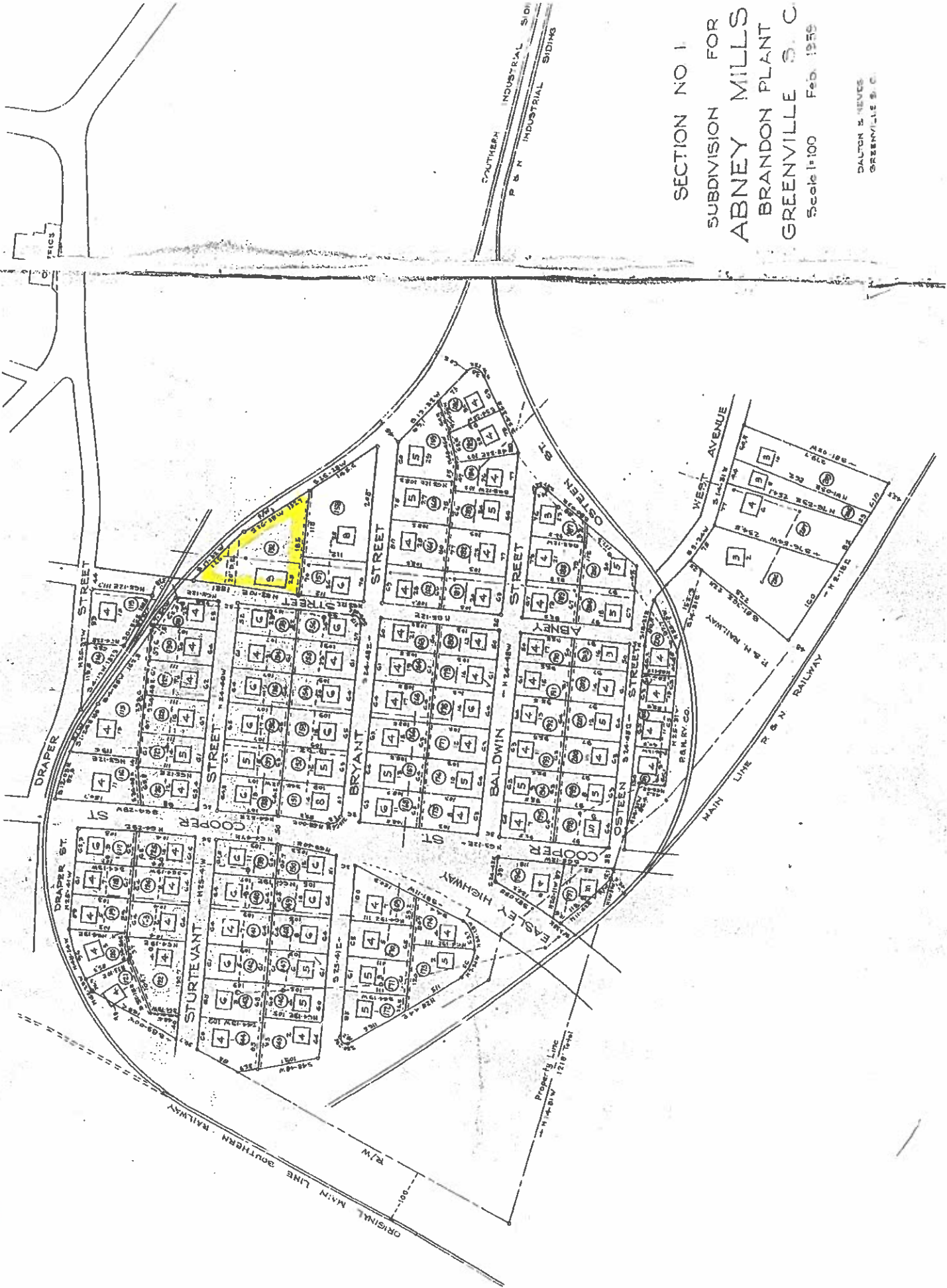
SECTION NO. 2.
SUBDIVISION FOR
ABNEY MILLS
BRANDON PLANT
GREENVILLE S. C.
Scale 1"=100' Feb. 1959

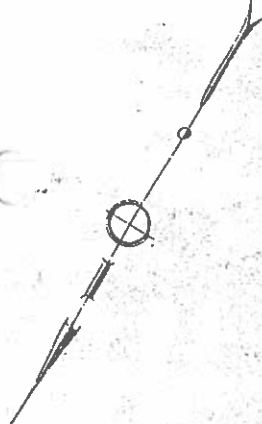
DALTON & NEVES
GREENVILLE S. C.



SECTION NO 1
 SUBDIVISION FOR
 ABNEY MILLS
 BRANDON PLANT
 GREENVILLE S. C.
 Scale 1"=100 Feb. 1959

DALTON & NEVES
 GREENVILLE S. C.





- LEGEND:
- Sanitary Sewers
 - Water Mains
 - 10 Ft Easement
 - Electric Pole Lines
 - Sewers are in Streets except as shown
 - Telephone & Power Lines are in Streets or Easements except as shown
 - Iron Pins at all Corners

SECTION NO. 1.
SUBDIVISION FOR
ABNEY MILLS
BRANDON PLANT
GREENVILLE S. C.
Scale 1"=100 Feb. 1939

DALTON & NEVES
GREENVILLE S. C.

Plat Formed in Vol. 10, Page 107 of the
Records of the County of Greenville, S. C.
Filed for Record in Vol. 10, Page 107 of the
Records of the County of Greenville, S. C.
This is a true and correct copy of the
original as the same appears on file in the
office of the County Clerk of Greenville, S. C.
at Greenville, S. C. this 10th day of February, 1939.
County Clerk of Greenville, S. C.



THIS PLAT IS NOT A SUBDIVISION
AS DEFINED BY THE GREENVILLE
COUNTY SUBDIVISION REGULATIONS
2/20/13 *[Signature]*
P. [illegible]
[illegible]

PROPERTY OF
KM FABRICS, INC.
GREENVILLE COUNTY, S.C.

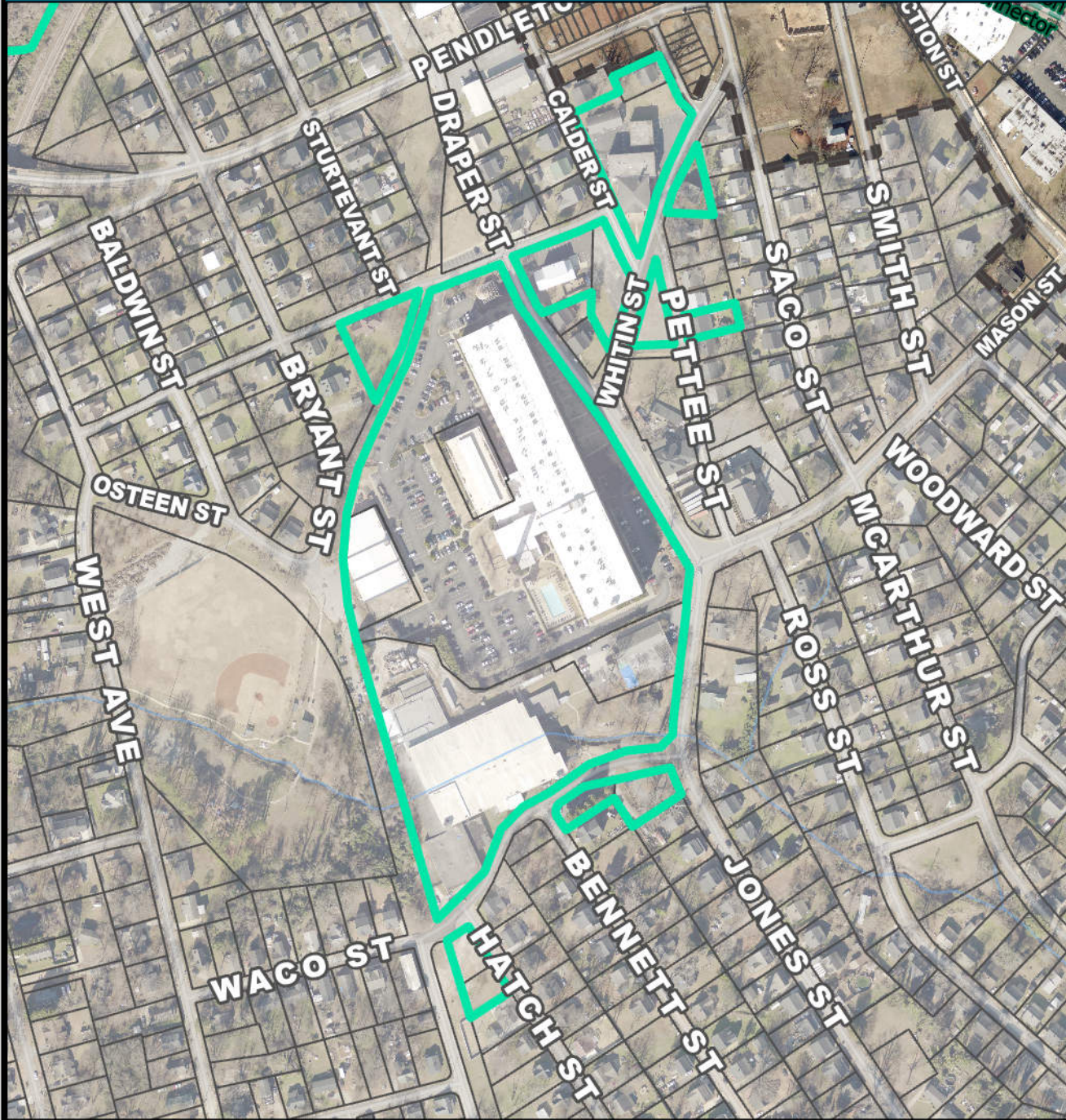
Scale 1" = 100' July, 2013
G.M. & N.E.S. 40, 15, 10, 10, 10
12' 100' 100' 100'
OFFICIAL: [illegible]

9-Q-50
[illegible]

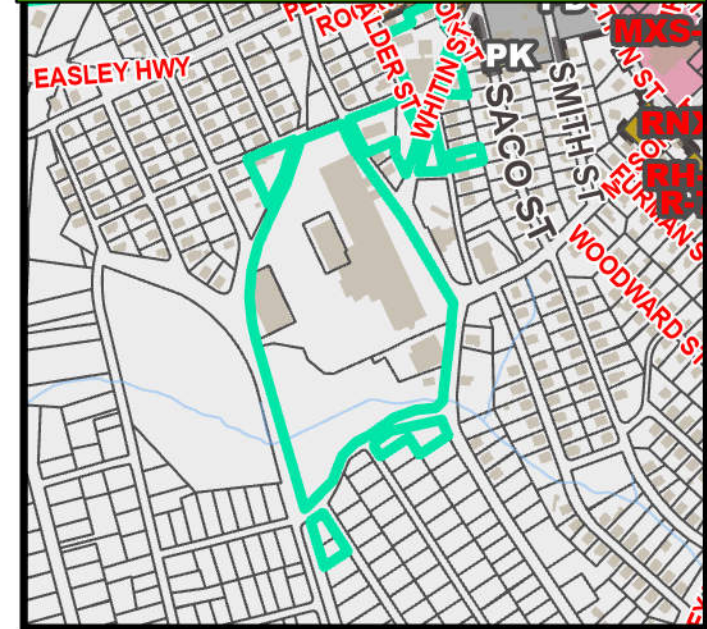
2013
[illegible]
[illegible]
[illegible]

TRACT 1 = 7.199 Acres
TRACT 2 = 4.210 Acres
TRACT 3 = 0.296 Acres
TOTAL 11.605 Acres
AREA EASEMENT 0.174 Acres
+ 0.024 (4.11)
[illegible]

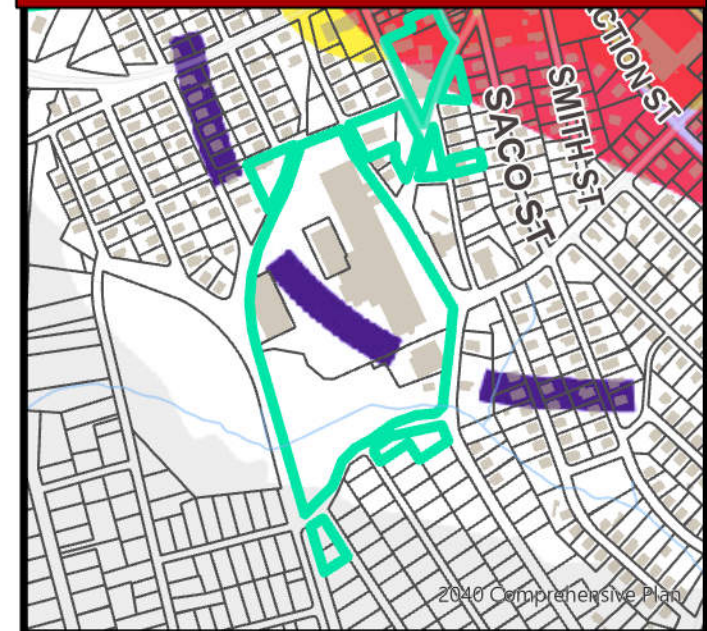
AERIAL VIEW



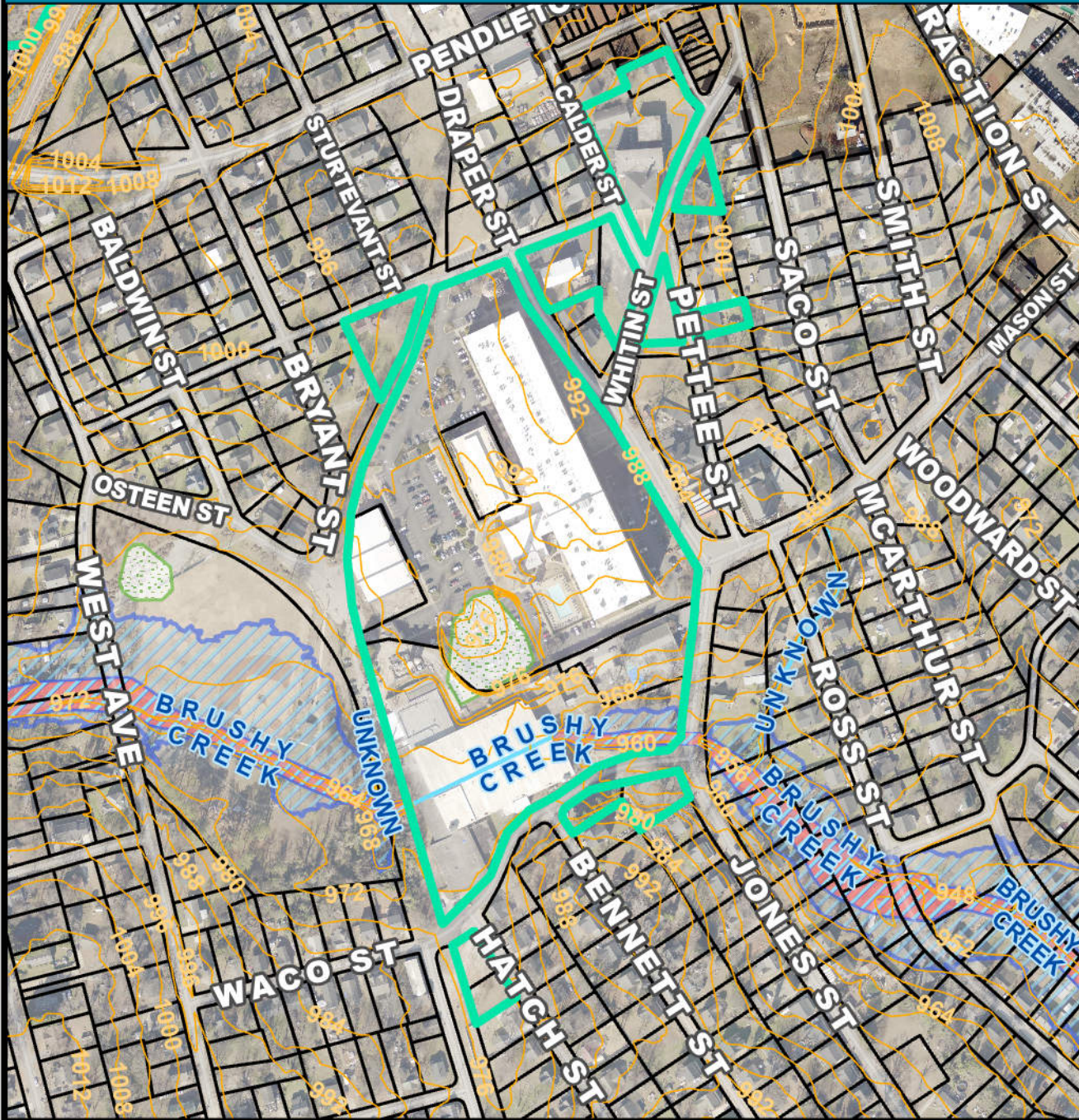
CURRENT ZONING



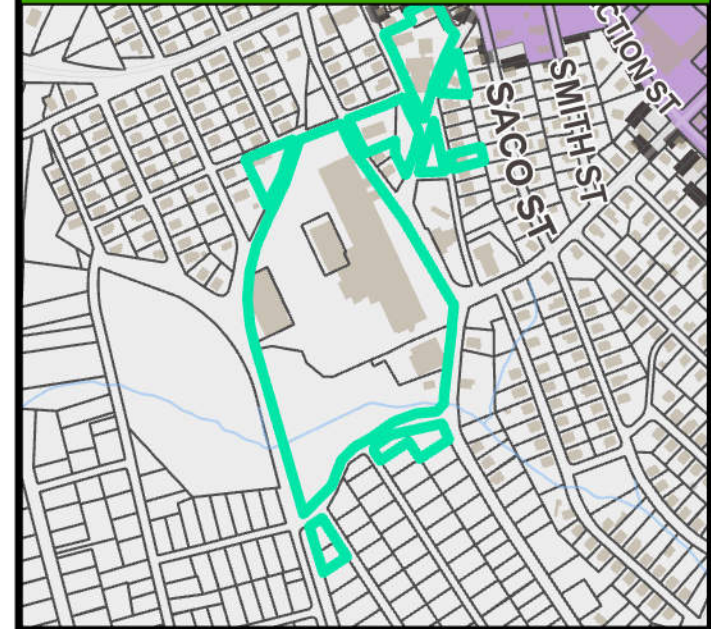
FUTURE LAND USE



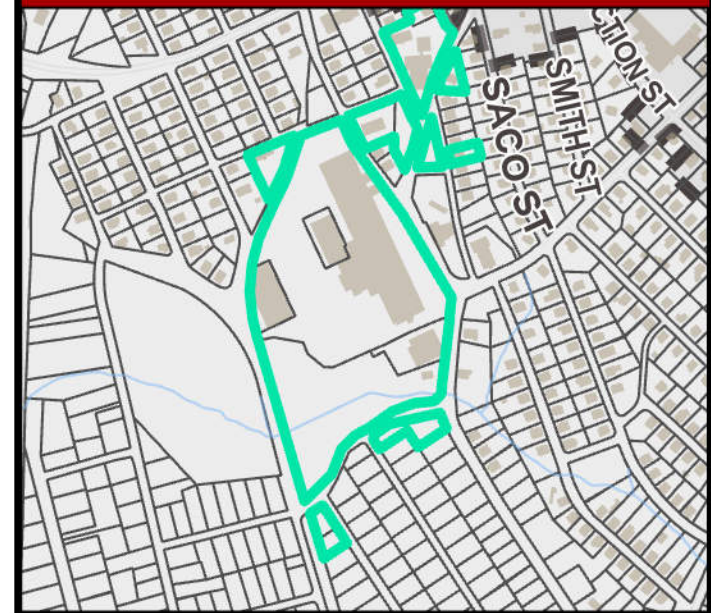
NATURAL / ENVIRONMENTAL FEATURES



SPECIAL EMPHASIS NEIGHBORHOODS



PRESERVATION OVERLAYS





ANNEXATION MAP

for Tax Map Number(s):

0117000701200, 0117000701300,
0117000901600, 0117000901700,
0118001200200, 0118001200300,
0118001200800, 0121001000500,
0121001000600, 0121002000200,
0121002100300, 0121002100600,
0121002200100, 0121002200103,
0121002200104, 0121002200106,
0121002200107

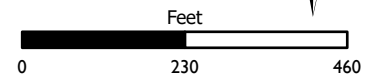
to the City of Greenville

-  TotalAnnexationArea
-  Greenville City Limits

Total Area of Annexation:
1,026,923.3 Sq.Ft.

Total Acreage of Annexation:
23.57 Acres

Existing County Zoning: **C-2, R-7.5, O-D, NC, PD, I-1**
Proposed City Zoning: **RH-D, RNX-B, RNX-C, MX-5, IX, IG**
City Council District: **2**
File Number: **AX-17-2025**



This map is a product of the City of Greenville, SC and was compiled from plats and other available information. No actual field survey was performed. Reasonable efforts have been made to ensure the accuracy of this map. The City of Greenville expressly disclaims any responsibility or liability with regard to the use of this map.
Copyright: The City of Greenville, SC

**UNINCORPORATED
GREENVILLE COUNTY**

REAL PROPERTY:
782,145.04 SQFT
17.96 ACRES

RIGHT OF WAY:
244,778.26 SQFT
5.62 ACRES

PENDLETON ST

BRYANT ST

BALDWIN ST

WEST AVE

ABNEY ST

DRAPER ST

WHITTIN ST

PITTEE ST

SACO ST

SMITH ST

MASON ST

MCARTHUR ST

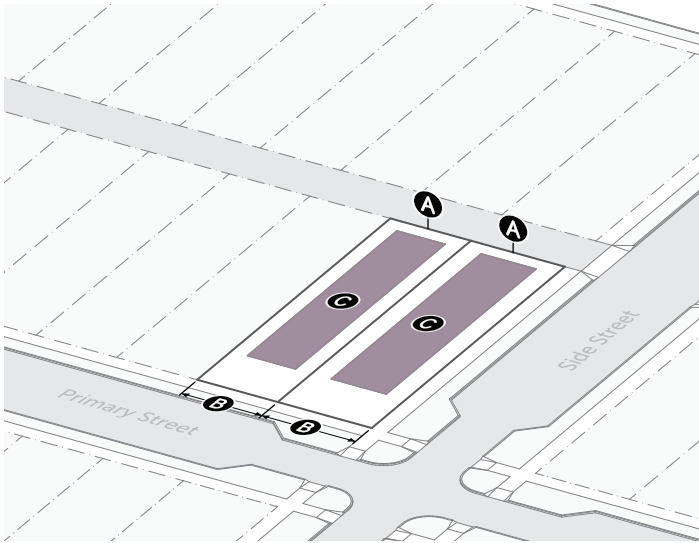
ROSS ST

JONES ST

WACO ST

19-2.2.5. RH-D HOUSE D

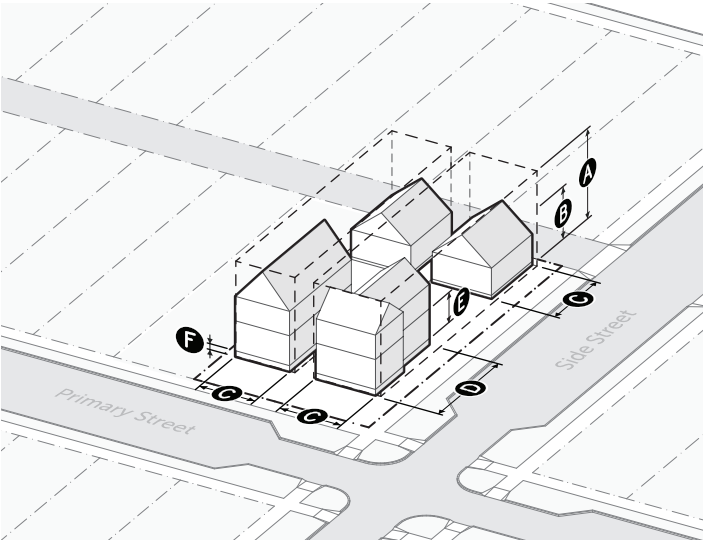
A. SITE



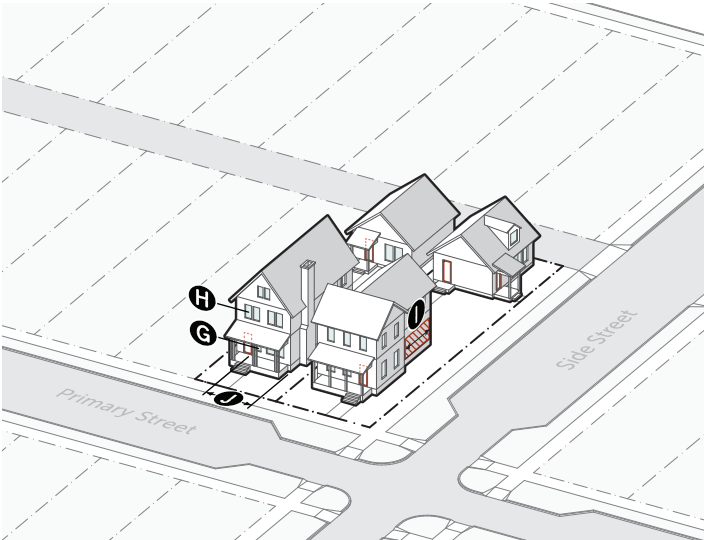
1. LOT SIZE	Sec. 2.11.2.
A Area (min)	3,000 SF
B Width (min)	
Front access	40'
Side/rear access	25'
2. DENSITY	Sec. 2.11.3.
Dwellings per lot (max)	
Primary units	1
Accessory Dwelling units	1
3. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	50%

4. BUILDING SETBACKS	Sec. 2.11.5.
D Primary street lot line (min)	
Primary structure	20' or Setback Range
Accessory structure	50'
E Side street lot line (min)	7'
F Side lot line (min)	5'
G Rear/alley lot line (min)	
Primary structure	4'
Accessory structure	4'
5. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	30'
Side street (min)	10'
6. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type E 6'

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Primary structure ¹	2.5 / 32'
Accessory structure	1.5 / 20'
B Side wall (max)	
Primary structure	25'
Accessory structure	16'
2. MASSING	Sec. 2.11.11.
C Building width (max)	35'
D Building depth (max)	60'
3. GROUND STORY	Sec. 2.11.12.
E Story height (min)	9'
F Finish floor elevation (min/max)	0' / 5'

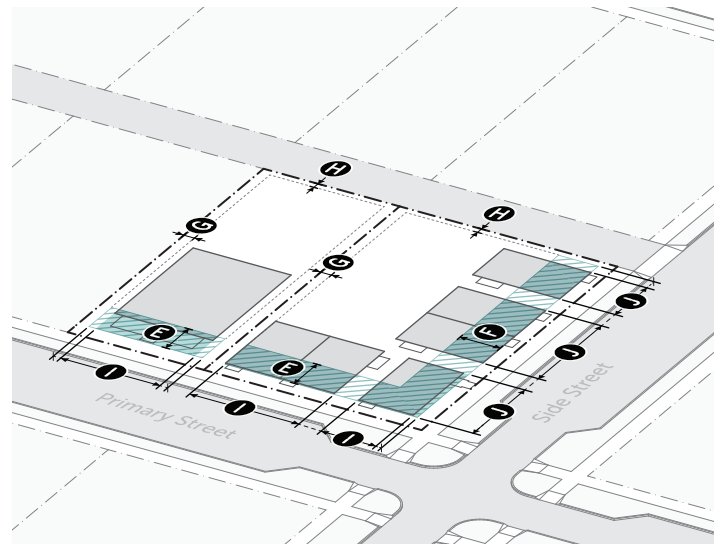
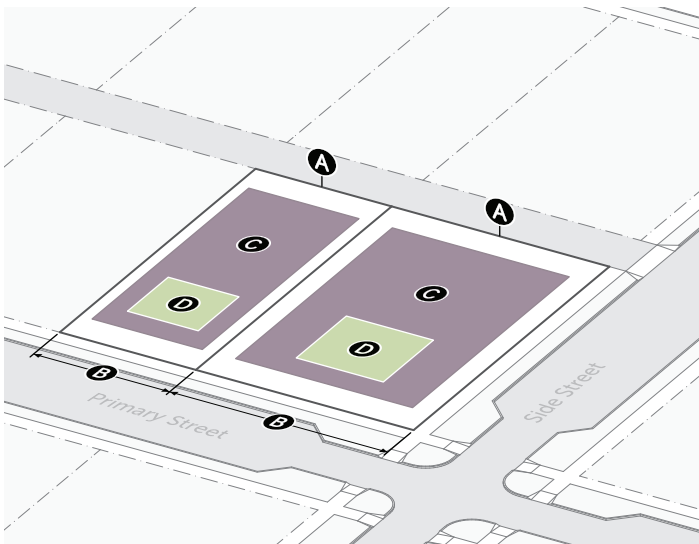


	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
G Ground story (min)	25%	20%
H Upper story (min)	15%	15%
I Blank wall width (max)	10'	20'
5. ENTRANCES	Sec. 2.11.14.	
J Street-facing entry spacing (max)	20'	40'
Entry feature	Yes	No

NOTE: Additional standards apply for lots within the Neighborhood Revitalization Overlay District.
[View the Neighborhood Revitalization Overlay District Map](#)
[View the Neighborhood Revitalization Overlay District Design Standards](#)

19-2.3.4. RNX-B NEIGHBORHOOD FLEX B

A. SITE



1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	25'
2. DENSITY	Sec. 2.11.3.
Dwellings per lot (max)	
Base	8
Bonus	10
3. COVERAGE ²	Sec. 2.11.4.
C Building coverage (max)	
0 to 8 units and Nonresidential	65%
9 to 10 units	70%
D Outdoor amenity space (min)	10%

4. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	5' / 20'
F Side street lot line (min/max)	5' / 20'
G Side lot line (min)	4'
H Rear/alley lot line (min)	4'
5. TRANSITION	Sec. 2.11.6.
Transition type	Type A
6. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	65%
J Side street	40%
7. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	20'
Side street (min)	5'
8. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type E 6'

RNX-B

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet) ¹	2.5 / 32'
B Side wall (max)	25'
2. MASSING	Sec. 2.11.11.
C Building width (max)	40'
D Building depth (max)	90'
Active depth (min)	
E Primary street	15'
F Side street	9'
3. GROUND STORY	Sec. 2.11.12.
G Story height (min)	10'
H Finish floor elevation (min/max)	
Residential	0' / 5'
Nonresidential	-2' / 5'

	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
I Ground story (min)		
Residential	35%	30%
Nonresidential	50%	30%
J Upper story (min)	20%	20%
K Blank wall width (max)	10'	20'
5. ENTRANCES	Sec. 2.11.14.	
L Street-facing entry spacing (max)	30'	50'
Entry feature	Yes	Yes

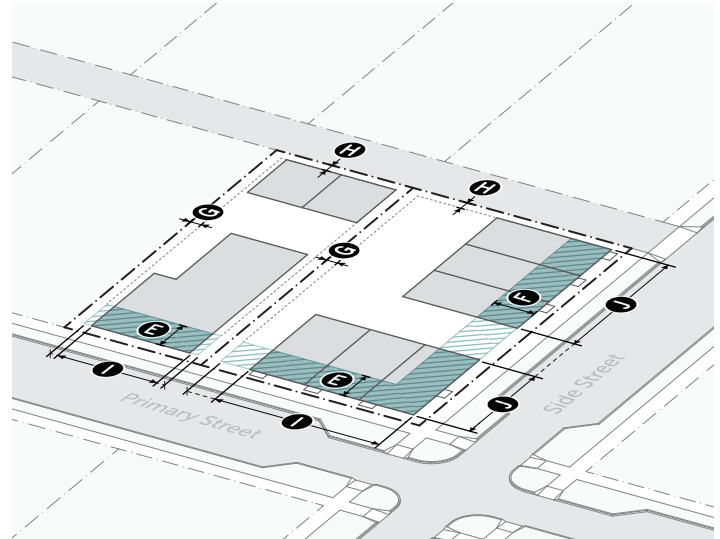
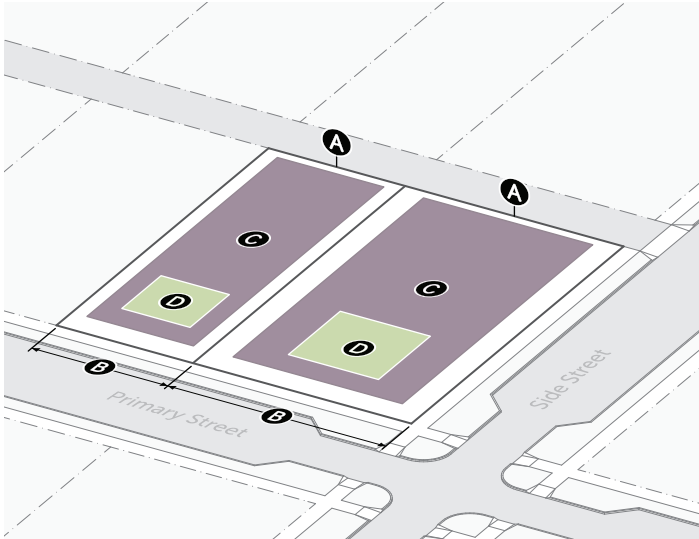
NOTE: Additional standards apply for lots within the Neighborhood Revitalization Overlay District.

[View the Neighborhood Revitalization Overlay District Map](#)

[View the Neighborhood Revitalization Overlay District Design Standards](#)

19-2.3.6. RNX-C NEIGHBORHOOD FLEX C

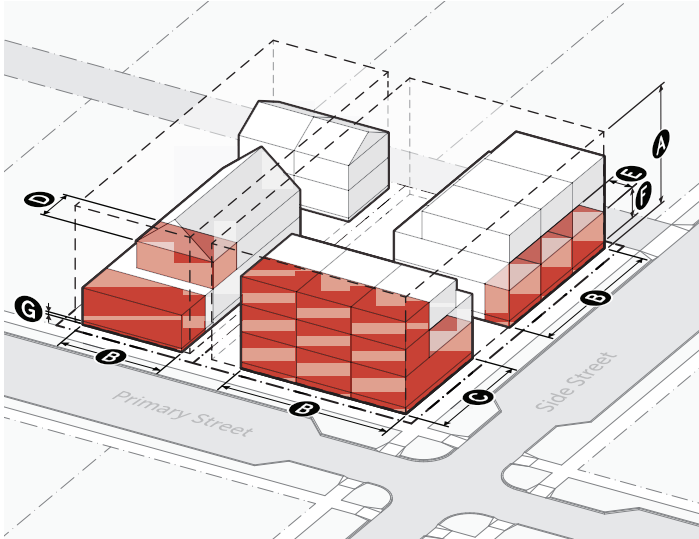
A. SITE



1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	25'
2. DENSITY	Sec. 2.11.3.
Dwellings per lot (max)	
Base	12
Bonus	16
3. COVERAGE ²	Sec. 2.11.4.
C Building coverage (max)	
0 to 12 units and Nonresidential	70%
13 to 16 units	75%
D Outdoor amenity space (min)	10%

4. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	5' / 20'
F Side street lot line (min/max)	5' / 20'
G Side lot line (min)	4'
H Rear/alley lot line (min)	4'
5. TRANSITIONS	Sec. 2.11.6.
Transition type	Type A
6. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	65%
J Side street	40%
7. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	20'
Side street (min)	5'
8. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type E 6'

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	3 / 42'
2. MASSING	Sec. 2.11.11.
B Building width (max)	100'
C Building depth (max)	100'
Active depth (min)	
D Primary street	15'
E Side street	9'
3. GROUND STORY	Sec. 2.11.12.
F Story height (min)	10'
G Finish floor elevation (min/max)	
Residential	0' / 5'
Nonresidential	-2' / 5'

	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
H Ground story (min)		
Residential	35%	30%
Nonresidential	50%	30%
I Upper story (min)	20%	20%
J Blank wall width (max)	10'	20'
5. ENTRANCES	Sec. 2.11.14.	
K Street-facing entry spacing (max) ¹	40'	50'
Entry feature	Yes	Yes

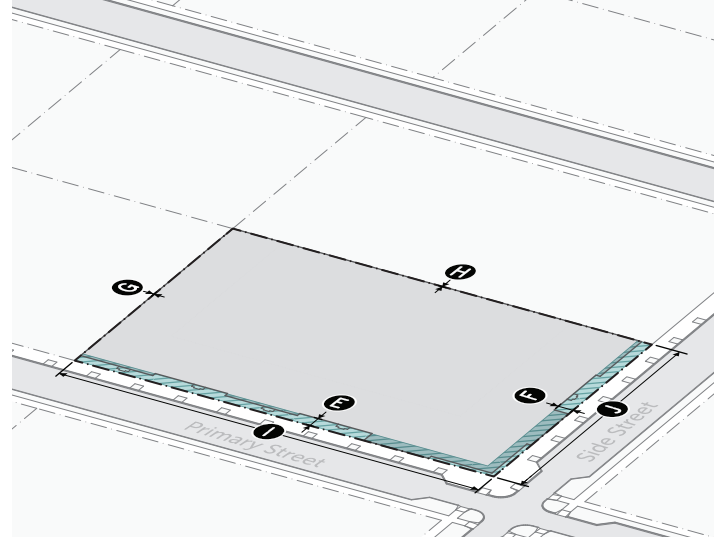
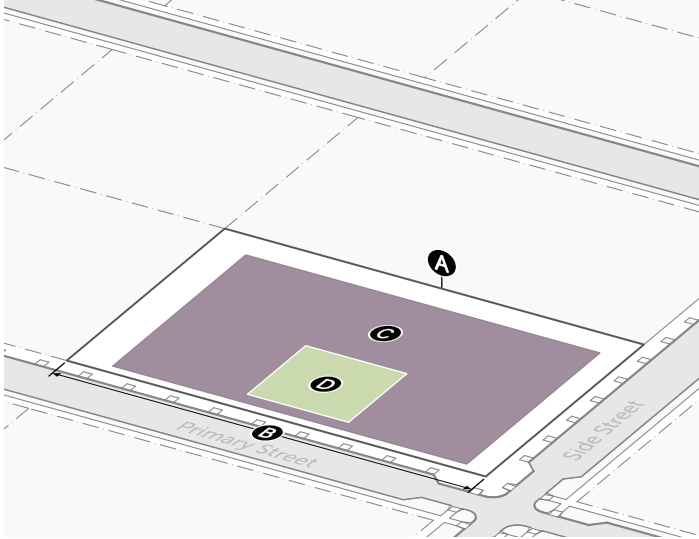
NOTE: Additional standards apply for lots within the Neighborhood Revitalization Overlay District.

[View the Neighborhood Revitalization Overlay District Map](#)

[View the Neighborhood Revitalization Overlay District Design Standards](#)

19-2.5.4. MX-5 MIXED USE 5

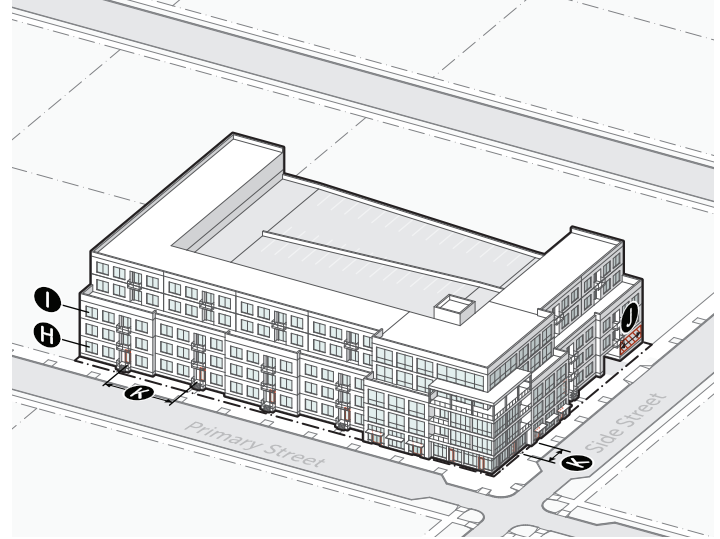
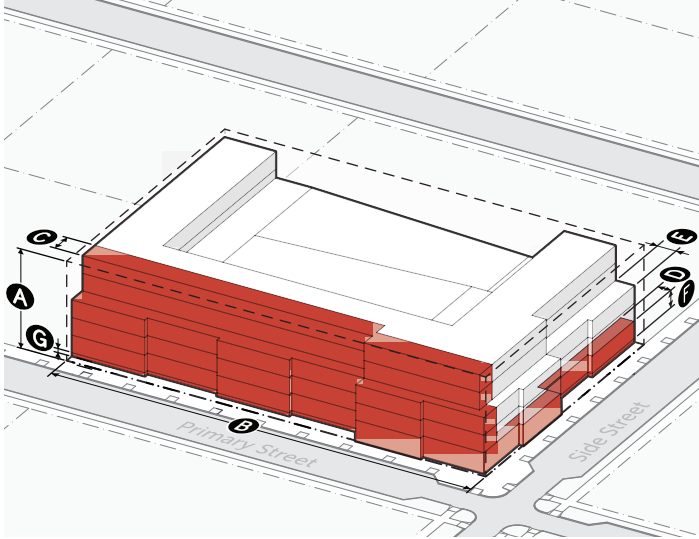
A. SITE



1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	15'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	None
D Outdoor amenity space (min)	10%

3. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	0' / 10'
F Side street lot line (min/max)	0' / 10'
G Side lot line (min)	0'
H Rear lot line (min)	0'
Alley lot line (min)	5'
4. TRANSITIONS	Sec. 2.11.6.
Transition type	Type A, B
5. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	75%
J Side street	45%
6. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	20'
Side street (min)	5'
7. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type F 8'

B. BUILDING

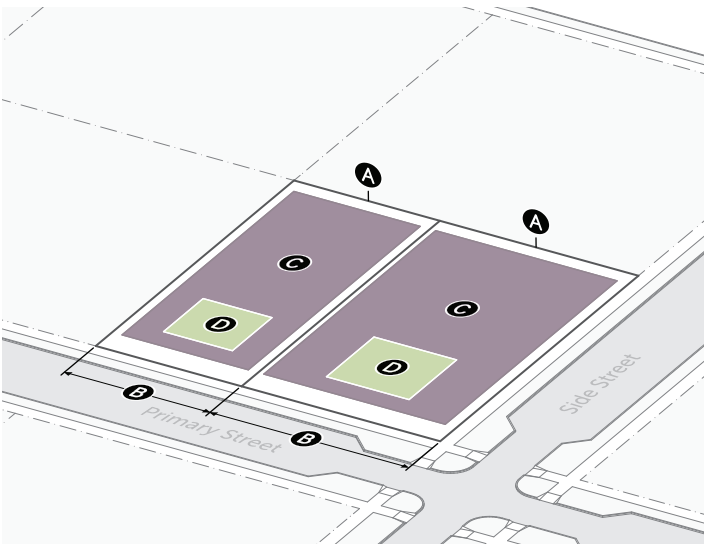


1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Base	5 / 68'
Bonus	7 / 94'
2. MASSING	Sec. 2.11.11.
B Building width (max)	275'
Active depth (min)	
C Primary street	15'
D Side street	9'
Street step-backs	
Stories without step-back (max)	3
E Step-back depth (min)	10'
3. GROUND STORY	Sec. 2.11.12.
F Story height (min)	
Residential	10'
Nonresidential	14'
G Finish floor elevation (min/max)	
Residential	2' / 5'
Nonresidential	-2' / 2'

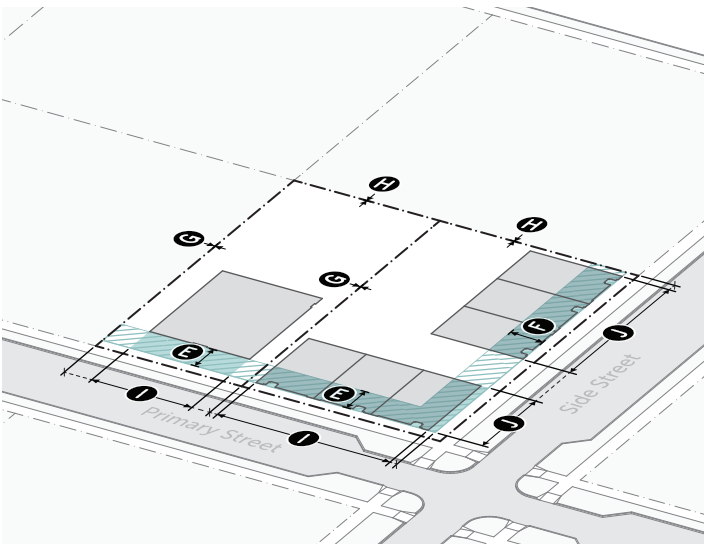
	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
H Ground story (min)		
Residential	35%	30%
Nonresidential	50%	30%
I Upper story (min)	20%	20%
J Blank wall width (max)	15'	25'
5. ENTRANCES	Sec. 2.11.14.	
K Street-facing entry spacing (max)	40'	60'
Entry feature	Yes	Yes

19-2.8.2. IX INDUSTRIAL FLEX

A. SITE

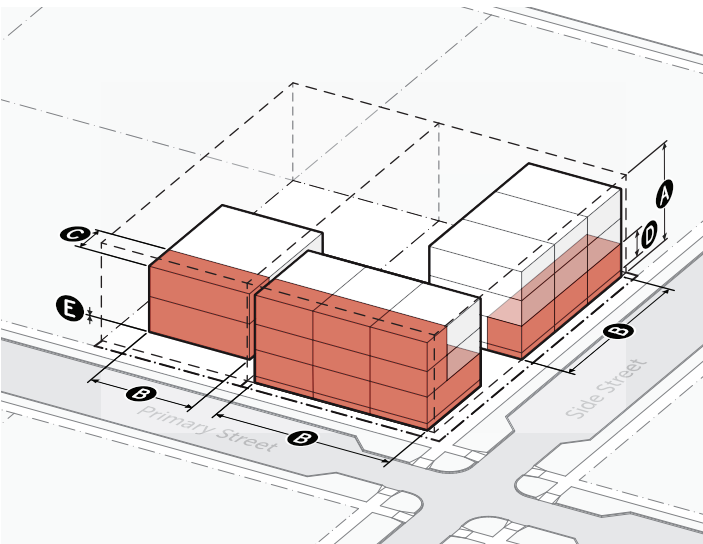


1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	15'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	80%
D Outdoor amenity space (min)	10%

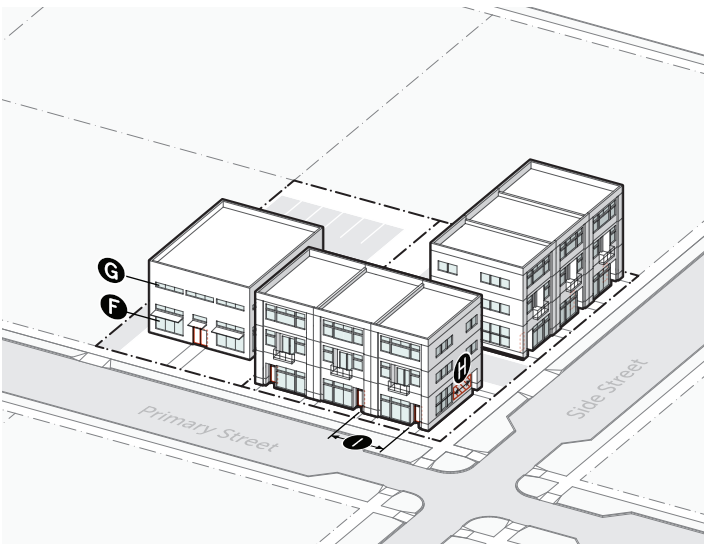


3. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	5' / 20'
F Side street lot line (min/max)	5' / 20'
G Side lot line (min)	0'
H Rear lot line (min)	0'
Alley lot line (min)	5'
4. TRANSITIONS	Sec. 2.11.6.
Transition type	Type A, B
5. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	75%
J Side street	45%
6. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	20'
Side street (min)	5'
7. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type F 8'

B. BUILDING



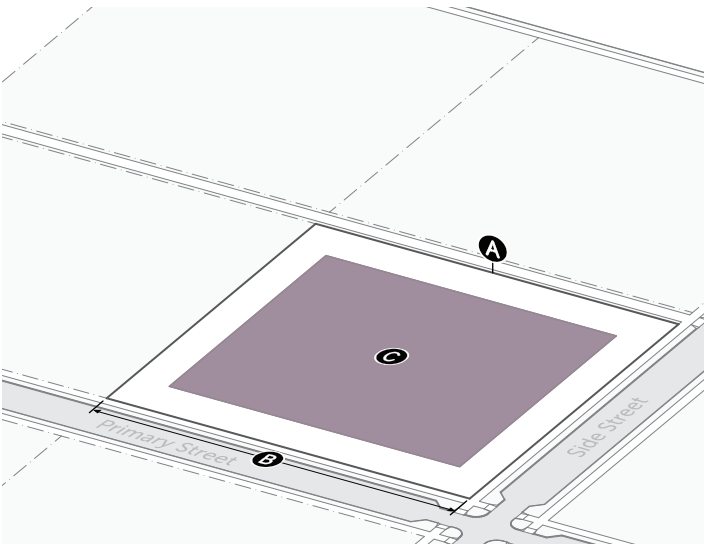
1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Base	3 / 42'
Bonus	5 / 68'
2. MASSING	Sec. 2.11.11.
B Building width (max)	275'
C Active depth (min)	15'
3. GROUND STORY	Sec. 2.11.12.
D Story height (min)	14'
E Finish floor elevation (min/max)	-2' / 5'



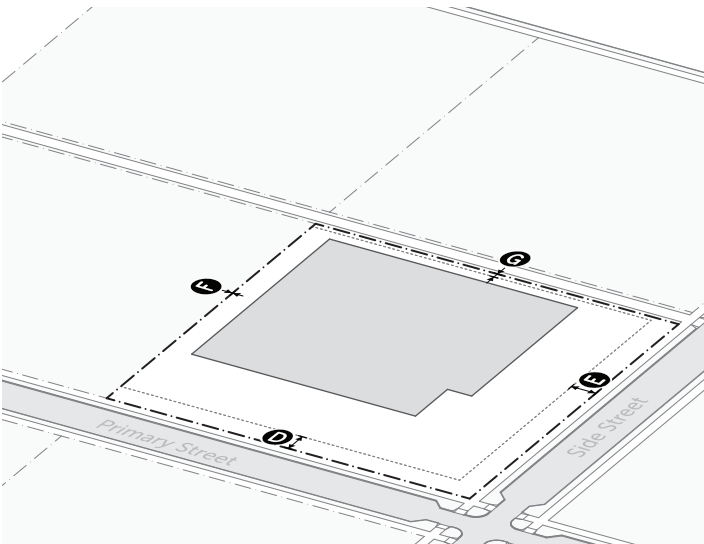
	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
F Ground story (min)	20%	20%
G Upper story (min)	20%	20%
H Blank wall width (max)	20'	40'
5. ENTRANCES	Sec. 2.11.14.	
I Street-facing entry spacing (max)	50'	75'
Entry feature	Yes	Yes

19-2.8.3. IG INDUSTRIAL GENERAL

A. SITE



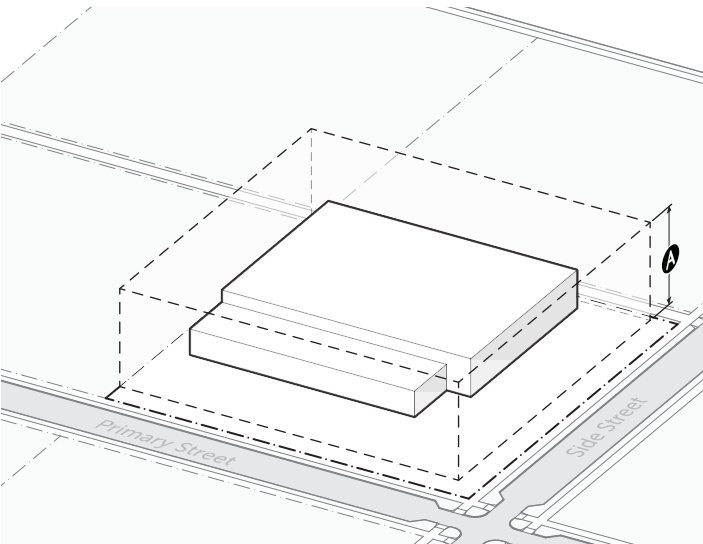
1. LOT SIZE	Sec. 2.11.2.
A Area (min)	10,000
B Width (min)	100'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	60%
Outdoor amenity space (min)	None



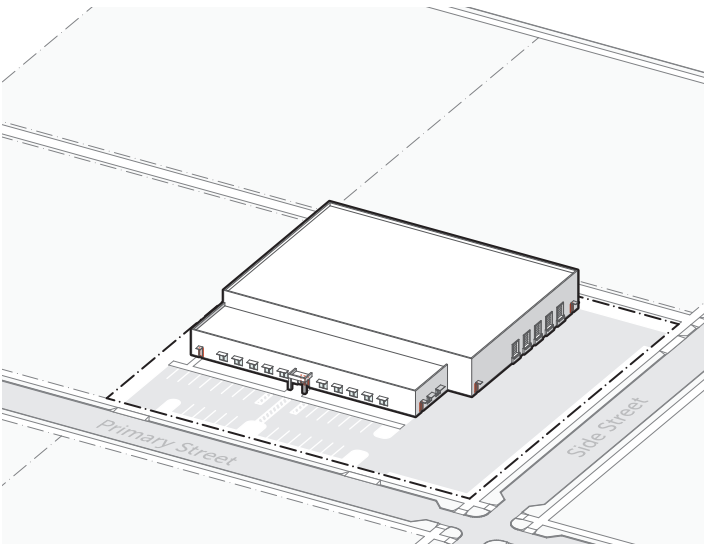
3. BUILDING SETBACKS	Sec. 2.11.5.
D Primary street lot line (min)	20'
E Side street lot line (min)	20'
F Side lot line (min)	0'
G Rear lot line (min)	0'
Alley lot line (min)	5'
4. TRANSITIONS	Sec. 2.11.6.
Transition type	Type C
5. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	10'
Side street (min)	5'
6. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type D 8'
Side street yard height (max)	Type D 8'
Side/rear yard height (max)	Type F 8'



B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max)	80'
2. MASSING	Sec. 2.11.11.
Building width (max)	None
Active depth (min)	None
3. GROUND STORY	Sec. 2.11.12.
Story height (min)	None
Finish floor elevation (min/max)	None



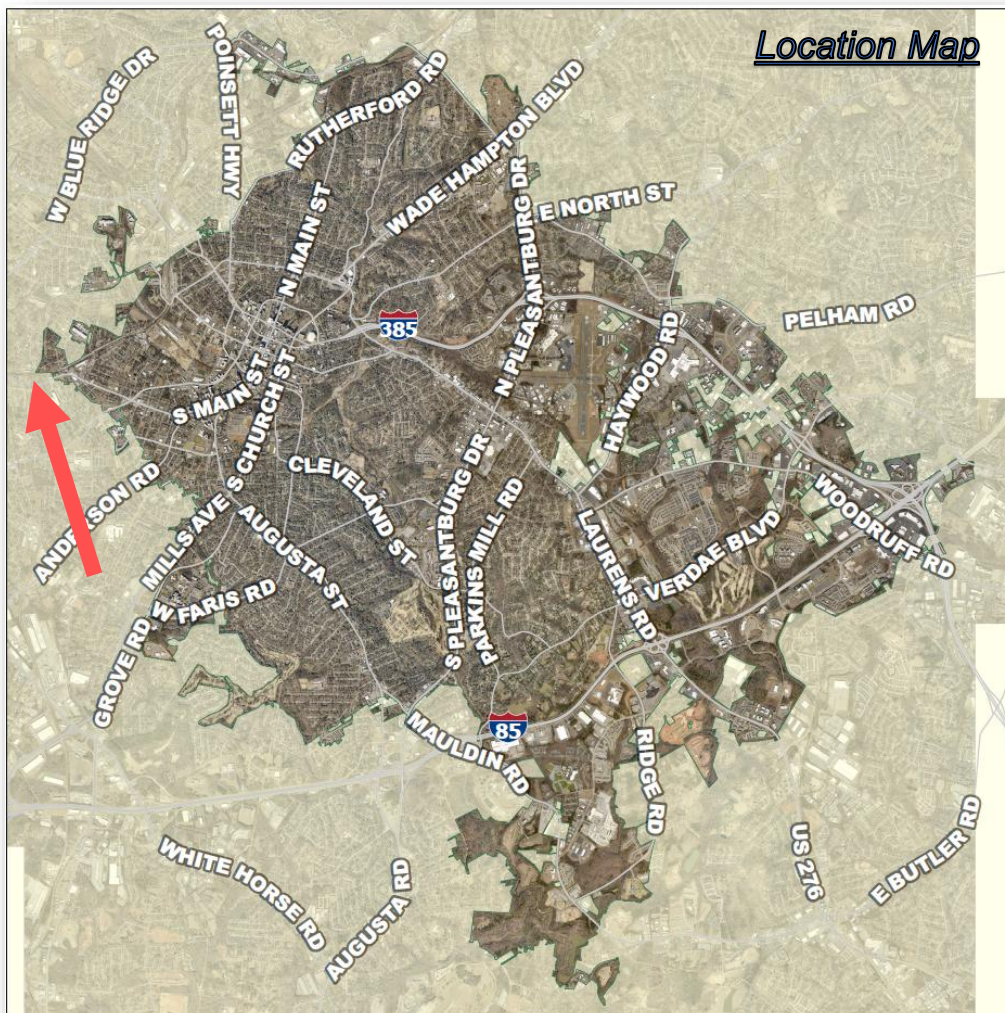
	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
Ground story (min)	None	None
Upper story (min)	None	None
Blank wall width (max)	None	None
5. ENTRANCES	Sec. 2.11.14.	
Street-facing entry spacing (max)	None	None
Entry feature	No	No



PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: AX-18-2025
Applicant(s): City of Greenville
Property Owner(s): Redrock Capital, LLC
Property Location: Draper Street and Melrose Avenue
Tax Map Number(s): 0121002400200
Property Area: 1.35 acres
Rezone Request: PK, Park District
Recommendation: Approval



Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 *Function, Powers, and Duties of the Planning Commission*

Sec 19-1.1.3 *Purpose and Intent*

Sec.19-1.3 *Official Zoning Map*

Sec.19-2 *Zoning Districts*

Sec.19-6.1.3 *Planning Commission*

Sec.19-6.2.2 *Legislative Review*

Project Overview:

The City of Greenville proposes to annex approximately 1.35 acres of lot area into the Greenville city limits and to zone it PK, Park District, under the Greenville Development Code. The subject property is home to the Brandon Mill Cemetery. Other cemeteries across the City have been similarly zoned PK.

Land Use Review

The proposed zoning district for the annexation is PK, Park District. The PK District allows for recreational and cemetery uses. The PK district will allow for the preservation of the cemetery use for the site and is consistent with similar state laws protecting cemeteries. There is no Future Land Use Map (FLUM) recommendation for the property

LAND USE OF SURROUNDING PROPERTIES		
Location	Zoning	Current Use
Subject Property	S-1, Service District (County)	Cemetery
North	S-1, Service District (County)	Across railroad - Single-family residential and industrial
East	FRD, Flexible review district, and R-7.5, Single-family residential district (County)	Across railroad – Vacant and Single-family residential
South	S-1, Service District (County)	Vehicle service and repair
West	S-1, Service District (County)	Vacant and Single-family residential



Procedural Requirements:

Pre-Application and Development Meetings

The City is the applicant.

Other Site Information:

While the property is located in the Freetown Special Emphasis Neighborhood in Greenville County, it is not proposed to be added to a special emphasis neighborhood in the City at this time. The property is not located in a County Overlay District. The site is a cemetery that was historically used by the Brandon Mill community. The PK designation will provide the cemetery further protections through the City's Greenville Development Code. No development is proposed on the property.

Definitions:

Please see the attachments for the **PK District**.

Staff Analysis:

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	N/A
Comments: The city's Future land Use Map (FLUM) does not provide a recommendation for the property, which is currently outside the city limits. The property will be reviewed in a future update to the comprehensive plan.	

AX-18-2025: Brandon Mill Cemetery

(b) Consistent with Applicable Plans and Studies.	N/A
--	------------

Comments: The city has not conducted a plan or study that includes the subject property.

(c) Compatible with Surrounding Uses.	YES
--	------------

Comments: The property appears to have been used as a cemetery for around 100 years. Therefore, the use is compatible with its surroundings and will continue as such in the City.

(d) Provide logical and orderly Development Pattern.	YES
---	------------

Comment: The rezoning is consistent with the existing use. No future development is anticipated on the property.

STAFF RECOMMENDATION:

APPROVE rezone to PK, Park District.

Staff Comments

Planning Comments

Recommend: Approve

Addressing Comments

Recommend: Approve w/ Comments

Comments:

- *1. NEW PARCEL
- *2. ASSIGNED Address: 6 Melrose Avenue
- *3. PIN#: 0121002400200

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

- *1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

Civil Engineer Comments

Recommend: Approve w/ Comments

Comments:

Draper Street will be classified as a "Neighborhood" street.

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. Site is a cemetery. Future development is not anticipated.



city of greenville

APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	City of Greenville	Redrock Capital, LLC
*Title:		
*Address:	206 S. Main Street	1708-C Augusta St, #309
*City, State:	Greenville, SC	Greenville, SC
*Zip:	29601	29605
*Phone:	864-232-2273	
*Email:	planning@greenvillesc.gov	

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) 012100-24-00200

*TOTAL ACREAGE 1.35

*CURRENT ZONING DESIGNATION (County) S-1, Services District

*PROPOSED ZONING DESIGNATION (City) PK, Park District

TYPE OF ANNEXATION

*Please select one (1) type: ☒ 100% ☐ 75% ☐ 25%

For 100% and 75% Annexations, please Include the corresponding **Annexation Petition** with the application submittal.

INSTRUCTIONS

1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
2. Staff will review the application for "completeness" pursuant to **Section 19-6.2.1.B.3. Completeness Determination**. If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
3. Please refer to **Sections 19-6.1.3. Planning Commission** for additional information.
4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
5. **Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.**
6. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.

Mary Douglas Hirsch *APPLICANT SIGNATURE
7/7/25 DATE

7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initial: MDH

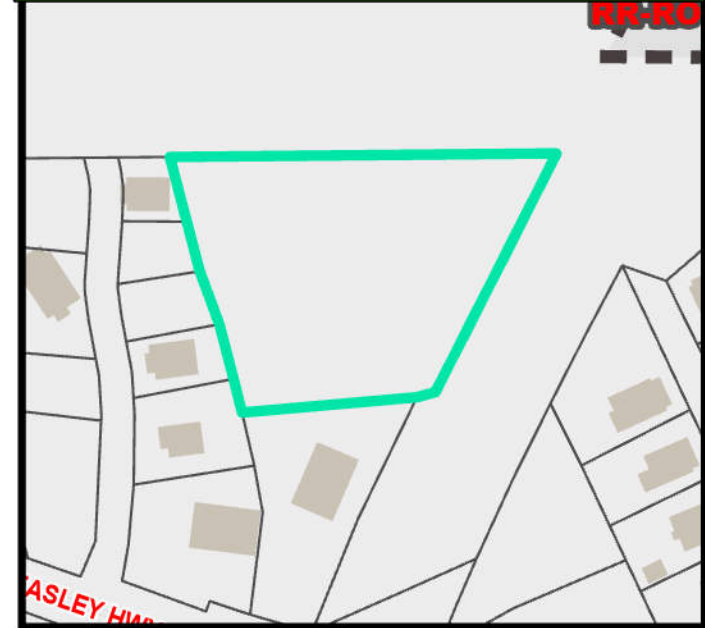
*Signatures	
Applicant	Mary Douglas Hirsch
Date	7/7/25
Property Owner/Authorized Agent	Not required per S.C. Code Section 5-3-250
Date	

AX-18-2025 • DRAPER STREET AND MELROSE AVENUE

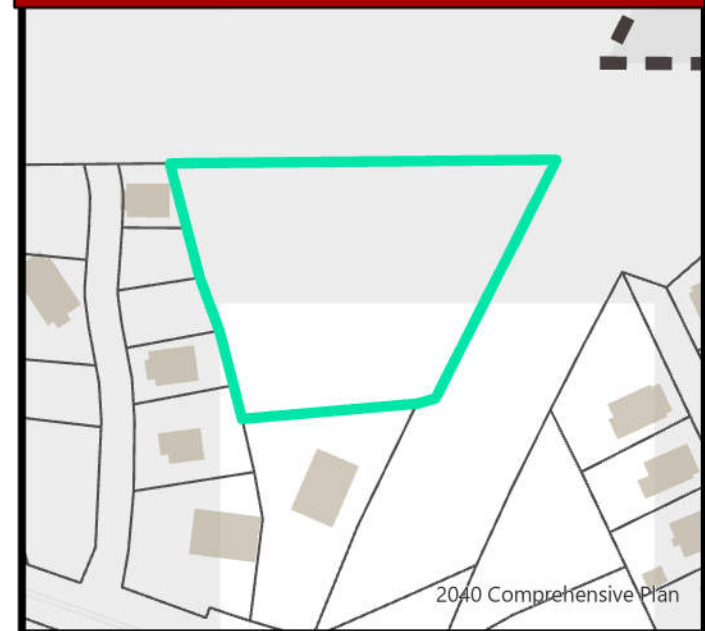
AERIAL VIEW



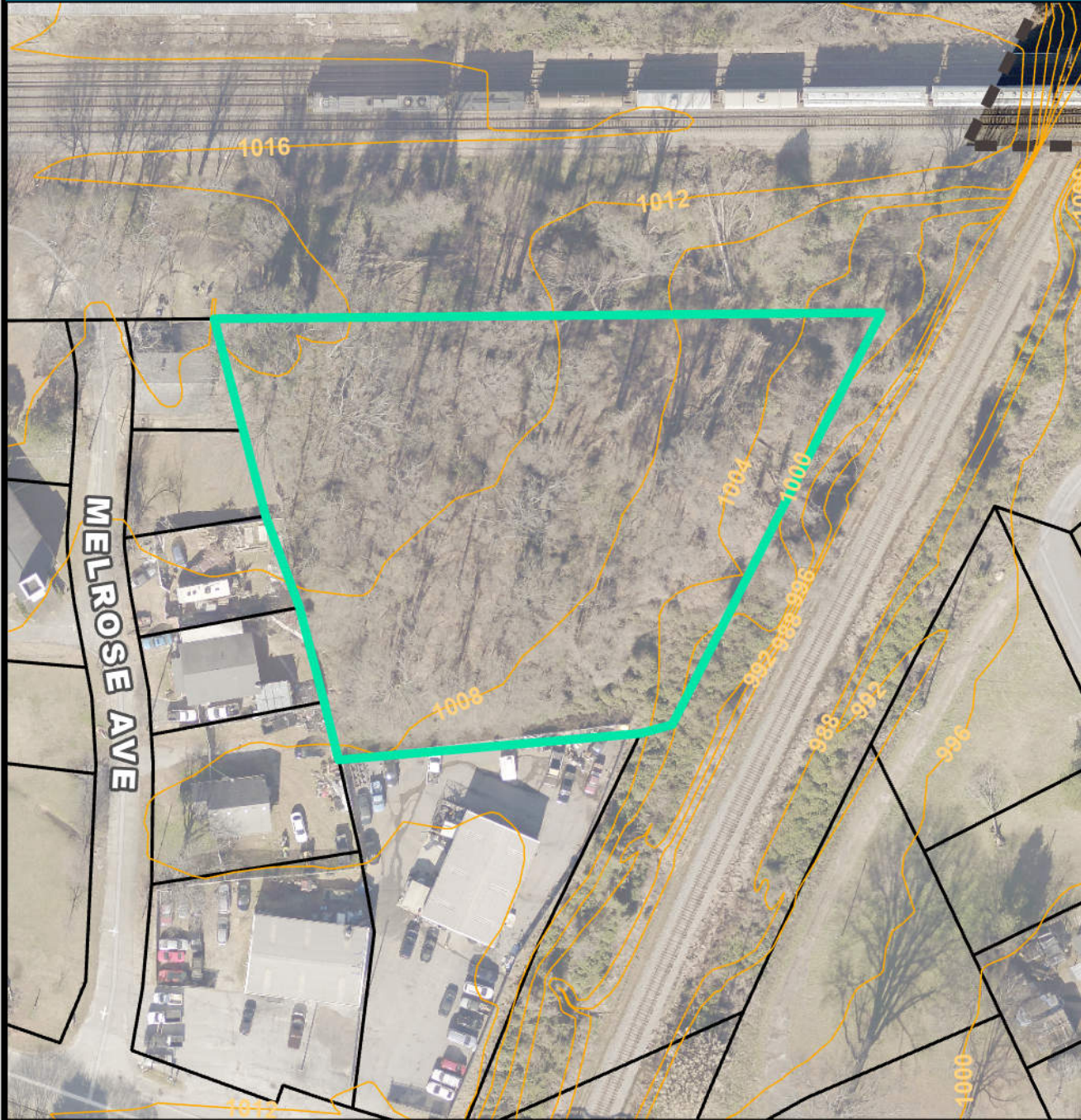
CURRENT ZONING



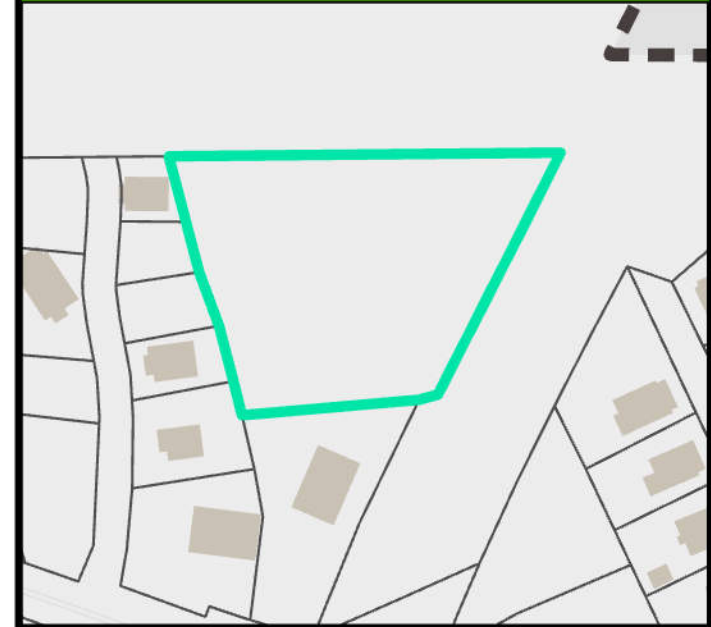
FUTURE LAND USE



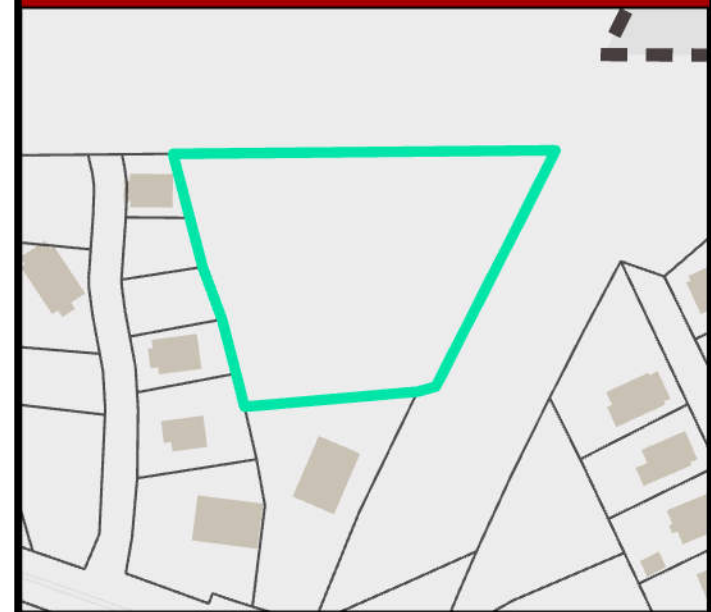
NATURAL / ENVIRONMENTAL FEATURES



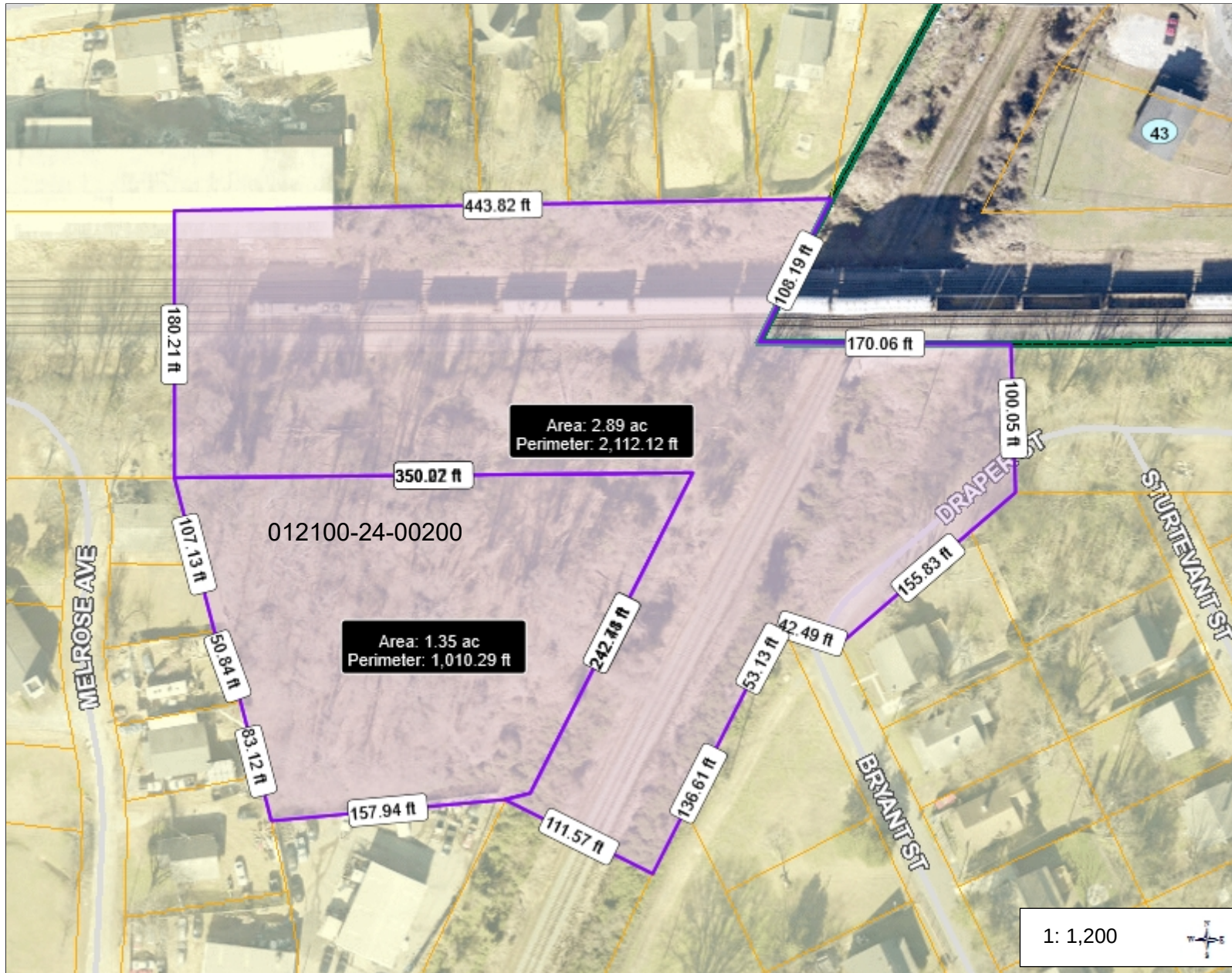
SPECIAL EMPHASIS NEIGHBORHOODS



PRESERVATION OVERLAYS



AX-18-2025: Draper Street and Melrose Avenue



200 0 100 200 Feet

NAD_1983_HARN_StatePlane_South_Carolina_FIPS_3900_Feet_Intl
© City of Greenville, SC Date Created: 6/23/2025

This map is user generated from the City of Greenville's MapIT 2.0 intranet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable and should be appropriately used with caution. Contact the GIS Division for all questions pertaining to the MapIT 2.0 program and data.



Legend

Address Points

- Comm/Industrial
- Residential - SFD
- Residential - SFA
- Residential - Multi
- Mixed Use
- Parking Lot or Structure
- School
- City Park
- Under Construction
- Accessory Structure
- Other

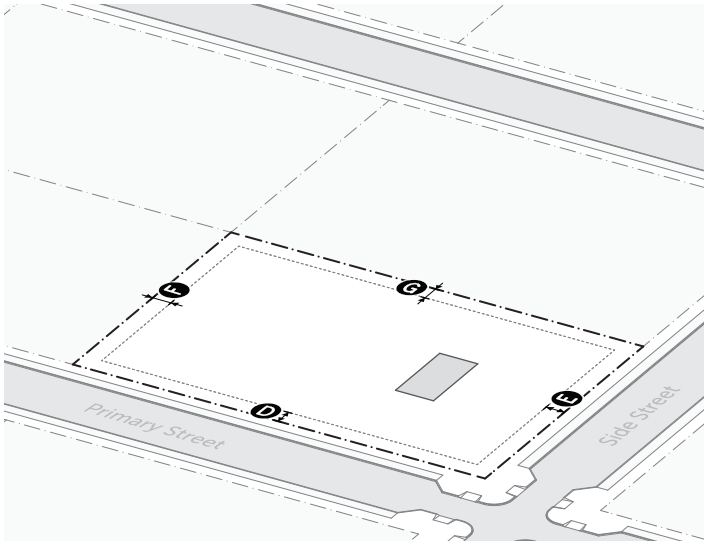
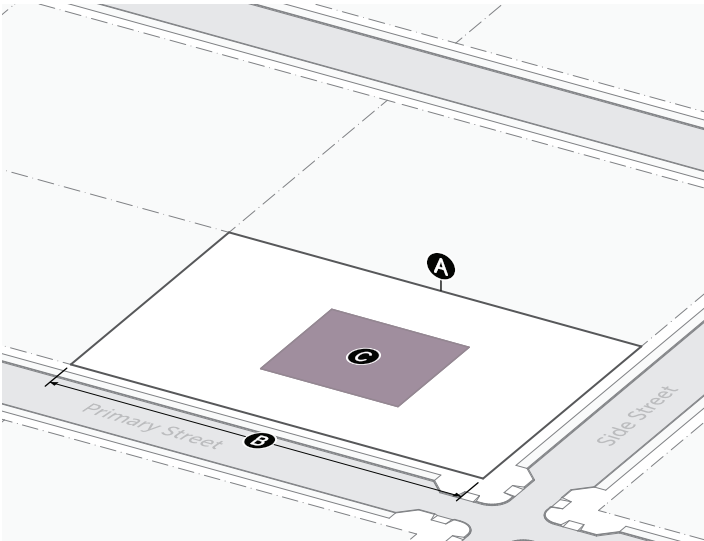
- Parcels with Ownership
- City of Greenville Limits
- County Background

Notes

Total area to be annexed: 4.24 acres;
City Council District: 2; County Zoning District: S-1; City Zoning District: PK

19-2.9.4. PK PARK

A. SITE



1. LOT SIZE	Sec. 2.11.2.
A Area (min)	2,000 SF
B Width (min)	20'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	15%
Outdoor amenity space (min)	None

3. BUILDING SETBACKS	Sec. 2.11.5.
D Primary street lot line (min)	10'
E Side street lot line (min)	10'
F Side lot line (min)	10'
G Rear lot line (min)	10'
Alley lot line (min)	5'

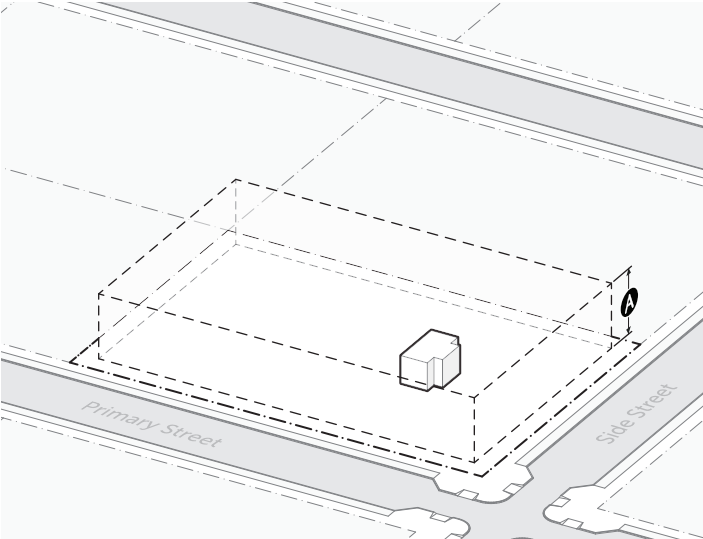
4. TRANSITIONS ²	Sec. 2.11.6.
Transition type	--

5. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	10'
Side street (min)	10'

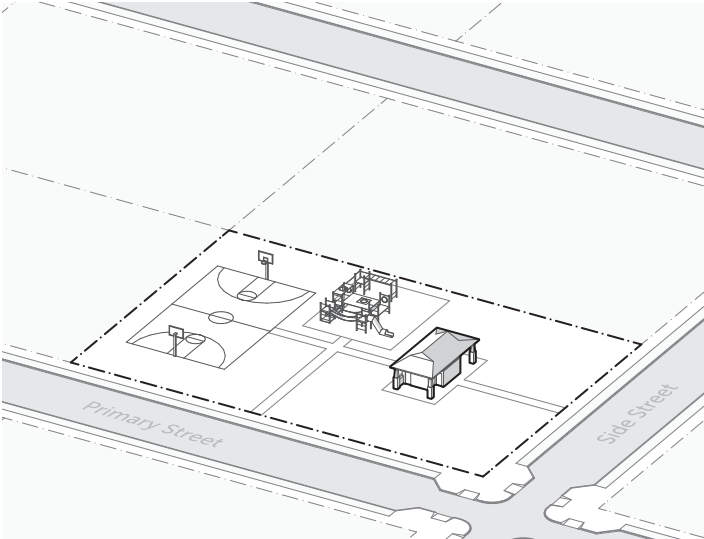
6. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type D 8'
Side street yard height (max)	Type D 8'
Side/rear yard height (max)	Type F 8'



B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max)	35'
2. MASSING	Sec. 2.11.11.
Building width (max)	None
Active depth (min)	None
3. GROUND STORY	Sec. 2.11.12.
Story height (min)	None
Finish floor elevation (min/max)	None



	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
Ground story (min)	None	None
Upper story (min)	None	None
Blank wall width (max)	None	None
5. ENTRY FEATURE	Sec. 2.11.14.	
Street-facing entry spacing (max)	None	None
Entry feature	No	No

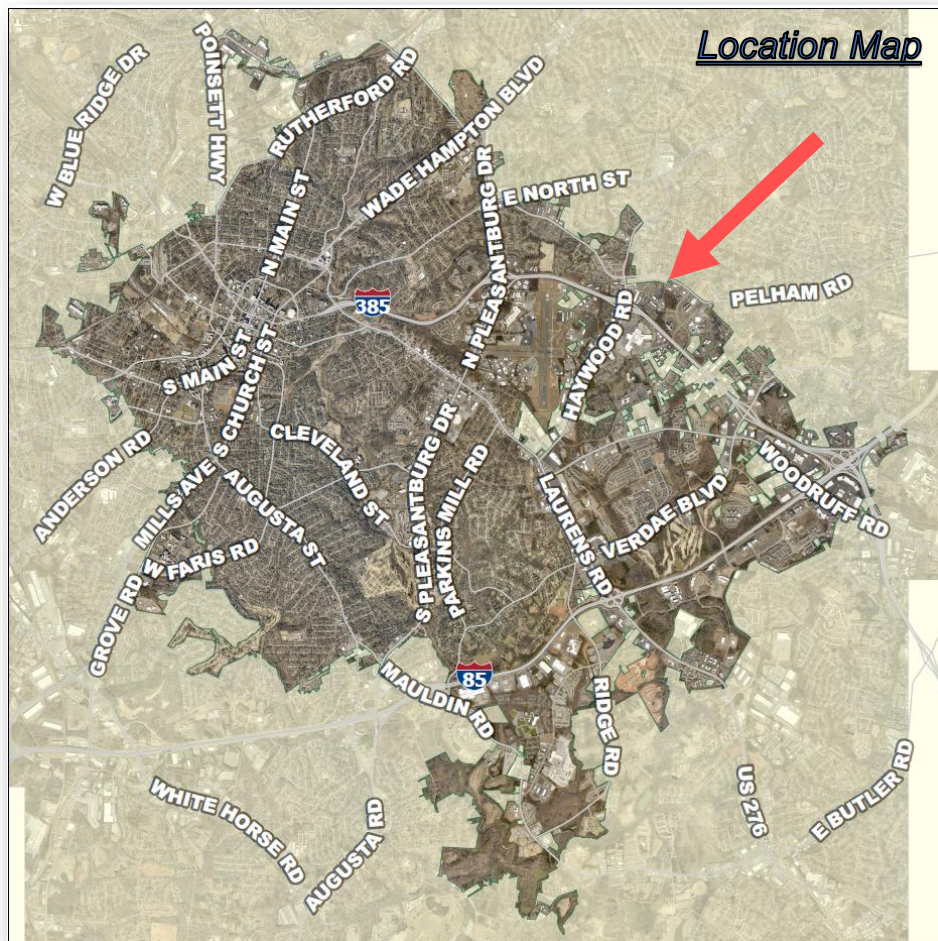


Planning Staff Report to
Greenville Planning Commission
for the August 7, 2025 Public Hearing

PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: AX-19-2025
Applicant(s): Toll Southeast LP Company Inc
Property Owner(s): Toll Southeast LP Company Inc
Property Location: Redland Way
Tax Map Number(s): 0543150100300, 0543150100900, 0543150101000, and 0543150101500
Property Area: 0.89 acres
Rezone Request: RH-C, House C District
Recommendation: Approval



Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 Function, Powers, and Duties of the Planning Commission
Sec 19-1.1.3 Purpose and Intent

AX-19-2025: Hudson Pointe

Sec.19-1.3 Official Zoning Map

Sec.19-2 Zoning Districts

Sec.19-6.1.3 Planning Commission

Sec.19-6.2.2 Legislative Review

Project Overview:

The applicant has petitioned the City of Greenville to annex approximately 0.89 acres of lot area into the Greenville city limits and to zone it RH-C, House C District, under the Greenville Development Code. The subject property is improved with a subdivision named Hudson Pointe, consisting of single-family homes that are currently under construction. Earlier this year, the City conducted two annexations, one for the open space areas and eight (8) single-family lots through AX-3-2025, followed by a second annexation phase for an additional seven (7) lots through AX-10-2025. There are a total of 27 lots within the subdivision that will be annexed. The remaining 8 lots will be annexed through a subsequent petition(s)

Land Use Review

The proposed zoning district for the annexation is RH-C, House C District. The RH-C District allows for single-family residential uses with a minimum lot size of 6,000 sf. The GVL2040 Comprehensive Plan provides the future land use recommendation of Areas Suitable for Missing Middle Housing for the property.

The subdivision was approved by Greenville County utilizing their cluster subdivision requirements. Per these requirements, smaller lot sizes than otherwise required in the R-20 District were achieved to provide open space. The lot dimensions of the approved residential parcels closely align with the RH-C District.

LAND USE OF SURROUNDING PROPERTIES		
Location	Zoning	Current Use
Subject Property	R-20, Single-family residential district (County)	Single-family detached residential (under construction)
North	R-20, Single-family residential district (County); RH-C, House C District	Single-family detached residential
East	R-20, Single-family residential district (County); RH-C, House C District, and PK, Park District	Single-family detached residential and open space
South	R-20, Single-family residential district (County); RH-C, House C District	Single-family detached residential
West	R-20, Single-family residential district (County); RH-C, House C District, and PK, Park District	Single-family detached residential and open space

Zoning Map



Procedural Requirements:

Pre-Application and Development Meetings

The City and the applicant held a pre-application meeting on June 25, 2025.

Other Site Information:

The property is not located in a Greenville County Special Emphasis Neighborhood nor a County Overlay District.

The site is improved with single-family homes, which are under construction. There are no known waterways on the property; however, the neighborhood is served by a new stormwater pond.

As previously noted, the remaining single-family lots will be annexed through future petition(s).

Definitions:

Please see the attachments for the **RH-C District** general provisions.

Staff Analysis:

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	N/A
--	------------

Comments: While the GVL 2040 Comprehensive Plan's Future Land Use MAP (FLUM) does provide a land use recommendation of Areas Suitable for Missing Middle Housing, the development was approved in the County. The requested zoning district reflects the county-approved subdivision development.

(b) Consistent with Applicable Plans and Studies.	N/A
--	------------

Comments: The City has not conducted any applicable plans or studies where the property lies.

(c) Compatible with Surrounding Uses.	YES
--	------------

Comments: The RH-C District is compatible with the surrounding single-family residential in the area. If further residential is annexed in the area, it is assumed a House-Scale District would also be applied based on the prevailing lot dimensions.

(d) Provide logical and orderly Development Pattern.	YES
---	------------

Comment: The area north of Pelham Road in this area of Greenville County is low-density residential. The RH-C District provides a logical and orderly development pattern consistent with surrounding development patterns and will be applied to Hudson Pointe's other residential lots as they are annexed.

STAFF RECOMMENDATION:

APPROVE rezone to RH-C, House C District, with comments.

Staff Comments

Planning Comments

Recommend: Approve

Addressing Comments

Recommend: Approve w/ Comments

Comments:

*1. NEW PARCELS

*2. ASSIGNED Address: 205 Redland Way, 216 Redland Way, 217 Redland Way, 219 Redland Way

*3. PIN#: TM#0543150100300, TM#0543150101500, TM#0543150100900, TM#0543150101000

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

*1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

Civil Engineer Comments

Recommend: Approve w/ Comments

AX-19-2025: Hudson Pointe

Comments:

Redland Way will be classified as a “Neighborhood” street.

Traffic Engineer Comments

Recommend: Approve w/ Conditions

Comments:

If decorative street name or regulatory signs are proposed for this development, the execution of a Decorative Sign Agreement is required. Please contact the Traffic Engineering office (864-467-4360) for additional information.

Fire Department Comments

Recommend: Approve

Comments:

Wade Hampton Fire Contract Area

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. The project site has been cleared and is currently under development and will not require additional tree removals. A full tree inventory per 19-5.2.2.A will be required with any future site permit submittals and mitigation for tree removals must be provided.
2. Street trees will be required along the Redland Way frontage with any future site disturbance.
3. All plant selections in future plans must comply with Div. 19-4.10.



APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	Toll Southeast LP Company, Inc	Toll Southeast LP Company, Inc
*Title:		
*Address:		
*City, State:		
*Zip:		
*Phone:		
*Email:		

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) 054315-01-00300, 054315-01-00900, 054315-01-01000, and 054315-01-01500

*TOTAL ACREAGE 0.8

*CURRENT ZONING DESIGNATION (County) R-20, Single-family residential district

*PROPOSED ZONING DESIGNATION (City) RH-C, House C District

TYPE OF ANNEXATION

*Please select one (1) type: ☒ 100% ☐ 75% ☐ 25%

For 100% and 75% Annexations, please Include the corresponding **Annexation Petition** with the application submittal.

INSTRUCTIONS

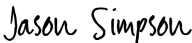
- 1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
- 2. Staff will review the application for “completeness” pursuant to **Section 19-6.2.1.B.3. Completeness Determination.** If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
- 3. Please refer to **Sections 19-6.1.3. Planning Commission** for additional information.
- 4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
- 5. **Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.**
- 6. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant’s behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.

DocuSigned by:


C28CBA882048449...

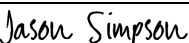
06-25-2025

*APPLICANT SIGNATURE

DATE

- 7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initial: 

DocuSigned by:	
*Signatures	 C28CBA882048449...
Applicant	
Date	
Property Owner/Authorized Agent	
Date	



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

100 Percent
PETITION FOR ANNEXATION

The person(s) whose signatures appear below are freeholders owning real estate in an area which is contiguous to the City of Greenville and which is proposed to be annexed into the City. In general, the area can be described as see below (address) and consisting of approximately 0.8 acres located on see below (tax map parcel). That area is identified more particularly by the tax map parcel number(s) provided below and the Annexation Plat which is being provided to the City of Greenville Planning Commission in conjunction with this petition. Any and all plats are incorporated by reference as a description of the area. By their signatures, the freeholder(s) petition(s) the City Council of the City of Greenville to annex the entire area shown as being annexed on the plats, and such additional acreage within the outer boundaries of the area as the owners through their agent may designate.

This petition is submitted under the provisions of S.C. Code ' 5-3-150, authorizing the City Council to annex an area when presented with a petition signed by all persons owning real property in the area proposed to be annexed. This petition and all signatures thereto shall be open for public inspection on demand at the City Hall, located at the address set forth above. All zoning processes will be in accordance with state statutes and city ordinance otherwise existing.

Property Owner(s)	Address/ Tax Map Number	Signature	Date
Toll Southeast LP Company, Inc	205 Redland Way/ TMS# 054315-01-00300	DocuSigned by: Jason Simpson C28CBA882048449...	06-25-2025
Toll Southeast LP Company, Inc	217 Redland Way/ TMS# 054315-01-00900	DocuSigned by: Jason Simpson C28CBA882048449...	06-25-2025
Toll Southeast LP Company, Inc	219 Redland Way/ TMS# 054315-01-01000	DocuSigned by: Jason Simpson C28CBA882048449...	06-25-2025
Toll Southeast LP Company, Inc	216 Redland Way/ TMS# 054315-01-01500	DocuSigned by: Jason Simpson C28CBA882048449...	06-25-2025



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

CERTIFICATION OF PETITION SIGNATURE

I, Jason Simpson, have this 25 day of June, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I have ownership interest by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

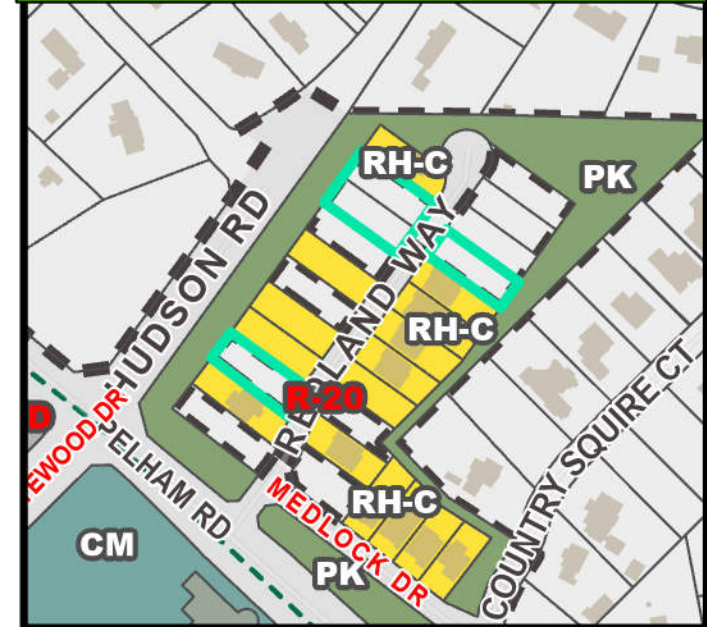
054315-01-00300, -00900, -01000, -01500

DocuSigned by:
Jason Simpson
Signature

AERIAL VIEW



CURRENT ZONING



FUTURE LAND USE



NATURAL / ENVIRONMENTAL FEATURES

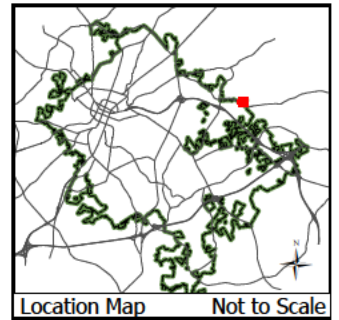
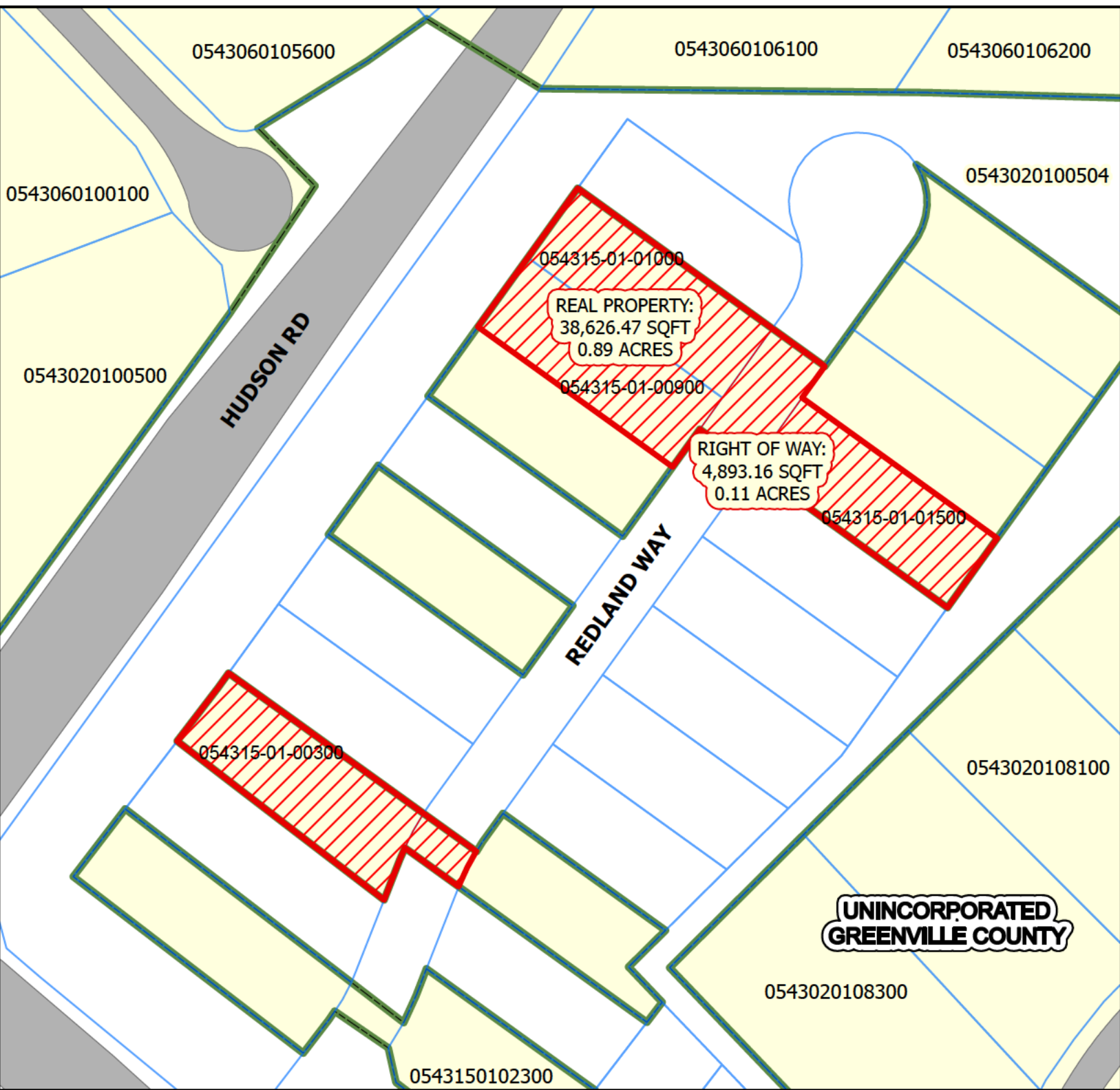


SPECIAL EMPHASIS NEIGHBORHOODS



PRESERVATION OVERLAYS



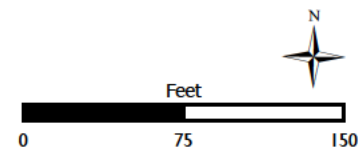


ANNEXATION MAP
 for Tax Map Number(s):
0139000701500 0139000701600
0139000701700 0139000900200
0139000900300 0139000900400
0139001000300
 into the City of Greenville

- TotalAnnexationArea
- Greenville City Limits

Total Area of Annexation:
43,519.63 Sq.Ft.
 Total Acreage of Annexation:
1 Acre

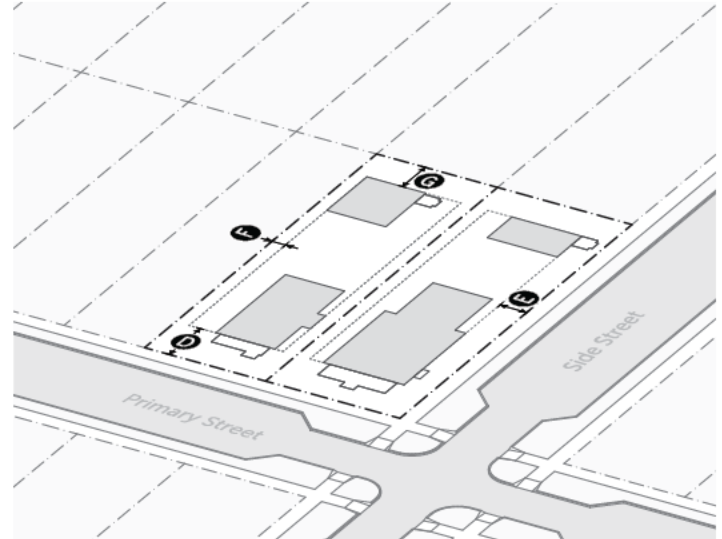
Existing County Zoning: **R-20**
 Proposed City Zoning: **RH-C**
 City Council District: **3**
 File Number: **AX-19-2025**



This map is a product of the City of Greenville, SC and was compiled from plats and other available information. No actual field survey was performed. Reasonable efforts have been made to ensure the accuracy of this map. The City of Greenville expressly disclaims any responsibility or liability with regard to the use of this map.
 Copyright: The City of Greenville, SC

19-2.2.4. RH-C HOUSE C

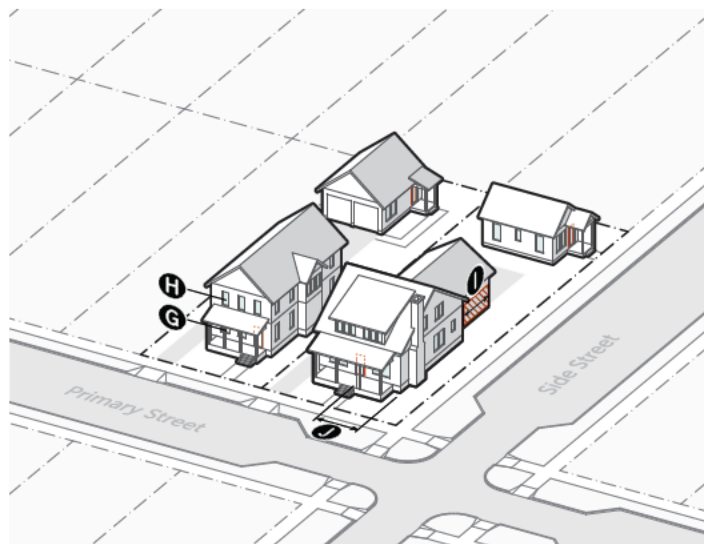
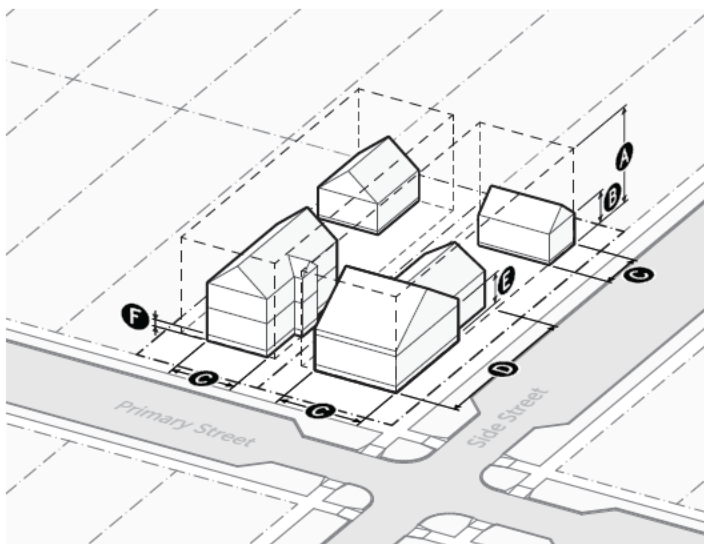
A. SITE



1. LOT SIZE	Sec. 2.11.2.
A Area (min)	6,000 SF
B Width (min)	40'
2. DENSITY	Sec. 2.11.3.
Dwellings per lot (max)	
Primary units	1
Accessory Dwelling units	1
3. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	
Up to 9,000 SF lot	45%
9,001 to 14,000 SF lot	40%
14,001 to 20,000 SF lot	35%
Above 20,000 SF lot	30%

4. BUILDING SETBACKS ²	Sec. 2.11.5.
D Primary street lot line (min)	
Primary structure	20' or Setback Range
Accessory structure	50'
E Side street lot line (min)	10'
F Side lot line (min)	
Up to 60' wide lot	5'
61' to 100' wide lot	7'
Above 100' wide lot	10'
G Rear/alley lot line (min)	
Primary structure	15'
Accessory structure	5'
5. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	30'
Side street (min)	10'
6. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type E 6'

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Primary structure ¹	2.5 / 32'
Accessory structure	1.5 / 20'
B Side wall (max)	
Primary structure	25'
Accessory structure	16'
2. MASSING	Sec. 2.11.11.
C Building width (max)	
Up to 60' wide lot	40'
61' to 80' wide lot	50'
81' to 100' wide lot	60'
Above 100' wide lot	70'
D Building depth (max)	70'
3. GROUND STORY	Sec. 2.11.12.
E Story height (min)	9'
F Finish floor elevation (min/max)	0' / 5'

	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
G Ground story (min)	25%	20%
H Upper story (min)	15%	15%
I Blank wall width (max)	10'	20'
5. ENTRANCES	Sec. 2.11.14.	
J Street-facing entry spacing (max)	40'	40'
Entry feature	Yes	No

NOTE: Additional standards apply for lots within the Neighborhood Revitalization Overlay District.

[View the Neighborhood Revitalization Overlay District Map](#)

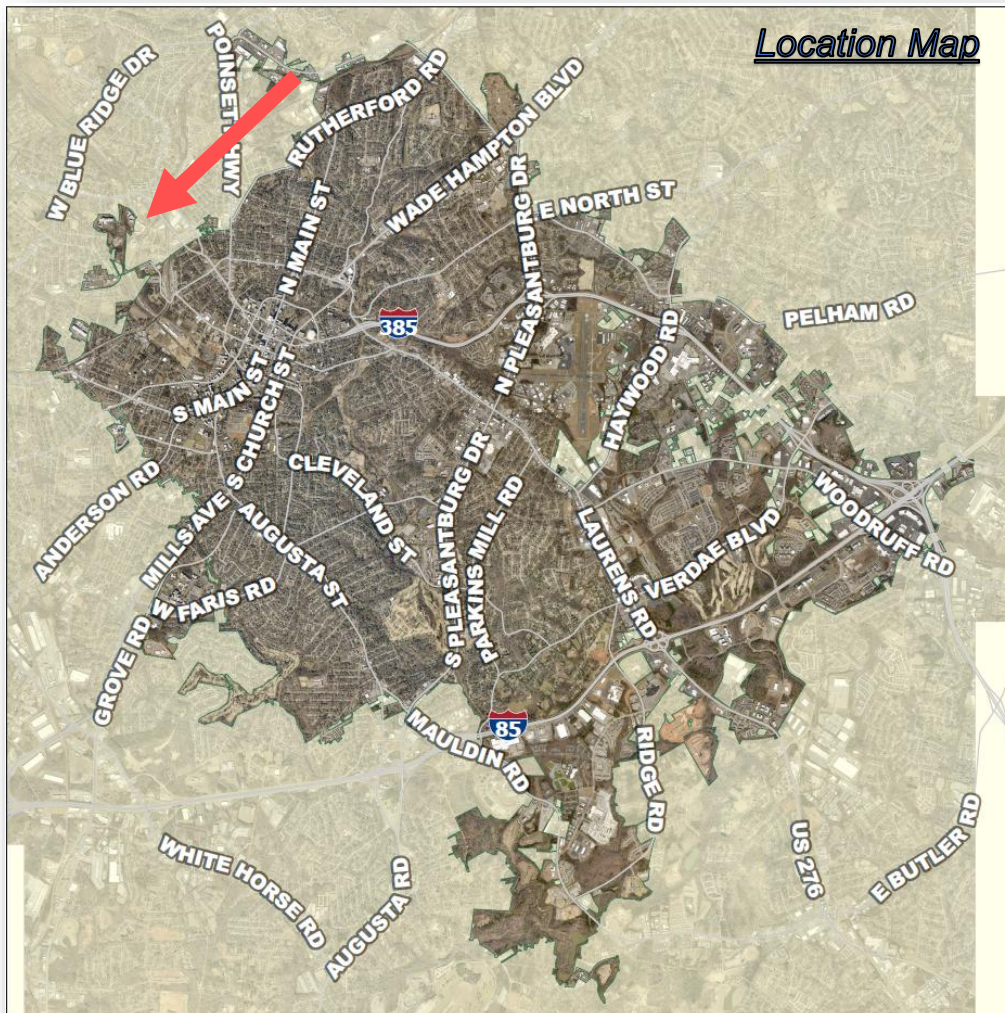
[View the Neighborhood Revitalization Overlay District Design Standards](#)



PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: AX-20-2025
Applicant(s): C. Daniel Hathaway
Property Owner(s): Water Tower Apartments Holdings, LLC
Property Location: 1000 Water Tower Circle
Tax Map Number(s): 0140000100100 and 0140000100200
Property Area: 9.2 acres
Rezone Request: RC-5, Community 5 District
Recommendation: Approval



Location Map

Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 *Function, Powers, and Duties of the Planning Commission*

Sec 19-1.1.3 *Purpose and Intent*

Sec.19-1.3 *Official Zoning Map*

Sec.19-2 *Zoning Districts*

Sec.19-6.1.3 *Planning Commission*

Sec.19-6.2.2 *Legislative Review*

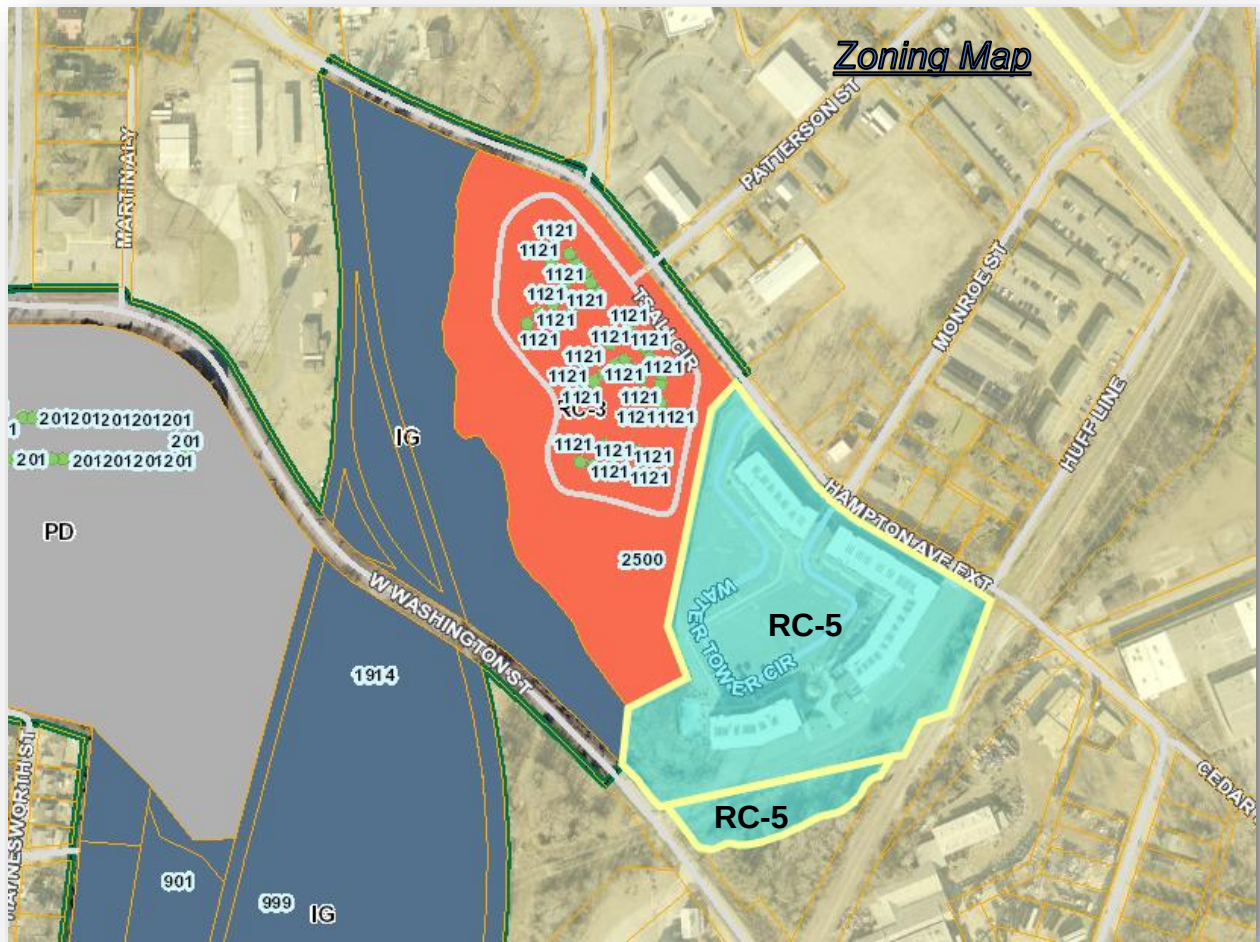
Project Overview:

The applicant has petitioned the City of Greenville to annex approximately 9.2 acres of lot area into the Greenville city limits and to zone it RC-5, Community 5 District, under the Greenville Development Code. The subject property is the location of Water Tower Apartments, a 235-unit multifamily complex of three multistory buildings built around a historic water tower.

Land Use Review

The proposed zoning district for the annexation is RC-5, Community 5 District. The RC-5 District allows for high-density multifamily residential, with limited commercial uses. The district allows five stories by-right, with two further stories allowed with the Development Bonus. The Future Land Use Map (FLUM) does not provide a recommendation for the property.

LAND USE OF SURROUNDING PROPERTIES		
Location	Zoning	Current Use
Subject Property	FRD, Flexible review district (County)	Multifamily residential
North	R-M20, Multifamily residential district (County)	Church, vacant, single-family detached
East	I-1, Industrial district (County)	Scrapyard
South	I-1, Industrial district (County)	Vacant and railroad engine repair yard
West	RC-3, Community 3 District, and IG, Industrial General District	Multifamily residential and vacant



Procedural Requirements:

Pre-Application and Development Meetings

The City and the applicant held a pre-application meeting on February 13, 2025.

Other Site Information:

The property is not located in a Greenville County Special Emphasis Neighborhood nor a County Overlay District. The site's multifamily buildings include one (1) five-story building and two (2) four-story buildings. Natural features on the site include the Reedy River on the western border and Cripple Creek on the southern border. A portion of the Swamp Rabbit Trail's Orange Line is also located on the property.

Definitions:

Please see the attachments for the **RC-5 District**.

Staff Analysis:

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	N/A
--	------------

Comments: The Future land Use Map (FLUM) does not provide a recommendation for the property. A recommendation will be reviewed in a future Comprehensive Plan update.

(b) Consistent with Applicable Plans and Studies.	N/A
--	------------

Comments: The city has not conducted a plan or study that includes the subject property.

(c) Compatible with Surrounding Uses.	YES
--	------------

Comments: The property is adjacent to Riverside Apartments, which is zoned RC-3. The proposed RC-5 District allows for a range of uses that would be compatible to the current use of the property and adjacent properties.

(d) Provide logical and orderly Development Pattern.	YES
---	------------

Comment: The rezoning provides a consistent zoning district to that of the subject property's use. The greater area surrounding the subject property is redeveloping with new residential and commercial uses. The RC-5 District appears to provide a logical and orderly development pattern for the continuing redevelopment of the area.

STAFF RECOMMENDATION:

APPROVE rezone to RC-5, Community 5 District.

Staff Comments

Planning Comments

Recommend: Approve

Addressing Comments

Reviewed by: Jordan P. Harris

Date: 7/24/2025

Recommend: Approve w/ Comments

Comments:

ANNEXATION REVIEW:

*1. NEW PARCELS

*2. ASSIGNED Address: 1250 Water Tower Circle, West Washington Street (1800-Block)

*3. PIN#: 0140000100100, 0140000100200

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

*1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

Civil Engineer Comments

Recommend: Approve w/ Comments

Comments:

All streets in this annexation will be classified as "District" streets.

Environmental Engineer Comments

Recommend: Approve

Comments:

*Area is currently served by Metro for Sanitary Sewer

Fire Department Comments

Recommend: Approve w/ Comments

Comments:

GCFD will be responding to the annexed areas, as well as completing required business inspections. GCFD will update Knox boxes with business owners to ensure code compliance.

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. The project site is currently developed and would not require tree removal for any future development. A full tree inventory per 19-5.2.2.A will be required with the site permit submittal and mitigation for tree removals must be provided.
2. Any trees intended to be saved must be protected with tree protection fencing per Sec. 19-5.2.2.F.
3. Street trees will be required along all public rights-of-way with any major site disturbance.
4. All plant selections in future plans must comply with Div. 19-4.10.



city of greenville

APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	C. Daniel Hathaway	Water Tower Apartments Holdings, LLC
*Title:	Member	
*Address:		
*City, State:		
*Zip:		
*Phone:		
*Email:		

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) 0140000100100, 0140000100200

*TOTAL ACREAGE 9.2

*CURRENT ZONING DESIGNATION (County) FRD, Flexible Review District

*PROPOSED ZONING DESIGNATION (City) RC-5, Community 5 District

TYPE OF ANNEXATION

*Please select one (1) type: ☒ 100% ☐ 75% ☐ 25%

For 100% and 75% Annexations, please Include the corresponding **Annexation Petition** with the application submittal.

INSTRUCTIONS

1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
2. Staff will review the application for "completeness" pursuant to **Section 19-6.2.1.B.3. Completeness Determination**. If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
3. Please refer to **Sections 19-6.1.3. Planning Commission** for additional information.
4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
5. **Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.**
6. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.

6/30/25

*APPLICANT SIGNATURE

DATE

7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initial: CDH

*Signatures	
Applicant	C. Daniel Hathaway
Date	6/30/25
Property Owner/Authorized Agent	Water Tower Apartments Holdings, LLC
Date	6/30/25



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

**100 Percent
PETITION FOR ANNEXATION**

The person(s) whose signatures appear below are freeholders owning real estate in an area which is contiguous to the City of Greenville and which is proposed to be annexed into the City. In general, the area can be described as 1000 Water Tower Circle (address) and consisting of approximately 9.2 acres located on see below (tax map parcel). That area is identified more particularly by the tax map parcel number(s) provided below and the Annexation Plat which is being provided to the City of Greenville Planning Commission in conjunction with this petition. Any and all plats are incorporated by reference as a description of the area. By their signatures, the freeholder(s) petition(s) the City Council of the City of Greenville to annex the entire area shown as being annexed on the plats, and such additional acreage within the outer boundaries of the area as the owners through their agent may designate.

This petition is submitted under the provisions of S.C. Code ' 5-3-150, authorizing the City Council to annex an area when presented with a petition signed by all persons owning real property in the area proposed to be annexed. This petition and all signatures thereto shall be open for public inspection on demand at the City Hall, located at the address set forth above. All zoning processes will be in accordance with state statutes and city ordinance otherwise existing.

Property Owner(s)	Address/ Tax Map Number	Signature	Date
Water Tower Apartments Holdings, LLC	1000 Water Tower Circle/ TMS# 014000-01-00100		6/30/25
Water Tower Apartments Holdings, LLC	1000 Water Tower Circle/ TMS# 014000-01-00200		6/30/25



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

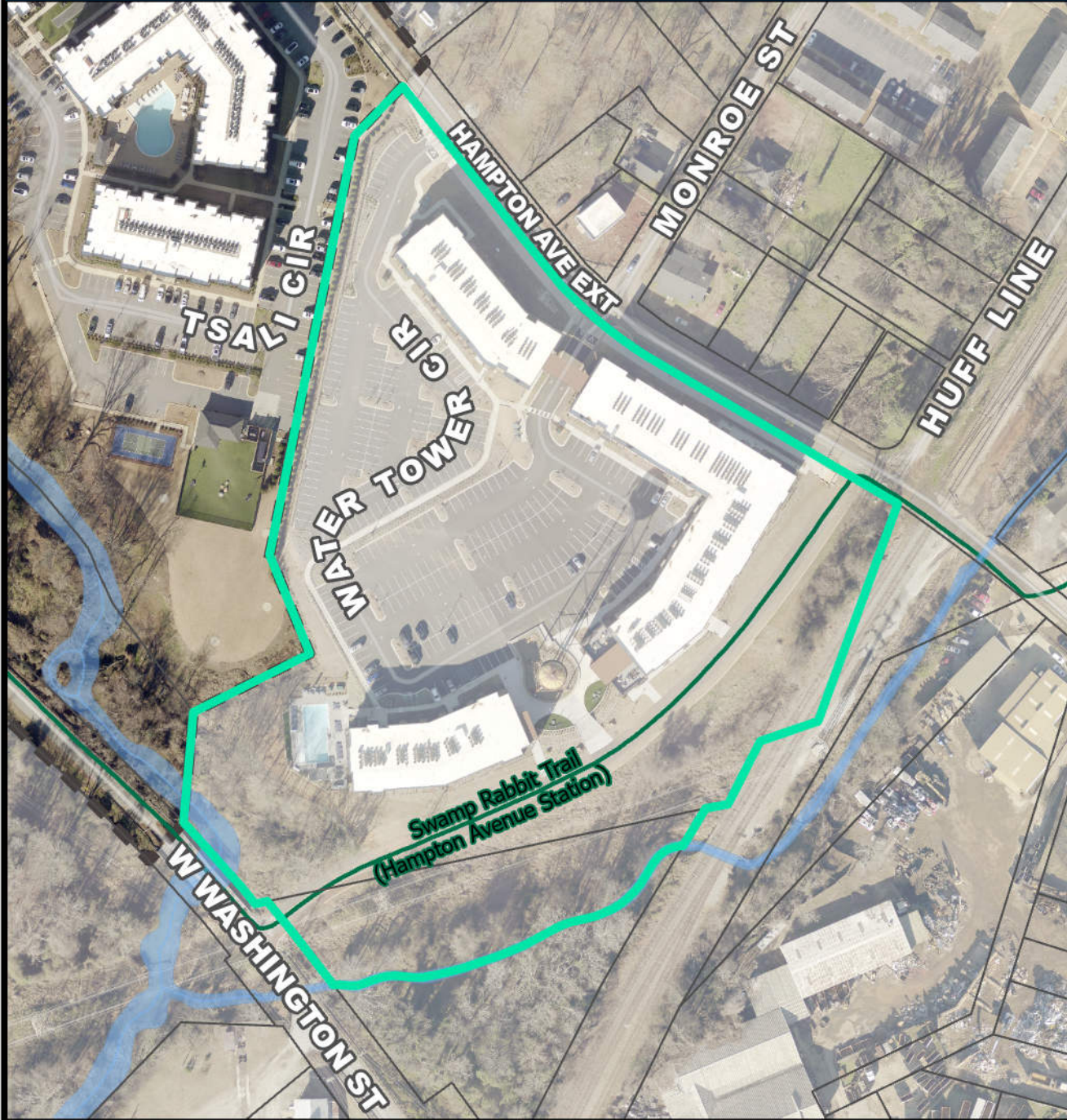
CERTIFICATION OF PETITION SIGNATURE

I, C. Daniel Hathaway, have this 30th day of June, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I have ownership interest by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

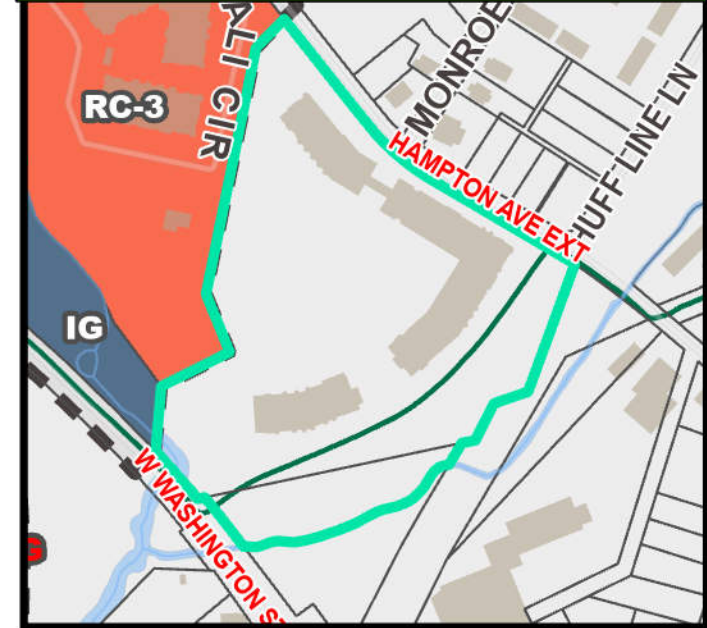
014000-01-00100, 014000-01-00200

Signature

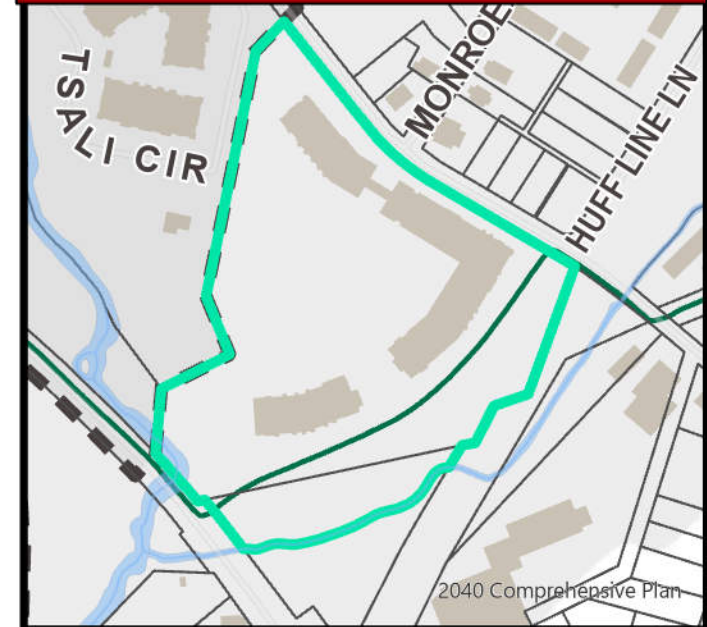
AERIAL VIEW



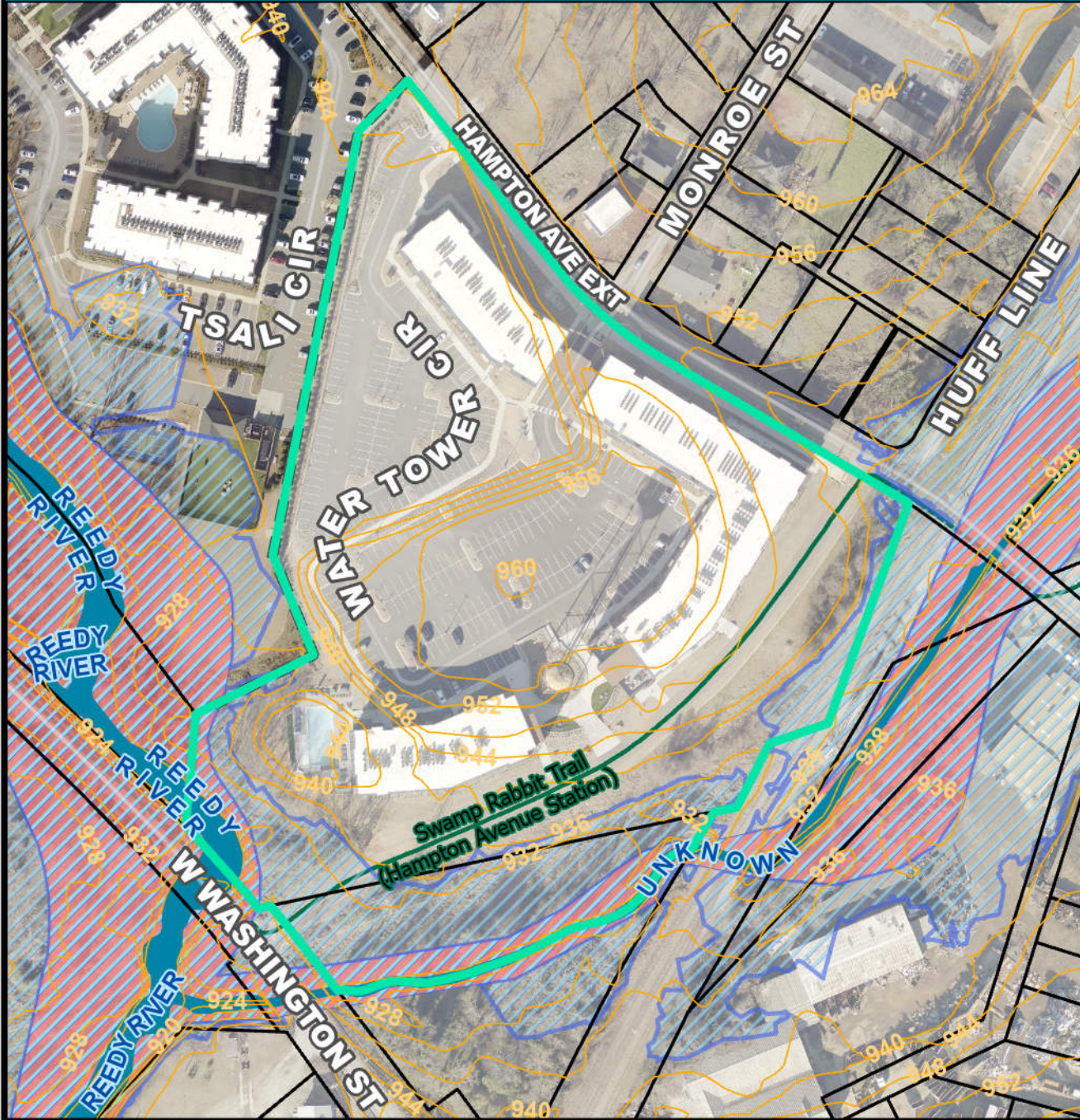
CURRENT ZONING



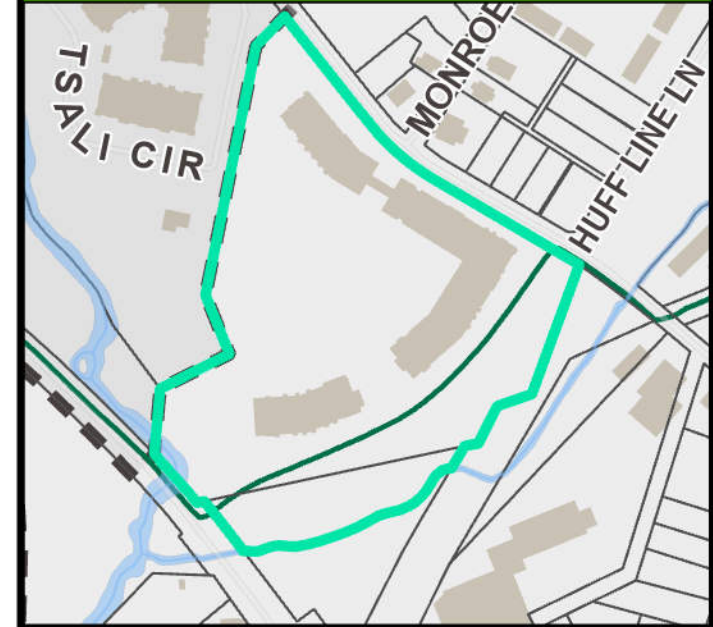
FUTURE LAND USE



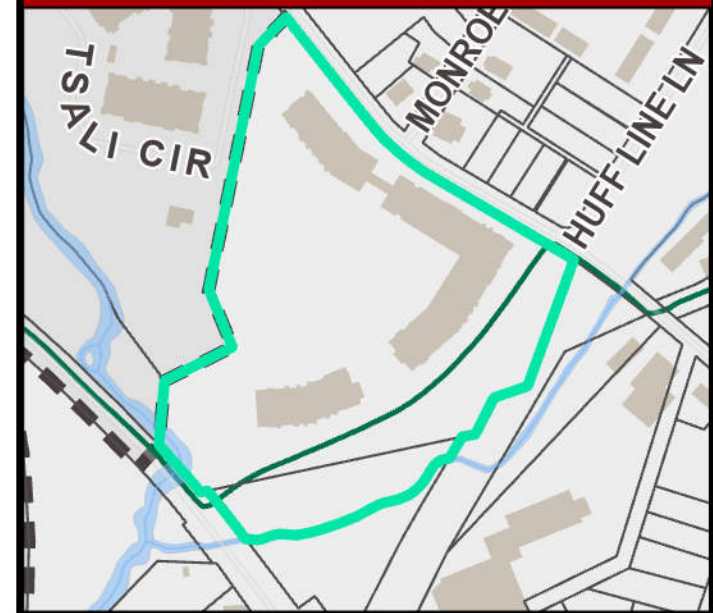
NATURAL / ENVIRONMENTAL FEATURES

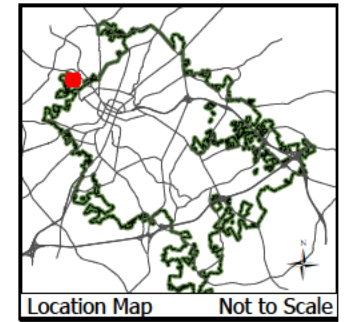


SPECIAL EMPHASIS NEIGHBORHOODS



PRESERVATION OVERLAYS



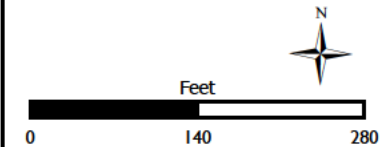


ANNEXATION MAP
for Tax Map Number(s):
0140000100100 & 0140000100200
into the City of Greenville

-  TotalAnnexationArea
-  Greenville City Limits

Total Area of Annexation:
477,869.715 Sq.Ft.
Total Acreage of Annexation:
10.97 Acres

Existing County Zoning: **FRD**
Proposed City Zoning: **RC-5**
City Council District: **2**
File Number: **AX-20-2025**



This map is a product of the City of Greenville, SC and was compiled from plats and other available information. No actual field survey was performed. Reasonable efforts have been made to ensure the accuracy of this map. The City of Greenville expressly disclaims any responsibility or liability with regard to the use of this map.
Copyright: The City of Greenville, SC

**UNINCORPORATED
GREENVILLE COUNTY**

0149001000500

0140000100101

TSALI CIR

0141000200400

WATER TOWER CIR

HAMPTON AVE EXT

HUFF LINE

REAL PROPERTY:
400,735 SQFT
9.2 ACRES

RIGHT OF WAY:
77,177.05 SQFT
1.77 ACRES

014000-01-00100

0140000100200

0140000100300

0140000200100

0140000300100

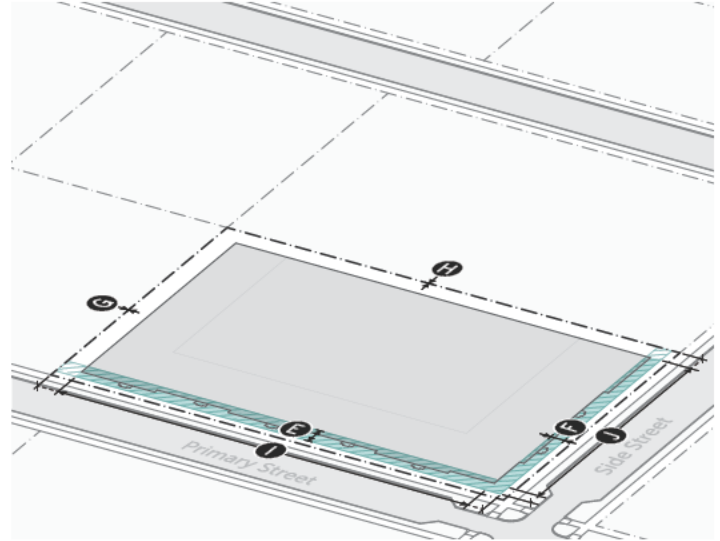
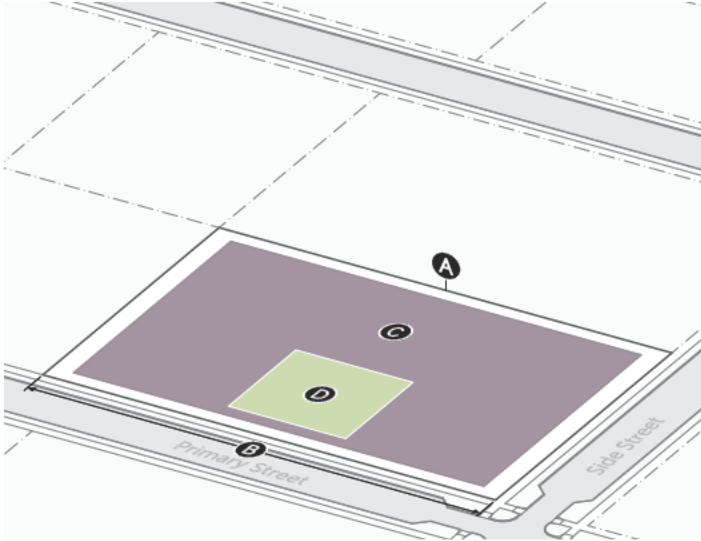
0140000300102

0140000300101

W WASHINGTON ST

19-2.4.4. RC-5 COMMUNITY 5

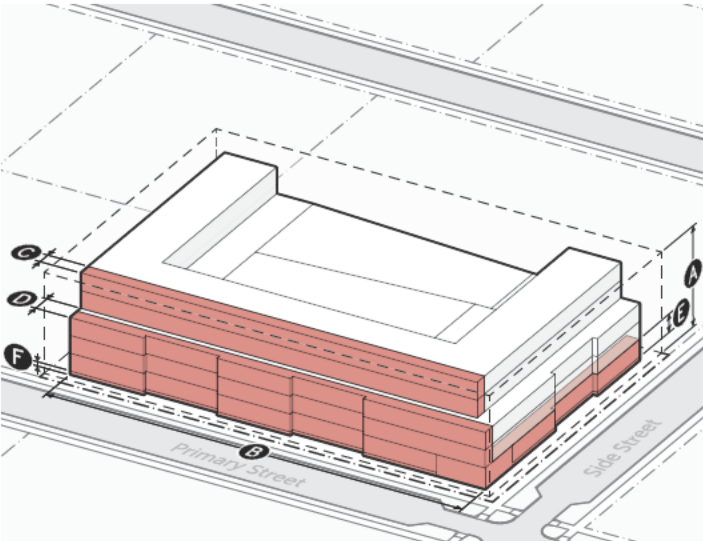
A. SITE



1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	15'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	None
D Outdoor amenity space (min)	10%

3. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	5' / 20'
F Side street lot line (min/max)	5' / 15'
G Side lot line (min)	0'
H Rear lot line (min)	0'
Alley lot line (min)	5'
4. TRANSITIONS	Sec. 2.11.6.
Transition type	Type A, B
5. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	75%
J Side street	45%
6. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	20'
Side street (min)	5'
7. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type E 6'

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Base	5 / 68'
Bonus	7 / 94'
2. MASSING	Sec. 2.11.11.
B Building width (max)	275'
C Active depth (min)	9'
Street step-backs	
Stories without step-back (max)	3
D Step-back depth (min)	10'
3. GROUND STORY	Sec. 2.11.12.
E Story height (min)	10'
F Finish floor elevation (min/max)	0' / 5'



	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
G Ground story (min)	35%	30%
H Upper story (min)	20%	20%
I Blank wall width (max)	15'	25'
5. ENTRANCES	Sec. 2.11.14.	
J Street-facing entry spacing (max)	40'	60'
Entry feature	Yes	Yes

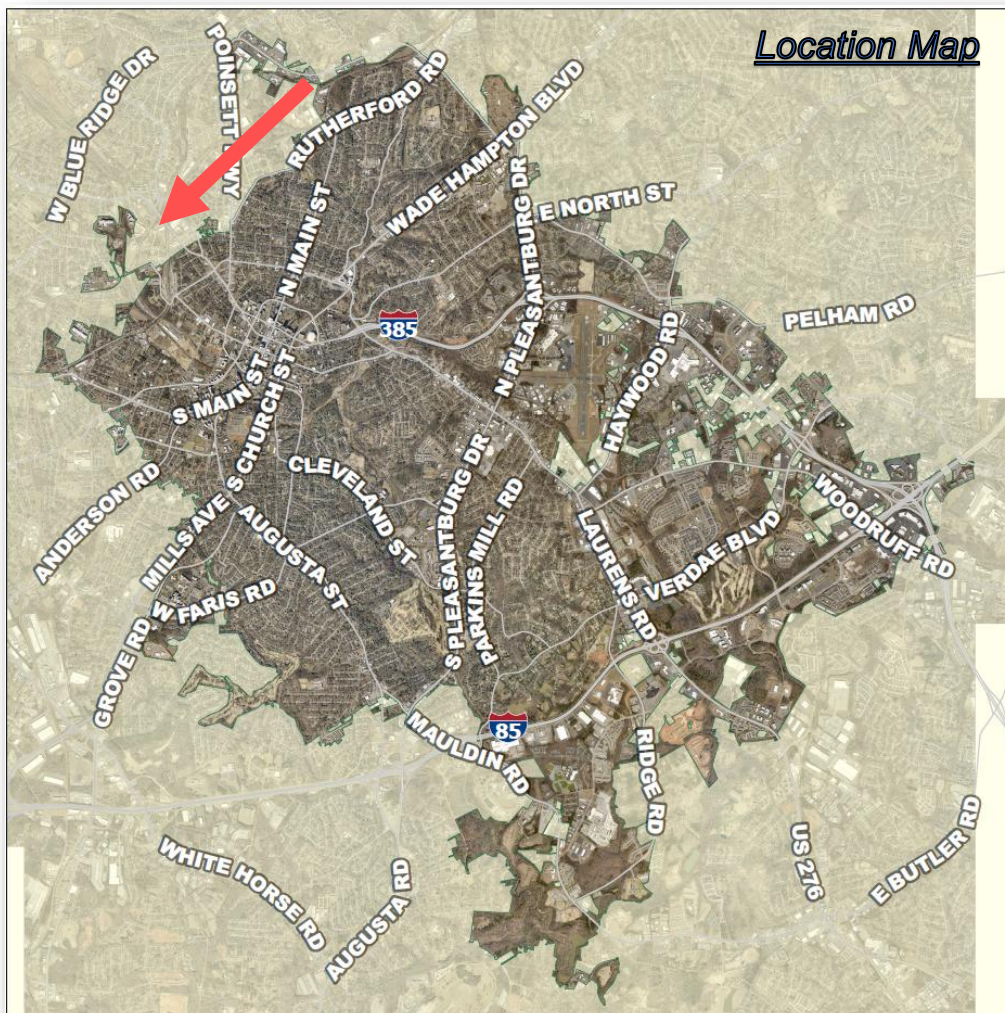
NOTE: Additional standards apply for lots within the Neighborhood Revitalization Overlay District.
[View the Neighborhood Revitalization Overlay District Map](#)
[View the Neighborhood Revitalization Overlay District Design Standards](#)



PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: AX-21-2025
Applicant(s): Wes McAdams
Property Owner(s): Ac Hampton Station Owner, LLC
Property Location: Hampton Ave Ext, Huff Line, Cedar Lane Ct, Pete Hollis Blvd, and Buncombe Rd
Tax Map Number(s): 0139000100100, 0139000100300, 0149000800200, and 0149000800100
Property Area: 13.04 acres
Rezone Request: IX, Industrial Flex District
Recommendation: Approval



Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 *Function, Powers, and Duties of the Planning Commission*

Sec 19-1.1.3 *Purpose and Intent*

Sec.19-1.3 *Official Zoning Map*

Sec.19-2 *Zoning Districts*

Sec.19-6.1.3 *Planning Commission*

Sec.19-6.2.2 *Legislative Review*

Project Overview:

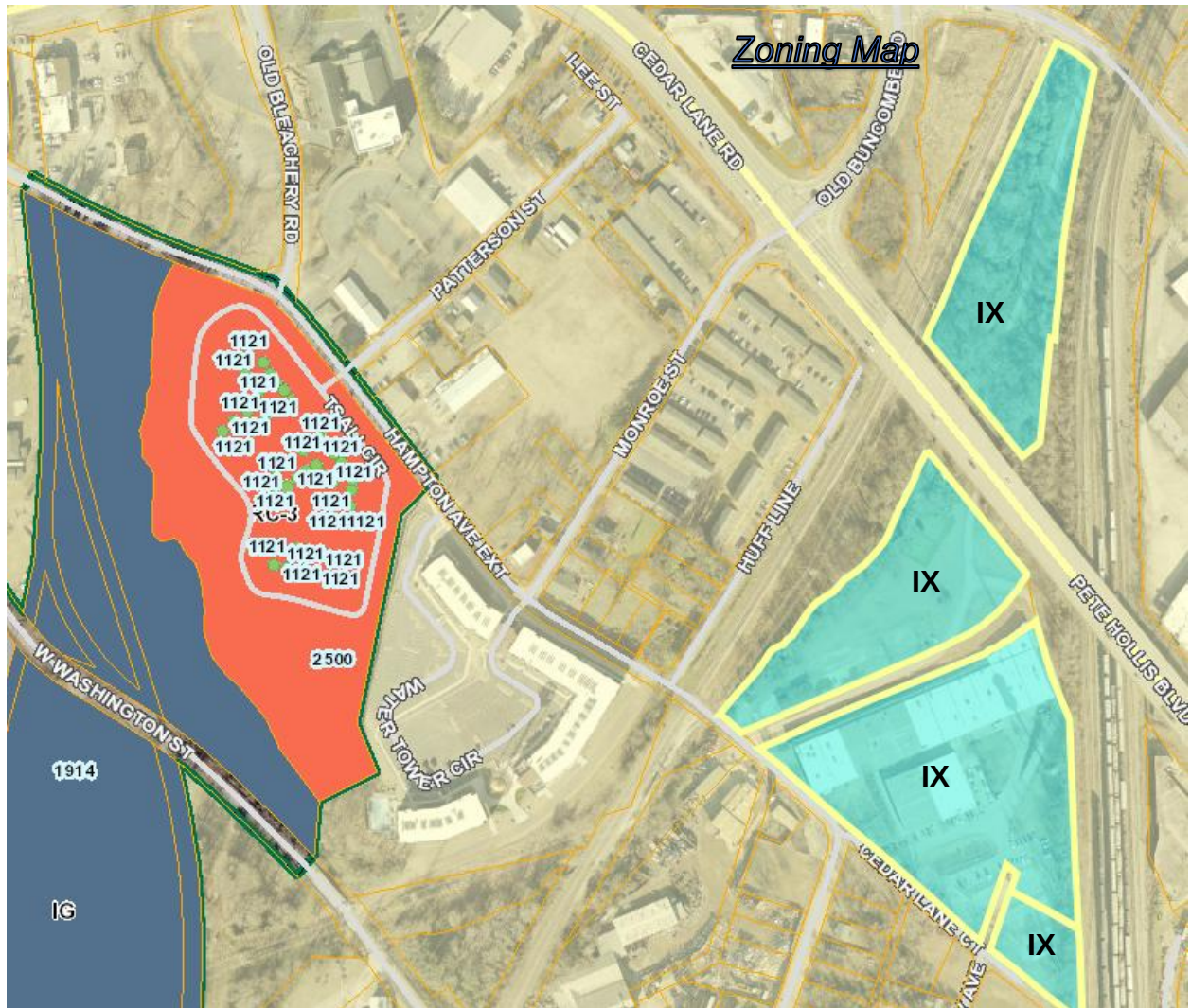
The applicant has petitioned the City of Greenville to annex approximately 13.04 acres of lot area into the Greenville city limits and to zone it IX, Industrial Flex District, under the Greenville Development Code. The subject property is a redeveloped, historic cotton warehouse known as Hampton Station, which includes retail, restaurant, flex, and office space. It will also soon welcome a new brewery.

The property is provided contiguity through AX-20-2025, the annexation of Water Tower Apartments at 1000 Water Tower Circle.

Land Use Review

The proposed zoning district for the annexation is IX, Industrial Flex District. The IX District allows for a wide range of uses from low-density residential to low-intensity industrial. The IX District was specifically designed to assist with the redevelopment of former industrial properties.

LAND USE OF SURROUNDING PROPERTIES		
Location	Zoning	Current Use
Subject Property	FRD, Flexible review district (County)	Restaurant, retail, flex, office, and brewery
North	PD, Planned development district (County)	Mixed use including multifamily
East	I-1, Industrial district (County)	Service businesses
South	I-1, Industrial district, C-2, Commercial district, and FRD, Flexible review district (County)	Scrapyard, retail, vacant
West	FRD, Flexible review district (current), R-M20, Multifamily residential district	Multifamily residential and vacant



Procedural Requirements:

Pre-Application and Development Meetings

The City and the applicant held a pre-application meeting on February 13, 2025.

Other Site Information:

The property is not located in a Greenville County Special Emphasis Neighborhood nor a County Overlay District. The site consists of two former cotton warehouses that have been reused for new commercial uses. Natural features on the site include Cripple Creek along the western border. A portion of the Swamp Rabbit Trail's Orange Line is also located on the property.

Definitions:

Please see the attachments for the **IX District**.

Staff Analysis:

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	N/A
--	------------

Comments: The Future land Use Map (FLUM) does not provide a recommendation for the property. A recommendation will be reviewed in a future Comprehensive Plan update.

(b) Consistent with Applicable Plans and Studies.	N/A
--	------------

Comments: The city has not conducted a plan or study that includes the subject property.

(c) Compatible with Surrounding Uses.	YES
--	------------

Comments: The property is adjacent and in the vicinity of other former cotton warehouses and other textile heritage sites. The IX District provides for compatible uses for the redevelopment of these former industrial sites.

(d) Provide logical and orderly Development Pattern.	YES
---	------------

Comment: The rezoning provides a consistent zoning district to that of the subject property's use. The greater area surrounding the subject property is redeveloping with new residential and commercial uses. The IX District appears to provide a logical and orderly development pattern for the continuing redevelopment of the area. If other textile heritage sites in the area also annex, it is anticipated the IX District would similarly be proposed for many of these properties as well.

STAFF RECOMMENDATION:

APPROVE rezone to IX, Industrial Flex District.

Staff Comments

Planning Comments

Recommend: Approve

Addressing Comments

Recommend: Approve w/ Comments

Comments:

ANNEXATION REVIEW:

- *1. NEW PARCELS (Assigned Address):
 - 0149000800100 (1700-Block Buncombe Road)
 - 0149000800200 (1300-Block Hampton Avenue Extension)
 - 0139000100100 (1320 Hampton Avenue Extension)

0139000100300 (0-Block Cedar Lane Court)

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

*1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

Civil Engineer Comments

Recommend: Approve w/ Comments

AX-21-2025: Hampton Station

Comments:

Hampton Avenue Extension will be classified as a "District" street.
Cedar Lane Court will be classified as a "Neighborhood" street.
Kelly Avenue shall be classified as an "Alley" street.
Hidden Corner Court shall be classified as a "Neighborhood" street.
Huff Line shall be classified as a "Neighborhood" street.
Pete Hollis Blvd shall be classified as a "Thoroughfare" street.
Buncombe Road shall be classified as a "District" street.

Fire Department Comments

Recommend: Approve w/ Comments

Comments:

GCFD will be responding to the annexed areas, as well as completing required business inspections. GCFD will update Knox boxes with business owners to ensure code compliance. As property is developed all current fire code requirements will be required to include road widths, water supply and hydrant locations.

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. The project site is currently developed and tree removals are not anticipated for any future redevelopment. A full tree inventory per 19-5.2.2.A will be required with the site permit submittal and mitigation for tree removals must be provided.
2. Any trees intended to be saved must be protected with tree protection fencing per Sec. 19-5.2.2.F.
3. Street trees will be required along all public rights-of-way with any major site disturbance.
4. All plant selections in future plans must comply with Div. 19-4.10.



APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	Wes McAdams	Ac Hampton Station Owner, LLC
*Title:	MANAGER	
*Address:		
*City, State:		
*Zip:		
*Phone:		
*Email:		

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) 013900-01-00100, 013900-01-00300, 014900-08-00200, 014900-08-00100

*TOTAL ACREAGE 13.04

*CURRENT ZONING DESIGNATION (County) FRD, Flexible Review District

*PROPOSED ZONING DESIGNATION (City) IX, Industrial Flex District

TYPE OF ANNEXATION

*Please select one (1) type: ☒ 100% ☐ 75% ☐ 25%

For 100% and 75% Annexations, please include the corresponding **Annexation Petition** with the application submittal.

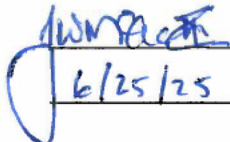
INSTRUCTIONS

1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
2. Staff will review the application for "completeness" pursuant to **Section 19-6.2.1.B.3. Completeness Determination**. If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
3. Please refer to **Sections 19-6.1.3. Planning Commission** for additional information.
4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
5. **Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.**
6. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

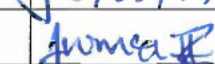
If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.

 _____ ***APPLICANT SIGNATURE**
6/25/25 _____ **DATE**

7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initial: 

*Signatures	
Applicant	
Date	6/25/25
Property Owner/Authorized Agent	
Date	6/25/25



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

100 Percent
PETITION FOR ANNEXATION

The person(s) whose signatures appear below are freeholders owning real estate in an area which is contiguous to the City of Greenville and which is proposed to be annexed into the City. In general, the area can be described as see below (address) and consisting of approximately 13.04 acres located on see below (tax map parcel). That area is identified more particularly by the tax map parcel number(s) provided below and the Annexation Plat which is being provided to the City of Greenville Planning Commission in conjunction with this petition. Any and all plats are incorporated by reference as a description of the area. By their signatures, the freeholder(s) petition(s) the City Council of the City of Greenville to annex the entire area shown as being annexed on the plats, and such additional acreage within the outer boundaries of the area as the owners through their agent may designate.

This petition is submitted under the provisions of S.C. Code ' 5-3-150, authorizing the City Council to annex an area when presented with a petition signed by all persons owning real property in the area proposed to be annexed. This petition and all signatures thereto shall be open for public inspection on demand at the City Hall, located at the address set forth above. All zoning processes will be in accordance with state statutes and city ordinance otherwise existing.

Property Owner(s)	Address/ Tax Map Number	Signature	Date
Ac Hampton Station Owner, LLC	1320 Hampton Ave Ext/ TMS# 013900-01-00100		6/25/25
Ac Hampton Station Owner, LLC	105 Cedar Lane Ct/ TMS# 013900-01-00300		6/25/25
Ac Hampton Station Owner, LLC	1326 Hampton Ave Ext/ TMS# 014900-08-00200		6/25/25
Ac Hampton Station Owner, LLC	1655 Buncombe Road/ TMS# 014900-08-00100		6/25/25



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

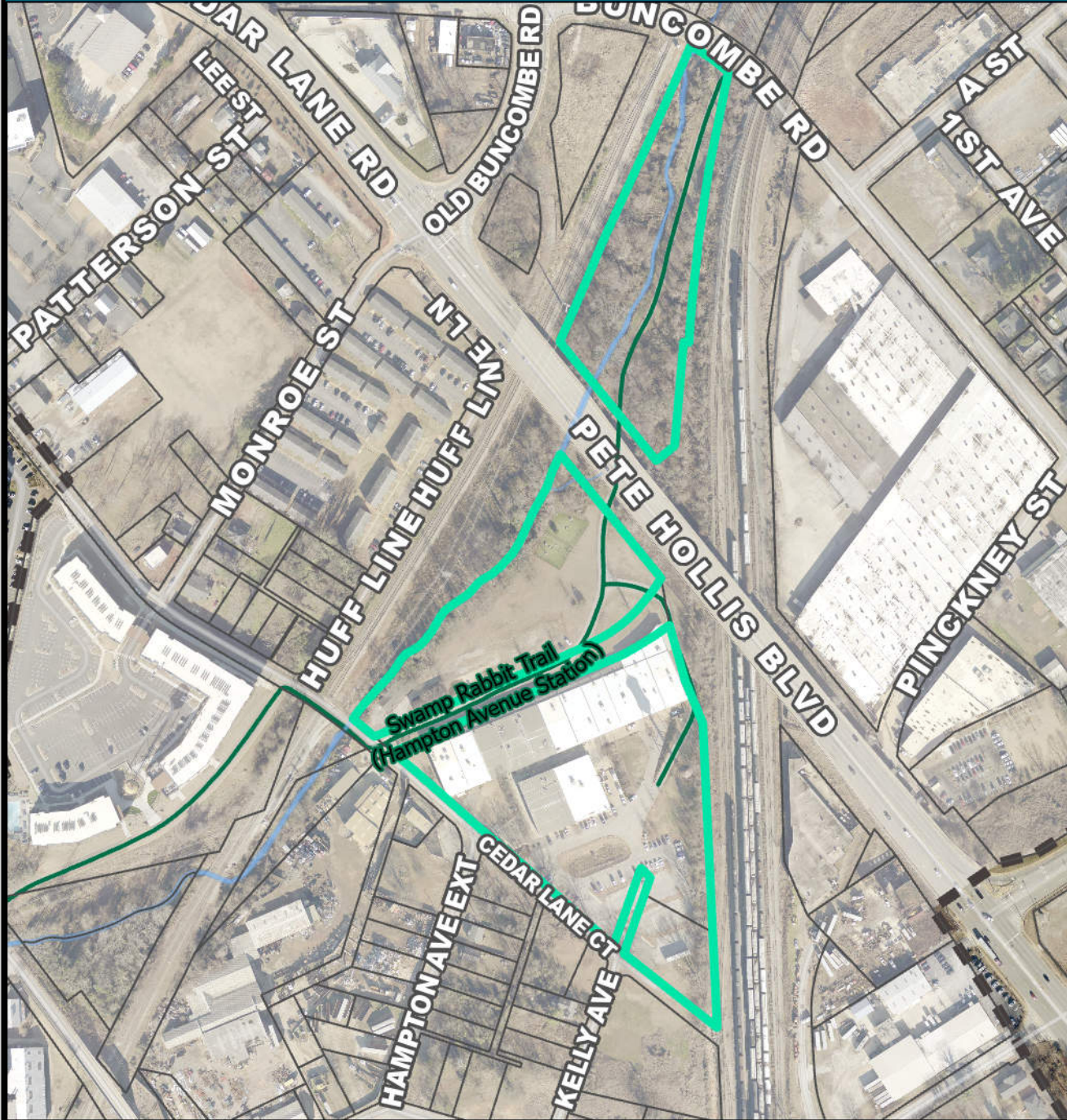
CERTIFICATION OF PETITION SIGNATURE

I, Wes McAdams, have this 25 day of June, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I have ownership interest by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

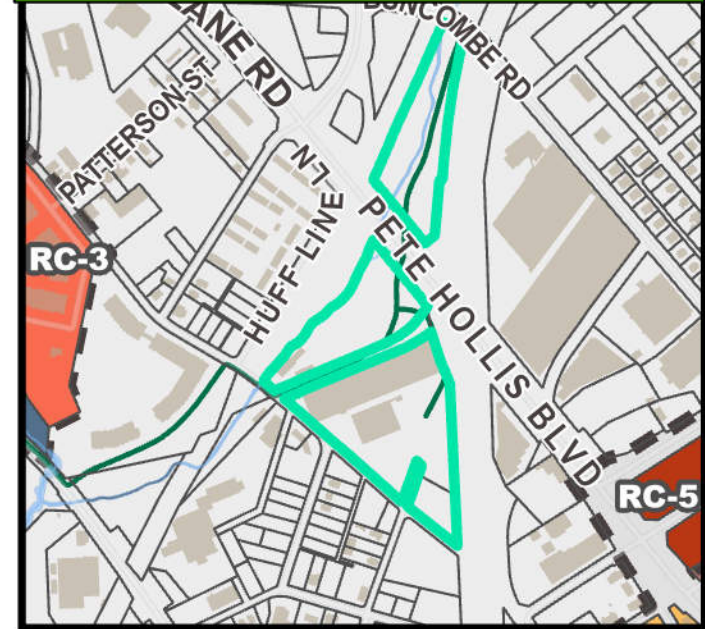
013900-01-00100, 013900-01-00300, 014900-08-00200
014900-08-00100

[Signature]
Signature

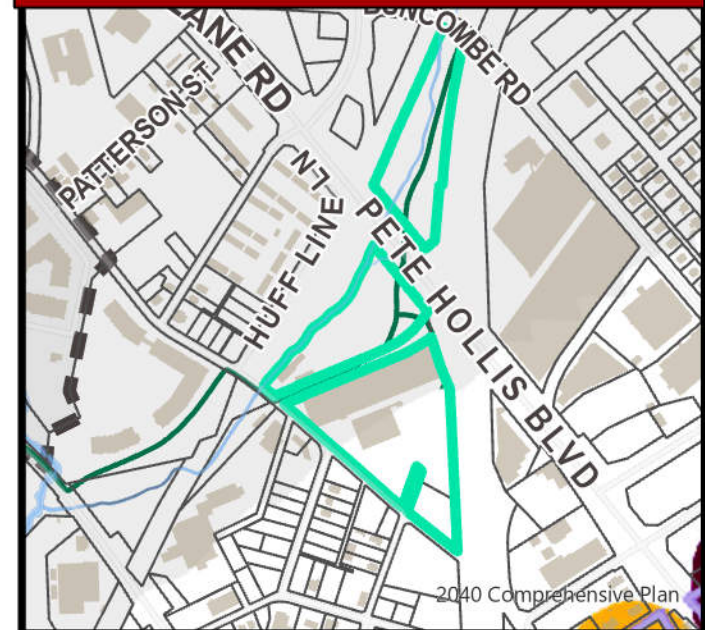
AERIAL VIEW



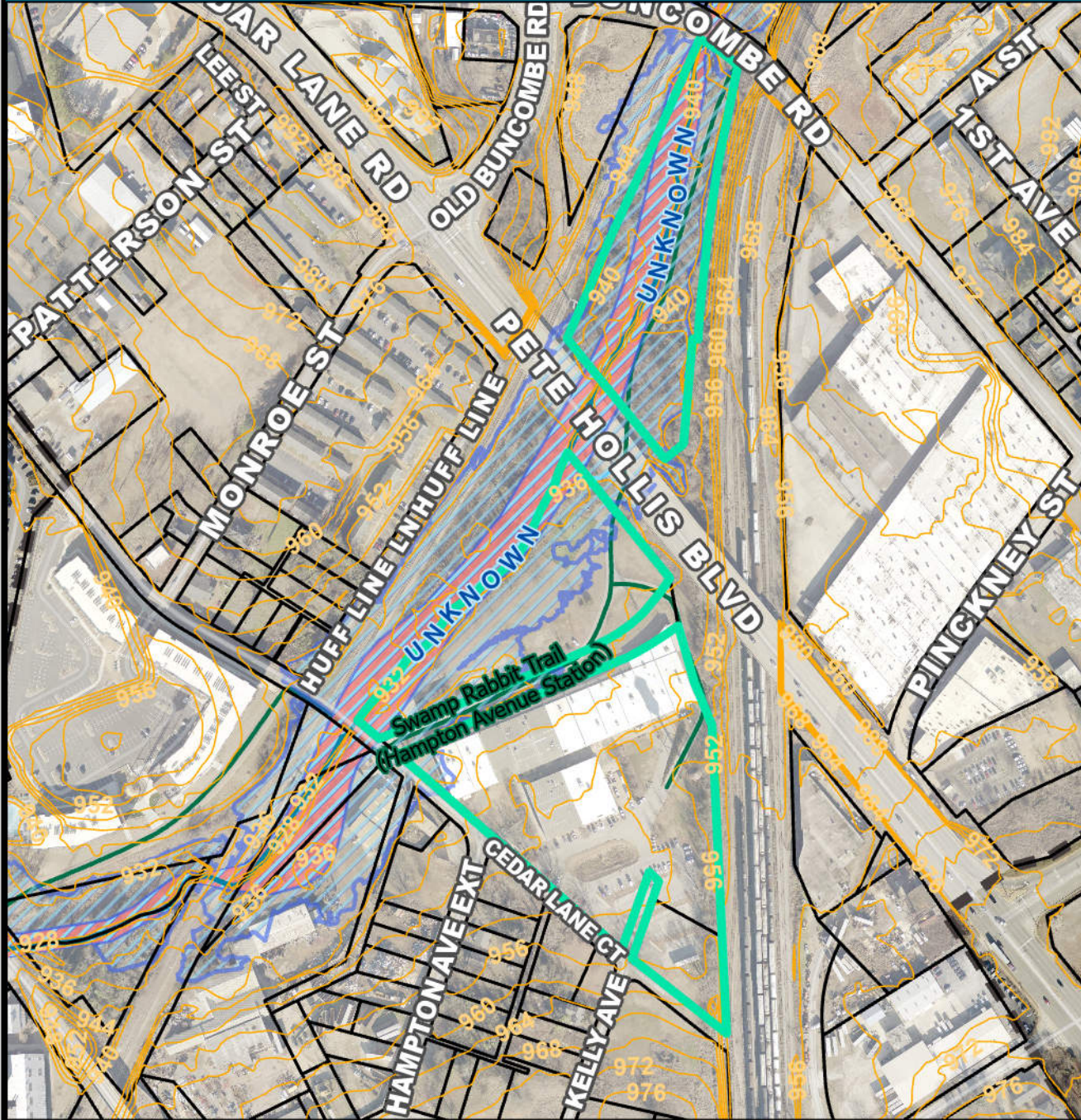
CURRENT ZONING



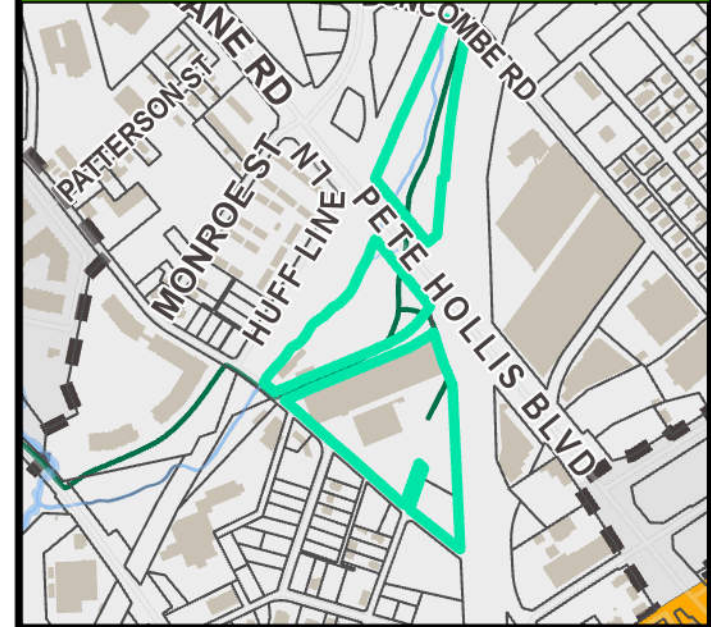
FUTURE LAND USE



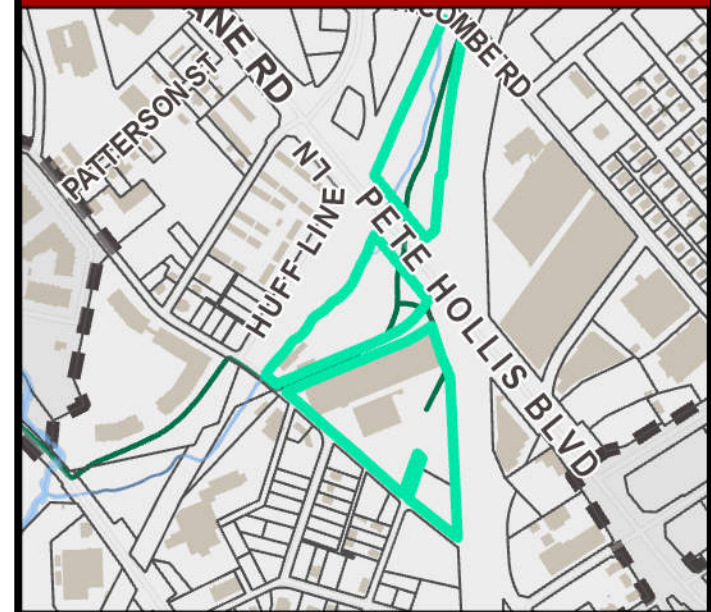
NATURAL / ENVIRONMENTAL FEATURES



SPECIAL EMPHASIS NEIGHBORHOODS



PRESERVATION OVERLAYS





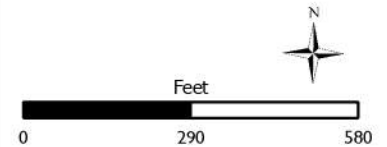
ANNEXATION MAP

for Tax Map Number(s):
**0139000100100, 0139000100300,
0149000800100, 0149000800200**
into the City of Greenville

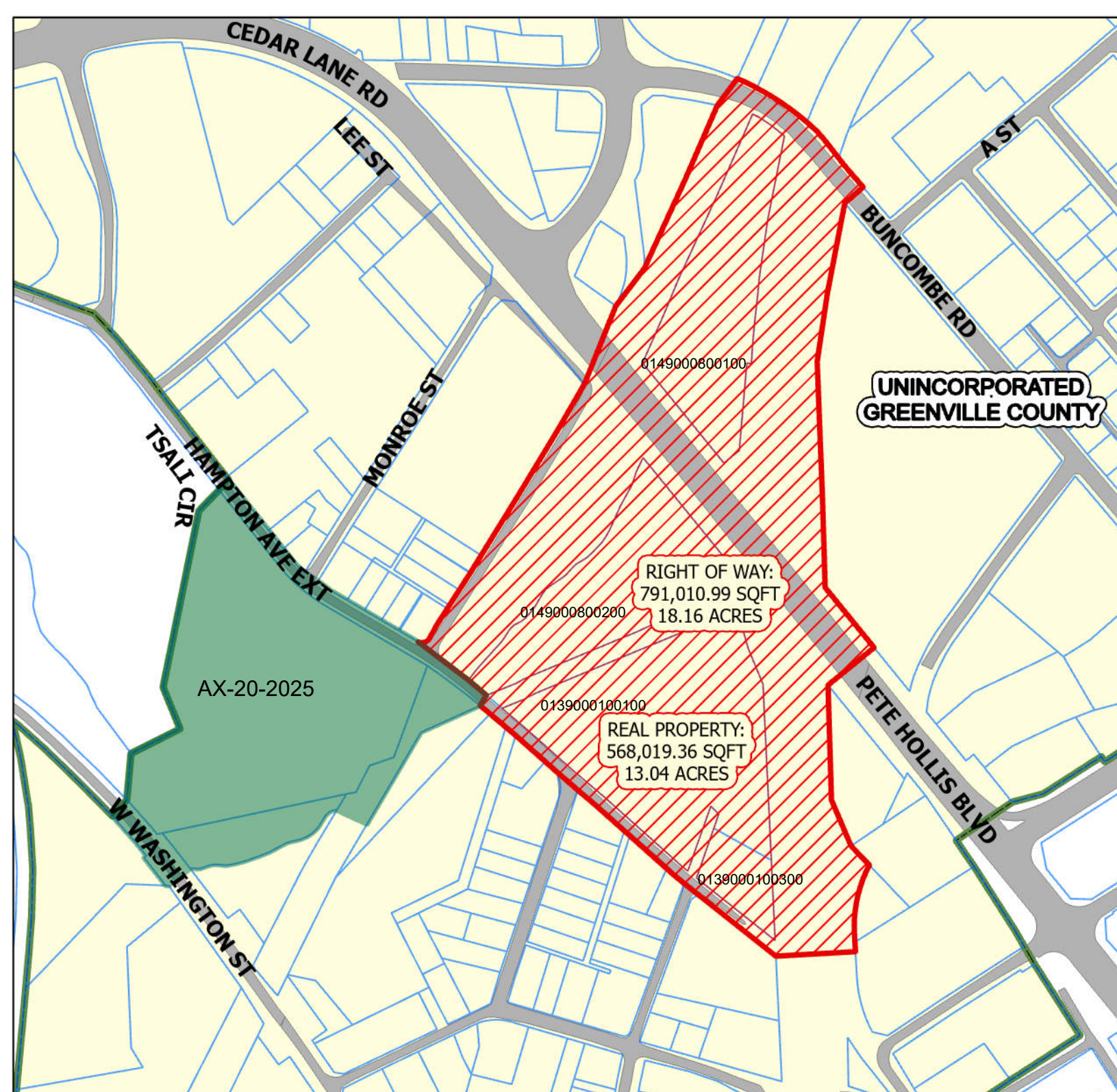
-  TotalAnnexationArea
-  Greenville City Limits
-  ContiguousAnnexation

Total Area of Annexation:
1,359,030.35 Sq.Ft.
Total Acreage of Annexation:
31.2 Acres

Existing County Zoning: **FRD**
Proposed City Zoning: **IX**
City Council District: **2**
File Number: **AX-21-2025**

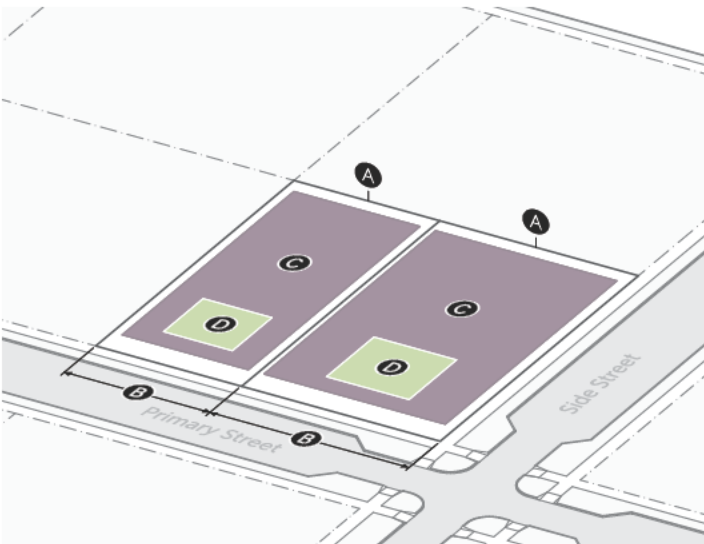


This map is a product of the City of Greenville, SC and was compiled from plats and other available information. No actual field survey was performed. Reasonable efforts have been made to ensure the accuracy of this map. The City of Greenville expressly disclaims any responsibility or liability with regard to the use of this map.
Copyright: The City of Greenville, SC

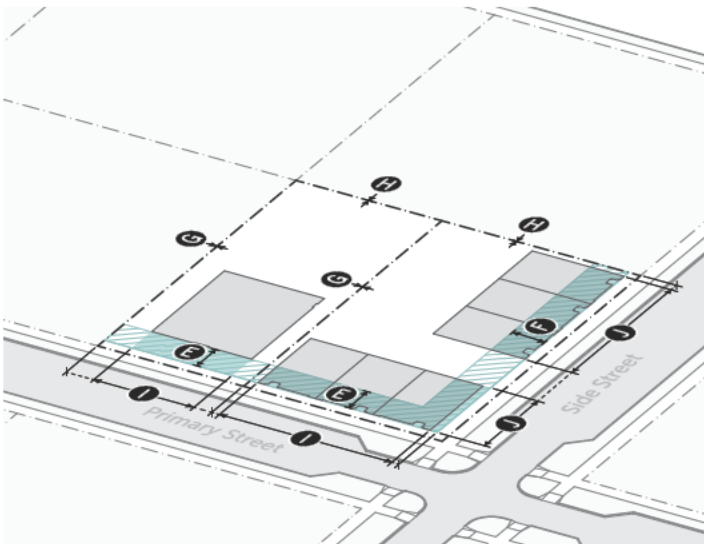


19-2.8.2. IX INDUSTRIAL FLEX

A. SITE



1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	15'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	80%
D Outdoor amenity space (min)	10%



3. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	5' / 20'
F Side street lot line (min/max)	5' / 20'
G Side lot line (min)	0'
H Rear lot line (min)	0'
Alley lot line (min)	5'
4. TRANSITIONS	Sec. 2.11.6.
Transition type	Type A, B
5. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	75%
J Side street	45%
6. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	20'
Side street (min)	5'
7. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type F 8'

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Base	3 / 42'
Bonus	5 / 68'
2. MASSING	Sec. 2.11.11.
B Building width (max)	275'
C Active depth (min)	15'
3. GROUND STORY	Sec. 2.11.12.
D Story height (min)	14'
E Finish floor elevation (min/max)	-2' / 5'



	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
F Ground story (min)	20%	20%
G Upper story (min)	20%	20%
H Blank wall width (max)	20'	40'
5. ENTRANCES	Sec. 2.11.14.	
I Street-facing entry spacing (max)	50'	75'
Entry feature	Yes	Yes

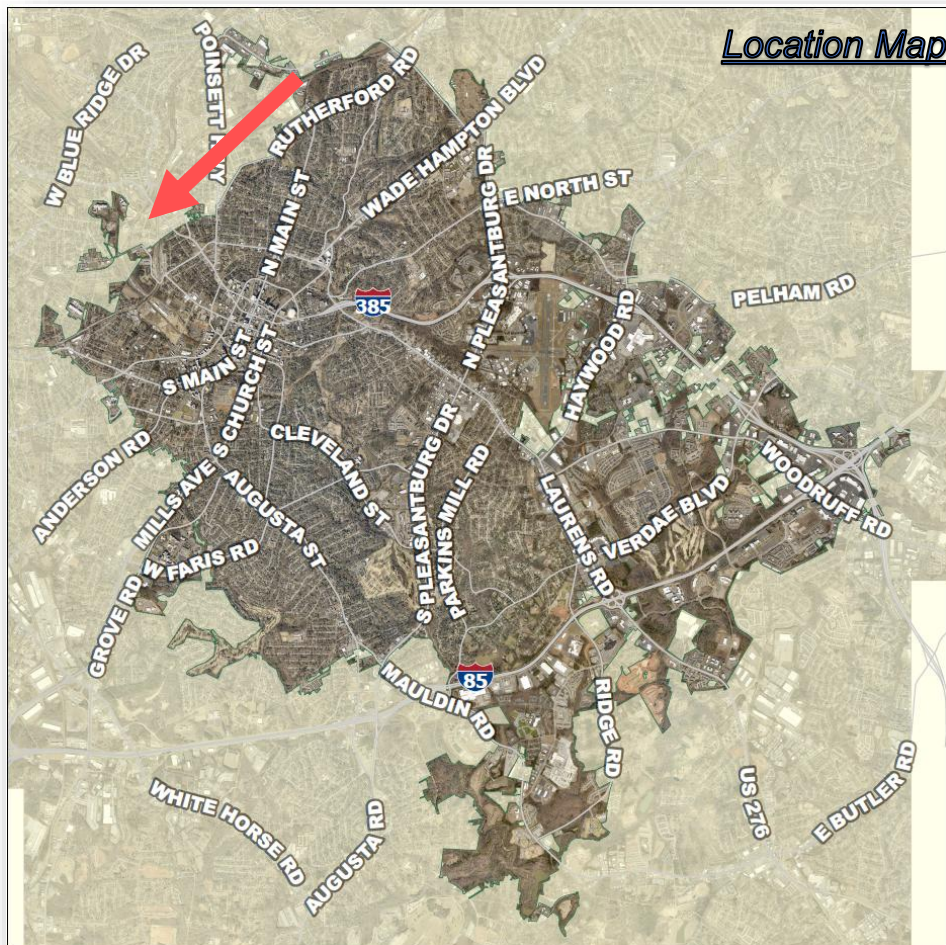


Planning Staff Report to
Greenville Planning Commission
for the August 7, 2025 Public Hearing

PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: AX-22-2025
Applicant(s): Simon Tuohy
Property Owner(s): Water Dagger, LLC
Property Location: Hampton Ave Ext, Cedar Lane Ct, and Kelly Ave
Tax Map Number(s): 0139000601800, 0139000600301, 0139000600300, 0139000600400,
0139000600500, 0139000600501, 0139000600700, 0139000600900,
0139000601000, 0139000601100, 0139000601200, 0139000601300,
0139000601400, 0139000500100, and 0139000500200
Property Area: 4.94 acres
Rezone Request: RC-3, Community 3 District
Recommendation: Approval



Location Map

Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 *Function, Powers, and Duties of the Planning Commission*

Sec 19-1.1.3 *Purpose and Intent*

Sec.19-1.3 *Official Zoning Map*

Sec.19-2 *Zoning Districts*

Sec.19-6.1.3 *Planning Commission*

Sec.19-6.2.2 *Legislative Review*

Project Overview:

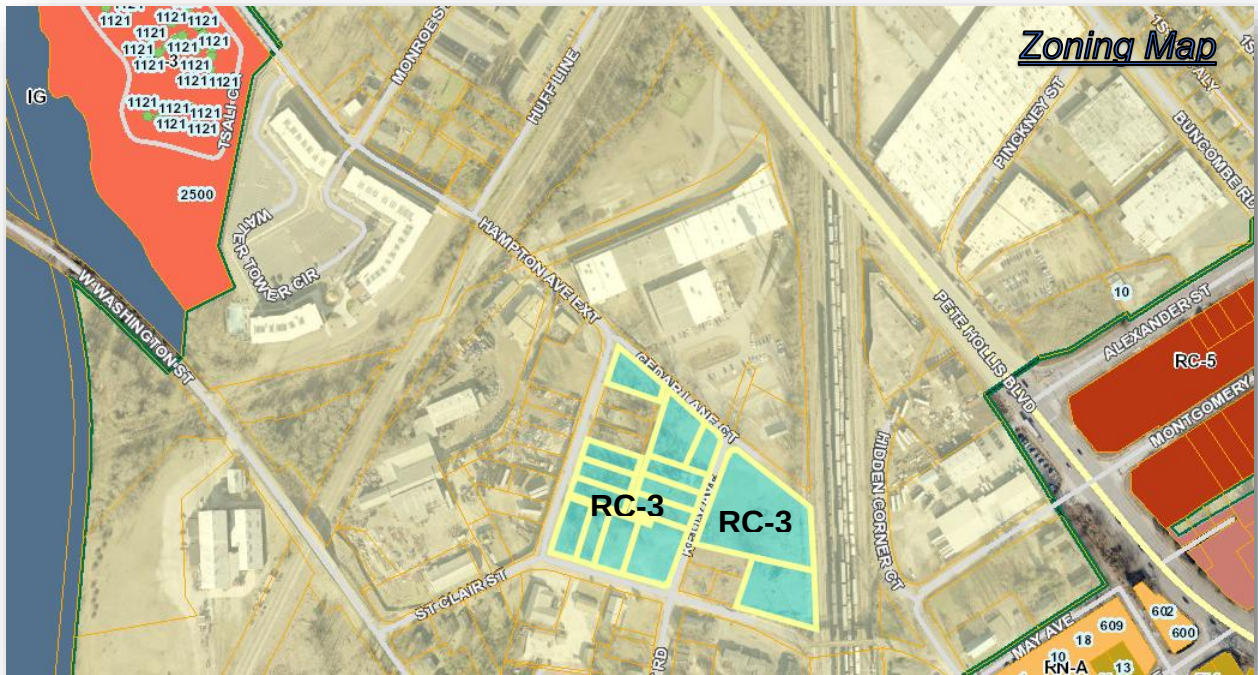
The applicant has petitioned the City of Greenville to annex approximately 15 parcels of land totaling 4.94 acres of lot area into the Greenville city limits and to zone it RC-3, Community 3 District, under the Greenville Development Code. The subject property has a County-approved Flexible Review District for three-story townhomes that the developer now wishes to develop in the City instead.

The property is provided contiguity through AX-21-2025, the annexation of Hampton Station at Hampton Ave Ext, Huff Line, Cedar Lane Ct, and Buncombe Rd.

Land Use Review

The proposed zoning district for the annexation is RC-3, Community 3 District. The RC-3 District allows for high-density multifamily residential with limited commercial uses. The district allows three stories by-right, with two further stories allowed with the Development Bonus. The Future Land Use Map (FLUM) does not provide a recommendation for the property.

LAND USE OF SURROUNDING PROPERTIES		
Location	Zoning	Current Use
Subject Property	FRD, Flexible review district (County)	Vacant
North	FRD, Flexible review district (Current - County)	Retail, restaurant, office, flex, and brewery
East	I-1, Industrial district (County)	Service businesses
South	I-1, Industrial district, C-2, Commercial district, and R-7.5, Single-family residential district (County)	Vacant, multifamily residential, vacant commercial
West	I-1, Industrial district, C-2, Commercial district, and R-7.5, Single-family residential district (County)	Scrapyard, vacant, single-family residential



Procedural Requirements:

Pre-Application and Development Meetings

The City and the applicant held a pre-application meeting on February 13, 2025.

Other Site Information:

The property is not located in a Greenville County Special Emphasis Neighborhood nor a County Overlay District. The site consists of 15 vacant parcels that are intended to be redeveloped into townhomes. No natural features exist on the property. The Hampton Avenue pedestrian bridge is included within the adjacent right-of-way to be annexed.

Definitions:

Please see the attachments for the **RC-3 District**.

Staff Analysis:

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	N/A
Comments: The Future land Use Map (FLUM) does not provide a recommendation for the property. A recommendation will be reviewed in a future Comprehensive Plan update.	
(b) Consistent with Applicable Plans and Studies.	N/A
Comments: The city has not conducted a plan or study that includes the subject property.	

AX-22-2025: Hampton Ave Ext, Cedar Lane Ct, and Kelly Ave

(c) Compatible with Surrounding Uses.	YES
--	------------

Comments: The property is near Water Tower Apartments, which is proposed to be zoned RC-5 through AX-20-2025. The RC-3 District allows for development similar to that of the existing Flexible Review District in the County. There is multi-unit residential to the south along Hampton Ave Ext.

(d) Provide logical and orderly Development Pattern.	YES
---	------------

Comment: The rezoning provides a consistent zoning district to that of the subject property's County-approved use for a townhome development. The greater area surrounding the subject property is redeveloping with new residential and commercial uses. The RC-3 District appears to provide a logical and orderly development pattern for the continuing redevelopment of the area. All future development must comply with the Greenville Development Code. The code includes transition requirements between zoning districts and allows the Administrator to require transitions, when appropriate, to help protect established residential areas outside the city limits.

STAFF RECOMMENDATION:

APPROVE rezone to RC-3, Community 3 District.

Staff Comments

Planning Comments

Recommend: Approve

Addressing Comments

Recommend: Approve w/ Comments

Comments:

ANNEXATION REVIEW:

- *1. NEW PARCELS (Assigned Address):
 - 013900-06-00301 (0-Block Cedar Lane Court)
 - 013900-05-00200 (1100-Block Hampton Avenue Extension)
 - 013900-06-01100 (1200-1300 Block Hampton Avenue Extension)
 - 013900-06-01000 (1200-Block Hampton Avenue Extension)
 - 013900-06-00700 (1200-Block Hampton Avenue Extension)
 - 013900-06-00900 (1200-Block Hampton Avenue Extension)
 - 013900-06-01800 (0-Block Cedar Lane Court)
 - 013900-06-01200 (1300-Block Hampton Avenue Extension)
 - 013900-06-01300 (1300-Block Hampton Avenue Extension)
 - 013900-06-01400 (1300-Block Hampton Avenue Extension)
 - 013900-05-00100 (0-Block Kelly Avenue)
 - 013900-06-00400 (0-Block Kelly Avenue)
 - 013900-06-00500 (0-Block Kelly Avenue)
 - 013900-06-00501 (0-Block Kelly Avenue)
 - 013900-06-00300 (0-Block Kelly Avenue)

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

*1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

AX-22-2025: Hampton Ave Ext, Cedar Lane Ct, and Kelly Ave

Civil Engineer Comments

Recommend: Approve w/ Comments

Comments:

Hampton Avenue Extension will be classified as a “District” street.
Kelly Avenue will be classified as a “Neighborhood” street.
Unnamed paper alleyways will be classified as “Alley” streets.

Environmental Engineer Comments

Recommend: Approve

Comments:

*Area is currently served by Metro for Sanitary Sewer.

Fire Department Comments

Recommend: Approve w/ Comments

Comments:

GCDF will be responding to the annexed areas. As property is developed all current fire code requirements will be required to include road widths, water supply, and hydrant locations
GCDF will continue to evaluate response data to ensure adequate coverage is provided.

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. The project site is currently undeveloped and would require tree removal for any future development. A full tree inventory per 19-5.2.2.A will be required with the site permit submittal and mitigation for tree removals must be provided.
2. Any trees intended to be saved must be protected with tree protection fencing per Sec. 19-5.2.2.F.
3. Street trees will be required along all public rights-of-way with any major site disturbance.
4. All plant selections in future plans must comply with Div. 19-4.10.



APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	SIMON TUOHY	Water Dagger, LLC
*Title:	FINANCIAL OFFICER	
*Address:		
*City, State:		
*Zip:		
*Phone:		
*Email:		

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) 013900-06-01800, -301, -300, -400, -500, -501, -700, -900, -1000, -1100, -1200, -1300, -1400, and 013900-05-00100, -200

*TOTAL ACREAGE 4.95

*CURRENT ZONING DESIGNATION (County) FRD, Flexible Review District

*PROPOSED ZONING DESIGNATION (City) RC-3, Community 3 District

TYPE OF ANNEXATION

*Please select one (1) type: ☒ 100% ☐ 75% ☐ 25%

For 100% and 75% Annexations, please Include the corresponding **Annexation Petition** with the application submittal.

INSTRUCTIONS

1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
2. Staff will review the application for "completeness" pursuant to **Section 19-6.2.1.B.3. Completeness Determination**. If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
3. Please refer to **Sections 19-6.1.3. Planning Commission** for additional information.
4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
5. **Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.**
6. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.

_____  ***APPLICANT SIGNATURE**
6/11/2025 _____ **DATE**

7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initial: 

*Signatures	
Applicant	
Date	6/11/25
Property Owner/Authorized Agent	
Date	6/11/25



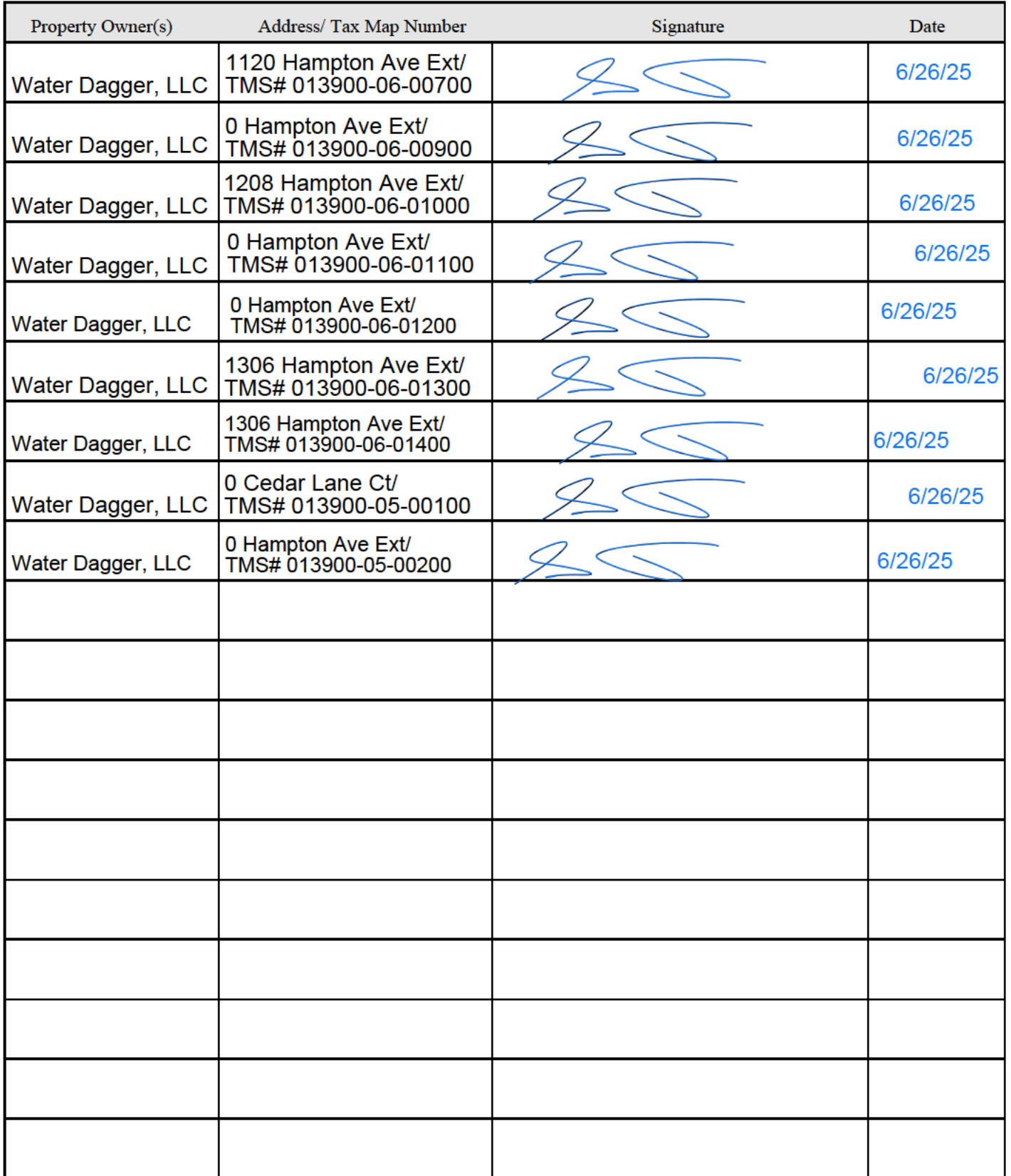
CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

100 Percent
PETITION FOR ANNEXATION

The person(s) whose signatures appear below are freeholders owning real estate in an area which is contiguous to the City of Greenville and which is proposed to be annexed into the City. In general, the area can be described as see below (address) and consisting of approximately 4.95 acres located on see below (tax map parcel). That area is identified more particularly by the tax map parcel number(s) provided below and the Annexation Plat which is being provided to the City of Greenville Planning Commission in conjunction with this petition. Any and all plats are incorporated by reference as a description of the area. By their signatures, the freeholder(s) petition(s) the City Council of the City of Greenville to annex the entire area shown as being annexed on the plats, and such additional acreage within the outer boundaries of the area as the owners through their agent may designate.

This petition is submitted under the provisions of S.C. Code ' 5-3-150, authorizing the City Council to annex an area when presented with a petition signed by all persons owning real property in the area proposed to be annexed. This petition and all signatures thereto shall be open for public inspection on demand at the City Hall, located at the address set forth above. All zoning processes will be in accordance with state statutes and city ordinance otherwise existing.

Property Owner(s)	Address/ Tax Map Number	Signature	Date
Water Dagger, LLC	8 Cedar Lane Court/ TMS# 013900-06-01800		6/26/25
Water Dagger, LLC	15 Cedar Lane Court/ TMS# 013900-06-00301		6/26/25
Water Dagger, LLC	104 Kelly Avenue/ TMS# 013900-06-00300		6/26/25
Water Dagger, LLC	106 Kelly Avenue/ TMS# 013900-06-00400		6/26/25
Water Dagger, LLC	0 Kelly Avenue/ TMS# 013900-06-00500		6/26/25
Water Dagger, LLC	110 Kelly Avenue/ TMS# 013900-06-00501		6/26/25





CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

CERTIFICATION OF PETITION SIGNATURE

I, Simon Tuohy, have this 26th day of June, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I have ownership interest by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

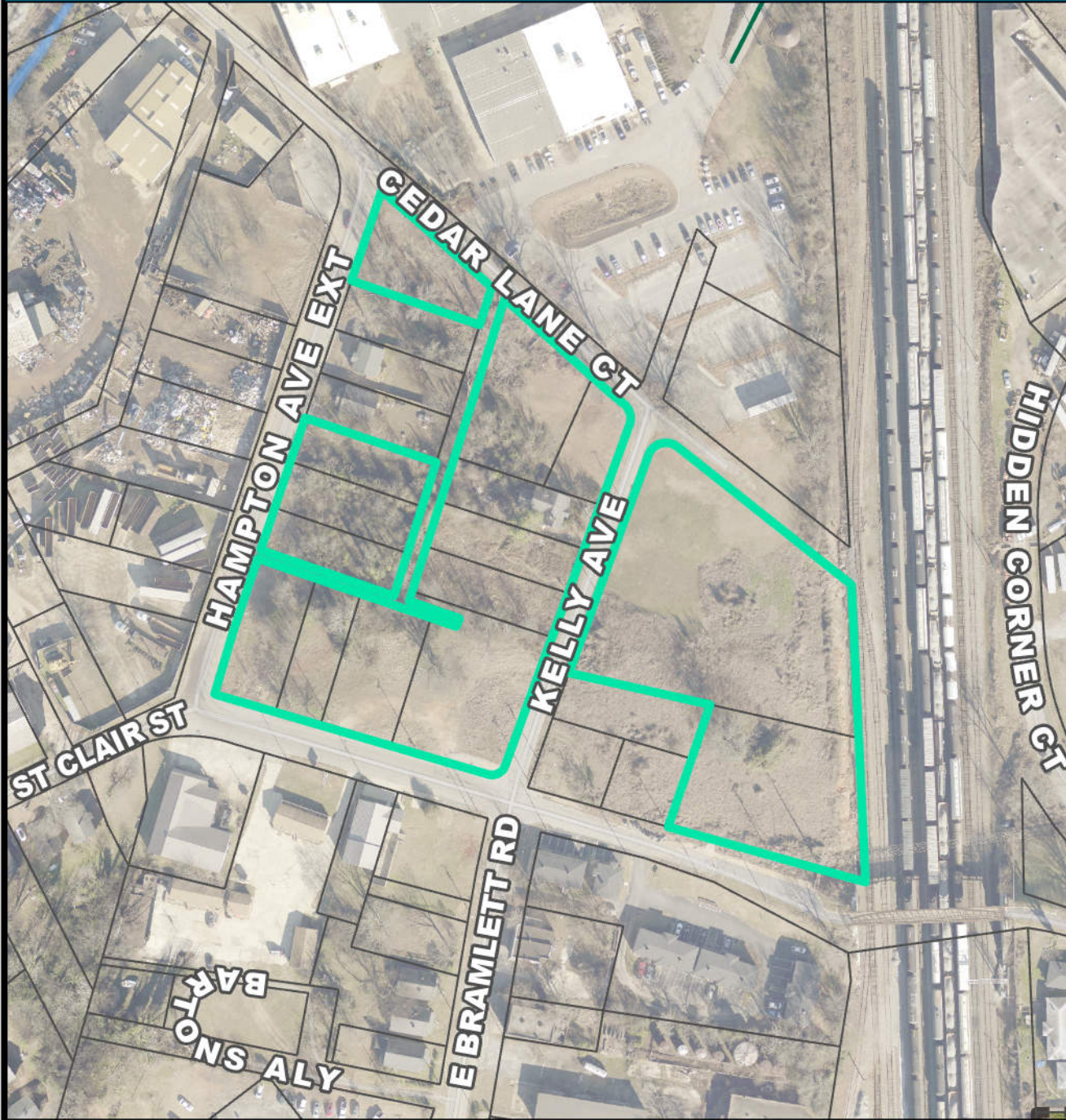
013900-06-01800, -301, -300, -400, -500, -501, -700, -900, -1000
-1100, -1200, -1300, -1400 and 013900-05-00100, -200

A handwritten signature in blue ink, appearing to be 'ST' or similar, written over a horizontal line.

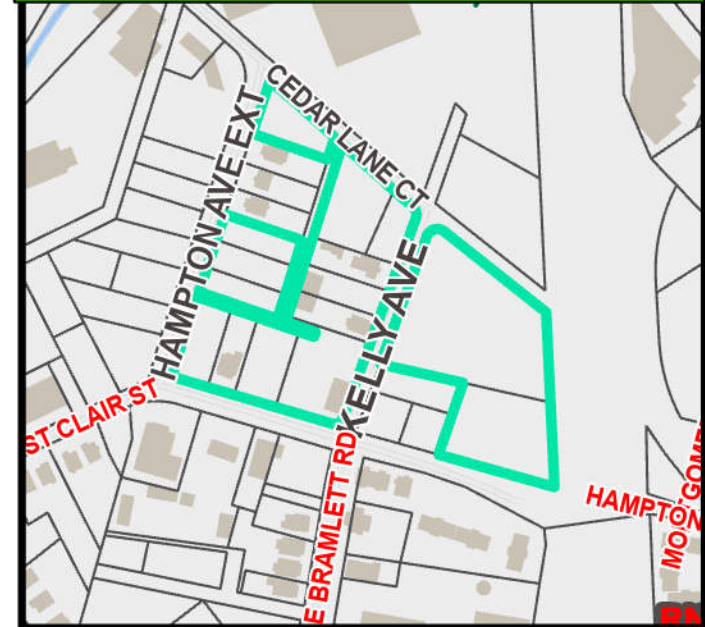
Signature

AX-22-2025 • HAMPTON AVE EXT, CEDAR LANE CT, AND KELLY AVE

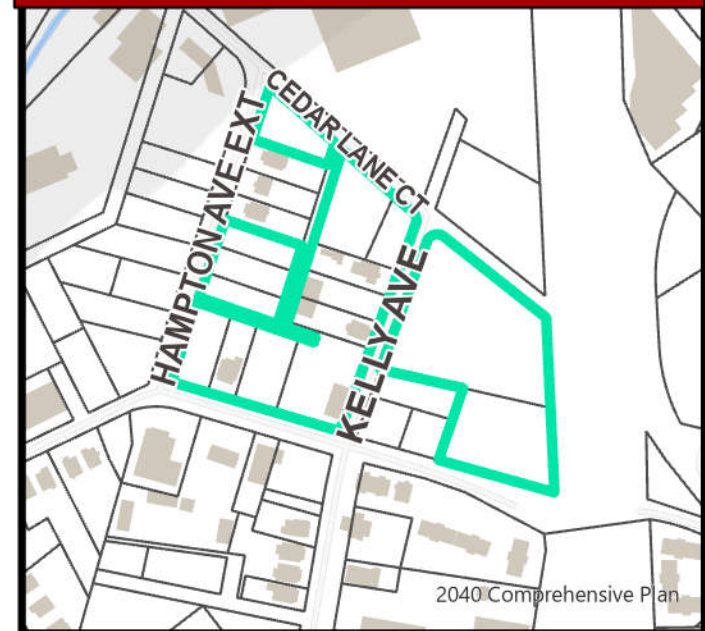
AERIAL VIEW



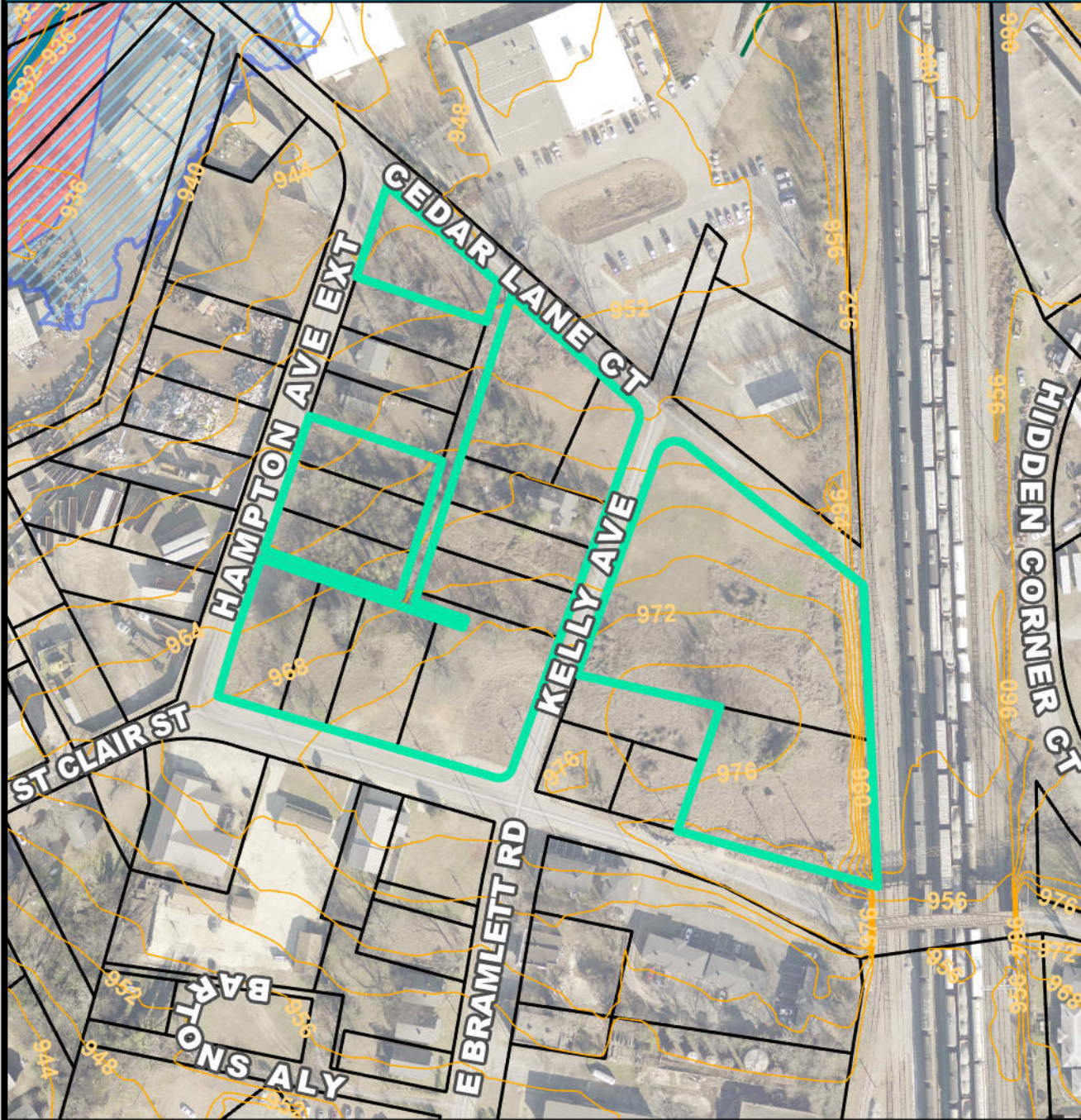
CURRENT ZONING



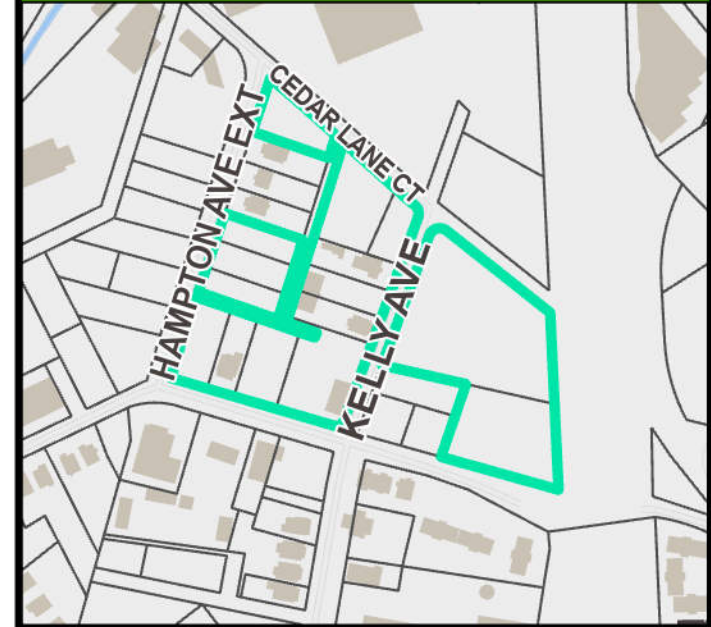
FUTURE LAND USE



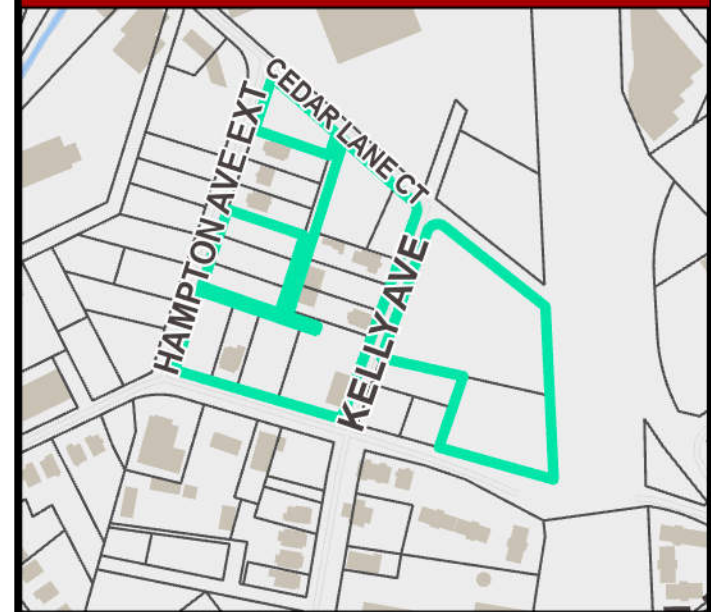
NATURAL / ENVIRONMENTAL FEATURES



SPECIAL EMPHASIS NEIGHBORHOODS



PRESERVATION OVERLAYS





ANNEXATION MAP

for Tax Map Number(s):

0139000500100, 0139000500200,
0139000600300, 0139000600301,
0139000600400, 0139000600500,
0139000600501, 0139000600700,
0139000600900, 0139000601000,
0139000601100, 0139000601200,
0139000601300, 0139000601400,
0139000601800,

into the City of Greenville

-  TotalAnnexationArea
-  Greenville City Limits
-  ContiguousAnnexation

Total Area of Annexation:

356,962.98 Sq.Ft.

Total Acreage of Annexation:

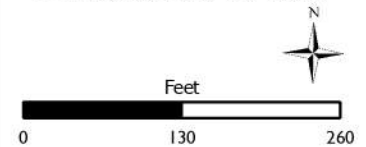
8.19 Acres

Existing County Zoning: **FRD**

Proposed City Zoning: **RC-3**

City Council District: **2**

File Number: **AX-22-2025**



This map is a product of the City of Greenville, SC and was compiled from plats and other available information. No actual field survey was performed. Reasonable efforts have been made to ensure the accuracy of this map. The City of Greenville expressly disclaims any responsibility or liability with regard to the use of this map.
Copyright: The City of Greenville, SC

AX-21-2025

REAL PROPERTY:
215,029.27 SQFT
4.94 ACRES

RIGHT OF WAY:
141,933.7 SQFT
3.26 ACRES

**UNINCORPORATED
GREENVILLE COUNTY**

CEDAR LANE CT

KELLY AVE

HIDDEN CORNER CT

MONTGOMERY AVE

E BRAMLETT RD

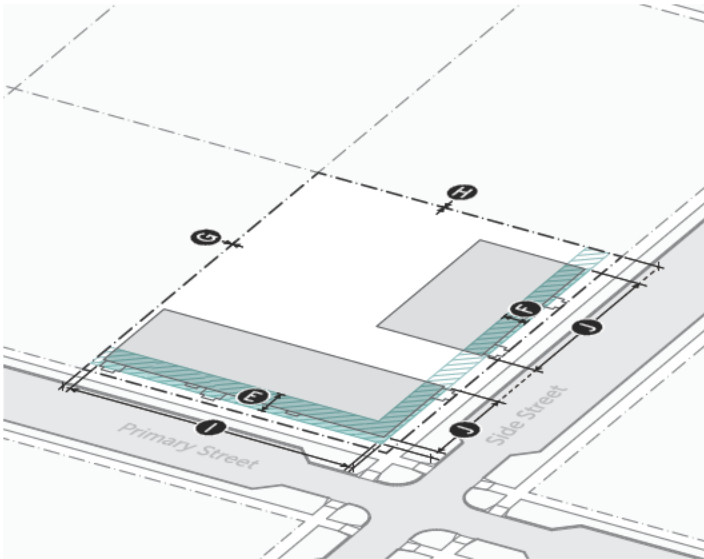
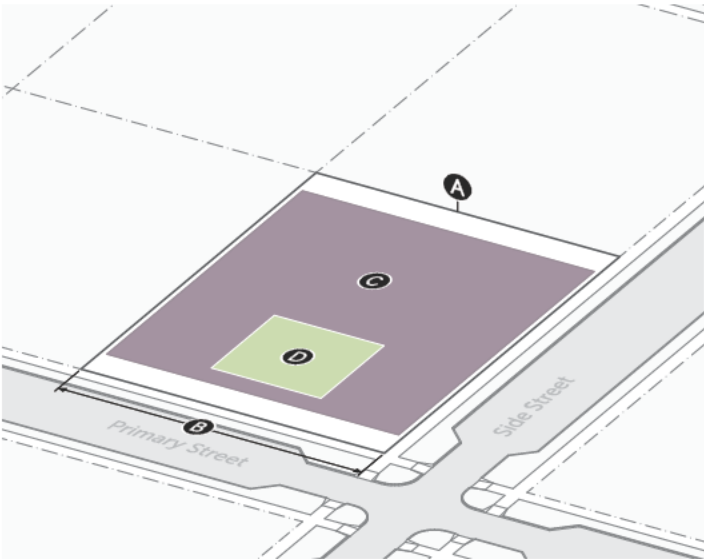
BARTONS ALY

HAMPTON AVE EXT

ST CLAIR ST

19-2.4.3. RC-3 COMMUNITY 3

A. SITE



1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	15'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	80%
D Outdoor amenity space (min)	10%

3. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	5' / 20'
F Side street lot line (min/max)	5' / 15'
G Side lot line (min)	0'
H Rear lot line (min)	0'
Alley lot line (min)	5'
4. TRANSITIONS	Sec. 2.11.6.
Transition type	Type A, B
5. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	75%
J Side street	45%
6. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	20'
Side street (min)	5'
7. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type E 6'

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Base	3 / 42'
Bonus	5 / 68'
2. MASSING	Sec. 2.11.11.
B Building width (max)	175'
C Active depth (min)	9'
3. GROUND STORY	Sec. 2.11.12.
D Story height (min)	10'
E Finish floor elevation (min/max)	0' / 5'



	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
F Ground story (min)	35%	30%
G Upper story (min)	20%	20%
H Blank wall width (max)	15'	25'
5. ENTRANCES	Sec. 2.11.14.	
I Street-facing entry spacing (max)	40'	60'
Entry feature	Yes	Yes

NOTE: Additional standards apply for lots within the Neighborhood Revitalization Overlay District.
[View the Neighborhood Revitalization Overlay District Map](#)
[View the Neighborhood Revitalization Overlay District Design Standards](#)

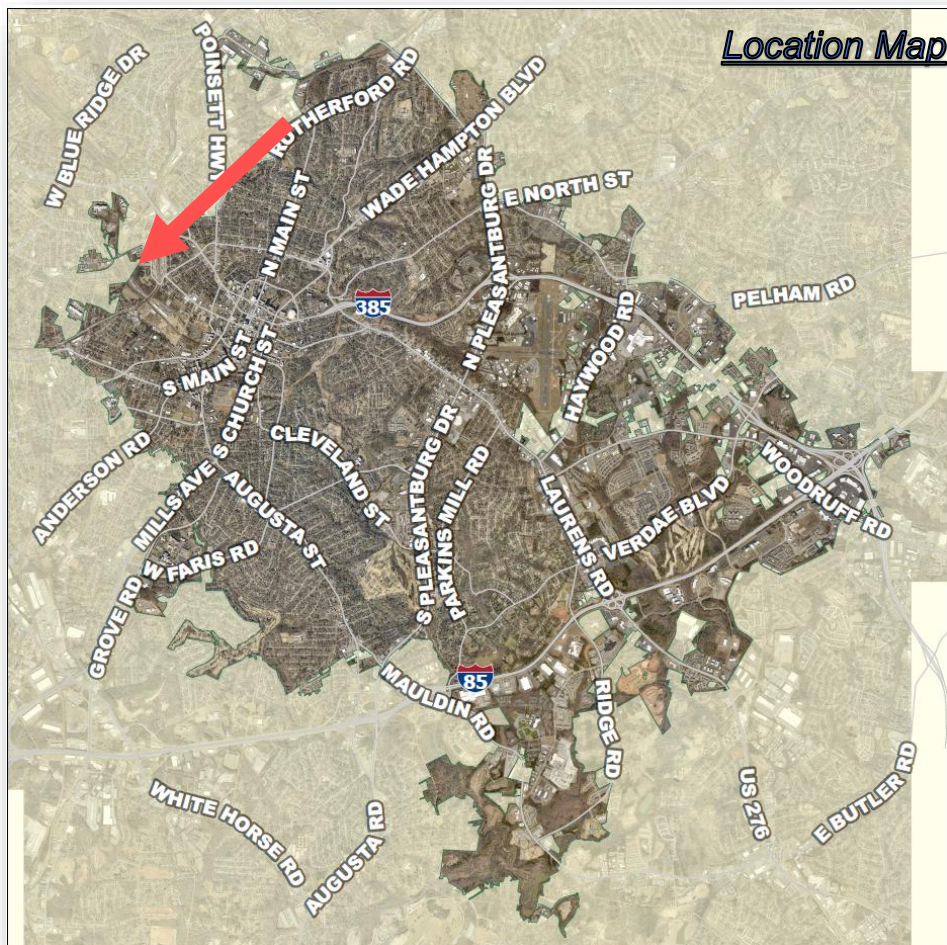


Planning Staff Report to
Greenville Planning Commission
for the August 7, 2025 Public Hearing

PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: AX-23-2025
Applicant(s): Greater Greenville Sanitation District
Property Owner(s): Greater Greenville Sanitation District
Property Location: 1501 W. Washington Street
Tax Map Number(s): portion of TM# 0025000401000
Property Area: 0.73 acre
Rezone Request: MX-3, Mixed Use 3 District
Recommendation: Approval



Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 Function, Powers, and Duties of the Planning Commission

Sec 19-1.1.3 *Purpose and Intent*
Sec.19-1.3 *Official Zoning Map*
Sec.19-2 *Zoning Districts*
Sec.19-6.1.3 *Planning Commission*
Sec.19-6.2.2 *Legislative Review*

Project Overview:

The applicant has petitioned the City of Greenville to annex a portion of property containing 0.73 acre of lot area into the Greenville city limits and to zone it MX-3, Mixed Use 3 District, under the Greenville Development Code. The subject property is currently split between the City and County by the 1932 City limit line. The property owner, Greater Greenville Sanitation District, intends to annex to have a consistent jurisdiction and zoning for the entire site.

Note: Although the property consists of four lots, all are included under one tax map number.

Land Use Review

The proposed zoning district for the annexation is MX-3, Mixed Use 3 District. The MX-3 District allows for high-density multifamily residential, with a mix of neighborhood-centric and locally utilized commercial uses. The district allows three stories by-right, with two further stories allowed with the Development Bonus. The Future Land Use Map (FLUM) provides the recommendation of Parks-Open Space for the property; however, this appears to be spillover from Unity Park and the wetlands west of the subject property.

LAND USE OF SURROUNDING PROPERTIES		
Location	Zoning	Current Use
Subject Property	R-6, Single-family residential district (County)	Government-run utility vehicle storage and maintenance facility
North	CM, Campus District	School
East	MX-3, Mixed Use 3 District	Government-run utility vehicle storage and maintenance facility
South	MX-3, Mixed Use 3 District	Government-run utility vehicle storage and maintenance facility
West	I-1, Industrial district (County); CM, Campus District	Vacant, school



Procedural Requirements:

Pre-Application and Development Meetings

The City and the applicant held a pre-application meeting on May 29, 2025.

Other Site Information:

While the subject portion of the property is not located in a Greenville County Special Emphasis Neighborhood, the portion of the property already within the City is in the Southernside Special Emphasis Neighborhood. The annexed portion of the parcel is proposed to be added to the Southernside neighborhood accordingly. The property is not located in a County Overlay District. The site is the current home to Greater Greenville Sanitation District's (GGSD) vehicle maintenance and trash truck storage facility.

There are two jurisdictional streams running within the adjacent rights-of-way to the site. Any redevelopment will require to meet all City stormwater control and stream buffer requirements.

Definitions:

Please see the attachments for the **MX-3 District**.

Staff Analysis:

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	N/A
--	------------

Comments: While the Future land Use Map (FLUM) does provide a recommendation for the property as Parks-Open Space, staff believes this is a spillover from Unity Park and the wetlands to the west of the site. Many other properties in the surrounding area are already developed or zoned for future development.

(b) Consistent with Applicable Plans and Studies.	YES
--	------------

Comments: The city has not conducted a plan or study that includes the subject property.

However, a privately funded plan conducted by the nearby Mountain View Baptist Church did recommend mixed-use development on the subject property. While this plan was not conducted or formally adopted by the City, staff did participate in the planning process. This plan was reviewed during the 2023 Citywide rezoning process and helped inform the zoning districts in this area.

(c) Compatible with Surrounding Uses.	YES
--	------------

Comments: The portion of the property currently within the City is already zoned MX-3. Future development is anticipated to be compatible with the surrounding uses.

(d) Provide logical and orderly Development Pattern.	YES
---	------------

Comment: The rezoning would provide zoning consistent to the portion of the property already within the City limits. The CM District to the north allows five stories by right. All future development must comply with the Greenville Development Code. The Code includes transition requirements between zoning districts and allows the Administrator to require transitions, when appropriate, to help protect established residential areas outside the city limits.

STAFF RECOMMENDATION:

APPROVE rezone to **MX-3, Mixed Use 3 District**.

Staff Comments

Planning Comments

Recommend: Approve

Comment: The portion of the property annexed will be incorporated into the Southernside Special Emphasis Neighborhood.

Addressing Comments

Recommend: Approve w/ Comments

Comments:

ANNEXATION REVIEW:

*1. NEW PARCEL

*2. ASSIGNED Address: 1501 West Washington Street

*3. PIN#: 0025000401000

AX-23-2025: 1501 W. Washington Street

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

*1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

Civil Engineer Comments

Recommend: Approve w/ Comments

Comments:

All unnamed paper alleyways in this annexation will be classified as "Alley" streets.

Fire Department Comments

Recommend: Approve w/ Comments

Comments:

GCDF will be responding to the annexed areas, as well as completing required business inspections. GCDF will update Knox boxes with business owners to ensure code compliance. With the continued annexation of property, GCDF will continue to evaluate response data to ensure adequate coverage is provided.

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. The project site is currently developed and would not likely require tree removal for any future development. A full tree inventory per 19-5.2.2.A will be required with the site permit submittal and mitigation for tree removals must be provided.
2. Any trees intended to be saved must be protected with tree protection fencing per Sec. 19-5.2.2.F.
3. Street trees will be required along the W. Washington St. and Walnut Dr. frontages with any major site disturbance.
4. All plant selections in future plans must comply with Div. 19-4.10.



city of greenville

APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	Greater Greenville Sanitation District	Greater Greenville Sanitation District
*Title:		
*Address:		
*City, State:		
*Zip:		
*Phone:		
*Email:		

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) portion of 002500-04-01000

*TOTAL ACREAGE 0.73

*CURRENT ZONING DESIGNATION (County) R-6, Single-family residential district

*PROPOSED ZONING DESIGNATION (City) MX-3, Mixed Use 3 District

TYPE OF ANNEXATION

*Please select one (1) type: ☒ 100% ☐ 75% ☐ 25%

For 100% and 75% Annexations, please Include the corresponding **Annexation Petition** with the application submittal.

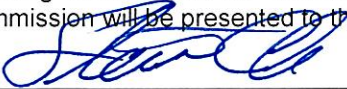
INSTRUCTIONS

1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
2. Staff will review the application for "completeness" pursuant to **Section 19-6.2.1.B.3. Completeness Determination**. If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
3. Please refer to **Sections 19-6.1.3. Planning Commission** for additional information.
4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
5. **Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.**
6. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.



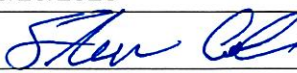
***APPLICANT SIGNATURE**

6/25/2025

DATE

7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initials: se

*Signatures	
Applicant	
Date	6/25/2025
Property Owner/Authorized Agent	
Date	6/25/2025



CITY OF GREENVILLE

206 South Main Street

P.O. Box 2207

Greenville, SC 29602

100 Percent

PETITION FOR ANNEXATION

The person(s) whose signatures appear below are freeholders owning real estate in an area which is contiguous to the City of Greenville and which is proposed to be annexed into the City. In general, the area can be described as 1501 W. Washington St (address) and consisting of approximately 0.73 acres located on see below (tax map parcel). That area is identified more particularly by the tax map parcel number(s) provided below and the Annexation Plat which is being provided to the City of Greenville Planning Commission in conjunction with this petition. Any and all plats are incorporated by reference as a description of the area. By their signatures, the freeholder(s) petition(s) the City Council of the City of Greenville to annex the entire area shown as being annexed on the plats, and such additional acreage within the outer boundaries of the area as the owners through their agent may designate.

This petition is submitted under the provisions of S.C. Code ' 5-3-150, authorizing the City Council to annex an area when presented with a petition signed by all persons owning real property in the area proposed to be annexed. This petition and all signatures thereto shall be open for public inspection on demand at the City Hall, located at the address set forth above. All zoning processes will be in accordance with state statutes and city ordinance otherwise existing.

Property Owner(s)	Address/ Tax Map Number	Signature	Date
Greater Greenville Sanitation District	1501 W. Washington Street/ TMS# 002500-04-01000		6/25/25



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

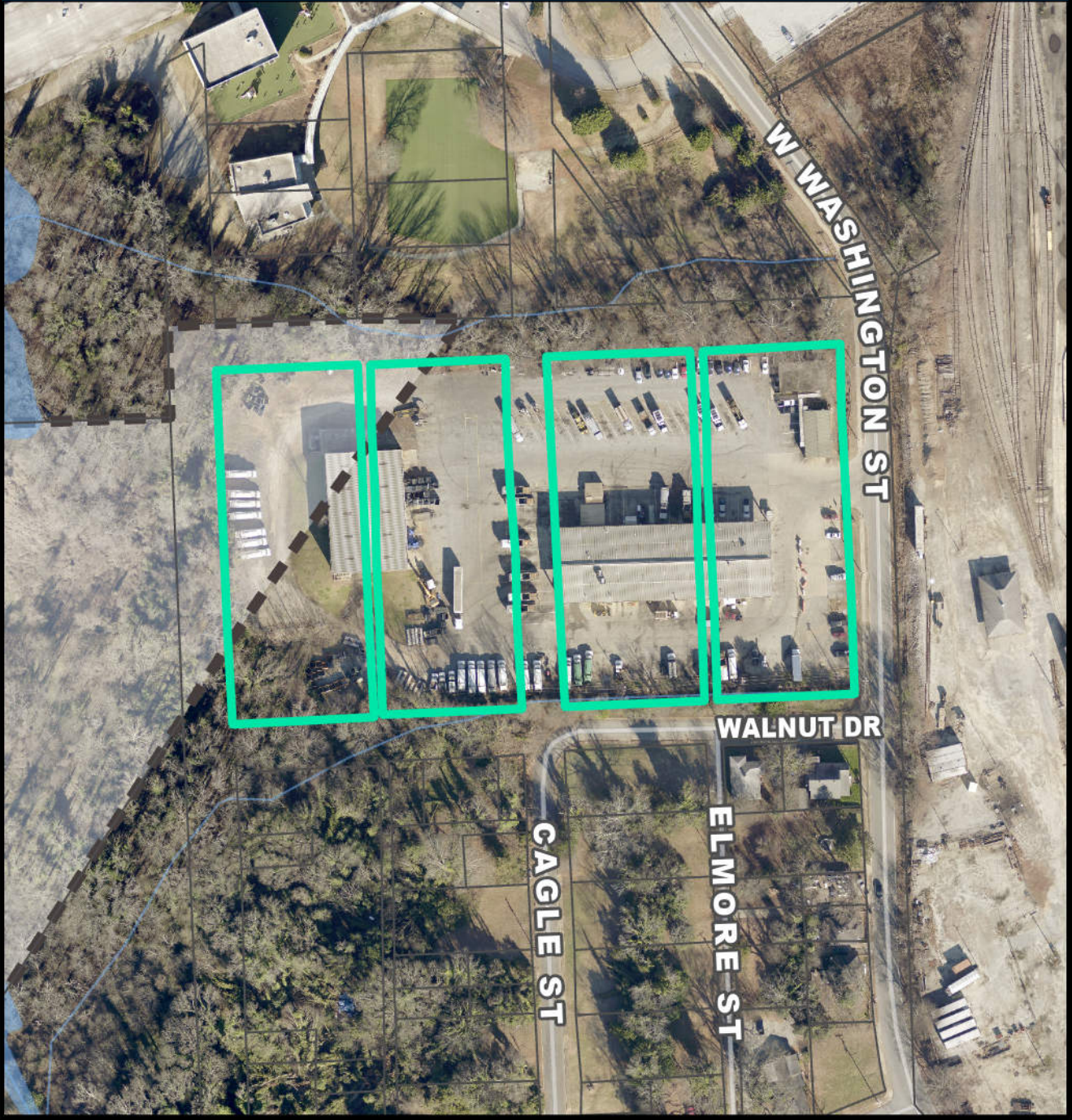
CERTIFICATION OF PETITION SIGNATURE

I, STEVE COLE, have this 25th day of JUNE, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I have ownership interest by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

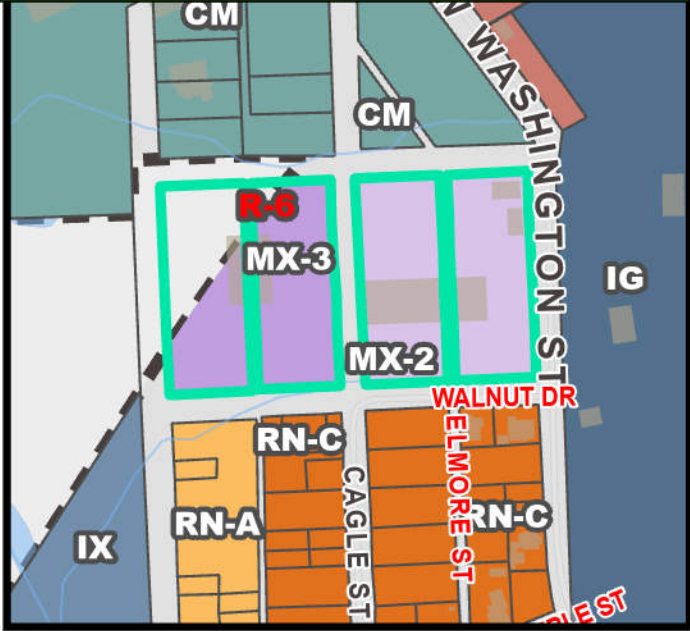
portion of TMS# 002500-04-01000

Signature

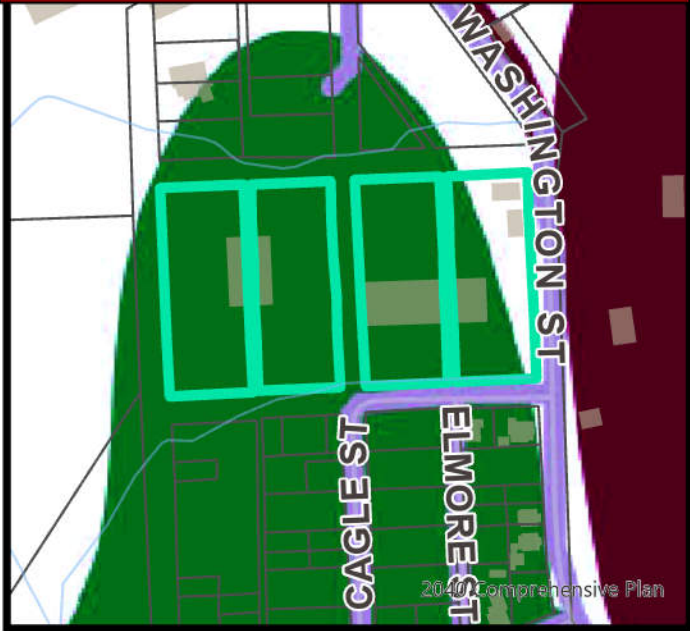
AERIAL VIEW



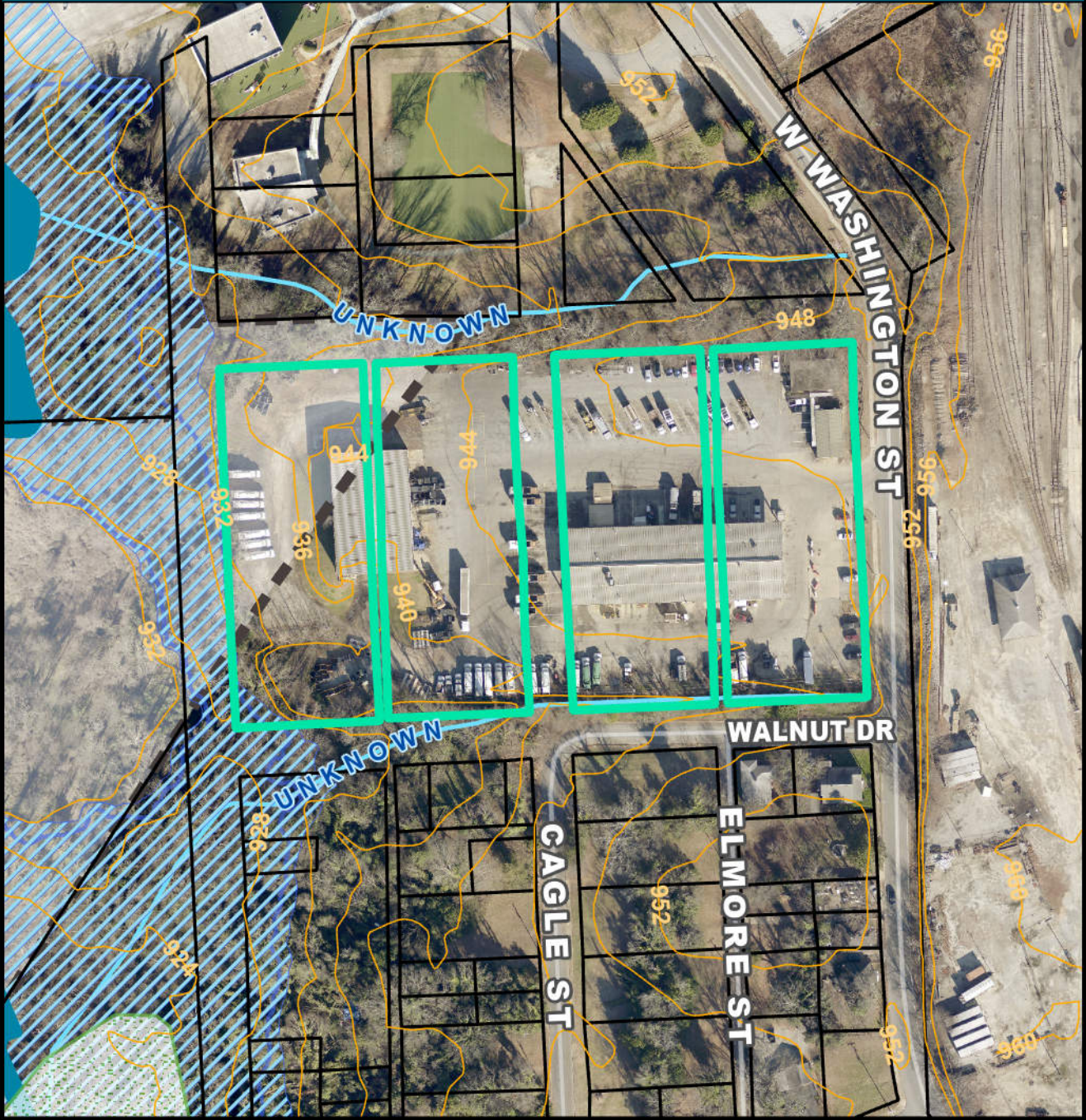
CURRENT ZONING



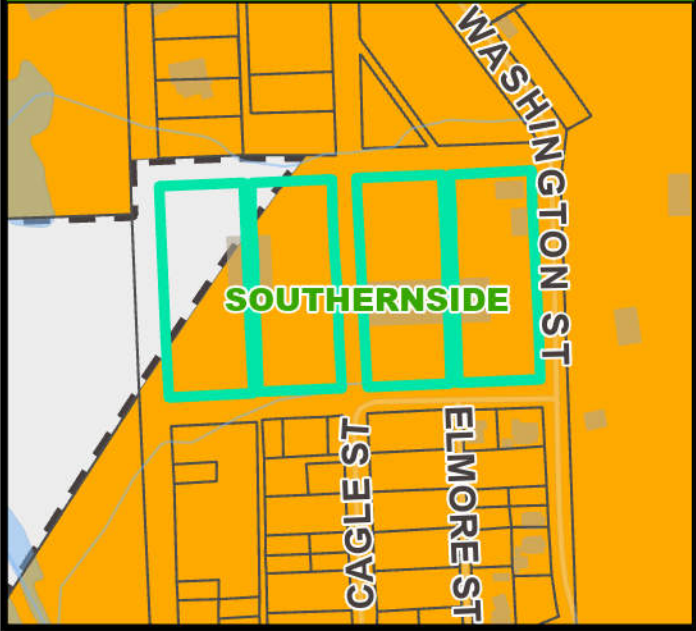
FUTURE LAND USE



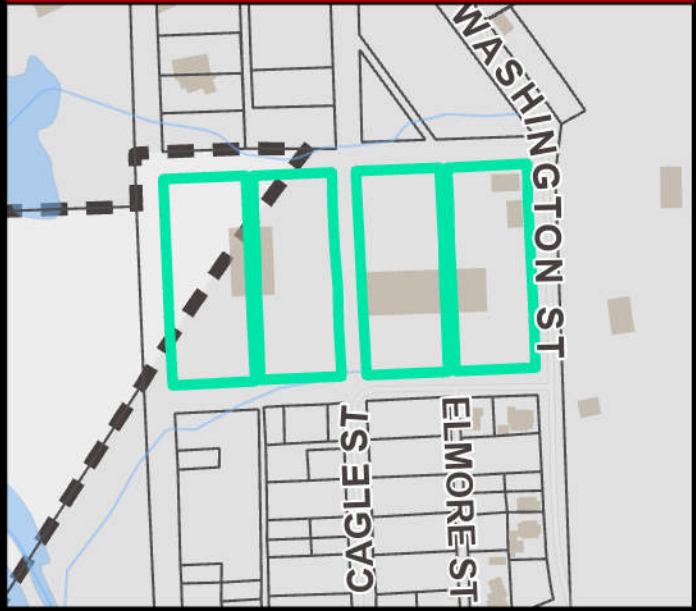
NATURAL / ENVIRONMENTAL FEATURES

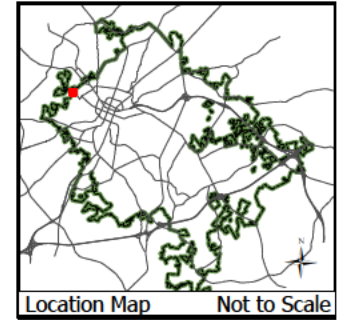


SPECIAL EMPHASIS NEIGHBORHOODS



PRESERVATION OVERLAYS



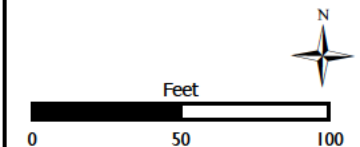


ANNEXATION MAP
for portions of Tax Map Number(s):
0025000401000
into the City of Greenville

-  TotalAnnexationArea
 Greenville City Limits

Total Area of Annexation:
64,293.97 Sq.ft.
1.48 Acres

Existing County Zoning: **R-6**
Proposed City Zoning: **MX-3**
City Council District: **2**
File Number: **AX-23-2025**



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Copyright: The City of Greenville, SC

0138000101000

0138000100900

0138000100800

0138000100300

RIGHT OF WAY:
32,615.35 SQFT
0.75 ACRES

REAL PROPERTY:
31,678.62 SQFT
0.73 ACRES

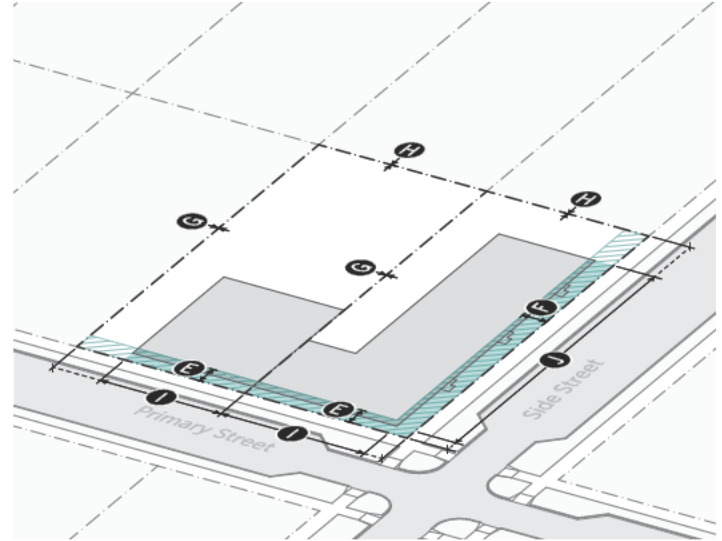
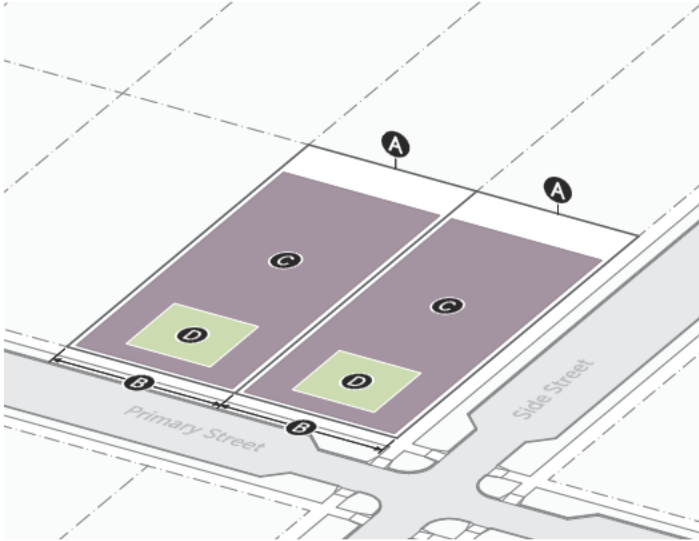
**UNINCORPORATED
GREENVILLE COUNTY**

0138000100100

0025000401000

19-2.5.3. MX-3 MIXED USE 3

A. SITE

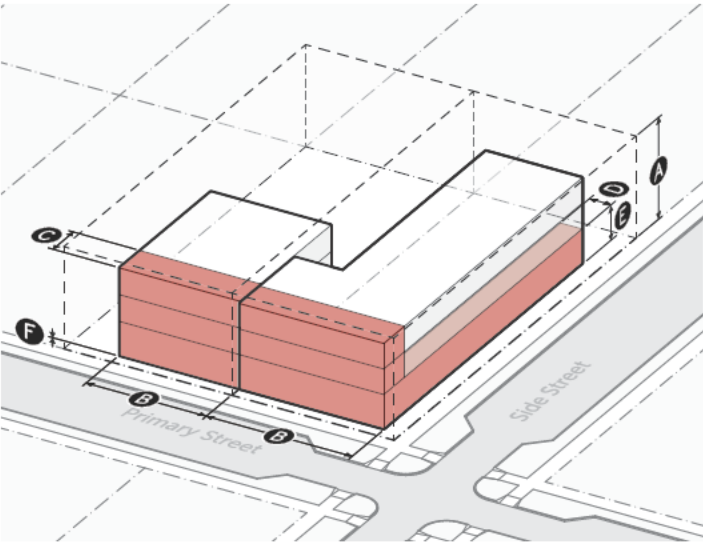


1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	15'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	80%
D Outdoor amenity space (min)	10%

3. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	0' / 10'
F Side street lot line (min/max)	0' / 10'
G Side lot line (min)	0'
H Rear lot line (min)	0'
Alley lot line (min)	5'
4. TRANSITIONS	Sec. 2.11.6.
Transition type	Type A, B
5. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	75%
J Side street	45%
6. PARKING SETBACKS	Sec. 2.11.8.
K Primary street (min)	20'
L Side street (min)	5'
7. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type F 8'

MX-3

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Base	3 / 42'
Bonus	5 / 68'
2. MASSING	Sec. 2.11.11.
B Building width (max)	275'
Active depth (min)	
C Primary street	15'
D Side street	9'
3. GROUND STORY	Sec. 2.11.12.
E Story height (min)	
Residential	10'
Nonresidential	14'
F Finish floor elevation (min/max)	
Residential	2' / 5'
Nonresidential	-2' / 2'



	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
G Ground story (min)		
Residential	35%	30%
Nonresidential	50%	30%
H Upper story (min)	20%	20%
I Blank wall width (max)	15'	25'
5. ENTRANCES	Sec. 2.11.14.	
J Street-facing entry spacing (max)	40'	60'
Entry feature	Yes	Yes

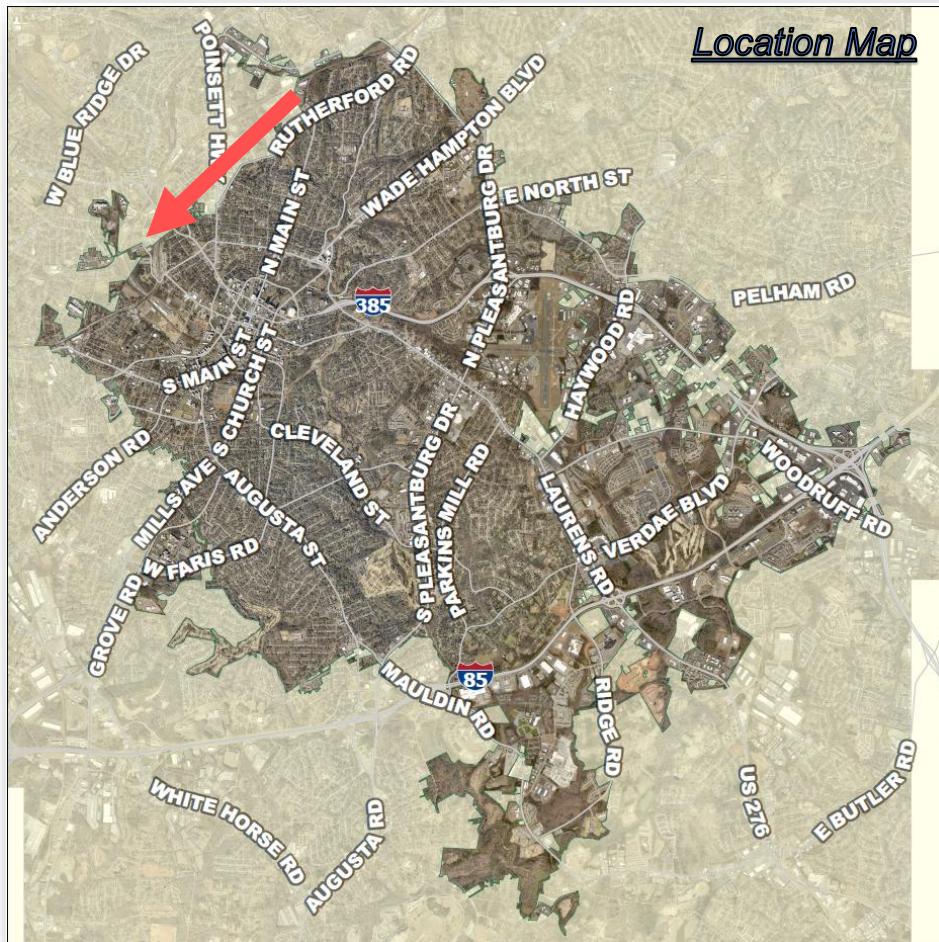


Planning Staff Report to
Greenville Planning Commission
for the August 7, 2025 Public Hearing

PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: AX-24-2025
Applicant(s): Greater Greenville Sanitation District
Property Owner(s): Greater Greenville Sanitation District
Property Location: W. Washington Street, E. Bramlett Street, and Bartons Alley
Tax Map Number(s): 0139001000300, 0139000900200, 0139000900300, 0139000900400,
0139000701500, 0139000701600, and 0139000701700
Property Area: 6.55 acres
Rezone Request: MX-3, Mixed Use 3 District
Recommendation: Approval



Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 Function, Powers, and Duties of the Planning Commission

Sec 19-1.1.3 Purpose and Intent

Sec.19-1.3 Official Zoning Map

Sec.19-2 Zoning Districts

Sec.19-6.1.3 Planning Commission

Sec.19-6.2.2 Legislative Review

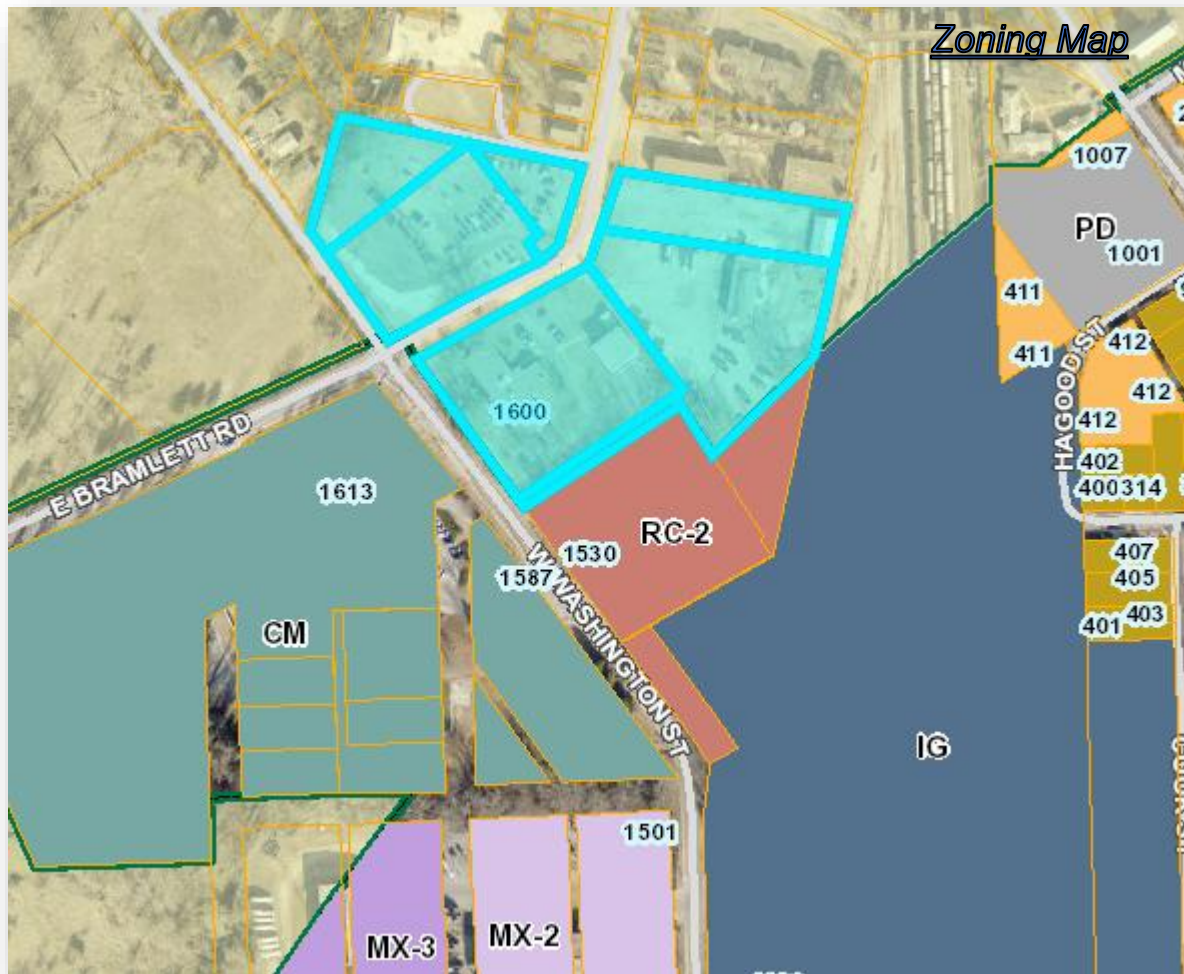
Project Overview:

The applicant has petitioned the City of Greenville to annex seven parcels of property totaling 6.55 acres of lot area into the Greenville city limits and to zone it MX-3, Mixed Use 3 District, under the Greenville Development Code. The property owner, Greater Greenville Sanitation District, desires to have a consistent jurisdiction for both their sites in the general vicinity along with consistent zoning.

Land Use Review

The proposed zoning district for the annexation is MX-3, Mixed Use 3 District. The MX-3 District allows for high-density multifamily residential, with a mix of neighborhood-centric and locally utilized commercial uses. The district allows three stories by-right, with two additional stories allowed with the Development Bonus. While the City's Future Land Use Map (FLUM) does not provide a recommendation for the subject property, the County Comprehensive Plan FLUM recommends "Mixed Employment Center." This designation's recommendation includes mixed-use buildings and multifamily residential with 8-30 dwellings per acre.

LAND USE OF SURROUNDING PROPERTIES		
Location	Zoning	Current Use
Subject Property	I-1, Industrial District, and R-6, Single-family residential district (County)	Government-run utility vehicle storage and maintenance
North	I-1, Industrial District, and R-6, Single-family residential district (County)	Industrial, Single-family detached residential, vacant
East	S-1, Services district (County); RC-2, Community 2 District	Railyard and vacant
South	I-1, Industrial district (County); CM, Campus District; and RC-2, Community 2 District	Vacant, school, parking lot
West	I-1, Industrial district, and R-7.5 Single-family residential district (County)	Vacant, multi-unit residential



Procedural Requirements:

Pre-Application and Development Meetings

The City and the applicant held a pre-application meeting on May 29, 2025.

Other Site Information:

The property is not located in a Greenville County Special Emphasis Neighborhood nor located in a County Overlay District. The site is the current home to Greater Greenville Sanitation District (GGSD).

Definitions:

Please see the attachments for the **MX-3 District**.

Staff Analysis:

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	N/A
--	------------

Comments: While the City's Future land Use Map (FLUM) does not provide a recommendation for the property, the County's Comprehensive Plan does recommend the area as "Mixed Employment Center." This recommendation includes mixed-use buildings and multifamily residential with 8-30 dwellings per acre. Staff finds the MX-3 request consistent in intent to this recommendation.



MEC

MIXED EMPLOYMENT CENTER

Place Type Characteristics

Mixed Employment Centers are a new type of office park or corporate campus-like developments geared toward meeting the needs of mid-to large businesses. Typical features include signature architectural elements and a campus-style development pattern that connects jobs to amenities and places of residence in a well-organized fashion.

Primary Uses	Advanced manufacturing, office, mixed-use buildings, civic/institutional facilities
Secondary Uses	Open space, neighborhood commercial, multi-family residential
Gross Density	8 to 30 dwellings per acre
Transportation	Auto oriented but walkable, transit/park-and-ride lots should be provided
Parking	Large surface parking on street parking, central parking garages should be encouraged
Open Space	Civic greens, courtyard greens

Exert from Plan Greenville County for "Mixed Employment Center"

(b) Consistent with Applicable Plans and Studies.	N/A
--	------------

Comments: The city has not conducted a plan or study that includes the subject property.

(c) Compatible with Surrounding Uses.	YES
--	------------

Comments: The area containing the subject property is largely a former industrial area. This area is redeveloping with mixed-use and higher-density residential developments. This redevelopment has been a result of both the Swamp Rabbit Trail's Green Line and Orange Line, both of which run through the area. In addition, there are plans to better connect the area to the Hampton-Pinckney and Southernside neighborhoods by the use of the Hampton Ave bridge. Staff finds that the existing redevelopment

AX-24-2025: W. Washington Street, E. Bramlett Street, and Bartons Alley

strategies and the regional multi-use pathways in the area make the MX-3 District compatible with the surrounding uses.

(d) Provide logical and orderly Development Pattern.	YES
---	------------

Comment: The subject property is adjacent to property zoned CM. The CM District to the south allows five stories by right. It is anticipated that future annexation requests in the area may propose a similar zoning designation as redevelopment occurs. All future development must comply with the Greenville Development Code. The code includes transition requirements between zoning districts and allows the Administrator to require transitions, when appropriate, to help protect established residential areas outside the city limits.

STAFF RECOMMENDATION:

APPROVE rezone to MX-3, Mixed Use 3 District.

Staff Comments

Planning Comments

Recommend: Approve

Addressing Comments

Recommend: Approve w/ Comments

Comments:

ANNEXATION REVIEW:

- *1. NEW PARCELS (Assigned Address):
 - 013900-07-01500 (1700-Block West Washington Street)
 - 013900-07-01600 (200-Block East Bramlett Road)
 - 013900-07-01700 (200-Block East Bramlett Road)
 - 013900-09-00200 (200-Block East Bramlett Road)
 - 013900-09-00300 (200-Block East Bramlett Road)
 - 013900-09-00400 (1600-Block West Washington Street)
 - 013900-10-00300 (1600 West Washington Street)

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

*1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

Civil Engineer Comments

Recommend: Approve w/ Comments

Comments:

W. Washington Street will be classified as a "District" street.
E. Bramlett Road will be classified as a "District" street.
Bartons Alley will be classified as an "Alley" street.

Environmental Engineer Comments

Recommend: Approve

AX-24-2025: W. Washington Street, E. Bramlett Street, and Bartons Alley

Comments:

*Area currently served by Metro for sanitary sewer.

Fire Department Comments

Recommend: Approve w/ Comments

Comments:

PZ -25-596 GCFD will be responding to the annexed areas, as well as completing required business inspections. GCFD will update Knox boxes with business owners to ensure code compliance. With the continued annexation of property, GCFD will continue to evaluate response data to ensure adequate coverage is provided.

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. The project site is currently developed and would not likely require tree removals for any future development. A full tree inventory per 19-5.2.2.A will be required with the site permit submittal and mitigation for tree removals must be provided.
2. Any trees intended to be saved must be protected with tree protection fencing per Sec. 19-5.2.2.F.
3. Street trees will be required along the W. Washington St. and E. Bramlett Rd. frontages with any major site disturbance.
4. All plant selections in future plans must comply with Div. 19-4.10.



city of greenville

APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

APPLICANT

PROPERTY OWNER

*Name:	Greater Greenville Sanitation District	Greater Greenville Sanitation District
*Title:		
*Address:		
*City, State:		
*Zip:		
*Phone:		
*Email:		

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) 013900-10-00300, 013900-09-00200, 013900-09-00300, 013900-09-00400, 013900-07-01500, 013900-07-01600, 013900-07-01700

*TOTAL ACREAGE 6.55

*CURRENT ZONING DESIGNATION (County) I-1, Industrial District; R-7.5, Single-family residential district

*PROPOSED ZONING DESIGNATION (City) MX-3, Mixed Use 3 District

TYPE OF ANNEXATION

*Please select one (1) type: ☒ 100% ☐ 75% ☐ 25%

For 100% and 75% Annexations, please Include the corresponding **Annexation Petition** with the application submittal.

INSTRUCTIONS

1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
2. Staff will review the application for "completeness" pursuant to **Section 19-6.2.1.B.3. Completeness Determination**. If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
3. Please refer to **Sections 19-6.1.3. Planning Commission** for additional information.
4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
5. **Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.**
6. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.



***APPLICANT SIGNATURE**

6/25/2025

DATE

7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initial: SC

*Signatures	
Applicant	
Date	6/25/2025
Property Owner/Authorized Agent	
Date	6/25/2025



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

**100 Percent
PETITION FOR ANNEXATION**

The person(s) whose signatures appear below are freeholders owning real estate in an area which is contiguous to the City of Greenville and which is proposed to be annexed into the City. In general, the area can be described as see below (address) and consisting of approximately 6.55 acres located on see below (tax map parcel). That area is identified more particularly by the tax map parcel number(s) provided below and the Annexation Plat which is being provided to the City of Greenville Planning Commission in conjunction with this petition. Any and all plats are incorporated by reference as a description of the area. By their signatures, the freeholder(s) petition(s) the City Council of the City of Greenville to annex the entire area shown as being annexed on the plats, and such additional acreage within the outer boundaries of the area as the owners through their agent may designate.

This petition is submitted under the provisions of S.C. Code ' 5-3-150, authorizing the City Council to annex an area when presented with a petition signed by all persons owning real property in the area proposed to be annexed. This petition and all signatures thereto shall be open for public inspection on demand at the City Hall, located at the address set forth above. All zoning processes will be in accordance with state statutes and city ordinance otherwise existing.

Property Owner(s)	Address/ Tax Map Number	Signature	Date
Greater Greenville Sanitation District	0 W. Washington Street/ 013900-09-00400		6-25-25
Greater Greenville Sanitation District	1600 W. Washington Street/ 013900-10-00300		6-25-25
Greater Greenville Sanitation District	315 E. Bramlett Road/ TMS# 013900-09-00300		6-25-25
Greater Greenville Sanitation District	0 E. Bramlett Road/ TMS# 013900-09-00200		6-25-25
Greater Greenville Sanitation District	0 Bartons Alley/ TMS# 013900-07-01500		6-25-25
Greater Greenville Sanitation District	0 E. Bramlett Road/ TMS# 013900-07-01600		6-25-25





CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

CERTIFICATION OF PETITION SIGNATURE

I, STEVE COLE, have this 25th day of JUNE, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I have ownership interest by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

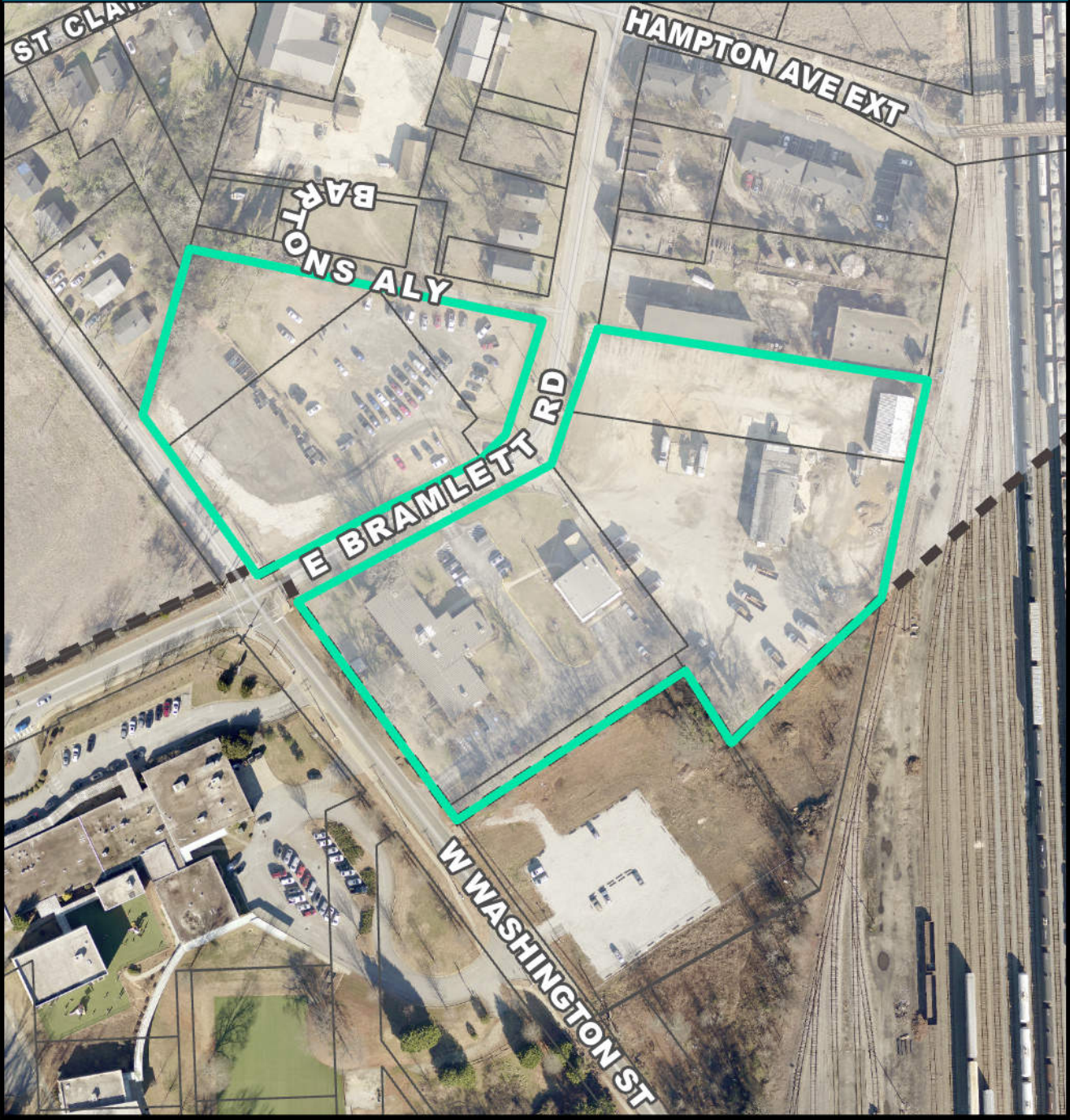
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013900-09-00400, 013900-07-01500, 013900-07-01600
013900-07-01700



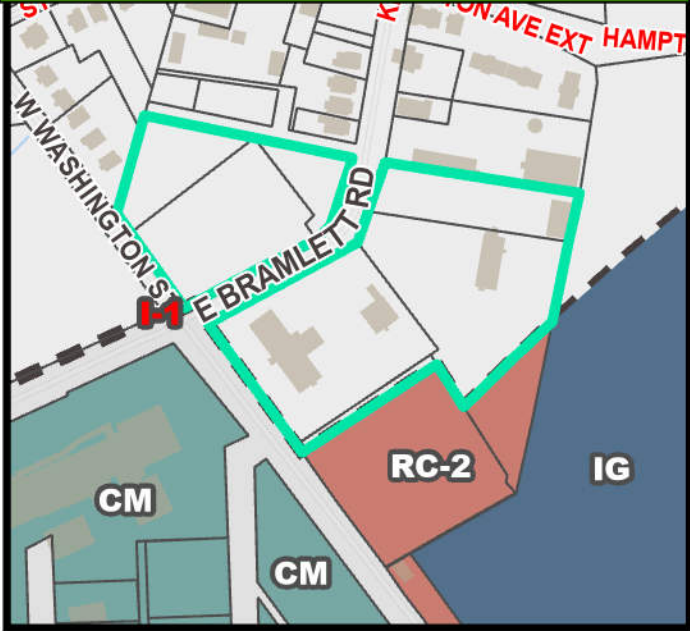
Signature

AX-24-2025 • W. WASHINGTON ST, E. BRAMLETT RD, AND BARTONS ALY

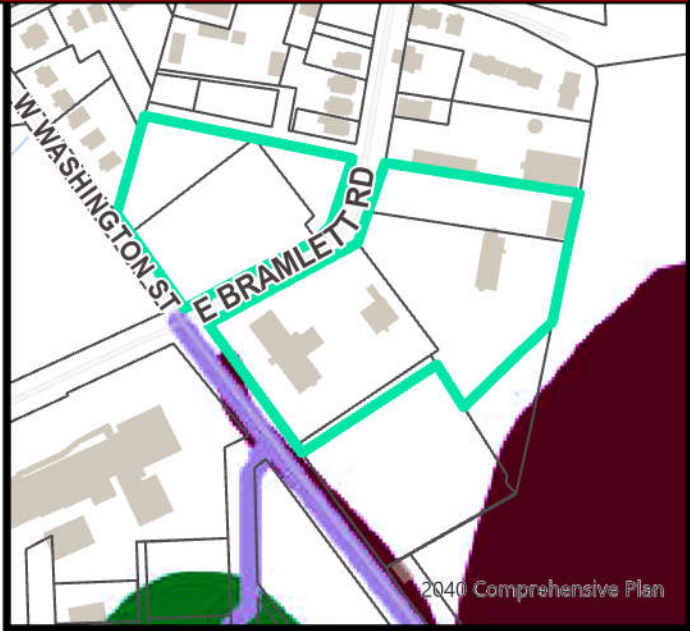
AERIAL VIEW



CURRENT ZONING



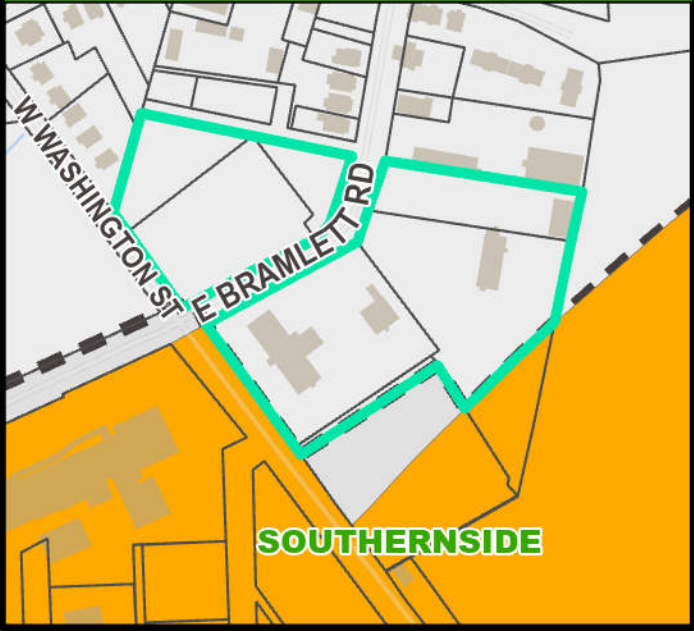
FUTURE LAND USE



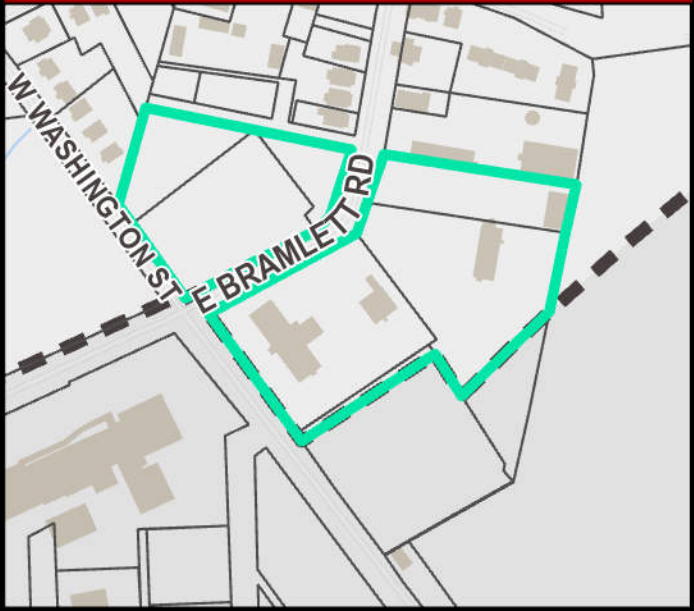
NATURAL / ENVIRONMENTAL FEATURES

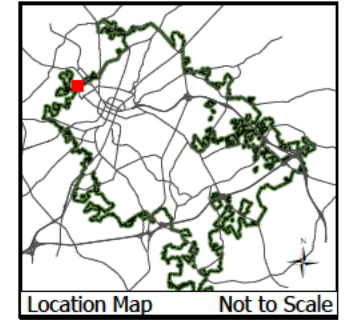


SPECIAL EMPHASIS NEIGHBORHOODS



PRESERVATION OVERLAYS





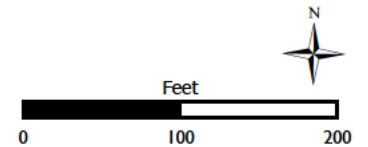
ANNEXATION MAP

for Tax Map Number(s):
0139000701500 0139000701600
0139000701700 0139000900200
0139000900300 0139000900400
0139001000300
into the City of Greenville

-  TotalAnnexationArea
-  Greenville City Limits

Total Area of Annexation:
325,292.67 Sq.Ft.
Total Acreage of Annexation:
7.47 Acres

Existing County Zoning: **R-7.5, I-1**
Proposed City Zoning: **MX-3**
City Council District: **2**
File Number: **AX-24-2025**



This map is a product of the City of Greenville, SC and was compiled from plats and other available information. No actual field survey was performed. Reasonable efforts have been made to ensure the accuracy of this map. The City of Greenville expressly disclaims any responsibility or liability with regard to the use of this map.
Copyright: The City of Greenville, SC

**UNINCORPORATED
GREENVILLE COUNTY**

0139000701200

0139000500200

0139000800300

0139000701300

0139000900101

BARTONS ALY

E BRAMLETT RD

0139000701500

0139000701700

0139000900200

0139000701600

RIGHT OF WAY:
39,994.09 SQFT
0.92 ACRES

REAL PROPERTY:
285,298.58 SQFT
6.55 ACRES

0139000900300

0140000300300

0139001000300

0139000900400

0025000100700

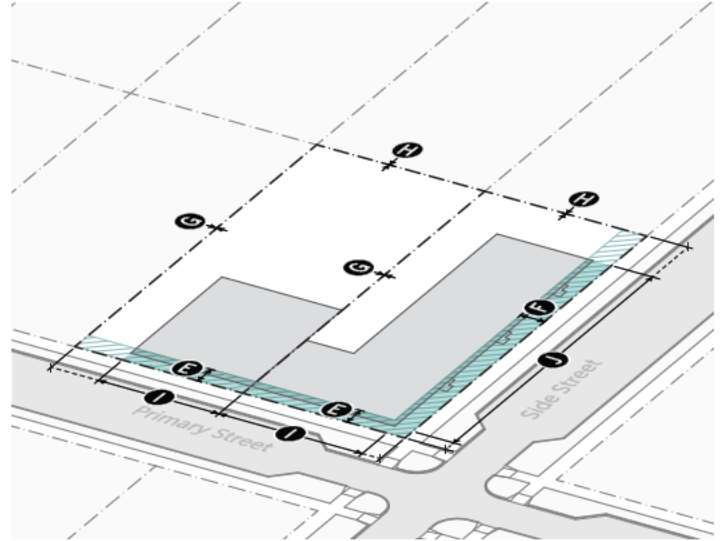
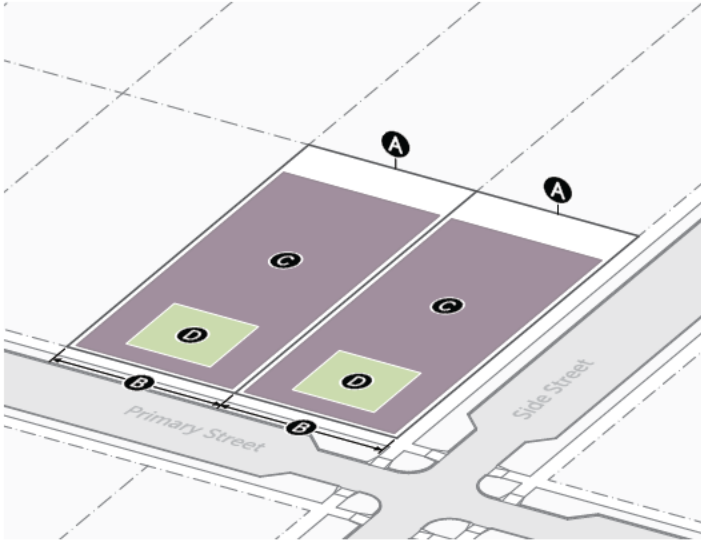
0138000100300

0025000100101

W WASHINGTON ST

19-2.5.3. MX-3 MIXED USE 3

A. SITE

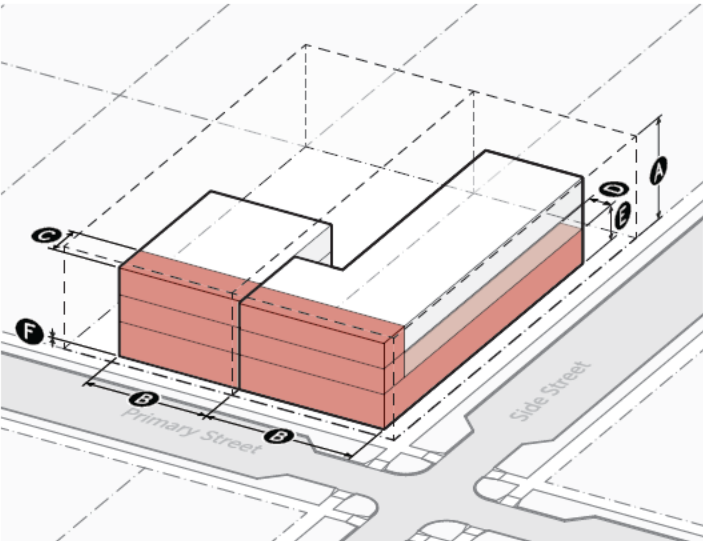


1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	15'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	80%
D Outdoor amenity space (min)	10%

3. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	0' / 10'
F Side street lot line (min/max)	0' / 10'
G Side lot line (min)	0'
H Rear lot line (min)	0'
Alley lot line (min)	5'
4. TRANSITIONS	Sec. 2.11.6.
Transition type	Type A, B
5. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	75%
J Side street	45%
6. PARKING SETBACKS	Sec. 2.11.8.
K Primary street (min)	20'
L Side street (min)	5'
7. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type F 8'

MX-3

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Base	3 / 42'
Bonus	5 / 68'
2. MASSING	Sec. 2.11.11.
B Building width (max)	275'
Active depth (min)	
C Primary street	15'
D Side street	9'
3. GROUND STORY	Sec. 2.11.12.
E Story height (min)	
Residential	10'
Nonresidential	14'
F Finish floor elevation (min/max)	
Residential	2' / 5'
Nonresidential	-2' / 2'



	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
G Ground story (min)		
Residential	35%	30%
Nonresidential	50%	30%
H Upper story (min)	20%	20%
I Blank wall width (max)	15'	25'
5. ENTRANCES	Sec. 2.11.14.	
J Street-facing entry spacing (max)	40'	60'
Entry feature	Yes	Yes



Applications involving rezoning require a public hearing.

[illegible]

Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 *Function, Powers, and Duties of the Planning Commission*

Sec 19-1.1.3 *Purpose and Intent*

Sec.19-1.3 *Official Zoning Map*

Sec.19-2 *Zoning Districts*

Sec.19-6.1.3 *Planning Commission*

Sec.19-6.2.2 *Legislative Review*

Project Overview:

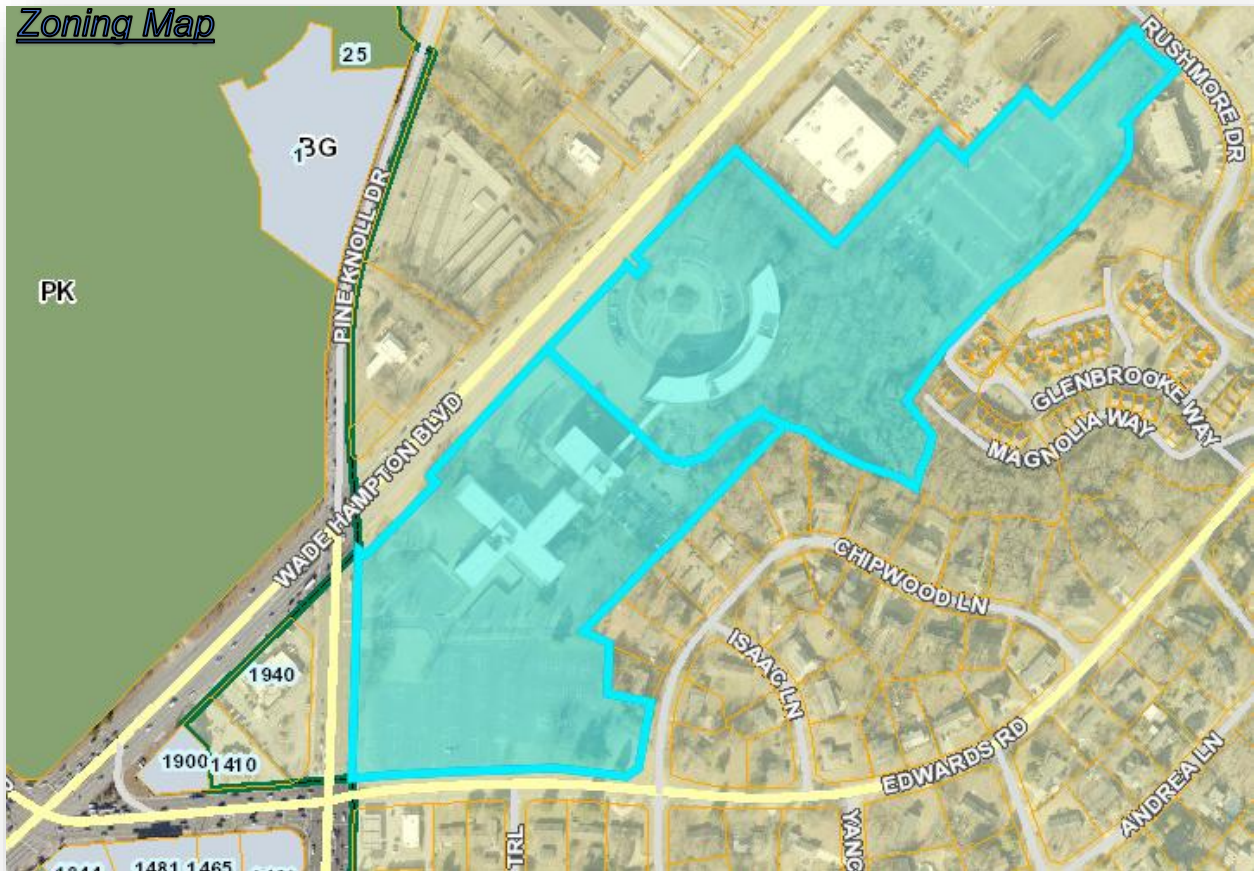
The applicant has petitioned the City of Greenville to annex two parcels of property totaling 28.66 acres of lot area into the Greenville city limits and to zone it a combination of MX-3, Mixed Use 3 District, and RC-3, Community 3 District, under the Greenville Development Code (see exhibits in application packet). The site was originally constructed for Liberty Life between the 1950s and 1980s. The property is proposed to be split zoned between MX-3 and RC-3. The newer office building at 2006 Wade Hampton Blvd is the current home of Concentrix.

Land Use Review

The proposed zoning districts for the annexation are the MX-3, Mixed Use 3 District, and the RC-3, Community 3 District. The MX-3 District allows for high-density multifamily residential, with a mix of neighborhood-specific and locally utilized commercial uses. The RC-3 District allows for high-density multifamily residential, with limited commercial uses. Both districts allow three stories by-right, with two further stories allowed with the Development Bonus.

The City's Future Land Use Map (FLUM) only provides a partial recommendation of Corridor Mixed Use and Areas Suitable for Missing Middle Housing for the site at the southern end. However, the County Comprehensive Plan's FLUM recommends "Mixed Use Corridor" for both parcels. This designation's recommendation includes mixed-use residential and commercial with 12-40 dwellings per acre.

LAND USE OF SURROUNDING PROPERTIES		
Location	Zoning	Current Use
Subject Property	C-2, Commercial district, and O-D, Office district (County)	Office
North	C-2, Commercial district, and S-1, Services district (County)	Banking, self-storage, fast food, commercial strip center, retail, gas station
East	C-2, Commercial district, R-M20, Multifamily residential district, and R-20, Single-family residential district (County)	Strip center, multifamily residential, single-family detached residential
South	C-2, Commercial district, and R-20, Single-family residential district (County)	Gas station and single-family detached residential
West	C-1, Commercial district (County); PK, Park District	Restaurant, bank, storage, and cemetery



Procedural Requirements:

Pre-Application and Development Meetings

The City and the applicant held a pre-application meeting on January 21, 2025.

Other Site Information:

The property is not located in a Greenville County Special Emphasis Neighborhood nor County Overlay District. The office complex was constructed for Liberty Life between the 1950s and 1980s until its purchase by Royal Bank of Canada (RBC). The proposed split-zoning is intended to provide the owner flexibility for the site. Approximately 2.54 acres of the site at the intersection of Edwards Road and Pine Knoll Drive is proposed to be zoned as MX-3 while the remaining 10.80 acres is proposed as RC-3. The 2006 Wade Hampton site is proposed to be entirely zoned as MX-3.

There is a jurisdictional stream that runs underneath the office building at 2006 Wade Hampton Blvd. Any potential development of the property in the future will be required to meet Greenville Development provisions.

Definitions:

Please see the attachments for the **MX-3 and RC-3 Districts**.

Staff Analysis:

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	YES
Comments: While the City's Future land Use Map (FLUM) only provides recommendations of Corridor Mixed Use and Areas Suitable for Missing Middle Housing for the southern portion of the property, the County's Comprehensive Plan does recommend both parcels as "Mixed Use Corridor". This designation's recommendation includes mixed-use residential and commercial with 12-40 dwellings per acre. Staff finds the MX-3 and RC-3 combination request consistent with the intent of both FLUMs.	



MUC

MIXED-USE CORRIDOR

Place Type Characteristics

Mixed-Use Corridors blend residential, commercial, or civic uses in one space, where those functions are, to some degree, physically and functionally integrated. An essential feature of this place type is the integration of multi-modal connections.

Primary Uses	Mixed-use residential and commercial, multi-family residential
Secondary Uses	Small-scale apartment buildings, civic and institutional facilities (e.g., places of worship)
Gross Density	12 to 40 dwellings per acre
Transportation	Wide right-of-way to allow multiple modes of transportation, interconnected street grid
Parking	On-street parking, off-street surface parking in rear of buildings
Open Space	Neighborhood parks, plazas

Excerpt from Plan Greenville County for "Mixed Use Corridor"

(b) Consistent with Applicable Plans and Studies.	N/A
Comments: The city has not conducted a plan or study that includes the subject property.	

(c) Compatible with Surrounding Uses.	YES
--	------------

Comments: The site has historically been used as office for nearly 75 years and has acted as its own campus, separate of the commercial strip centers, fast food restaurants, and big box stores on both Wade Hampton Blvd and N. Pleasantburg Dr. The uses allowed within the MX-3 and RC-3 District allows office space while introducing potential new uses to the site that may uplift the area and connect it better to other properties in the future.

(d) Provide logical and orderly Development Pattern.	YES
---	------------

Comment: The site has presented itself as an office campus for roughly 75 years, disjointed from other uses in the area. Staff finds the proposed zoning districts will provide a logical and orderly pattern that may enhance the campus. All future development must comply with the Greenville Development Code. The code includes transition requirements between zoning districts and allows the Administrator to require transitions, when appropriate, to help protect established residential areas even outside the city limits.

STAFF RECOMMENDATION:

APPROVE rezone to MX-3, Mixed Use 3 District, and RC-3, Community 3 District as provided in the Exhibits provided by the applicant.

Staff Comments

Planning Comments

Recommend: Approve

Addressing Comments

Recommend: Approve w/ Comments

Comments:

ANNEXATION REVIEW:

- *1. NEW PARCELS (Assigned Address):
 - 027600-02-00303 (2000 Wade Hampton Boulevard)
 - 027600-02-00107 (2006 Wade Hampton Boulevard)

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

*1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

Civil Engineer Comments

Recommend: Approve w/ Comments

Comments:

Chipwood Lane will be classified as a "Neighborhood" street.
Edwards Road will be classified as a "District" street.
Pine Knoll Drive and Wade Hampton Blvd will be classified as "Thoroughfare" streets.

Environmental Engineer Comments

Recommend: Approve

AX-25-2025: 2000 and 2006 Wade Hampton Blvd

Comments:

*Area currently served by Metro sewer.

Fire Department Comments

Recommend: Approve

Comments:

Wade Hampton Fire Contract Area

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. The project site is currently developed and tree removals are not anticipated for any future redevelopment. A full tree inventory per 19-5.2.2.A will be required with the site permit submittal and mitigation for tree removals must be provided.
2. Trees located in sensitive areas (stream buffers and wetlands) must be preserved and protected from all future redevelopment activity.
3. Any trees intended to be saved must be protected with tree protection fencing per Sec. 19-5.2.2.F.
4. Street trees will be required along all public rights-of-way with any major site disturbance.
5. All plant selections in future plans must comply with Div. 19-4.10.



city of greenville

APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	Andrew Butcher	Packard Wade, LLC/ Two Pop, LLC
*Title:	Director / Owner	
*Address:		
*City, State:		
*Zip:		
*Phone:		
*Email:		

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) 027600-02-00303, 027600-02-00107

*TOTAL ACREAGE 28.65

*CURRENT ZONING DESIGNATION (County) OD, Office and Institutional District, and C-2, Commercial District

*PROPOSED ZONING DESIGNATION (City) RC-3, Community 3 District, and MX-3, Mixed Use 3 District (see exhibit)

TYPE OF ANNEXATION

*Please select one (1) type: ☒ 100% ☐ 75% ☐ 25%

For 100% and 75% Annexations, please Include the corresponding **Annexation Petition** with the application submittal.

INSTRUCTIONS

1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
2. Staff will review the application for "completeness" pursuant to **Section 19-6.2.1.B.3. Completeness Determination**. If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
3. Please refer to **Sections 19-6.1.3. Planning Commission** for additional information.
4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
5. **Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.**
6. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.



6/25/25

*APPLICANT SIGNATURE
DATE

7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initial: 

*Signatures	
Applicant	
Date	6/25/25
Property Owner/Authorized Agent	
Date	6/25/2025



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

100 Percent
PETITION FOR ANNEXATION

The person(s) whose signatures appear below are freeholders owning real estate in an area which is contiguous to the City of Greenville and which is proposed to be annexed into the City. In general, the area can be described as see below (address) and consisting of approximately 28.65 acres located on see below (tax map parcel). That area is identified more particularly by the tax map parcel number(s) provided below and the Annexation Plat which is being provided to the City of Greenville Planning Commission in conjunction with this petition. Any and all plats are incorporated by reference as a description of the area. By their signatures, the freeholder(s) petition(s) the City Council of the City of Greenville to annex the entire area shown as being annexed on the plats, and such additional acreage within the outer boundaries of the area as the owners through their agent may designate.

This petition is submitted under the provisions of S.C. Code ' 5-3-150, authorizing the City Council to annex an area when presented with a petition signed by all persons owning real property in the area proposed to be annexed. This petition and all signatures thereto shall be open for public inspection on demand at the City Hall, located at the address set forth above. All zoning processes will be in accordance with state statutes and city ordinance otherwise existing.

Property Owner(s)	Address/ Tax Map Number	Signature	Date
Packard Wade, LLC	2000 Wade Hampton Blvd/ TMS# 027600-02-00303		6/25/2025
Two Pop, LLC	2006 Wade Hampton Blvd/ TMS# 027600-02-00107		6/25/2025



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

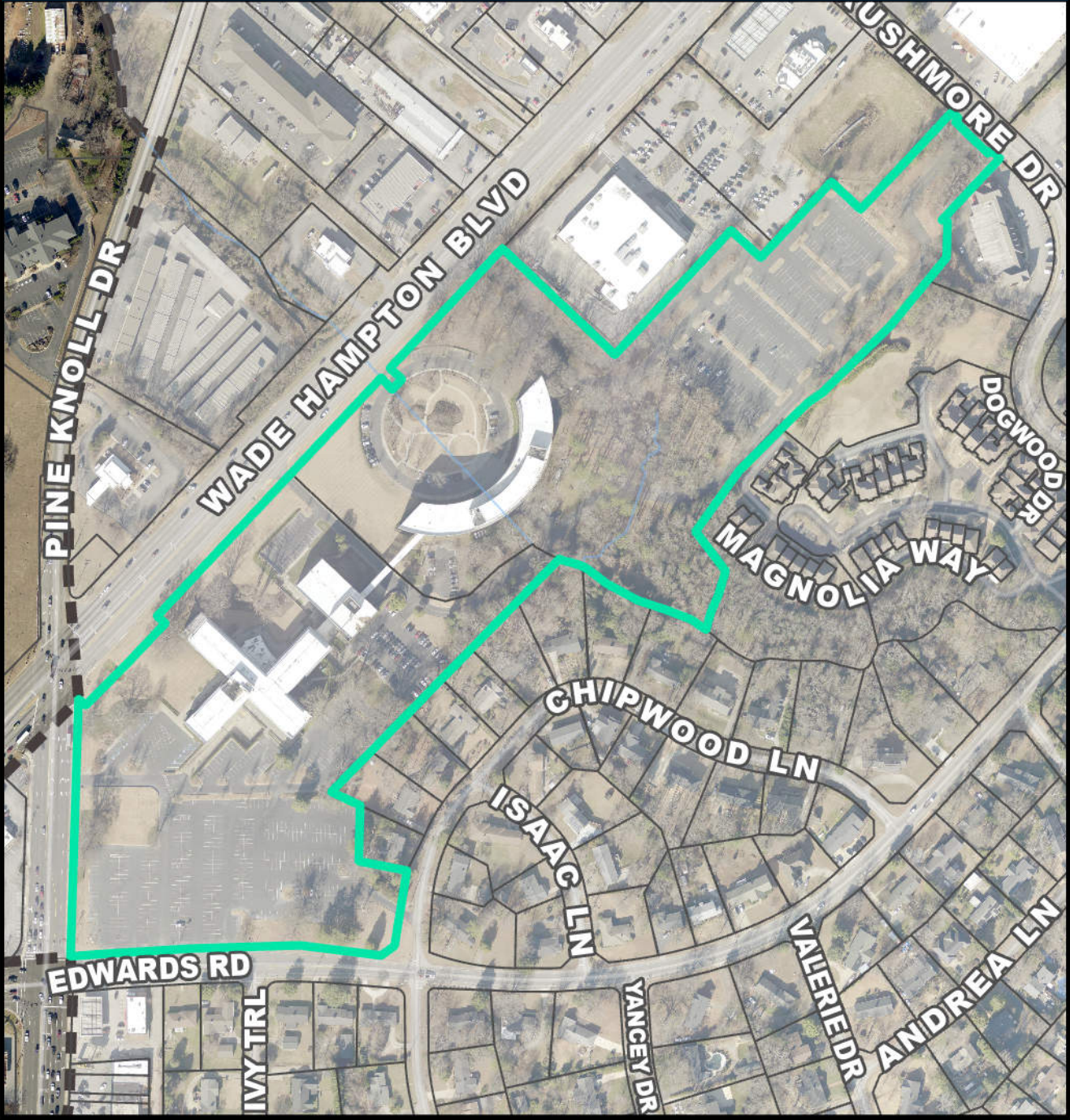
CERTIFICATION OF PETITION SIGNATURE

I, Andrew Butcher, have this 25 day of June, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I have ownership interest by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

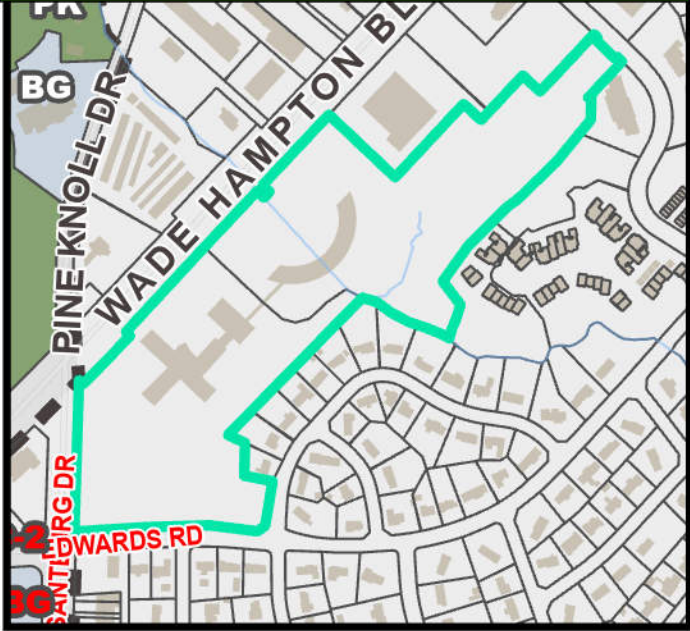
027600-02-00303, 027600-02-00107


Signature

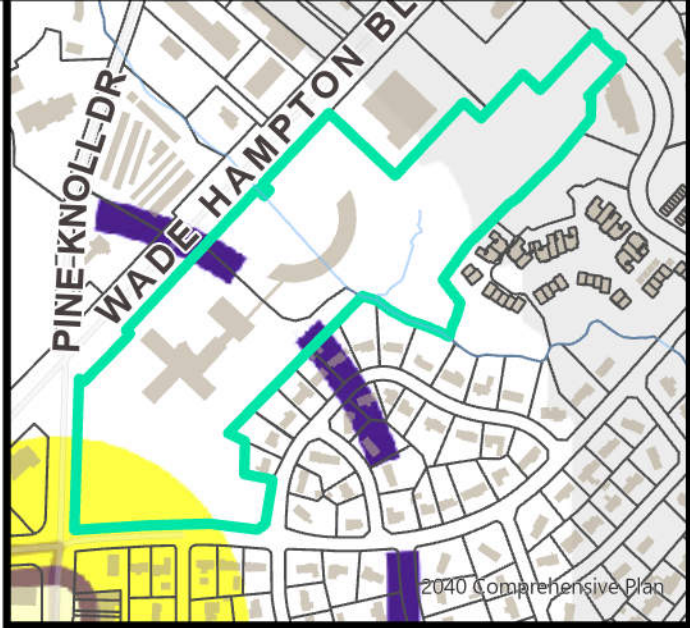
AERIAL VIEW



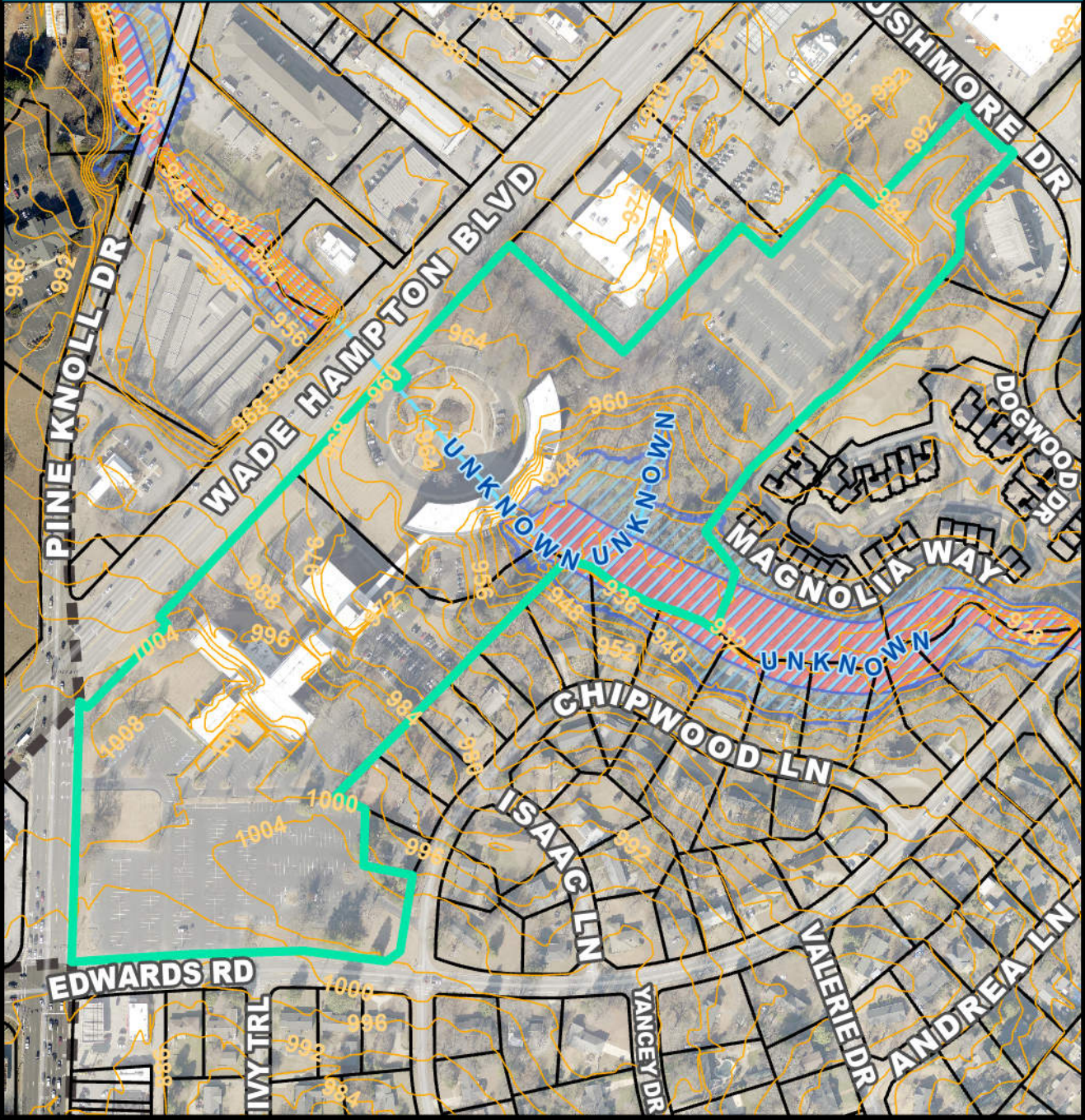
CURRENT ZONING



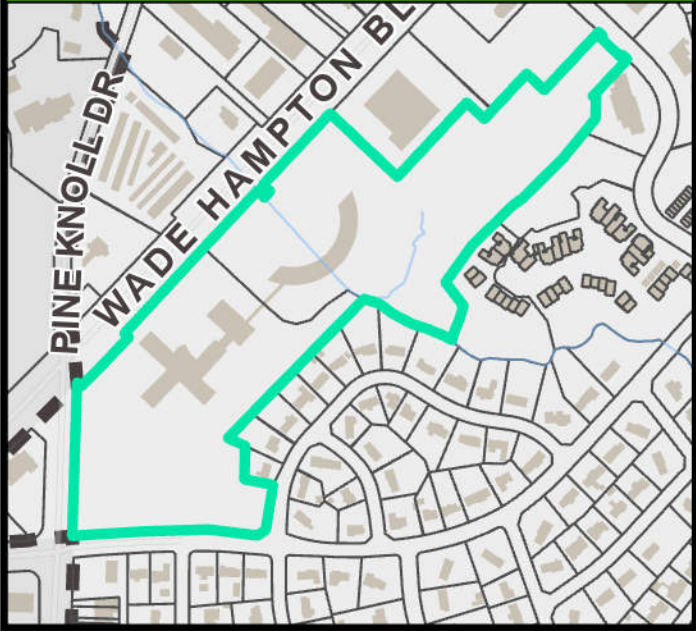
FUTURE LAND USE



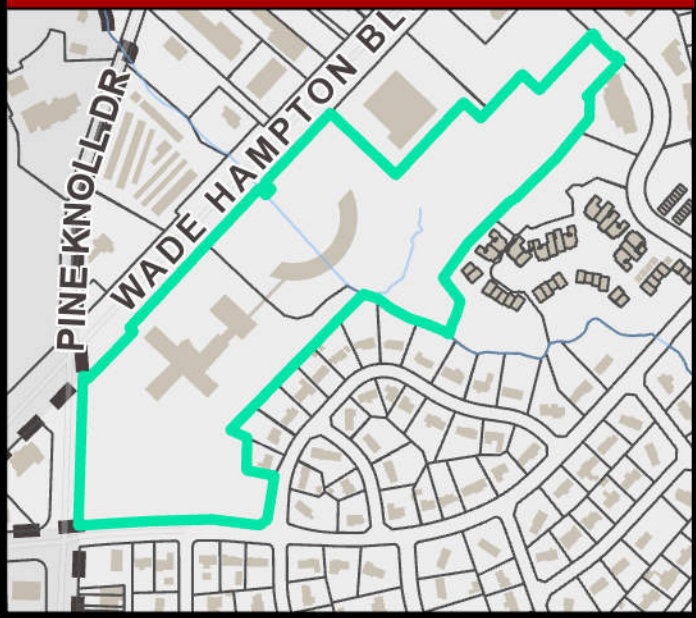
NATURAL / ENVIRONMENTAL FEATURES



SPECIAL EMPHASIS NEIGHBORHOODS



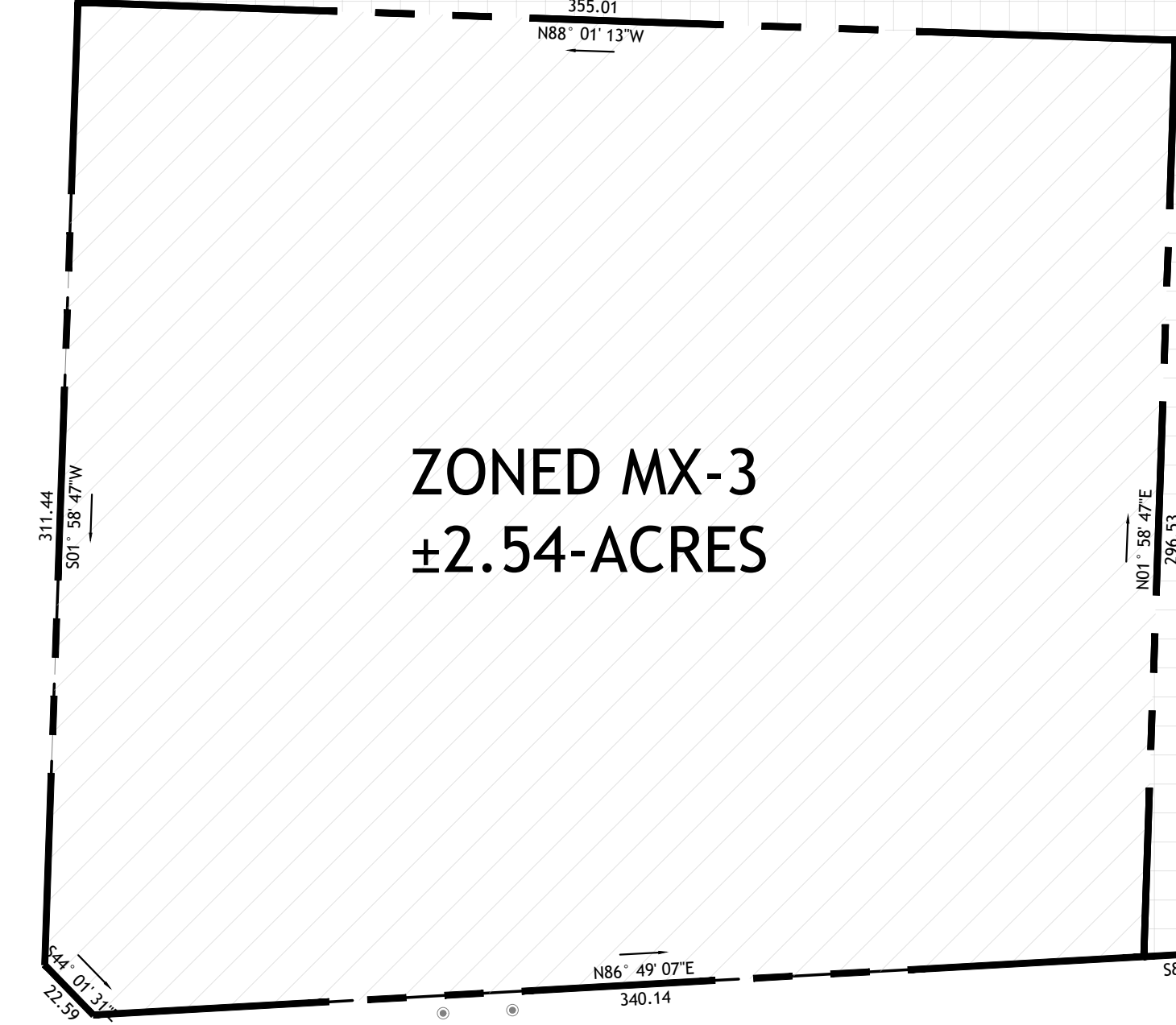
PRESERVATION OVERLAYS



SITE DATA	
TAX MAP #:	0276000200303
SITE AREA:	±13.34 ACRES
JURISDICTION:	GREENVILLE COUNTY
PROPOSED JURISDICTION:	CITY OF GREENVILLE
CURRENT ZONING:	C-2 & O-D (SOUTHEAST)
PROPOSED ZONING:	BG (BUSINESS GENERAL)
SETBACKS:	
BG ZONING:	PRIMARY STREET- 5' (MIN) 20' (MAX) SIDE STREET- 5' (MIN) 20' (MAX) SIDE LOT- 0' REAR LOT- 0' ALLEY LOT- 5'
MAXIMUM HEIGHT:	42' (BG ZONING)
BUFFERS/SCREENING:	20' BUFFER FROM ABUTTING R-20 ZONE MODERATE SCREENING
PARKING MAX (RETAIL):	1 SPACE PER 500 SF
PARKING MIN (RETAIL):	1 SPACE PER 250 SF
BICYCLE PARKING:	1 SHORT-TERM SPACE PER 10 UNITS 1 LONG-TERM SPACE PER UNIT
BUILDING COVERAGE:	80% (MAX)
OUTDOOR AMENITY SPACE:	10% (MIN)
ACREAGE:	
ROAD ROW:	±1.41 ACRES
TOTAL TOWNHOME:	±8.27 ACRES
C-STORE:	±1.79 ACRES
QSR A:	±1.08 ACRES
QSR B:	±0.95 ACRES
TOWNHOME UNITS:	±78 UNITS

LEGEND	
---	PROPERTY LINE
---	ADJOINER PROPERTY LINE
-.-.-	EASEMENT LINE
---SB---	STREAM BANK
---WB---	WETLAND BUFFER
---LC---	LIMITS OF CONSTRUCTION/DISTURBANCE
---1000---	EXISTING CONTOUR
---(1000)---	PROPOSED CONTOUR
⊙	WATER MANHOLE
⊙	DRAINAGE MANHOLE (EXISTING)
⊙	DRAINAGE MANHOLE (PROPOSED)
⊙	CATCH BASIN (EXISTING)
⊙	CATCH BASIN (PROPOSED)
⊙	HEADWALL (PROPOSED)
⊙	FLARED END PIPE (PROPOSED)
⊙	STORM DRAINAGE PIPE (EXISTING)
⊙	STORM DRAINAGE PIPE (PROPOSED)
⊙	SANITARY SEWER LINE (EXISTING)
⊙	SANITARY SEWER LINE (PROPOSED)
⊙	SANITARY SEWER MANHOLE (EXISTING)
⊙	SANITARY SEWER MANHOLE (PROPOSED)
⊙	WATER LINE (EXISTING)
⊙	WATER LINE (PROPOSED)
⊙	GAS LINE (EXISTING)
⊙	GAS LINE (PROPOSED)
⊙	UNDERGROUND TELEPHONE
⊙	UNDERGROUND FIBER OPTIC LINE (EXISTING)
⊙	UNDERGROUND FIBER OPTIC LINE (PROPOSED)
⊙	UNDERGROUND ELECTRIC (EXISTING)
⊙	UNDERGROUND ELECTRIC (PROPOSED)
⊙	OVERHEAD POWER (EXISTING)
⊙	OVERHEAD POWER (PROPOSED)
⊙	WATER METER
⊙	WATER VALVE
⊙	HYDRANT (EXISTING)
⊙	HYDRANT (PROPOSED)
⊙	LIGHT POLE (EXISTING)
⊙	UTILITY POLE (EXISTING)
⊙	TRAFFIC SIGNAL POLE
⊙	SIGN
⊙	TELEPHONE PEDESTAL
⊙	TRAFFIC SIGNAL BOX
⊙	IRON PIN-REBAR FOUND

PINE KNOLL DRIVE S-23-165
VARIABLE R/W

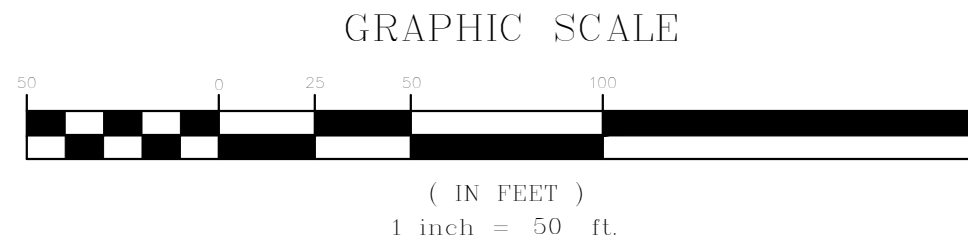
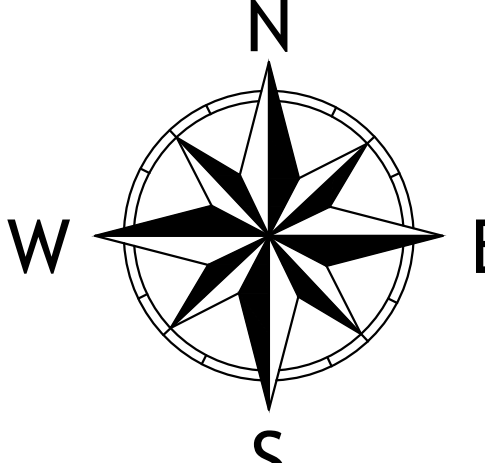


WADE HAMPTON BOULEVARD - U.S. HIGHWAY 29
150' R/W

ZONED RC-3
±10.80-ACRES

ZONED MX-3
+/-15.51-ACRES
(SEE PAGE TWO)

CHIPWOOD LANE
COUNTY ROAD J-0702
50' R/W



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Project Number: ----
DWG Name: 2023-057 P10.dwg
Drawing Scale: AS NOTED
Date of Project: ----
Engineer of Record:

Lynn A. Solesbee, P.E.
South Carolina P.E.# 15071
North Carolina P.E.# 000285

blueWATER
civil design
bluewater civil design, llc
718 Lowndes Hill Road • Greenville, SC 29607
www.bluewatercivil.com • info@bluewatercivil.com

Certificates of Authorization:
SC CD4212 - GA PEF005865
NC P0868 - AL CA4065E

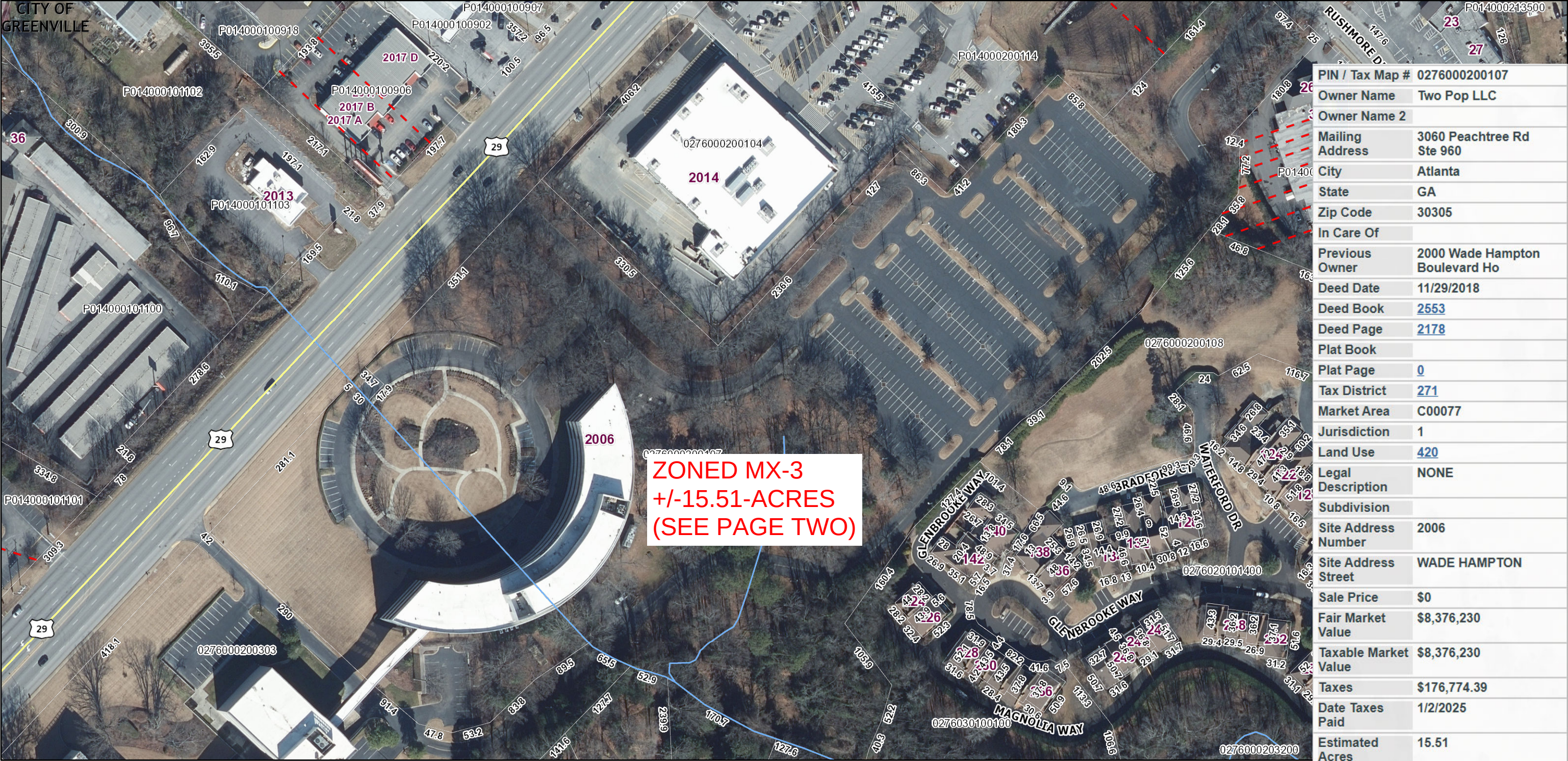
PLAN	REVISION	ISSUE	DATE	ISSUE	COMMENT
------	----------	-------	------	-------	---------

A	06/18/2025	Zoning Exhibit			
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PRELIMINARY
SITE PLAN

SP10

Greenville County, SC



PIN / Tax Map #	0276000200107
Owner Name	Two Pop LLC
Owner Name 2	
Mailing Address	3060 Peachtree Rd Ste 960
City	Atlanta
State	GA
Zip Code	30305
In Care Of	
Previous Owner	2000 Wade Hampton Boulevard Ho
Deed Date	11/29/2018
Deed Book	2553
Deed Page	2178
Plat Book	
Plat Page	0
Tax District	271
Market Area	C00077
Jurisdiction	1
Land Use	420
Legal Description	NONE
Subdivision	
Site Address Number	2006
Site Address Street	WADE HAMPTON
Sale Price	\$0
Fair Market Value	\$8,376,230
Taxable Market Value	\$8,376,230
Taxes	\$176,774.39
Date Taxes Paid	1/2/2025
Estimated Acres	15.51

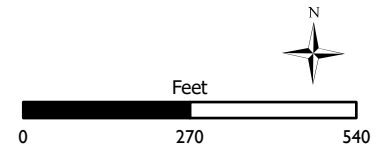


ANNEXATION MAP
for Tax Map Number(s):
0276000200303 & 0276000200107
into the City of Greenville

-  TotalAnnexationArea
-  Greenville City Limits

Total Area of Annexation:
1,583,916.82 Sq.Ft.
36.36 Acres

Existing County Zoning: **O-D, C-2**
Proposed City Zoning: **MX-3,**
RC-3
City Council District: **1**
File Number: **AX-25-2025**



This map is a product of the City of Greenville, SC and was compiled from plats and other available information. No actual field survey was performed. Reasonable efforts have been made to ensure the accuracy of this map. The City of Greenville expressly disclaims any responsibility or liability with regard to the use of this map.
Copyright: The City of Greenville, SC

0275000200300

0275000200301

P014000101100

**UNINCORPORATED
GREENVILLE COUNTY**

P014000200103

P014000200114

0276000200104

0276000200107

RIGHT OF WAY:
335,557.04 SQFT
7.7 ACRES

REAL PROPERTY:
1,248,359.78 SQFT
28.66 ACRES

PINE KNOLL DR

WADE HAMPTON BLVD

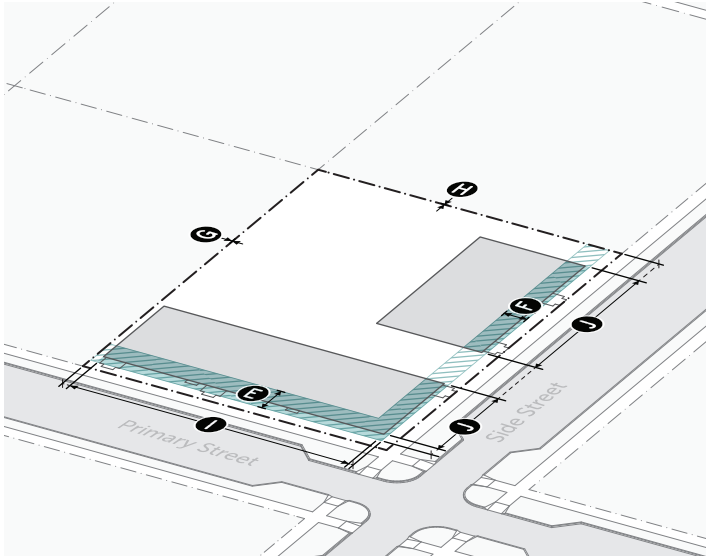
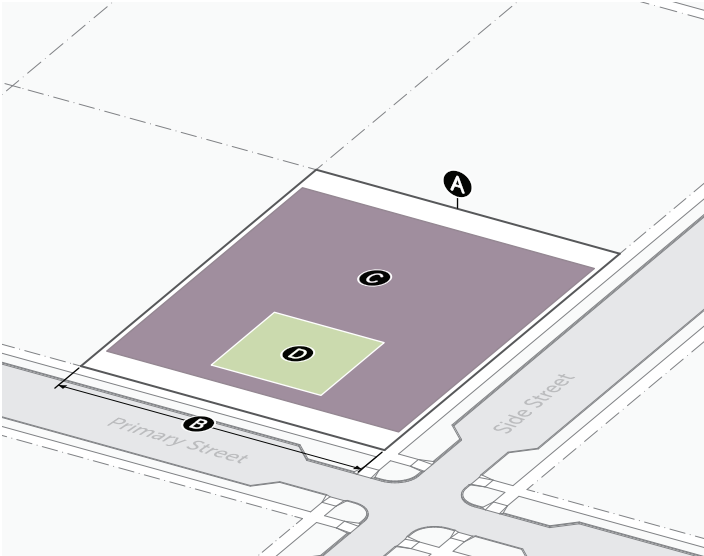
RUSHMORE DR

CHIPWOOD LN

EDWARDS RD

19-2.4.3. RC-3 COMMUNITY 3

A. SITE



1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	15'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	80%
D Outdoor amenity space (min)	10%

3. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	5' / 20'
F Side street lot line (min/max)	5' / 15'
G Side lot line (min)	0'
H Rear lot line (min)	0'
Alley lot line (min)	5'
4. TRANSITIONS	Sec. 2.11.6.
Transition type	Type A, B
5. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	75%
J Side street	45%
6. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	20'
Side street (min)	5'
7. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type E 6'

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Base	3 / 42'
Bonus	5 / 68'
2. MASSING	Sec. 2.11.11.
B Building width (max)	175'
C Active depth (min)	9'
3. GROUND STORY	Sec. 2.11.12.
D Story height (min)	10'
E Finish floor elevation (min/max)	0' / 5'

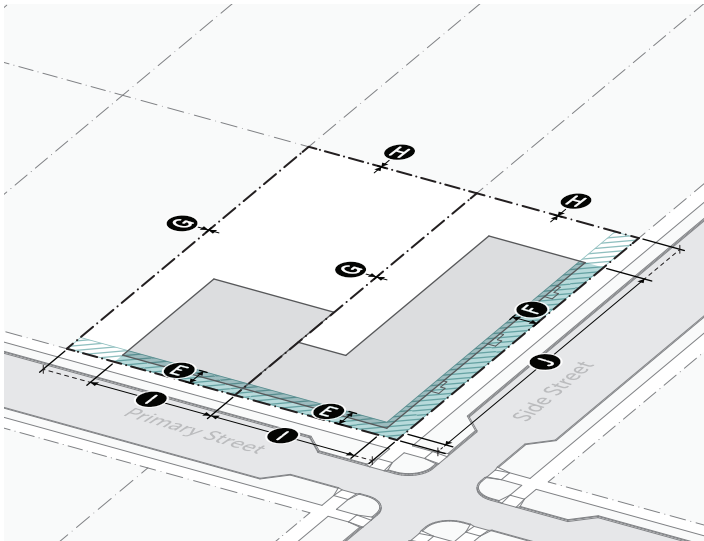
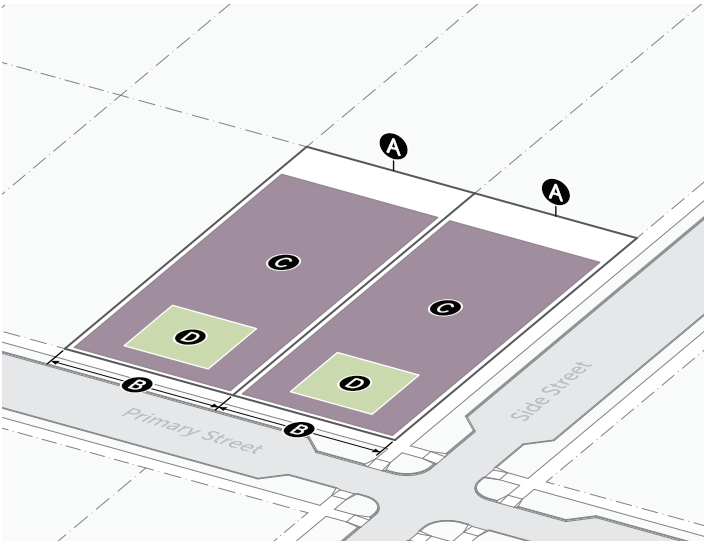


	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
F Ground story (min)	35%	30%
G Upper story (min)	20%	20%
H Blank wall width (max)	15'	25'
5. ENTRANCES	Sec. 2.11.14.	
I Street-facing entry spacing (max)	40'	60'
Entry feature	Yes	Yes

NOTE: Additional standards apply for lots within the Neighborhood Revitalization Overlay District.
[View the Neighborhood Revitalization Overlay District Map](#)
[View the Neighborhood Revitalization Overlay District Design Standards](#)

19-2.5.3. **MX-3** MIXED USE 3

A. **SITE**

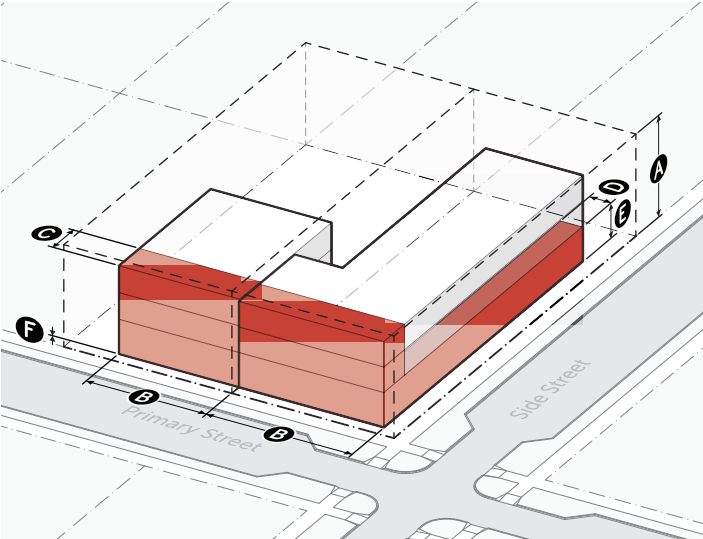


1. LOT SIZE	Sec. 2.11.2.
A Area (min)	None
B Width (min)	
Front access	40'
Side/rear access	15'
2. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	80%
D Outdoor amenity space (min)	10%

3. BUILDING SETBACKS	Sec. 2.11.5.
E Primary street lot line (min/max)	0' / 10'
F Side street lot line (min/max)	0' / 10'
G Side lot line (min)	0'
H Rear lot line (min)	0'
Alley lot line (min)	5'
4. TRANSITIONS	Sec. 2.11.6.
Transition type	Type A, B
5. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
I Primary street	75%
J Side street	45%
6. PARKING SETBACKS	Sec. 2.11.8.
K Primary street (min)	20'
L Side street (min)	5'
7. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type F 8'

MX-3

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Base	3 / 42'
Bonus	5 / 68'
2. MASSING	Sec. 2.11.11.
B Building width (max)	275'
Active depth (min)	
C Primary street	15'
D Side street	9'
3. GROUND STORY	Sec. 2.11.12.
E Story height (min)	
Residential	10'
Nonresidential	14'
F Finish floor elevation (min/max)	
Residential	2' / 5'
Nonresidential	-2' / 2'



	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
G Ground story (min)		
Residential	35%	30%
Nonresidential	50%	30%
H Upper story (min)	20%	20%
I Blank wall width (max)	15'	25'
5. ENTRANCES	Sec. 2.11.14.	
J Street-facing entry spacing (max)	40'	60'
Entry feature	Yes	Yes

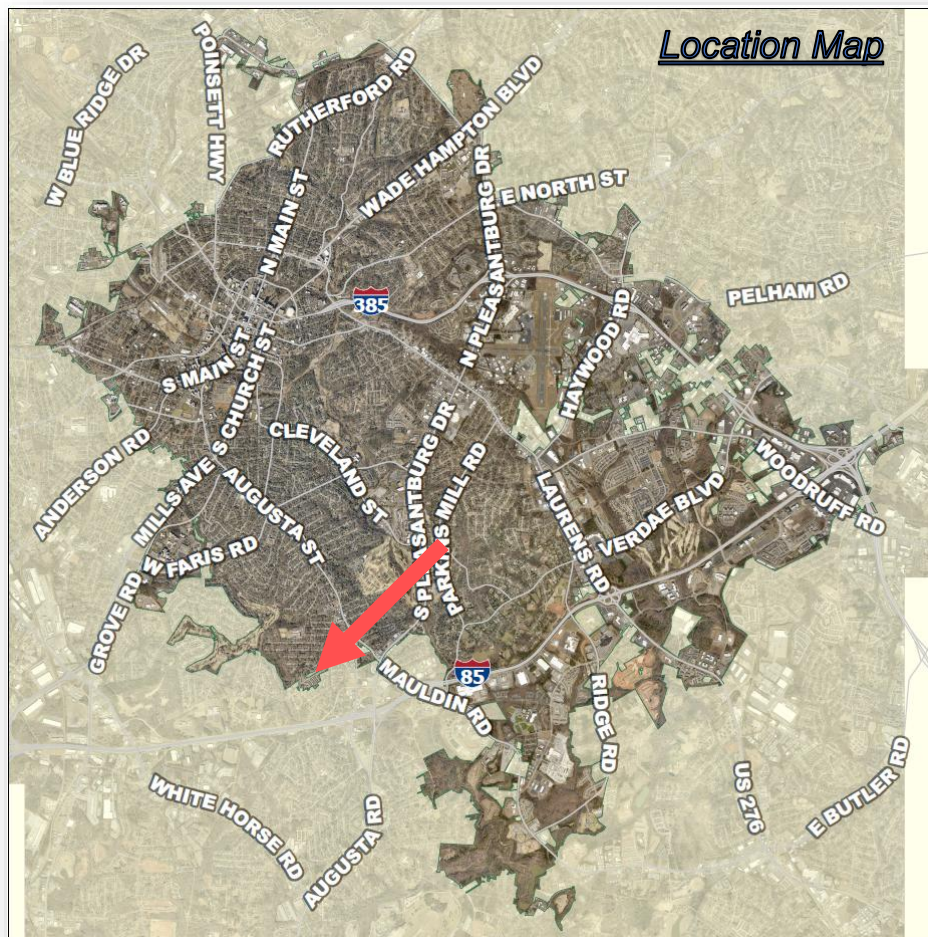


Planning Staff Report to
Greenville Planning Commission
for the August 7, 2025 Public Hearing

PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: AX-26-2025
Applicant(s): Ryan Anderson
Property Owner(s): SJ Anderson Construction, LLC
Property Location: 301 Prosperity Avenue
Tax Map Number(s): Portion of TM# 0367000100200
Property Area: 0.28 acre
Rezone Request: RH-C, House C District
Recommendation: Approval with staff comments



Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 *Function, Powers, and Duties of the Planning Commission*

Sec 19-1.1.3 *Purpose and Intent*

Sec.19-1.3 *Official Zoning Map*

Sec.19-2 *Zoning Districts*

Sec.19-6.1.3 *Planning Commission*

Sec.19-6.2.2 *Legislative Review*

Project Overview:

The applicant has petitioned the City of Greenville to annex approximately a 0.28 acre portion of lot area into the Greenville city limits and to zone it RH-C, House C District, under the Greenville Development Code. A portion of the parcel is currently within the city limits and already zoned RH-C.

Land Use Review

The proposed zoning for the annexed property is the RH-C, House C District. The RH-C District allows for single-family residential with an accessory dwelling unit on a minimum lot size of 6,000 sf. Commercial uses are not permitted. The Future Land Use Map designation for the property is Suburban Residential in accordance with the GVL2040 Comprehensive Plan. The property is not proposed to be located within an overlay district.

LAND USE OF SURROUNDING PROPERTIES		
Location	Zoning	Current Use
Subject Property	R-10, Single-family residential district (County)	Vacant
North	RH-C, House C District	Single-family detached residential and vacant
East	R-10, Single-family residential district (County); RH-C, House C District	Single-family detached residential and vacant
South	RC-2, Community 2 District	Multifamily residential
West	R-10, Single-family residential district (County)	Vacant



Procedural Requirements:

Pre-Application and Development Meetings

The City and the applicant held a pre-application meeting on July 1, 2025.

Other Site Information:

The property is located within the Pleasant Valley Special Emphasis Neighborhood within Greenville County. It will likewise be added to the City's designation. The front portion of the property was annexed with the 1940s. The property is currently vacant, and the intention of the owner is to construct a new single-family home.

There are no known natural features on the site. Any future development on the property must meet city requirements including tree mitigation.

Definitions:

Please see the attachments for the **RH-C District** general provisions.

Staff Analysis:

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	YES
Comments: The Future Land Use Map (FLUM) shows the adjacent properties currently in the city limits as Suburban Residential. This FLUM classification is consistent with the proposed zoning district.	
(b) Consistent with Applicable Plans and Studies.	N/A
Comments: City Council has not approved any applicable plans or studies where the property lies.	
(c) Compatible with Surrounding Uses.	YES
Comments: The proposed amendment allows for uses that are compatible with existing surrounding properties and uses. The request does not introduce a new zoning district to the area.	
(h) Provide logical and orderly development pattern.	YES
Comments: The rezoning would allow for development consistent with existing single-family development patterns.	

STAFF RECOMMENDATION:

APPROVE rezone to RH-C, House C District.

Staff Comments

Planning Comments

Recommend: Approve

Comment: The property shall be included within the Pleasant Valley Special Emphasis Neighborhood.

Addressing Comments

Recommend: Approve w/ Comments

Comments:

ANNEXATION REVIEW:

- *1. NEW PARCELS (Assigned Address):
 - 0367000100200 (100-Block Shemwood Lane **or** 200-Block Prosperity Avenue)

Fire Department Comments

Recommend: Approve w/ Comments

Comments:

GCFD will be responding to the annexed areas. With the continued annexation of property, GCFD will continue to evaluate response data to ensure adequate coverage is provided.

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. The project site is currently undeveloped and would require tree removal for any future development. A full tree inventory per 19-5.2.2.A will be required with the site permit submittal and mitigation for tree removals must be provided.

AX-26-2025: 301 Prosperity Avenue

2. Any trees intended to be saved must be protected with tree protection fencing per Sec. 19-5.2.2.F.
3. Street trees will be required along the Shemwood Lane frontage with any major site disturbance.
4. All plant selections in future plans must comply with Div. 19-4.10.

APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	RYAN ANDERSON	SJ ANDERSON CONSTRUCTION, LLC.
*Title:	OWNER	OWNER
*Address:		
*City, State:		
*Zip:		
*Phone:		
*Email:		

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) portion of 036700-01-00200

*TOTAL ACREAGE 0.28

*CURRENT ZONING DESIGNATION (County) R-10, Single-family residential district

*PROPOSED ZONING DESIGNATION (City) RH-C, House C District

TYPE OF ANNEXATION

*Please select one (1) type: ☒ 100% ☐ 75% ☐ 25%

For 100% and 75% Annexations, please include the corresponding Annexation Petition with the application submittal.

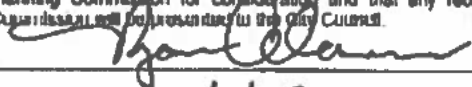
INSTRUCTIONS

1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
2. Staff will review the application for "completeness" pursuant to Section 19-4.2.1.B.3. *Completeness Determination*. If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
3. Please refer to Sections 19-4.1.3. *Planning Commission* for additional information.
4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 16 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
5. Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.
6. Please read carefully: The applicant and property owner affirm that all information submitted with this application, including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.

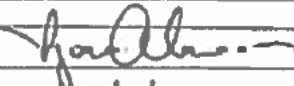

7/7/25

*APPLICANT SIGNATURE

DATE

7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initial: RA

*Signatures	
Applicant	
Date	<u>7/7/25</u>
Property Owner/Authorized Agent	<u>RYAN ANDERSON</u>
Date	<u>7/7/25</u>



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

**100 Percent
PETITION FOR ANNEXATION**

The person(s) whose signatures appear below are freeholders owning real estate in an area which is contiguous to the City of Greenville and which is proposed to be annexed into the City. In general, the area can be described as 301 Prosperity Ave (address) and consisting of approximately 0.28 acres located on see below (tax map parcel). That area is identified more particularly by the tax map parcel number(s) provided below and the Annexation Plat which is being provided to the City of Greenville Planning Commission in conjunction with this petition. Any and all plats are incorporated by reference as a description of the area. By their signatures, the freeholder(s) petition(s) the City Council of the City of Greenville to annex the entire area shown as being annexed on the plats, and such additional acreage within the outer boundaries of the area as the owners through their agent may designate.

This petition is submitted under the provisions of S.C. Code '5-3-150, authorizing the City Council to annex an area when presented with a petition signed by all persons owning real property in the area proposed to be annexed. This petition and all signatures thereto shall be open for public inspection on demand at the City Hall, located at the address set forth above. All zoning processes will be in accordance with state statutes and city ordinance otherwise existing.

Property Owner(s)	Address/ Tax Map Number	Signature	Date
<i>Bill Anderson</i>	301 Prosperity Ave/0.28 portion of 036700-01-00200	<i>[Signature]</i>	7/7/25
<i>JJ Anderson Construction LLC</i>			



city of
greenville
South Carolina

CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29601

CERTIFICATION OF PETITION SIGNATURE

I, Puan Anderson, have this seventh day of JULY, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I have ownership interest by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

0.28-acre portion of 036700-01-00200

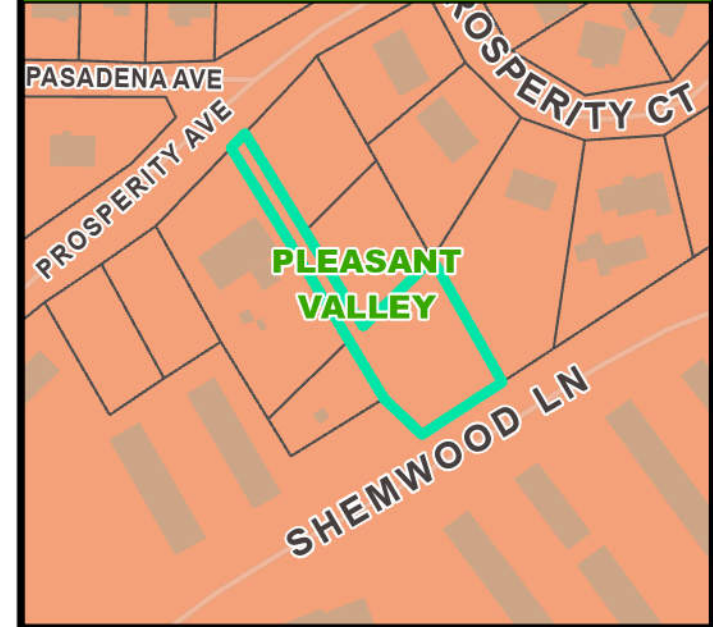


Signature

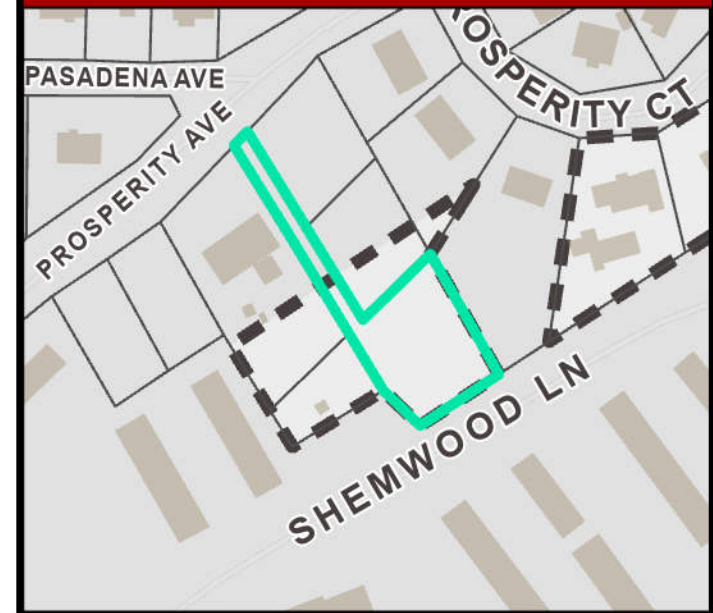
NATURAL / ENVIRONMENTAL FEATURES



SPECIAL EMPHASIS NEIGHBORHOODS



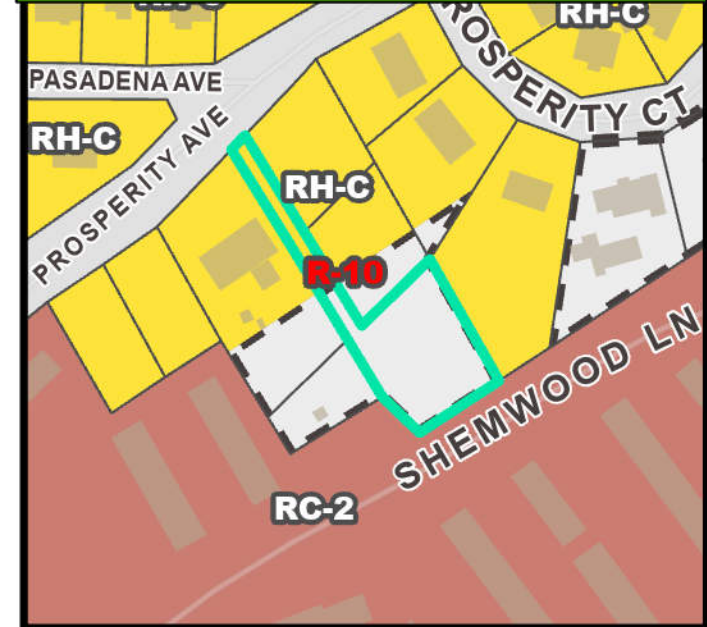
PRESERVATION OVERLAYS



AERIAL VIEW



CURRENT ZONING



FUTURE LAND USE





1: 600

Legend

Address Points

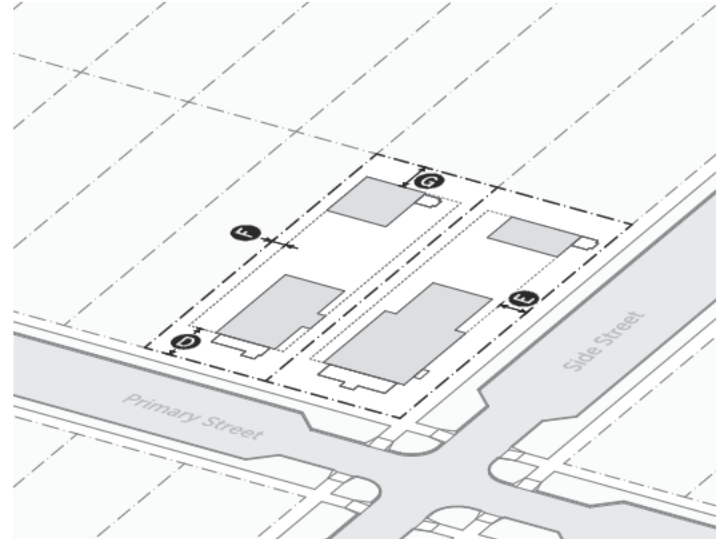
- Comm/Industrial
- Residential - SFD
- Residential - SFA
- Residential - Multi
- Mixed Use
- Parking Lot or Structure
- School
- City Park
- Under Construction
- Accessory Structure
- Other
- Parcels with Ownership
- City of Greenville Limits
- County Background

Notes

Total area to be annexed: 0.28 acre;
City Council District: 2; County Zoning
District: R-10; City Zoning District:
RH-C

19-2.2.4. RH-C HOUSE C

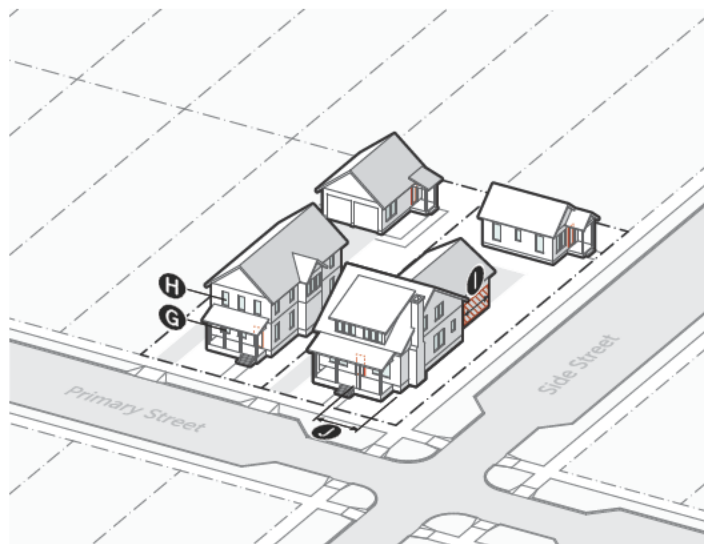
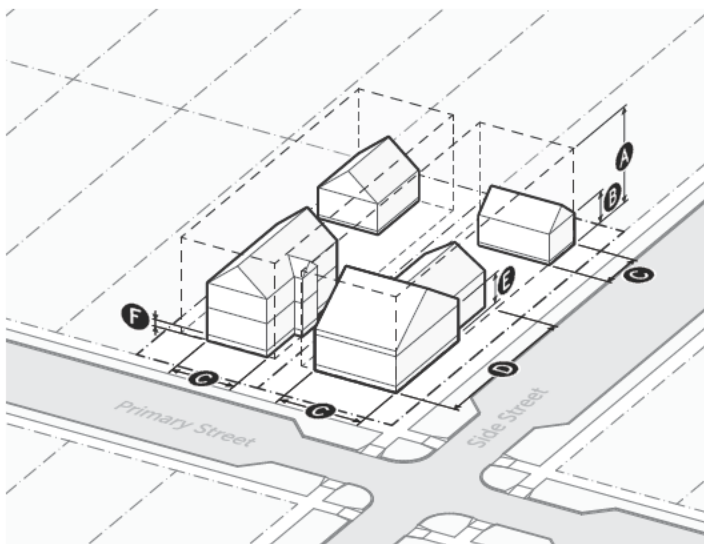
A. SITE



1. LOT SIZE	Sec. 2.11.2.
A Area (min)	6,000 SF
B Width (min)	40'
2. DENSITY	Sec. 2.11.3.
Dwellings per lot (max)	
Primary units	1
Accessory Dwelling units	1
3. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	
Up to 9,000 SF lot	45%
9,001 to 14,000 SF lot	40%
14,001 to 20,000 SF lot	35%
Above 20,000 SF lot	30%

4. BUILDING SETBACKS ²	Sec. 2.11.5.
D Primary street lot line (min)	
Primary structure	20' or Setback Range
Accessory structure	50'
E Side street lot line (min)	10'
F Side lot line (min)	
Up to 60' wide lot	5'
61' to 100' wide lot	7'
Above 100' wide lot	10'
G Rear/alley lot line (min)	
Primary structure	15'
Accessory structure	5'
5. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	30'
Side street (min)	10'
6. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type E 6'

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet)	
Primary structure ¹	2.5 / 32'
Accessory structure	1.5 / 20'
B Side wall (max)	
Primary structure	25'
Accessory structure	16'
2. MASSING	Sec. 2.11.11.
C Building width (max)	
Up to 60' wide lot	40'
61' to 80' wide lot	50'
81' to 100' wide lot	60'
Above 100' wide lot	70'
D Building depth (max)	70'
3. GROUND STORY	Sec. 2.11.12.
E Story height (min)	9'
F Finish floor elevation (min/max)	0' / 5'

	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
G Ground story (min)	25%	20%
H Upper story (min)	15%	15%
I Blank wall width (max)	10'	20'
5. ENTRANCES	Sec. 2.11.14.	
J Street-facing entry spacing (max)	40'	40'
Entry feature	Yes	No

NOTE: Additional standards apply for lots within the Neighborhood Revitalization Overlay District.

[View the Neighborhood Revitalization Overlay District Map](#)

[View the Neighborhood Revitalization Overlay District Design Standards](#)

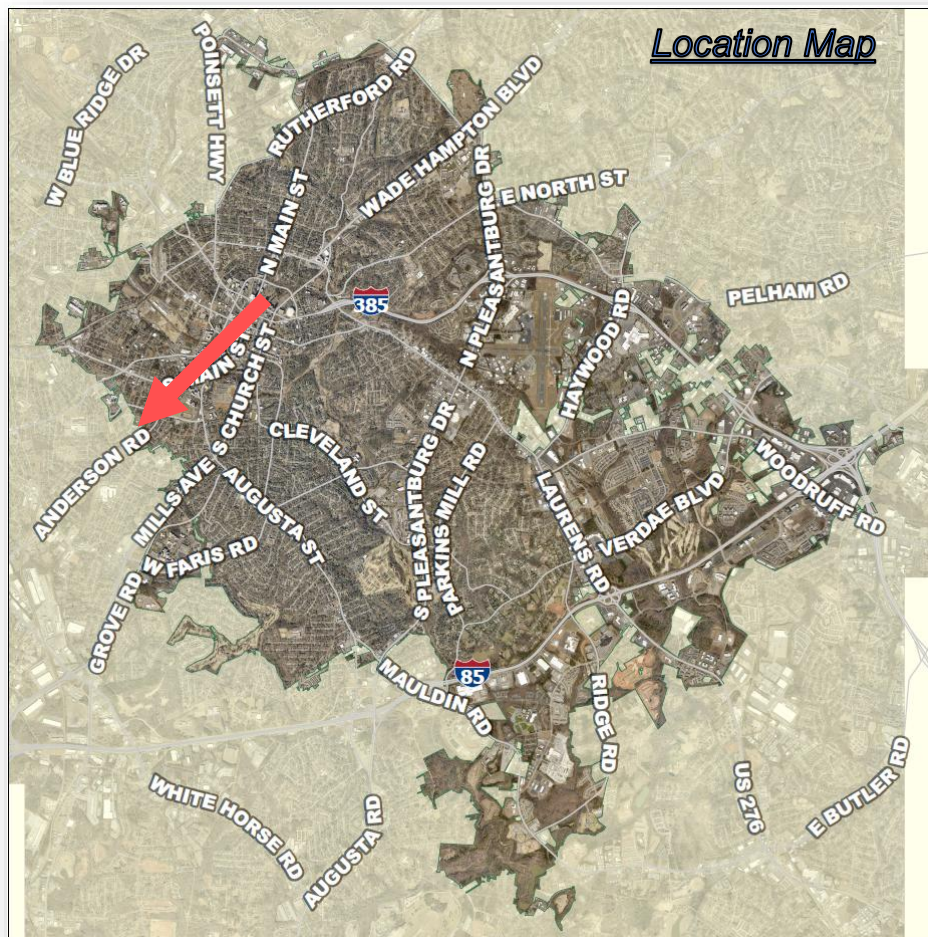


Planning Staff Report to
Greenville Planning Commission
for the August 7, 2025 Public Hearing

PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: AX-27-2025
Applicant(s): Sheila Dogan
Property Owner(s): Neighborhood Housing Corporation of Greenville, Inc
Property Location: 31 Young Street
Tax Map Number(s): 0112000800700
Property Area: 0.12 acre
Rezone Request: RN-A, Neighborhood A District
Recommendation: Approval with staff comments



Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 *Function, Powers, and Duties of the Planning Commission*

Sec 19-1.1.3 *Purpose and Intent*

Sec.19-1.3 *Official Zoning Map*

Sec.19-2 *Zoning Districts*

Sec.19-6.1.3 *Planning Commission*

Sec.19-6.2.2 *Legislative Review*

Project Overview:

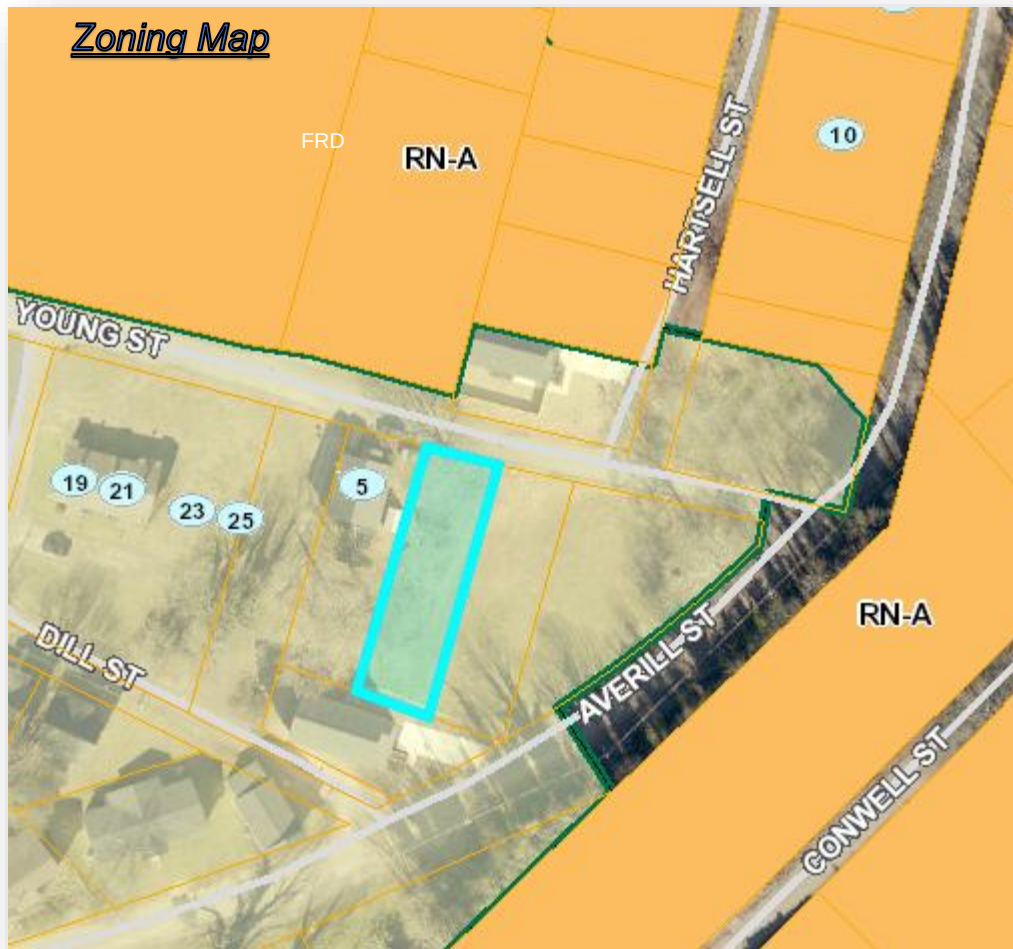
The applicant has petitioned the City of Greenville to annex a parcel containing approximately 0.12 acre of lot area into the Greenville city limits and to zone it RN-A, Neighborhood A District, under the Greenville Development Code. Adjacent properties in the City are likewise zoned RN-A. The property is currently vacant, and the owner intends to construct affordable housing on the property in the future.

Land Use Review

The proposed zoning district for the annexed property is RN-A, Neighborhood A District. The Future Land Use Map designation for the property is Urban Residential in accordance with the GVL2040 Comprehensive Plan. The property is not proposed to be located within an overlay district.

The RN-A District allows up to four residential units on a lot. Abutting parcels within the City of Greenville are also zoned RN-A. Commercial uses are not permitted.

LAND USE OF SURROUNDING PROPERTIES		
Location	Zoning	Current Use
Subject Property	R-M20, Multifamily residential district (County)	Vacant
North	R-M20, Multifamily residential district (County); RN-A, Neighborhood A District	Single-family detached residential and church
East	R-M20, Multifamily residential district (County)	Vacant
South	R-M20, Multifamily residential district (County)	Single-family detached residential
West	R-M20, Multifamily residential district (County)	Vacant



Procedural Requirements:

Pre-Application and Development Meetings

The City and the applicants held a pre-application meeting on June 15, 2025.

Other Site Information:

The property is located within the Sterling Special Emphasis Neighborhood within Greenville County. It will likewise be included in the City's designation. It is not located in a County overlay district.

The property is currently vacant. Historical aerals show a residential structure on the site up to 1979.

There are no known natural features on the site. Any future development on the property under a City permit must meet all city requirements.

Definitions:

Please see the attachments for the **RN-A District** general provisions.

Staff Analysis:

Staff offers the following responses to the standards to rezone found in Section 6.2.2(D)(2):

(a) Consistent with Comprehensive Plan.	YES
Comments: The Future Land Use Map (FLUM) provides a recommendation of Urban Residential. This FLUM classification is consistent with the proposed RN-A zoning district. The RN-A district allows for gentle density of up to four units per lot, which is also supported by the GVL2040 comprehensive plan.	
(b) Consistent with Applicable Plans and Studies.	YES
Comments: The City approved the Sterling Neighborhood Master Plan in 2010. This plan calls for infill residential development in this area and to provide more affordable housing options within the neighborhood as a whole.	
(c) Compatible with Surrounding Uses.	YES
Comments: The proposed amendment allows for uses that are compatible with existing surrounding properties and uses. The request does not introduce a new zoning district to the area. There are currently multi-unit housing options within the Sterling community.	
(h) Provide logical and orderly development pattern.	YES
Comments: The rezoning would allow for development consistent with existing surrounding uses and development patterns. There are existing multi-unit residential structures on Young Street.	

STAFF RECOMMENDATION:

APPROVE rezone to RN-A, Neighborhood A District.

Staff Comments

Planning Comments

Recommend: Approve

Comment: The property shall be included within the Sterling Special Emphasis Neighborhood

Addressing Comments

Recommend: Approve w/ Comments

Comments:

ANNEXATION REVIEW:

- *1. NEW PARCELS (Assigned Address):
 - 011200-08-00700 (3 Young Street)

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

*1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

Civil Engineer Comments

Recommend: Approve w/ Comments

Comments:

AX-27-2025: 31 Young Street

Young Street shall be classified as a "Neighborhood" street.

Fire Department Comments

Recommend: Approve w/ Comments

Comments:

GCFD will be responding to the annexed areas. With the continued annexation of property, GCFD will continue to evaluate response data to ensure adequate coverage is provided.

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

- 1.
2. The project site is currently undeveloped and would require tree removal for any future development. A full tree inventory per 19-5.2.2.A will be required with the site permit submittal and mitigation for tree removals must be provided.
3. Any trees intended to be saved must be protected with tree protection fencing per Sec. 19-5.2.2.F.
4. Street trees will be required along the Young St. frontage with any major site disturbance.
5. All plant selections in future plans must comply with Div. 19-4.10.



city of greenville

APPLICATION FOR ANNEXATION

Contact Planning & Development (864) 467-4476 or planning@greenvillesc.gov

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	Sheila Dogan	Neighborhood Housing Corporation of Greenville, Inc.
*Title:	Executive Director	
*Address:		
*City, State:		
*Zip:		
*Phone:		
*Email:		

LEGAL REPRESENTATIVE (if applicable)

Name:	
Title:	
Address:	
Phone:	
Email:	

PROPERTY INFORMATION

*TAX MAP #(S) 011200-08-00700

*TOTAL ACREAGE 0.12

*CURRENT ZONING DESIGNATION (County) R-M20, Multifamily residential district

*PROPOSED ZONING DESIGNATION (City) RN-A, Neighborhood A District

TYPE OF ANNEXATION

*Please select one (1) type: ☒ 100% ☐ 75% ☐ 25%

For 100% and 75% Annexations, please include the corresponding **Annexation Petition** with the application submittal.

INSTRUCTIONS

1. The applicant is strongly encouraged to schedule a preapplication conference with the Planning Development prior to the scheduled submission deadline. At this time, the applicant may also be encouraged to schedule a sufficiency review two (2) weeks prior to the scheduled submission deadline to allow staff review of the application. Call (864) 467-4476 to schedule an appointment.
2. Staff will review the application for "completeness" pursuant to **Section 19-6.2.1.B.3. Completeness Determination**. If the application is deemed incomplete, staff will notify the applicant and request that the application be revised and resubmitted to address incompleteness. In this event, the item will be postponed to a subsequent regularly scheduled planning commission meeting.
3. Please refer to **Sections 19-6.1.3. Planning Commission** for additional information.
4. **Public Notice Requirements.** Annexation applications require a planning commission public hearing. Staff shall post signs regarding the same on the subject property(s) at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date. Upon planning commission recommendation, the application item will be scheduled for a city council meeting.
5. **Please verify that all required information is reflected on the application and submit to staff with a complete annexation petition.**
6. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council.

Sherrita Doogan

***APPLICANT SIGNATURE**

6-18-2025

DATE

7. *Pursuant to S.C. Code Ann. § 6-29-1145, I hereby attest that the tract or parcel of land subject to this application IS NOT restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

Initial: *SD*

*Signatures	
Applicant	<i>Sherrita Doogan</i>
Date <i>6-18-2025</i>	
Property Owner/Authorized Agent	<i>Beyond Housing SC / NHC</i>
Date <i>6-18-2025</i>	



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

100 Percent
PETITION FOR ANNEXATION

The person(s) whose signatures appear below are freeholders owning real estate in an area which is contiguous to the City of Greenville and which is proposed to be annexed into the City. In general, the area can be described as 31 Young Street (address) and consisting of approximately 0.12 acres located on see below (tax map parcel). That area is identified more particularly by the tax map parcel number(s) provided below and the Annexation Plat which is being provided to the City of Greenville Planning Commission in conjunction with this petition. Any and all plats are incorporated by reference as a description of the area. By their signatures, the freeholder(s) petition(s) the City Council of the City of Greenville to annex the entire area shown as being annexed on the plats, and such additional acreage within the outer boundaries of the area as the owners through their agent may designate.

This petition is submitted under the provisions of S.C. Code ' 5-3-150, authorizing the City Council to annex an area when presented with a petition signed by all persons owning real property in the area proposed to be annexed. This petition and all signatures thereto shall be open for public inspection on demand at the City Hall, located at the address set forth above. All zoning processes will be in accordance with state statutes and city ordinance otherwise existing.

Property Owner(s)	Address/ Tax Map Number	Signature	Date
Neighborhood Housing Corporation of Greenville, Inc.	31 Young Street/ TMS# 011200-08-00700	Sheila Dozan	7-14-25



CITY OF GREENVILLE
206 South Main Street
P.O. Box 2207
Greenville, SC 29602

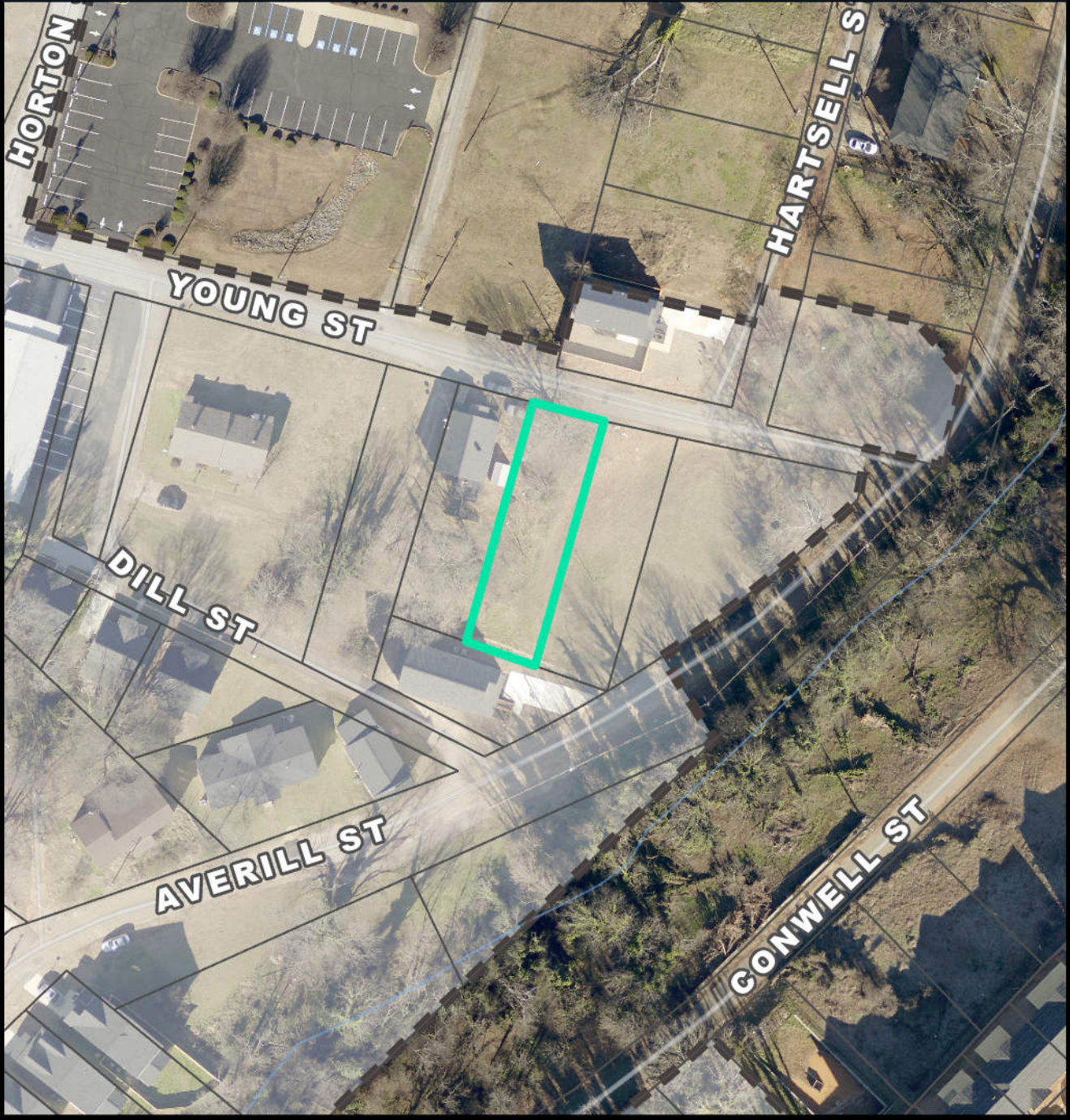
CERTIFICATION OF PETITION SIGNATURE

I, Shanta Dozon, have this 14 day of July, 2025, certified my signature previously given and dated for the annexation into the City of Greenville of one (1) or more parcels in which I have ownership interest by initialing a copy of the signature as previously given and dated. The parcel tax map number(s) is(are) as follows:

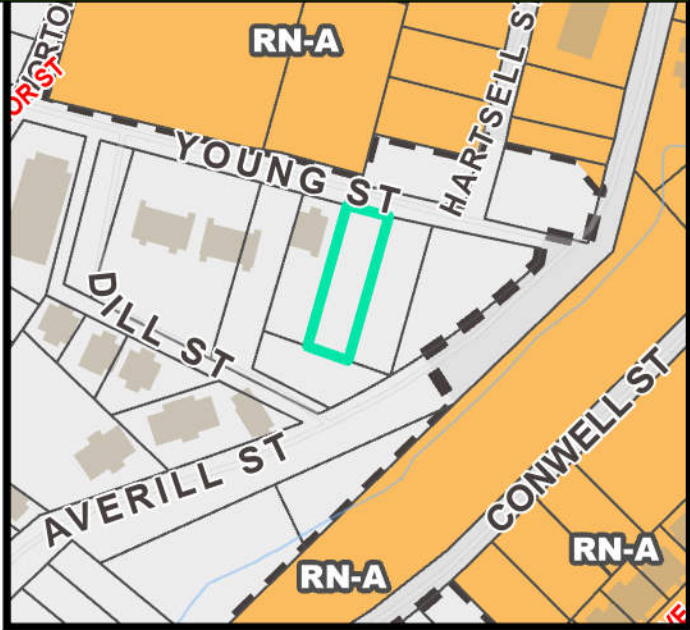
011200-08-00700

Shanta Dozon
Signature

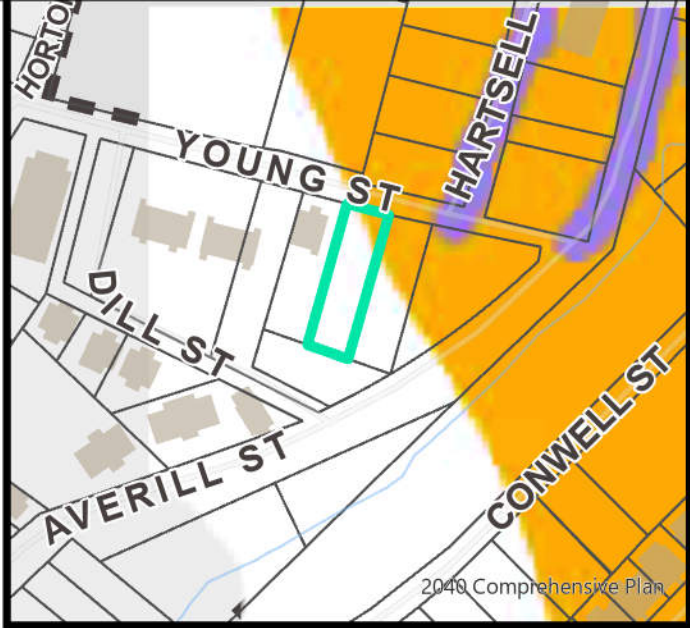
AERIAL VIEW



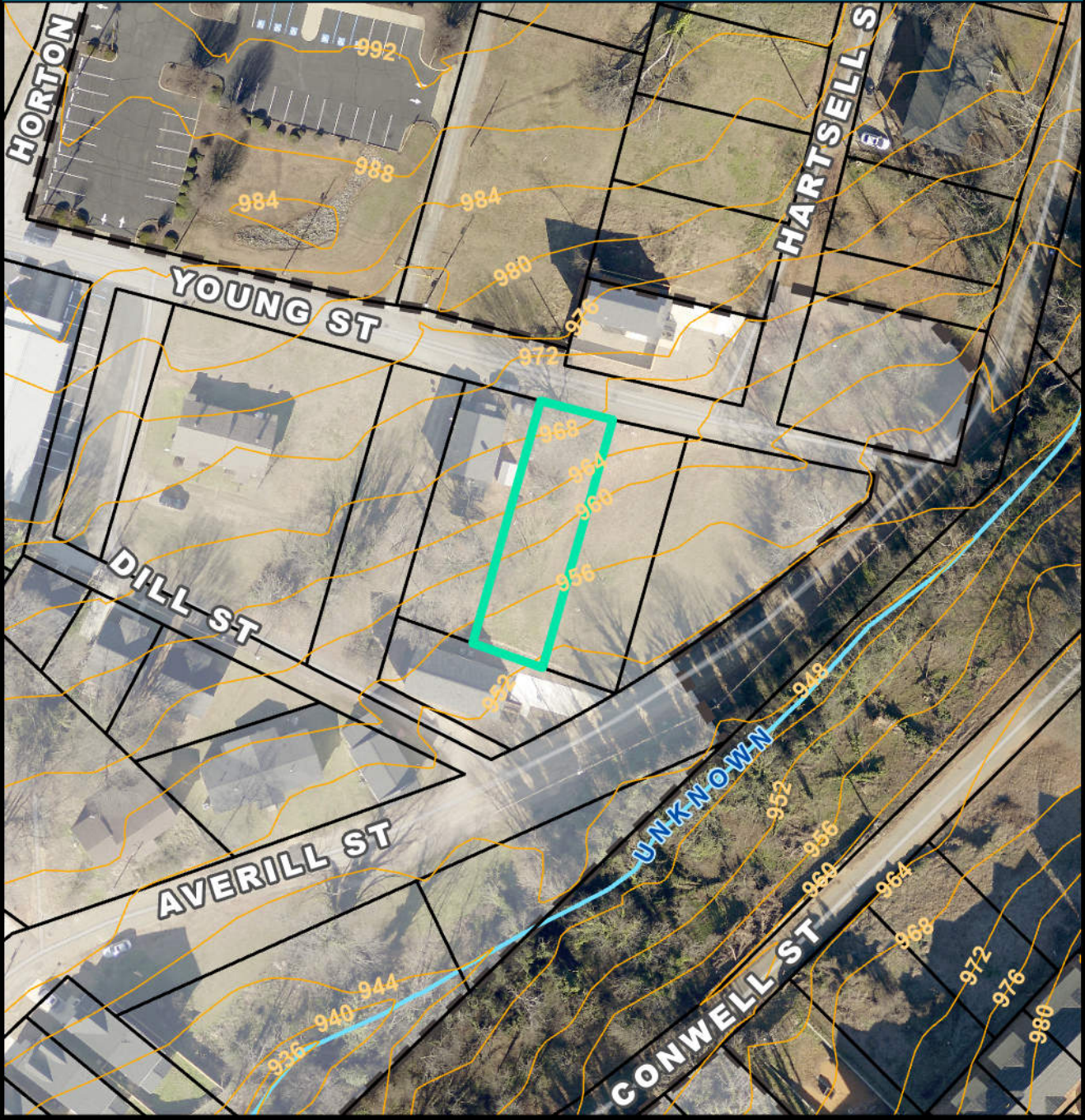
CURRENT ZONING



FUTURE LAND USE



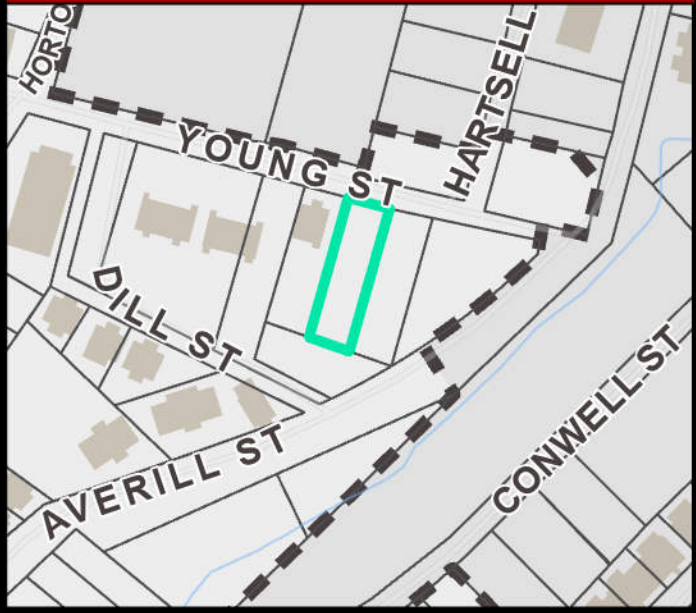
NATURAL / ENVIRONMENTAL FEATURES

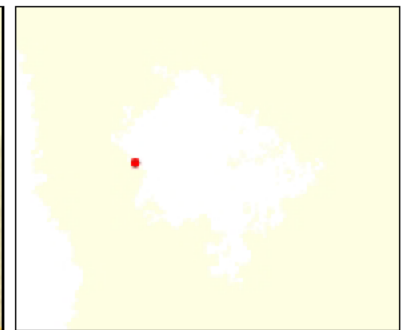


SPECIAL EMPHASIS NEIGHBORHOODS



PRESERVATION OVERLAYS





Legend

Address Points

- Comm/Industrial
- Residential - SFD
- Residential - SFA
- Residential - Multi
- Mixed Use
- Parking Lot or Structure
- School
- City Park
- Under Construction
- Accessory Structure
- Other
- Parcels with Ownership
- City of Greenville Limits
- County Background

Notes

Total area to be annexed: 0.14 acre; City Council District: 2; County Zoning District: R-M20; City Zoning District: RN-A



1: 300

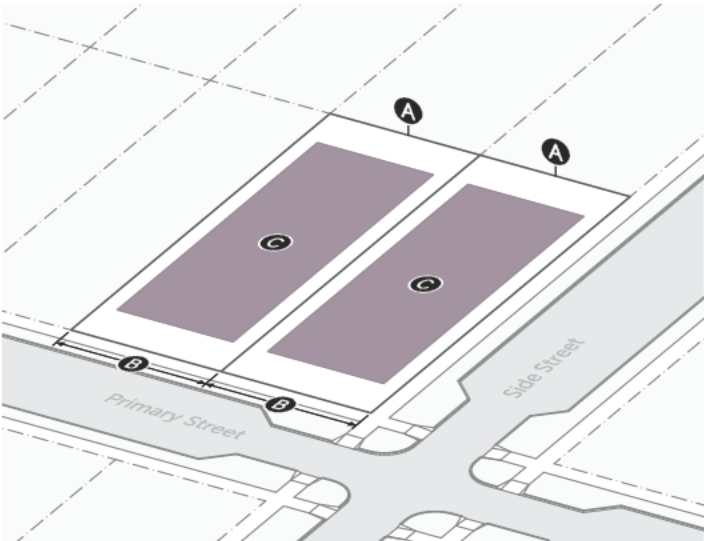
50 0 25 50Feet

NAD_1983_HARN_StatePlane_South_Carolina_FIPS_3900_Feet_Intl
© City of Greenville, SC Date Created: 7/9/2025

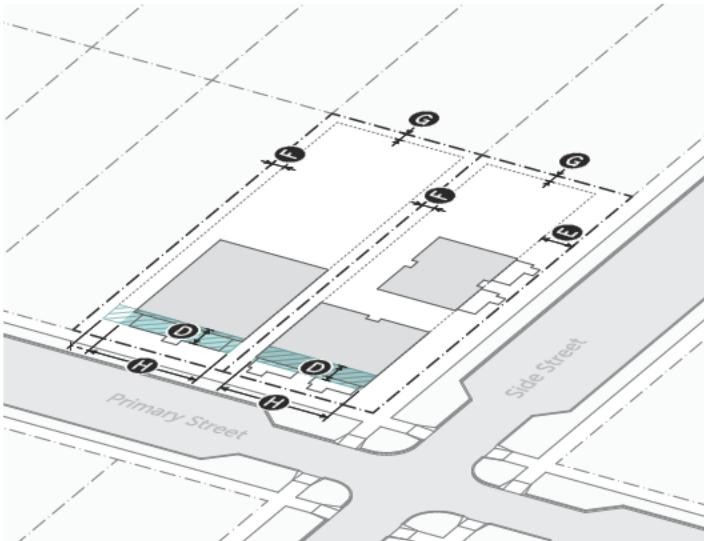
This map is user generated from the City of Greenville's MapIT 2.0 intranet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable and should be appropriately used with caution. Contact the GIS Division for all questions pertaining to the MapIT 2.0 program and data.

19-2.3.2. **RN-A** NEIGHBORHOOD A

A. SITE



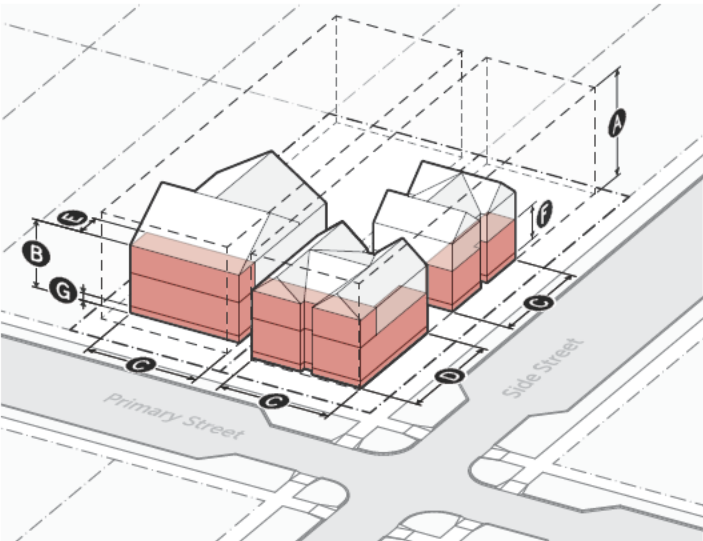
1. LOT SIZE	Sec. 2.11.2.
A Area (min)	2,000 SF
B Width (min)	
Front access	40'
Side/rear access	25'
2. DENSITY	Sec. 2.11.3.
Dwellings per lot (max)	4
3. COVERAGE	Sec. 2.11.4.
C Building coverage (max)	60%



4. BUILDING SETBACKS	Sec. 2.11.5.
D Primary street lot line (min/max)	10' / 20' or Setback Range
E Side street lot line (min/max)	10'
F Side lot line (min)	5'
G Rear/alley lot line (min)	4'
5. BUILD-TO	Sec. 2.11.7.
Build-to width (min)	
H Primary street	50%
Side street	None
6. PARKING SETBACKS	Sec. 2.11.8.
Primary street (min)	30'
Side street (min)	5'
7. FENCES AND WALLS	Sec. 2.11.9.
Front yard height (max)	Type B 3'
Side street yard height (max)	Type C 6'
Side/rear yard height (max)	Type E 6'

RN-A

B. BUILDING



1. HEIGHT	Sec. 2.11.10.
A Overall height (max stories/feet) ¹	2.5 / 32'
B Side wall (max)	25'
2. MASSING	Sec. 2.11.11.
C Building width (max)	40'
D Building depth (max)	70'
E Active depth (min)	9'
3. GROUND STORY	Sec. 2.11.12.
F Story height (min)	9'
G Finish floor elevation (min/max)	0' / 5'



	Primary St.	Side St.
4. TRANSPARENCY	Sec. 2.11.13.	
H Ground story (min)	25%	20%
I Upper story (min)	15%	15%
J Blank wall width (max)	10'	20'
5. ENTRANCES	Sec. 2.11.14.	
K Street-facing entry spacing (max)	30'	50'
Entry feature	Yes	Yes

NOTE: Additional standards apply for lots within the Neighborhood Revitalization Overlay District.
[View the Neighborhood Revitalization Overlay District Map](#)
[View the Neighborhood Revitalization Overlay District Design Standards](#)



PUBLIC HEARING REQUIRED

Zoning text amendments require a public hearing.

Docket Number: Z-12-2025
Text Amendment to: 24-Month update of Chapter 19: Greenville Development Code
Applicant(s): City of Greenville
Recommendation: Approve with modifications

Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 *Function, Powers, and Duties of Planning Commission*
Sec. 19-6.1.3. *Authority - - Planning Commission*
Sec. 19-6.2.2. *Legislative Review*

Background:

The new Greenville Development Code went into effect on July 15, 2023. As part of the adoption process, the city committed to conducting a review of the code at 6 months, 12 months, and annually thereafter to address any technical issues and to update the code in response to evolving trends, development patterns, and community feedback. The goal is to ensure the code remains effective and operational for Greenville for years to come.

Since adoption, three rounds of amendments have been adopted by City Council. The amendments primarily involved technical adjustments and follow-up edits from the initial drafting process. The latest round continues the effort to make the code more operable and responsive to Greenville's development patterns and neighborhood character.

Some of the more notable amendments in this round of updates were first introduced during a public session at the City Council work session on June 9, 2025, and at a special called Planning Commission workshop on June 13, 2025. The entire draft of the 24-month code update was available for review at the monthly Project Preview Meeting on June 24, 2025, as well as a "Coffee with the Code" session on June 25, 2025, at Greenville City Hall.

Planning Commission may include comments or propose modifications as part of its recommendation to City Council. Future changes may be initiated consistent with Sec. 19-6.2.2. or as part of the next scheduled update.

Discussion:

This section provides an overview of the more substantive amendments proposed with this 24-month review.

Note: The page numbers below refer to those in the published amendment document.

Applicability – Zoning Districts (Div. 19-2.1; pg. 9)

- The activity type description for Site Modification will be updated to specify that resurfacing is not included. Resurfacing is considered maintenance and repair. A definition to help distinguish repaving from resurfacing is proposed in Article 19-7.

House-Scale (RH-) (Div. 19-2.2; starting on pg. 9)

- Clarification on how to establish the primary structure setback is proposed in each RH- district table. The setback range or minimum setback number will remain as is, but setback range has been moved to the beginning to clarify its priority, and an asterisk has been added that clarifies that a setback range must be used unless a range cannot be established.
 - *Note: the update document includes a scrivener's error for the RH-A setback table. A second row for the primary street lot line setback for primary structures was inadvertently added.*
- Separation of alley setbacks into side and rear alley setbacks is proposed in each RH- district. Side alleys will follow the side street setback, while rear alleys will continue to use the rear setback.
- Separation of side street setbacks into primary and accessory structure is proposed in each RH- district. Primary structures will have the same setback as before, but accessory structures will have a greater setback. This added setback will ensure that accessory structures will not be too close to the street and in most cases behind the primary building. These changes are in conjunction with the proposed change in Section 19-3.5.1. that would allow accessory structures in the side street yard.
- A change for street-facing entrance spacing from maximum to average is proposed in each RH- district. These changes are in conjunction with the modifications to street-facing entry regulations in Section 19-2.11.14.
- An increase in the maximum story height of accessory structures from 1.5 stories to 2.0 stories is proposed in the RH-B, RH-C, and RH-D district. This would align with the current accessory structure story maximum in the RH-A district and would ease design constraints on above-garage accessory dwelling units. The overall height in feet would remain unchanged at 20 feet.
- Revise link in the Notes section of each RH- district page to reflect relocation of -NR standards to Section 19-2.10.4.

Neighborhood-Scale (RN-, RNX-) (Div. 19-2.3; starting on pg. 14)

- Clarification on how to establish the primary structure setback is proposed in the RN-A district table. The setback range or minimum setback number will remain as is, but setback range has been moved to the beginning to clarify its priority, and an asterisk has been added that clarifies that a setback range must be used unless a range cannot be established.
- Separation of alley setbacks into side and rear alley setbacks is proposed in the RN-A district. Side alleys will follow the side street setback, while rear alleys will continue to use the rear setback.
- A change for street-facing entrance spacing from maximum to average is proposed in each RN-/RNX- district. These changes are in conjunction with the modifications to street-facing entry regulations in Section 19-2.11.14.
- Revise link in the Notes section of RN-A district page to reflect relocation of -NR standards to Section 19-2.10.4.
- The base maximum building width is proposed to increase from 40 feet to 60 feet in the RN-B and RNX-B districts based on observations from Planning staff and feedback from design professionals.
- Creation of a bonus maximum building width is proposed in the RN-B, RNX-B, RN-C, and RNX-C districts to further ease affordable housing development and funding and to reflect the existing bonus density allowance. Under the current regulations, residential projects that attempt to use the bonus density may have difficulty adding those additional units as the district building height, width, and depth maximums do not scale up with the bonus.

Community-Scale (RC-) (Div. 19-2.4; starting on pg. 18)

- A change for street-facing entrance spacing from maximum to average is proposed in each RC-district. These changes are in conjunction with the modifications to street-facing entry regulations in Section 19-2.11.14.

Mixed Use (MX-) (Div. 19-2.5; starting on pg. 19)

- Removal of maximum building height in feet is proposed in each MX- district. These changes are in conjunction with the modifications to building height regulations in Section 19-2.11.10. and floor height regulations in Section 19-2.11.12. Height in these districts will continue to be regulated by height in stories and no changes to height in stories are proposed. These changes are in response to design professional feedback and are intended to improve flexibility while maintaining overall height expectations for each district.
- The Ground Story section of the building standards table in each MX- district will be replaced with Floor Heights to reflect changes being made in Section 19-2.11.12. and how height is measured in MX- districts. In addition to a minimum ground story height, a maximum ground story height and a maximum upper story height is proposed as building height in feet will no longer be used. Ground story heights will vary between residential and nonresidential buildings. The existing minimum ground story height will be reduced from 14' to 12' in the MX-2 and MX-3 districts in response to feedback from design professionals.
- A change for street-facing entrance spacing from maximum to average is proposed in each MX-district. These changes are in conjunction with the modifications to street-facing entry regulations in Section 19-2.11.14.
- A reduction in the alley setback from 5 feet to 0 feet in the MX-D district is proposed to align with the existing 0 feet setbacks for side street and rear property lines. Staff believes a farther setback from an alley compared to a street is unnecessary.

Shopfront (MXS-) (Div. 19-2.6; starting on pg. 22)

- Removal of maximum building height in feet is proposed in each MXS- district for the same reasons as discussed for the MX- districts above.
- The Ground Story section of the building standards table in each MXS- district is also being modified, consistent with the MX-districts.
- The same changes for street-facing entrance spacing are also proposed, consistent with the MX-districts.
- A reduction in the alley setback from 5 feet to 0 feet in the MX-D district is likewise proposed.

Business (BG, BH) (Div. 19-2.7; starting on pg. 26)

- Removal of maximum building height in feet is proposed in the BG district. This change is in conjunction with the modifications to building height regulations in Section 19-2.11.10. and floor height regulations in Section 19-2.11.12. Height in the BG district will continue to be regulated by height in stories.
- Creation of a bonus story allowance is proposed in the BG district to incentivize the creation of affordable housing development. The bonus would allow up to two additional stories for an overall maximum of five stories. The base and bonus story height would be in alignment with properties zoned RC-3, MX-3, MXS-3, and IX. Properties zoned BG are generally located along the city's larger thoroughfares such as Pleasantburg Drive as well as automobile-oriented business districts such as Haywood Road and Woodruff Road where additional height is not anticipated to be detrimental to the area's character.
- Changes to the story heights and street-facing entrance spacing are proposed, consistent with the other districts discussed above.

Industrial (IX, IG) (Div. 19-2.8; starting on pg. 28)

- Changes to maximum building height and floor heights are proposed in the IX district, consistent with the MX, MXS, and BG districts.
- A change for street-facing entrance spacing from maximum to average is proposed in the IX district. These changes are in conjunction with the modifications to street-facing entry regulations in Section 19-2.11.14.

Overlay Districts (Div. 19-2.10; starting on pg. 29)

- An incorrect reference to a historic certificate of appropriateness requirement for exterior work in the downtown design (-DD) overlay will be replaced with a reference to an urban design certificate of appropriateness. Even properties that are historically designated in the -DD overlay require an urban design certificate of appropriateness.
- Relocation of the existing Neighborhood Revitalization Overlay (-NR) standards from Appendix A to the Section 19-2.10.4. is proposed to increase visibility and reduce confusion on how to find the overlay standards. The existing -NR standards are unchanged, with the following clarification: References to the current code's building height and accessory structure sections are proposed to be corrected, and new illustrations may be added.
 - Planning staff in conjunction with Community Development staff may evaluate refinement of the -NR standards during a future code update.
- An amendment to add Donaldson Field Airport / SCTAC in the airport protective (-AP) overlay is proposed. This change will ensure that development near the airport complies with federal standards.

Rules for Zoning Districts (Div. 19-2.11; starting on pg. 33)

- New language is proposed that allows the Zoning Administrator to use side street standards on a property with two or more primary streets. Currently, lots with multiple primary street designations must comply with the primary street standards on those street frontages and facades. This may be infeasible or excessive in certain scenarios. For example, new construction of a single-family dwelling that has primary streets to the front and rear may not be able to comply with the primary street setback range or district's primary façade transparency requirements. This modification would allow use of the side street standards, which account for the appropriate design considerations and can usually be met without requiring relief.
- Refinement of the applicability of street-facing façade treatment is proposed. Currently, certain facades that are setback beyond 50 feet from the street do not require compliance with façade standards like entrances and transparency. This provision has been occasionally misinterpreted or incorrectly used to avoid requirements on facades that should have been subject to the street façade requirements. The proposed changes clarify what is meant by street-facing requirements and are expected to reduce confusion moving forward.
- A new rounding provision for lot width will be added to address how to administer zoning district standards that vary based on lot width. Currently, there is a gap in setback and building width standards. An example is included in the proposed language referencing this gap and how the Zoning Administrator would round in that scenario.
- A revision to exempt single-unit living from the outdoor amenity space requirement is proposed. Outdoor amenity space requirements do not apply in RH- and RN-A districts; however, single-unit living is permitted in multi-unit living and commercial districts that have outdoor amenity space requirements. Outdoor amenity space is intended to ensure public or private common space is constructed, which is incompatible with single unit living uses.
- Removal of the 2/3 perimeter maximum for required outdoor amenity space is proposed. Currently, the 67 percent or more of the perimeter of outdoor amenity space cannot be surrounded by walls or similar features. The current provision means that courtyards and similar private spaces cannot be used toward outdoor amenity space credit. This has been problematic for certain uses that require walled or fenced areas for safety or security purposes.
- Modifications to the building setback encroachment provisions are proposed.
- Changes are proposed to clarify how building height is measured:
 - Building height in stories will continue to be measured from all elevations and building height in feet will only be measured from the primary street. These changes codify the existing staff interpretation.
 - Language will also be added to reflect the modifications proposed in Section 19-2.11.12., Floor Heights. If a floor height exceeds the maximum height allowed, it will be considered an additional story or an encroachment, depending on the situation.

- The existing illustration for flat roof buildings will be updated to reflect how to measure a building with a parapet.
 - A title change in the encroachment section is proposed to bring more attention to screening on rooftops. Additionally, stairs will be removed from building height encroachment allowance examples.
- A rewrite of the building width break allowance is proposed to enable more buildings and designs to take advantage of the provision. The current language essentially limits the break to large nonresidential and multifamily buildings. The revised provision would allow for a variation of façade planes, at least 6' in depth and limited in façade width percentage, in exchange for increased overall building width. The exception is intended to ensure larger buildings maintain appropriate façade articulation while enabling smaller buildings to benefit from the break allowances.
- A new exception to the active depth requirement for multi-unit living uses with garages is proposed. Currently, corner buildings must comply with active depth requirements on both primary and side street facades. Garage space is specifically prohibited in areas where active depth is required. This has been an issue for townhouse developments that include a rear-loaded garage. The corner townhouse unit can typically comply with the primary street active depth standard, but the rear garage violates the side street active depth requirement. A redesign to comply is not typically viable because of the limited width of a townhouse (compared to a traditional detached house or apartment building). This exception would allow these corner units to have a garage if certain criteria are met.
- An overhaul of the Ground Story section is proposed to reflect a new approach in administering building height allowances in the MX-, MXS-, BG and IX districts. The section will be retitled Floor Heights and will be split between ground and upper stories. The existing provisions will be used in the Ground Stories subsection and new provisions will be added for the new Upper Stories section. To ensure that story count will not be manipulated through excessive floor height or use of mezzanines, each story will have a maximum height in feet. If a new building is designed to go beyond the maximum story height in feet, it will be considered an additional story or an encroachment, depending on the situation. For example, if a one level big box store in a BG district has an overall ground to ceiling height of 27 feet, it will be considered two stories for zoning purposes as the maximum ground floor height stops counting as one story at 18 feet in the BG district. These changes are proposed in response to design professional feedback and Planning staff observations.
- A rewrite of Street-facing Entry Spacing section is proposed to provide more flexibility in the placement of required entrances:
 - Spacing will change from a maximum distance to an averaging system. Averaging will be completed by taking the linear width of the street façade and dividing it by the zoning district's established spacing average. If the number results in a fraction, the number is rounded up or down accordingly. For example, if a new building has 130 feet of linear building width along the primary street façade and is in a BG district (which is proposed to have 60' spacing average), the calculation would be 130' divided by 60' which results in 2.167. This would be rounded down to two required street facing entrances. Those two entrances could be placed anywhere along the façade as long as the entrances are at least 20 feet apart (to limit clustering of entrances). Under the existing requirement, at least two entrances would also be required, but the entries could not exceed 60 feet between the two required doors or between door and edge of building. This generally results in entrances that are central to the building and have more rigid placement, unless additional entries are added.
 - The proposed change would also exempt single unit living uses from having to provide more than one required street facing entry. This change addresses an occasional challenge presented by large single-family dwellings.

Permitted Use Table (Div. 19-3.2; starting on pg. 42)

- A reference to Section 19-3.4.6., a new code section, is proposed in the hours of operation section. Section 19-3.4.6. will include late night use standards that will apply to all uses operating after midnight.

- *Note that a correction is needed in the code update document related to this provision. “2. Hours of operation” should be the subsection title and not part of the sentence.*
- To make it easier to locate, staff proposes to move “accessory dwelling unit” (ADU) from the Residential Uses category to Accessory Uses category within the Permitted Use Table. ADUs will continue to be permitted by right in all RH- districts. The designation of Low use intensity will be removed as accessory uses are not classified by intensity.
- A change to allow “religious assembly” uses in the IG district by right is proposed. Currently the use is not permitted. Planning staff believe this change is necessary to ensure compliance with the Religious Land Use and Institutionalized Persons Act (RLUIPA) as other assembly uses are allowed in the IG district.
- “Brewpub” and “microbrewery, small winery, or microdistillery” is proposed to change from permitted to permitted with conditions to reflect new use standards proposed in Section 19-3.4.3.C.

Use Definitions (Div. 19-3.3; starting on pg. 44)

- Clarification that only one accessory dwelling unit (ADU) is permitted on a lot is proposed.

Use Standards (Div. 19-3.4; pg. 44)

- Relocation of the accessory dwelling unit (ADU) use standards from the Residential Use Standards section is proposed. ADU use standards will be amended and relocated to the Accessory Use Standards section of 19-3.5.2.
- Modifications to roof-mounted communication facility standards are proposed to minimize visibility of such equipment. Changes would require that color always be considered regardless of location on the roof. Currently, the provisions imply that color is not considered if certain conditions such as location at the rear of the building apply. Changes would also add visibility consideration from a public park, such as Falls Park.
- A reference to the existing accessory outdoor entertainment stage standards is proposed in the use standards for “general outdoor entertainment” uses. This change will ensure alignment between outdoor entertainment uses whether primary or accessory in nature.
- A prohibition on late night operations of “general food and beverage” uses in RNX- and RC- districts is proposed. Currently, a “general food and beverage” use in these districts could request a special exception permit for after midnight hours. Planning staff does not believe that such requests would be appropriate given the predominate residential nature of these districts, and Planning staff does not believe any existing “general food and beverage” business would be impacted by this modification. Where permitted in other zoning districts, a reference to Section 19-3.4.6., a new code section that includes late night use standards, will be added.
- Minor modifications to the use standards for “bar and nightclub” uses are proposed. Removal of Phoenix Center is proposed to clarify that the city does not have a specific vendor preference for alcoholic beverage server training. Removal of the word “outdoor” from the security person standard is proposed to allow the Zoning Administrator or Board of Zoning Appeals, depending on the review type, to require both indoor and outdoor security persons, if warranted.
- Use standards are proposed for “Brewpub” and “microbrewery, small winery, or microdistillery” uses. Reuse of the existing “bar and nightclub” use standards will ensure consistency across these uses. Currently, the city is unable to impose use standards and added conditions on brewpubs, microbrewery, small winery, and microdistilleries that would ensure adequate public safety, such as a minimum number of security persons during peak operating hours. The change would also eliminate attempts by applicants to avoid the “bar or nightclub” use classification.
- Another proposed change clarifies that “general medical” uses in RNX- and RC- districts are limited in hours of operation, as additional use standards for “general medical” are proposed in this code update. The hours of operation limitation already apply and is unchanged.
- A restriction on “general medical” and “general office” uses in the Shopfront Downtown district is proposed. The change would prohibit these uses from occupying the first 15 feet of a ground floor storefront on Main Street or Augusta Street, essentially from the Hyatt on the north to Markley Street on the south end of Main Street. The intention of this change is to ensure other, more active uses occupy these storefronts instead. This provision will help ensure the city is promoting

an 18-hour, walkable downtown. Medical and office uses would still be permitted to occupy upper or basement floors on these two streets as well as the various side streets downtown. Existing medical and office uses not conforming with this provision would be permitted to remain and could even be replaced with a new tenant if the use remains the same. The provision would also allow the Zoning Administrator to waive the requirement on historically designated buildings like the historic Chamber of Commerce building.

- The use standards of “tattoo facility” will be amended to replace the reference to DHEC with its successor agency.
- A proposed reformatting of the “vehicle sales and service” use standards category will provide clarity to the reader and align with the formatting standards of the rest of the code. Sections will be created for “vehicle repair or service,” “vehicle sale or rental,” and “fueling station.” The standards for each of these use types are already existing and are unchanged, although the application of the transition screening standard to “vehicle repair or service” uses may have not been clear previously.
- A new section entitled “Additional Use Standards” is proposed to include regulations that do not directly align with a single use. This section will include regulations on late night hours of operation. Ten new use standards are proposed to ensure uses operating during these hours maintain compatibility with surrounding properties and ensure public safety. New regulations include prohibitions on traffic, sound amplification, opening of doors/windows, as well as outdoor/rooftop dining and seating areas during these extended hours. At least one security person will be required for all uses for at least the first six months of operation after midnight. The Board of Zoning Appeals will continue to review uses operating after midnight through the special exception permitting process and will have the ability to add to and modify some of these provisions.

Accessory Uses and Structures (Div. 19-3.5; pg. 52)

- A reference to the definition of accessory structure will be added to the General Standards section for clarification.
- A provision to allow breezeway connections between primary structures and accessory structures is proposed. The breezeway must be open (unenclosed) and cannot be wider than 8 feet. The provision would allow the two structures to be regulated separately despite being connected. The city allowed similar connections under the Land Management Ordinance.
- A change to allow accessory structures in side street yards of RH- and RN- districts is proposed. Accessory structures would be subject to the modified side street setbacks proposed in Article 19-2. to ensure the structures are not located too close to the side street. An additional provision would allow relief from the side street setback if the accessory structure were determined to be in the rear yard. The rear yard is established by the location of the primary structure. The change is intended to address feedback from residential property owners.
- Accessory Dwelling Unit (ADU) regulations will now be located under the Accessory Uses and Structures section. Modifications are also planned to make permitting more straightforward. The changes will also increase consistency between attached and detached ADUs.
 - The annual reporting period for ADUs will be expanded from 2025 to 2028 to continue monitoring ADU activity.
 - Setbacks, entry placement, and other dimensional standards will be simplified and aligned with existing RH- zoning district standards.
 - The previous table detailing maximum floor area has been condensed for clarity, but the existing ratio and floor area allowances are unchanged.
 - Clarification regarding ADU ownership, utilities, and addressing are proposed.
 - An increase in the number of stories allowed for accessory structures in the RH-B, RH-C, and RH-D districts will further enable the common ADU over garage design.
- A modification to allow home occupations to use an accessory structure is proposed. The area used would be limited to 500 square feet to ensure compatibility with the residential character of the property.

Temporary Uses and Structures (Div. 19-3.6; pg. 55)

- An existing provision requiring portable storage unit vendors to provide a report to the city will be removed. The provision has not been used by the Planning Department.

Development Bonus (Div. 19-4.2; starting on pg. 57)

- Changes to the Affordable Housing and Open Space section are proposed to reflect the proposed modifications that would add a bonus width allowance in the RN-B, RNX-B, RN-C, and RNX-C districts as well as a bonus height allowance in the BG district.

Streets (Div. 19-4.4; starting on pg. 58)

- A new sidewalk fee-in-lieu-of (FILO) construction provision is proposed. The FILO would allow for an applicant to make a cash payment instead of constructing a new sidewalk along the street frontage. The FILO funds would only be used by the city to fund new pedestrian infrastructure where it is more viable and useful. Eligibility for the FILO would be limited to certain scenarios, such as physical constraints or upcoming construction projects that would negatively impact the new sidewalk if built. The Zoning Administrator in conjunction with the city's Engineering Services Division would evaluate each request to ensure a FILO is appropriate. Currently, an applicant must either build the sidewalk or request a sidewalk waiver from Engineering Services. To be granted a waiver, the request must comply with the same criteria that is used for variances, which can be difficult to meet. The FILO option would enable a middle ground option for applicants and the city that should benefit all parties. The FILO amount for each project would be calculated using established figures in the accompanying Engineering Design and Specifications Manual update.

Vehicle Access and Parking (Div. 19-4.6; starting on pg. 59)

- An increase in the maximum parking requirement for general lodging uses is proposed. The maximum number would increase from 1 to 1.5 parking spaces per guest room.
- Electric vehicle standards will be overhauled. Current regulations allow for spaces to be either EV ready or EV installed. EV charging infrastructure will now be required for multi-unit living and parking decks, but the number of chargers will shift from a percentage to a fixed number based on parking provided. EV charging requirements for nonresidential development will shift to an incentive approach. If EV charging infrastructure is installed, minimum parking requirements may be reduced and maximum parking requirements may be increased. Associated definitions will be added to Division 19-7.2.
- An allowance for vehicles to park over landscape islands is proposed to be struck. This change is in response to observations by Tree and Landscape review staff.
- Garage design standard applicability will be clarified. New provisions are proposed to distinguish how to regulate a garage that is located on the front of a house but is side facing.

Transitions and Screening (Div. 19-4.8; starting on pg. 62)

- Changes to the waste receptacle screening standards are proposed. The changes will ensure dumpster enclosure gates are closed except during service and to prohibit certain building materials from being used as part of a dumpster enclosure.

Fences and Walls (Div. 19-4.9; starting on pg. 63)

- A modification to fence height allowances is proposed to allow residential properties to have a taller fence than the district maximum if the fence will be located along a commercial or industrial district that allows a taller fence. This change is intended to address feedback from residential property owners.
- Retaining wall regulations will be modified. The Intent subsection will be expanded to include minimizing mass grading of sites. The Industrial Flex (IX) district will be removed from the retaining wall standards applicability. The standards will be reorganized so that new retaining walls must comply with the established fence/wall height standards of the zoning district, not just when two or more retaining walls are needed.

Signs (Div. 19-4.11; starting on pg. 64)

- A number of changes are proposed to the sign ordinance. Changes are proposed that include: a new catch-all statement related to prohibited signs, revised allowances for flags and flagpoles on residential and commercial properties, adjustments to the placement of projecting signs, modifications to monument sign dimensions, and restrictions on the use of new electronic message boards.
- Modifications to the outdoor advertising sign allowances are proposed. Extended advertising areas beyond a billboard's frame would become prohibited. New provisions will be added to provide clarity on the approval process to modify an existing billboard.
 - *Additional changes are proposed to the outdoor advertising sign section under the Planning staff recommendations section of this report.*

Lighting (Div. 19-4.12; starting on pg. 69)

- Further clarification has been added to the lighting ordinance. Site modifications will only require changes to site lighting and cobra head fixtures will be prohibited.
- A maximum point light level amount of 20 footcandles is proposed. This change was requested by the city's Engineering Services Division and aligns with previous lighting standards used in the Land Management Ordinance.
- An increase in the number of lumens per net acre is proposed in response to design professional feedback. The increased numbers better address light intense uses but are still in alignment with "dark sky" best practices.

Materials (Div. 19-4.13; starting on pg. 71)

- Painted CMU block will be removed and replaced with polished CMU block under the Materials section. Painted CMU block will be regulated using the smooth-finished concrete block allowances.

Stormwater Management (Div. 19-5.3, starting on pg. 72)

- Multiple references to the South Carolina Department of Health and Environmental Control will be removed and replaced with the appropriate successor agency, the Department of Environmental Services.
- Multiple references to the waters of the United States are also proposed to be removed and replaced with the term aquatic resources as used by the Corps of Engineers. A definition for aquatic resources will also be added.
- Modification of the definition of wetland is also proposed to reference the Corps of Engineers manual.
- Minor formatting changes are also proposed.

Approval Processes (Div. 19-6.2, starting on pg. 78)

- Modification to the mailed notice procedure is proposed. Currently applicants are required to handle mailings for public notice. The proposed revision would no longer specify that applicants must handle the mailing. The revision would allow flexibility should the city opt to handle mailings.
 - *Note that a scrivener's error was made in the code update document regarding the section title. It should be Section 19-6.2.1. Common Review Procedures.*
- A typo was identified and proposed for correction under the minor subdivision section.
- A change to the definition of major subdivision is proposed. Currently major subdivisions are considered subdivisions not classified as minor subdivisions and defer to the definition of minor subdivision. The proposed change will modify the language to specify that major subdivisions are those where streets are dedicated for the proposed subdivision.
- An incorrect reference to newspaper publication for demolition of historically significant structures will be removed. Demolition of these structures only requires posting signage on the property.

Defined Terms (Div. 19-7.2, pg. 80)

- New definitions for architectural metal siding and corrugated metal siding are proposed. These definitions are intended to provide clarity to the Materials section of the code, in which corrugated metal siding is limited by zoning district.
- The definition of crematory incinerator will be amended to replace the reference to DHEC with its successor agency. Capitalization of incinerator is also proposed to align with existing formatting.
- A definition for customer service area is proposed. Customer service area is used to calculate parking requirements for certain food and beverage related uses. The definition will provide clarity on what areas are intended to be included and excluded in that calculation.
- A revision to the definition of demolition is proposed that expands the scope of what qualifies as a demolition. This change will specifically address scenarios where an alteration removes more than 50 percent of the building's walls/roof to its foundation.
- A definition for EV Installed is included to correspond to the proposed EV infrastructures changes in Article 19-4.
- Definitions for lumen, lumens per net acre, and total outdoor light output are proposed. These definitions will provide further clarity to the existing lighting requirements of Division 19-4.12.
- A definition of repaving is proposed. The language will help distinguish repaving from resurfacing and resealing, which do not trigger site modification requirements.
- Residential district will be defined. The term is used throughout the code and will codify the interpretation that RNX- is included as a residential district.
- A definition for street will be added to provide clarity on its meaning when used throughout the code. The term "alley" is already defined and distinguished from street.

Evaluation of Short-Term Rental Use Allowance in the RNX-C District

- During the January 7, 2025, Planning Commission meeting, the Commission asked Planning staff to evaluate the existing short term rental (STR) use allowances, particularly in the RNX-C district and to consider bringing forward a text amendment to implement changes that would offer an alternative other than a rezone. This request was in a response to a zoning map amendment case where the applicant had to rezone or cease operating an unpermitted short-term rental.
- With the assistance of the city's Geographic Information Systems (GIS) staff, Planning staff was able to determine that 453 parcels within the city are zoned RNX-C. Approximately 54 percent of these properties with known land use codes are used for nonresidential purposes. Data for the number of dwelling units on RNX-C zoned properties was not available.
- Planning staff found that RNX-C zoning is generally used in two capacities. Along neighborhood commercial corridors such as E North Street, E Washington Street, and Stone Avenue, and as a buffer between busier thoroughfares and abutting residential neighborhoods such as Laurens Road and Augusta Road. A map created by GIS staff showing the location of these properties and their use is included in the staff report package.
- After understanding the existing RNX-C conditions, Planning staff began evaluating the potential challenges of allowing short term rentals in the RNX-C District.
 - Under the Land Management Ordinance, STRs were classified as either "bed and breakfasts" or "hotels." Hotels included non-owner occupied STRs and were permitted through special exception in the Office-Institutional (OD) district. A noticeable increase in the number of special exception applications for hotels in the OD district were requested between 2022 and adoption of the current code. This trend resulted in concerns from the Board of Zoning Appeals and neighbors about the loss of long-term housing units and the perceived impacts to the residential character of these areas. During this period, Planning staff also observed a frequent number of inquiries from parties seeking to purchase OD zoned properties for the purpose of creating short term rentals. Based on the previous trends, Planning staff believe that this trend would return if permitted by right or by special exception in the RNX-C district. Additionally, Planning staff believe that requests to rezone properties from RH- / RN- / RNX-B to RNX-C would increase if STRs are allowed.
 - Planning staff also reviewed the trend of unpermitted STRs and the Planning Department's enforcement efforts. Staff found unpermitted STRs have decreased since adoption of the current code and that a limited number of STRs are in areas currently

- zoned RNX-C (15 total with 5 being unpermitted out of more than 600 total listings). A large number of unpermitted STRs are located in RH- districts, where a rezoning to RNX-C is not likely to be successful.
 - The Land Management Ordinance included several use standards for bed and breakfast uses, such as limiting them to certain roads and capping the number of guest rooms. Planning staff believes that inclusion of similar use standards would be appropriate in the RNX-C district; however, application of a road classification standard would result in a considerable reduction of eligible properties, particularly those used as buffers.
- After careful consideration, Planning staff does not recommend any changes to the existing general lodging use regulations in this round of changes and does not recommend permitting such use by right or by special exception in the RNX-C district at this time.

Staff Analysis:

(a) Consistent with Comprehensive Plan.	YES
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Comments: Staff finds the proposed text amendment is consistent with the Comprehensive Plan. The amendments are an update to the Greenville Development Code, which was prepared as an implementation step to GVL 2040. The amendments do not alter the major policy priorities from GVL 2040. Instead, the amendments are primarily technical edits or changes intended to ensure the code is operational for the Greenville community.

(b) Consistent with the Greenville Development Code	YES
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Comments: The amendments fit into the overall framework of the Greenville Development Code. These changes are prepared after working with the development community and homeowners who have been using the Code for the past two years.

(c) Addresses a community need.	YES
--	------------

Comments: The City of Greenville, as part of the adoption ordinance, committed to regular updates to the Development Code to respond to development patterns, neighborhood feedback, economic trends, and other factors expected in a dynamic and growing community. As expressed previously, the purpose of these updates is to ensure the code remains effective, responsive, and operational for the Greenville community.

(d) Effect of Development Impact on Community	N/A
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Comments: The proposed text amendment continues to provide protections for neighborhoods and compatible transitions between land uses.

STAFF RECOMMENDATION:

APPROVE

Staff recommends approval of the text amendment with modifications to the outdoor advertising signs provisions of Section 19-4.11.6.A. to reduce the number of permitted zoning districts and eliminate the allowance of LED message boards as specified below:

Staff recommends removing BG and IX from the permitted districts for Type I outdoor advertising signs.

2. Districts Where Permitted

- a. Type I outdoor advertising signs are permitted in ~~BG~~, BH, ~~IX~~ and IG districts, subject to the conditions of this section.

Additionally, staff recommends striking through the allowance of LED lighting on outdoor advertising signs, which reflects a commitment to ensuring protection for neighborhoods, ensuring appropriate commercial development patterns, and regulating the use of land for purposes that support and enhance the city for all its citizens.

11. Special Exception Permit Required for Type I Sign

~~b. The Board of Zoning Appeals in its discretion may also authorize the use of LED lighting, or comparable digital luminance, for the face of the sign in such instances with due regard to nearby land uses and the compatibility of the proposed luminance with those uses. If the application for the replacement of Type I signs results in a reduction in the total number of sign faces in the City, then the Board of Zoning Appeals may allow an increase in the height and face size of individual replacement signs beyond what is otherwise permitted under this section.~~

(renumber subsequent paragraphs)

- - -

12. Modifications to Existing Type I Signs

- a. With the exception of changing an advertisement on an existing face, modifications to an existing Type I Sign must obtain a special exception permit from the Board of Zoning Appeals.

- b. Modifications to an existing nonconforming Type I Sign must comply with the standards of Sec. 6.3.4.

~~c. The Board of Zoning Appeals in its discretion may also authorize the use of LED lighting, or comparable digital luminance, for the face of the sign in such instances with due regard to nearby land uses and the compatibility of the proposed luminance with those uses.~~

**Greenville Development Code
Text Amendment
24-Month Code Review**

Text Amendment Table of Contents

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USING THIS DOCUMENT

- This document contains proposed amendments to the Greenville Development Code (GDC). All amendments must be reviewed for recommendation by the City of Greenville Planning Commission, who will also conduct a public hearing on the proposed amendments. The amendments require approval of two readings of an ordinance by City Council to be formally adopted.
- Only those sections of the GDC with a proposed amendment are contained in this document. When reviewing the proposed amendments, it is recommended that you also have a copy of the GDC open to see the amendments within the context of the full code section. The GDC is available on the city website at www.greenvillesc.gov/devcode.
- Within this document, strikethrough (~~strikethrough~~) font indicates text currently in the GDC that is proposed for deletion. Underlined (underlined) font represents language that is proposed to be added to the code. When a change is proposed to a table or chart, only the rows or columns proposed for modification are typically shown.
- Staff commentary explaining changes is included at the end of each provision and is differentiated through colored, italicized text (*staff commentary*).
- Upon final adoption by City Council, Planning staff will incorporate the adopted amendments into the official GDC document and publish an updated version online. Please allow several weeks for these updates to be completed.
- Please contact the Planning Department at 864-467-4476 or planning@greenvillesc.gov if you have any questions about an amendment or need help using this document.

ART. 19-1. INTRODUCTORY PROVISIONS

Div. 19-1. GENERAL

No changes.

Div. 19-2. DISTRICTS ESTABLISHED

No changes.

Div. 19-3. OFFICIAL ZONING MAP

No changes.

ART. 19-2. ZONING DISTRICTS

Div. 19-2.1. Applicability

Section 19-2.1.2. ACTIVITY TYPE (GDC pg. 2-4)

B. Site Modification

Any substantial modification to a site, including landscaping, trees, fencing, walls, lighting, grading, flatwork, and parking lots including repaving of existing parking lots. As clarification, the resealing, ~~or~~ restriping, or resurfacing of parking lots is considered Maintenance and Repair.

Clarify that resurfacing of parking lots is maintenance and repair.

Div. 19-2.2. House-Scale (RH-)

Section 19-2.2.2. RH-A HOUSE A (GDC pg. 2-8)

A. Site

4. BUILDING SETBACKS	Sec. 2.11.5.
D. Primary street lot line (min)	
Primary structure	<u>Setback Range or</u> <u>30'*</u> <u>30' or Setback Range</u>
Primary structure	
Accessory structure	60'
E. Side street/ <u>side alley</u> lot line (min)	<u>15'</u>
<u>Primary structure</u>	<u>15'</u>
<u>Accessory structure</u>	<u>30'</u>
F. Side lot line (min)	
Up to 100' wide lot	10'
Above 100' wide lot	12'
G. Rear/ <u>rear alley</u> lot line (min)	
Primary structure	20'

Accessory structure	5'
---------------------	----

Clarify that the primary street setback must attempt to establish a setback range, before defaulting to the base setback. Separate alley setbacks by side and rear.

B. Building

5. ENTRANCES	Sec. 2.11.14.	
J. Street-facing entrance spacing (max) (avg)	60'	60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

NOTES:

*If a setback range cannot be established, a 30' minimum primary street lot setback shall be used.

Additional standards apply for lots within the Neighborhood Revitalization Overlay District.

View the Neighborhood Revitalization Overlay District Map

View the Neighborhood Revitalization Overlay District Design Standards

(Update Design Standards reference to Sec. 2.10.4.)

Add setback range footnote and update –NR overlay references.

Section 19-2.2.3. RH-B HOUSE B (GDC pg. 2-10)

A. Site

4. BUILDING SETBACKS	Sec. 2.11.5.
D. Primary street lot line (min)	
Primary structure	<u>Setback Range or</u> 20'*
Accessory structure	20' or Setback Range 50'
E. Side street/side alley lot line (min)	10'
Primary structure	<u>10'</u>
Accessory structure	<u>20'</u>

F. Side lot line (min)	
Up to 70' wide lot	5'
71' to 100' wide lot	7'
Above 100' wide lot	10'
G. Rear/ <u>rear</u> alley lot line (min)	
Primary structure	15'
Accessory structure	5'

Clarify that the primary street setback must attempt to establish a setback range, before defaulting to the base setback. Separate alley setbacks by side and rear.

B. Building

1. HEIGHT	Sec. 2.11.10.
A. Overall height (max stories/feet)	
Primary structure	2.5 / 32'
Accessory structure	1.5 <u>2</u> / 20'

5. ENTRANCES	Sec. 2.11.14.
J. Street-facing entrance spacing (max) (avg)	50' 50'

Increase maximum accessory structure height from 1.5 stories to 2 stories but maintain maximum height in feet. Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

NOTES:

*If a setback range cannot be established, a 20' minimum primary street lot setback shall be used.

Additional standards apply for lots within the Neighborhood Revitalization Overlay District.

View the Neighborhood Revitalization Overlay District Map

View the Neighborhood Revitalization Overlay District Design Standards

(Update Design Standards reference to Sec. 2.10.4.)

Add setback range footnote and update –NR overlay references.

Section 19-2.2.2. RH-C HOUSE C (GDC pg. 2-12)

A. Site

4. BUILDING SETBACKS	Sec. 2.11.5.
D. Primary street lot line (min)	
Primary structure	<u>Setback Range or</u> <u>20'</u> 20' or Setback Range
Accessory structure	50'
E. Side street/side alley lot line (min)	10'
Primary structure	<u>10'</u>
Accessory structure	<u>20'</u>
F. Side lot line (min)	
Up to 60' wide lot	5'
61' to 100' wide lot	7'
Above 100' wide lot	10'
G. Rear/rear alley lot line (min)	
Primary structure	15'
Accessory structure	5'

Clarify that the primary street setback must attempt to establish a setback range, before defaulting to the base setback. Separate alley setbacks by side and rear.

B. Building

1. HEIGHT	Sec. 2.11.10.
A. Overall height (max stories/feet)	
Primary structure	2.5 / 32'
Accessory structure	1.5 <u>2</u> / 20'

5. ENTRANCES	Sec. 2.11.14.
J. Street-facing entrance spacing (max) (avg)	40' 40'

Increase maximum accessory structure height from 1.5 stories to 2 stories but maintain maximum height in feet. Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

NOTES:

*If a setback range cannot be established, a 20' minimum primary street lot setback shall be used.

Additional standards apply for lots within the Neighborhood Revitalization Overlay District.

View the Neighborhood Revitalization Overlay District Map

View the Neighborhood Revitalization Overlay District Design Standards

(Update Design Standards reference to Sec. 2.10.4.)

Add setback range footnote and update –NR overlay references.

Section 19-2.2.4. RH-D HOUSE D (GDC pg. 2-14)

A. Site

4. BUILDING SETBACKS	Sec. 2.11.5.
D. Primary street lot line (min)	
Primary structure	<u>Setback Range or</u> <u>20'*</u> 20' or Setback Range
Accessory structure	50'
E. Side street/side alley lot line (min)	<u>7'</u>
Primary structure	<u>7'</u>
Accessory structure	<u>15'</u>
F. Side lot line (min)	5'
G. Rear/rear alley lot line (min)	<u>4'</u>
—Primary structure	4'
—Accessory structure	4'

Clarify that the primary street setback must attempt to establish a setback range, before defaulting to the base setback. Separate alley setbacks by side and rear.

B. Building

1. HEIGHT	Sec. 2.11.10.
A. Overall height (max stories/feet)	

Primary structure	2.5 / 32'
Accessory structure	1.5 <u>2</u> / 20'

5. ENTRANCES	Sec. 2.11.14.	
J. Street-facing entrance spacing (max) (avg)	20'	40'

Increase maximum accessory structure height from 1.5 stories to 2 stories but maintain maximum height in feet. Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

NOTES:

*If a setback range cannot be established, a 20' minimum primary street lot setback shall be used.

Additional standards apply for lots within the Neighborhood Revitalization Overlay District.

View the Neighborhood Revitalization Overlay District Map

View the Neighborhood Revitalization Overlay District Design Standards

(Update Design Standards reference to Sec. 2.10.4.)

Add setback range footnote and update –NR overlay references.

Div. 19-2.3. Neighborhood-Scale (RN-, RNX-)

Section 19-2.3.1. INTENT (GDC pg. 2-17)

RN-A	RN-B	RNX-B	RN-C	RNX-C
4 dwelling units (max)	8 dwelling units, 10 with bonus (max)	8 dwelling units, 10 with bonus (max)	12 dwelling units, 16 with bonus (max)	12 dwelling units, 16 with bonus (max)
25' lot width (min)	25' lot width (min)	25' lot width (min)	25' lot width (min)	25' lot width (min)
2.5 stories / 32' in height (max)	2.5 stories / 32' in height (max)	2.5 stories / 32' in height (max)	3 stories / 42' in height (max)	3 stories / 42' in height (max)
40' building width (max)	60' building width 80' with bonus (max)	60' building width 80' with bonus (max)	100' building width 125' with bonus (max)	100' building width 125' with bonus (max)
		Limited small-scale commercial		Limited small-scale commercial

Amend building width allowances in RN-B, RNX-B, RN-C, and RNX-C.

Section 19-2.3.2. RN-A NEIGHBORHOOD A (GDC pg. 2-18)

A. Site

4. BUILDING SETBACKS	Sec. 2.11.5.
D. Primary street lot line (min/ max)	10' / 20' or Setback Range*
E. Side street/ <u>side alley</u> lot line (min/ max)	10'
F. Side lot line (min)	5'
G. Rear/ rear alley lot line (min)	4'

Clarify that the primary street setback must attempt to establish a setback range, before defaulting to the base setback. Separate alley setbacks by side and rear.

B. Building

5. ENTRANCES	Sec. 2.11.14.	
K. Street-facing entrance spacing (max) (avg)	30'	50'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

NOTES:

*If a setback range cannot be established, a 10' minimum / 20' maximum primary street lot setback shall be used.

Additional standards apply for lots within the Neighborhood Revitalization Overlay District.

View the Neighborhood Revitalization Overlay District Map

View the Neighborhood Revitalization Overlay District Design Standards

(Update Design Standards reference to Sec. 2.10.4.)

Add setback range footnote and update -NR overlay references.

Section 19-2.3.3. RN-B NEIGHBORHOOD B (GDC pg. 2-20)

B. Building

2. MASSING	Sec. 2.11.11.
A. Building width (max)	40'
Base	60'
Bonus	80'

Increase maximum building width for base and add bonus.

5. ENTRANCES	Sec. 2.11.14.
K. Street-facing entrance spacing (max) (avg)	30' 50'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.3.4. RNX-B NEIGHBORHOOD FLEX B (GDC pg. 2-22)

B. Building

2. MASSING	Sec. 2.11.11.
A. Building width (max)	40'
Base	60'
Bonus	80'

Increase maximum building width for base and add bonus.

5. ENTRANCES	Sec. 2.11.14.
K. Street-facing entrance spacing (max) (avg)	30' 50'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.3.5. RN-C NEIGHBORHOOD C (GDC pg. 2-24)

B. Building

2. MASSING	Sec. 2.11.11.
A. Building width (max)	100'
Base	<u>100'</u>
Bonus	<u>125'</u>

Create maximum building width bonus.

5. ENTRANCES	Sec. 2.11.14.	
K. Street-facing entrance spacing (max) (avg)	40'	50'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.3.6. RNX-C NEIGHBORHOOD FLEX C (GDC pg. 2-26)

B. Building

2. MASSING	Sec. 2.11.11.
A. Building width (max)	100'
Base	<u>100'</u>
Bonus	<u>125'</u>

Create maximum building width bonus.

5. ENTRANCES	Sec. 2.11.14.	
K. Street-facing entrance spacing (max) (avg)	40'	50'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Div. 19-2.4. Community-Scale (RC-)

Section 19-2.4.2. RC-2 COMMUNITY 2 (GDC pg. 2-30)

B. Building

5. ENTRANCES	Sec. 2.11.14.	
I. Street-facing entrance spacing (max) (avg)	40'	60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.4.3. RC-3 COMMUNITY 3 (GDC pg. 2-32)

B. Building

5. ENTRANCES	Sec. 2.11.14.	
I. Street-facing entrance spacing (max) (avg)	40'	60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.4.4. RC-5 COMMUNITY 5 (GDC pg. 2-34)

B. Building

5. ENTRANCES	Sec. 2.11.14.	
J. Street-facing entrance spacing (max) (avg)	40'	60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Div. 19-2.5. Mixed Use (MX-)

Section 19-2.5.1. INTENT (GDC pg. 2-37)

MX-2	MX-3	MX-5	MX-D
No density restrictions	No density restrictions	No density restrictions	No density restrictions
15' lot width (min)	15' lot width (min)	15' lot width (min)	15' lot width (min)
2 stories in height 4 stories with bonus (max)	3 stories in height 5 stories with bonus (max)	5 stories in height 7 stories with bonus (max)	See height map
275' building width (max)	275' building width (max)	275' building width (max)	275' building width (max)

Remove references to building in feet maximums in MX- districts. Height will remain regulated by stories.

Section 19-2.5.2. MX-2 MIXED USE 2 (GDC pg. 2-38)

B. Building

1. HEIGHT	<i>Sec. 2.11.10.</i>
A. Overall height (max stories/ feet)	
Base	2 / 30'
Bonus	4 / 54'

Remove 30' and 54' maximum. Height will remain regulated by stories.

3. GROUND STORY FLOOR HEIGHTS	<i>Sec. 2.11.12.</i>
<u>GROUND STORY</u>	
E. Story height (min/max)	
Residential	10' to 18'
Nonresidential	14' 12' to 18'
<u>UPPER STORY</u>	
Story height (max)	<u>15'</u>

(Renumber subsequent sections)

Adjust ground story minimums and add maximum. Add upper story minimum and maximums.

5-6. ENTRANCES	Sec. 2.11.14.	
J. Street-facing entrance spacing (max) (avg)	40'	60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.5.3. MX-3 MIXED USE 3 (GDC pg. 2-40)

B. Building

1. HEIGHT	Sec. 2.11.10.
A. Overall height (max stories/ feet)	
Base	3 / 42'
Bonus	5 / 68'

Remove 42' and 68' maximum. Height will remain regulated by stories.

3. GROUND STORY FLOOR HEIGHTS	Sec. 2.11.12.
GROUND STORY	
E. Story height (min/ max)	
Residential	10' to <u>18'</u>
Nonresidential	14' <u>12'</u> to <u>18'</u>

UPPER STORY	
Story height (max)	<u>15'</u>

(Renumber subsequent sections)

Adjust ground story minimums and add maximum. Add upper story minimum and maximums.

5-6. ENTRANCES	Sec. 2.11.14.	
J. Street-facing entrance spacing (max) (avg)	40'	60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.5.4. MX-5 MIXED USE 5 (GDC pg. 2-42)

B. Building

1. HEIGHT	Sec. 2.11.10.	
A. Overall height (max stories/ feet)		
Base	5	68'
Bonus	7	94'

Remove 68' and 94' maximum. Height will remain regulated by stories.

3. GROUND STORY FLOOR HEIGHTS	Sec. 2.11.12.	
<u>GROUND STORY</u>		
E. Story height (min/ max)		
Residential	10'	<u>to 18'</u>
Nonresidential	14'	<u>to 18'</u>

<u>UPPER STORY</u>		
Story height (max)	15'	

(Renumber subsequent sections)

Adjust ground story minimums and add maximum. Add upper story minimum and maximums.

5-6. ENTRANCES	Sec. 2.11.14.	
K. Street-facing entrance spacing (max) (avg)	40'	60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.5.5. MX-D MIXED USE DOWNTOWN (GDC pg. 2-44)

A. Site

3. BUILDING SETBACKS	Sec. 2.11.5.
----------------------	--------------

G. Rear lot line (min)	0'
Alley lot line (min)	5' 0'

Reduce alley setback to 0ft.

B. Building

3. GROUND STORY FLOOR HEIGHTS	Sec. 2.11.12.
-------------------------------	---------------

GROUND STORY	
--------------	--

E. Story height (min/max)	
Residential	10' to 18'
Nonresidential	14' to 18'

UPPER STORY	
-------------	--

Story height (max)	15'
--------------------	-----

(Renumber subsequent sections)

Adjust ground story minimums and add maximum. Add upper story minimum and maximums.

5.6. ENTRANCES	Sec. 2.11.14.
----------------	---------------

J. Street-facing entrance spacing (max)	40'	60'
(avg)		

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Div. 19-2.6. Shopfront (MXS-)

Section 19-2.6.1. INTENT (GDC pg. 2-47)

MXS-2	MXS-3	MXS-5	MXS-D
No density restrictions	No density restrictions	No density restrictions	No density restrictions
15' lot width (min)	15' lot width (min)	15' lot width (min)	15' lot width (min)
2 stories in height 4 stories with bonus (max)	3 stories in height 5 stories with bonus (max)	5 stories in height 7 stories with bonus (max)	See height map
175' building width (max)	175' building width (max)	175' building width (max)	175' building width (max)

Remove references to building in feet maximums in MXS- districts. Height will remain regulated by stories.

Section 19-2.6.2. MXS-2 SHOPFRONT 2 (GDC pg. 2-48)

B. Building

1. HEIGHT	Sec. 2.11.10.
A. Overall height (max stories/feet)	
Base	2 / 30'
Bonus	4 / 54'

Remove 30' and 54' maximum. Height will remain regulated by stories.

3. GROUND STORY FLOOR HEIGHTS	Sec. 2.11.12.
GROUND STORY	
E. Story height (min/max)	14' to 18'

UPPER STORY	
Story height (max)	15'
(Renumber subsequent sections)	

Add ground story and upper story maximum.

5-6. ENTRANCES	Sec. 2.11.14.
---------------------------	---------------

J. Street-facing entrance spacing (max) (avg)	40'	60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.6.3. MXS-3 SHOPFRONT 3 (GDC pg. 2-50)

B. Building

1. HEIGHT	Sec. 2.11.10.
A. Overall height (max stories/feet)	
Base	3 / 42'
Bonus	5 / 68'

Remove 42' and 68' maximum. Height will remain regulated by stories.

3. GROUND-STORY FLOOR HEIGHTS	Sec. 2.11.12.
GROUND STORY	
E. Story height (min/max)	14' to 18'

UPPER STORY	
Story height (max)	15'
(Renumber subsequent sections)	

Add ground story and upper story maximum.

5-6. ENTRANCES	Sec. 2.11.14.
J. Street-facing entrance spacing (max) (avg)	40' 60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.6.4. MXS-5 SHOPFRONT 5 (GDC pg. 2-52)

B. Building

1. HEIGHT	Sec. 2.11.10.
A. Overall height (max stories/feet)	
Base	5 / 68'
Bonus	7 / 94'

Remove 68' and 94' maximum. Height will remain regulated by stories.

3. GROUND-STORY FLOOR HEIGHTS	Sec. 2.11.12.
GROUND STORY	
F. Story height (min/max)	14' to <u>18'</u>

UPPER STORY	
Story height (max)	<u>15'</u>

(Renumber subsequent sections)

Add ground story and upper story maximum.

5-6. ENTRANCES	Sec. 2.11.14.	
K. Street-facing entrance spacing (max) (avg)	40'	60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.6.5. MXS-D SHOPFRONT DOWNTOWN (GDC pg. 2-54)

A. Site

3. BUILDING SETBACKS	Sec. 2.11.5.
G. Rear lot line (min)	0'
Alley lot line (min)	<u>5' 0'</u>

Reduce alley setback to 0ft.

B. Building

3. GROUND-STORY FLOOR HEIGHTS	<i>Sec. 2.11.12.</i>
GROUND STORY	
E. Story height (min/max)	14' to <u>18'</u>

UPPER STORY	
Story height (max)	<u>15'</u>

(Renumber subsequent sections)

Add ground story and upper story maximum.

<u>5-6.</u> ENTRANCES	<i>Sec. 2.11.14.</i>	
J. Street-facing entrance spacing (max) (avg)	40'	60'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Div. 19-2.7. Business (BG, BH)

Section 19-2.7.1. INTENT (GDC pg. 2-57)

BG	BH
No density restrictions	Residential not allowed
15' lot width (min)	75' lot width (min)
3 stories in height 5 stories in height with bonus (max)	55' in height (max)
175' building width (max)	Unlimited building width

Remove reference to building height in feet and reflect new bonus stories in BG district. Height will remain regulated by stories.

Section 19-2.7.2. BG BUSINESS GENERAL (GDC pg. 2-58)

B. Building

(Amend illustration to reflect modified floor height provisions)

1. HEIGHT	<i>Sec. 2.11.10.</i>
A. Overall height (max stories/feet)	3 / 42'
Base	<u>3</u>
Bonus	<u>5</u>

Add bonus height allowance and remove 42' maximum. Height will remain regulated by stories.

3. GROUND-STORY FLOOR HEIGHTS	<i>Sec. 2.11.12.</i>
<u>GROUND STORY</u>	
D. Story height (min/ max)	
Residential	<u>10' to 18'</u>
Nonresidential	14' <u>12' to 18'</u>

<u>UPPER STORY</u>	
E. Story height (max)	<u>15'</u>

(Renumber subsequent sections)

Add ground story and upper story maximum. Decrease nonresidential ground story minimum.

5-6. ENTRANCES	<i>Sec. 2.11.14.</i>	
I. Street-facing entrance spacing (max) (avg)	60'	100'

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Section 19-2.7.3. BH BUSINESS HEAVY (GDC pg. 2-60)

B. Building

5. ENTRANCES	Sec. 2.11.14.	
C. Street-facing entrance spacing (max) (avg)	150'	None

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Div. 19-2.8. Industrial (IX, IG)

Section 19-2.8.1. INTENT (GDC pg. 2-63)

IX	IG
No density restrictions	Residential not allowed
15' lot width (min)	100' lot width (min)
3 stories in height 5 stories in height with bonus (max)	80' in height (max)
275' building width (max)	Unlimited building width

Remove references to building height in feet maximums in IX. Height will remain regulated by stories.

Section 19-2.8.2. IX INDUSTRIAL FLEX (GDC pg. 2-64)

B. Building

1. HEIGHT	Sec. 2.11.10.
A. Overall height (max stories/feet)	
Base	3 / 42'
Bonus	5 / 68'

Remove 42' and 68' maximum. Height will remain regulated by stories.

3. GROUND-STORY FLOOR HEIGHTS	Sec. 2.11.12.
GROUND STORY	
D. Story height (min/max)	14'

<u>Residential</u>	<u>10' to 18'</u>
<u>Nonresidential</u>	<u>12' to 18'</u>

UPPER STORY	
E. Story height (max)	<u>15'</u>

(Renummer subsequent sections)

Add ground story and upper story maximum. Decrease residential and nonresidential ground story minimum.

5-6. ENTRANCES	Sec. 2.11.14.	
I. Street-facing entrance spacing (max)	50'	75'
(avg)		

Replace maximum entrance spacing with average entrance spacing to reflect new calculation.

Div. 19-2.9. Special (CM, CV, PK)

No changes

Div. 19-2.10. Overlay Districts

Section 19-2.10.2. DOWNTOWN DESIGN OVERLAY (-DD) (GDC pg. 2-78)

B. Standards

All demolition, new construction, additions, and all exterior changes to existing structures in the Downtown Design overlay must comply with the terms and conditions of a Major ~~Historic~~ Urban Design Certificate of Appropriateness, and is subject to the Downtown Design (-DD) overlay design guidelines.

Correct type of Certificate of Appropriateness needed.

Section 19-2.10.4. NEIGHBORHOOD REVITALIZATION OVERLAY (-NR) (GDC pg. 2-79)

B. Standards Applicability

The standards approved by City Council for each district are found in Appendix A. Design Standards for Neighborhood Revitalization Overlay Districts and apply to the following projects:

1. New lots created by summary plat or major subdivision.
2. Construction of a new single-unit attached or detached dwelling, accessory dwelling, duplex dwelling, or garage/carport.
3. Addition of an attached garage/carport.
4. Installation or expansion of a driveway or parking pad.
5. Additions to a dwelling that have a construction value that exceeds 50% of the fair market value of the property as reflected on the Greenville County Tax Assessor's role. Additions phased over a 5-year period will be combined to determine applicability of the percent threshold criteria. Renovations are exempt from the overlay standards, but their value is calculated in the 5-year phased period above.
6. Additions that increase the principal building footprint square footage by more than 40%. Additions phased over a 5-year period will be combined to determine the applicability of the percent threshold criteria.

C. Standards

1. Single-Family Detached and Duplex Dwellings.

New housing should be compatible with the existing fabric of the community and promote a walkable environment.

(Add or update existing illustration)

a. Lot Width: 40 feet minimum.

b. Driveways: Shall at no point be wider than ten feet (except in rear yard or connecting to an alley) and shall only be located to the side and/or rear of a house. Parking in a front yard may be allowed by the Administrator when conditions exist that do not allow access to the side or rear yard (i.e. topography, limited space between an existing house and lot line (an area less than ten feet wide). Backup space in a front yard may be allowed by zoning administrator when access to an adjacent street may be difficult due to traffic patterns on the street. The Administrator shall determine that the design and landscaping of the parking and or backup space ensures adequate stormwater mitigation and protection of the character of the block.

c. Walkways: All houses shall have a sidewalk between three and five feet wide that connects the front porch to the public sidewalk, or the front porch to the driveway if no public sidewalk exists.

d. Retaining Walls: Must be faced in stone, brick, or stucco, if visible from the public street.

e. Foundation: Slab foundations shall be elevated a minimum of 16 inches above finished grade on all elevations and shall consist of brick/stone. Crawlspace foundations shall consist of brick/stone veneer at a minimum height of 16 inches above finished grade on all elevations (zoning administrator may make exceptions considered for accessibility requirements).

(Add or update existing illustration)

f. Building Height: 30 feet maximum, as defined in **Sec. 2-11.10.**

g. Roof: Shall be gable or hipped with pitch between 3/12 and 14/12.

h. Eave Overhang: 12 inch minimum.

i. Chimneys: Must be faced in stone or brick.

j. Attached or Detached Garages: Must be located behind the back wall of the primary structure.

k. Accessory Structures: See **Div. 3-5.**

(Add or update existing illustration)

l. Front Porches: Must have a front porch at least six foot minimum depth and eight foot minimum width from edge of wall to edge of porch. Porches shall not be enclosed and have at least two columns with a minimum six inch nominal diameter each.

m. Exterior Walls: No concrete block masonry or metal panel is permitted. Stucco may be used as an accent.

n. Trim Details: Four inch nominal width minimum for siding or two inch minimum for brick masonry trim shall be used at windows, doors, corners, cornices, eaves, rakes, and fascias.

o. Fenestration (Doors and Windows): 25 percent minimum of the front facade shall be fenestrated and 10% minimum of each of the side and rear facades shall be fenestrated.

2. Single-Family Attached

New single-family attached housing should be compatible with the existing fabric of the community and promote a walkable environment.

a. Driveways: All driveways/parking areas shall be located to the side and/or rear of a unit. No front yard parking locations are permitted. Parking in a front yard may be allowed by zoning administrator when conditions exist that do not allow access to the side or rear yard (i.e. topography, limited space between an existing house and lot line (an area less than ten feet wide). Backup space in a front yard may be allowed by zoning administrator when access to an adjacent street may be difficult due to traffic patterns on the

street. The administrator shall determine that the design and landscaping of the parking and or backup space ensures adequate stormwater mitigation and protection of the character of the block.

b. Shared Alleys: All attached developments shall be required to share a rear parking access through the use of a shared alley. To the extent possible, alleys shall be accessed via the side of the block. Where not possible (i.e., infill development in block interiors), alleys shall be accessed via the primary street but shall have no more than two curb cuts.

c. Walkways: Each individual unit shall have a sidewalk between three and five feet wide that connects the front porch to the public sidewalk (no shared walkway).

d. Retaining Walls: Must be faced in stone, brick, or stucco, if visible from the public street.

e. Foundation: Slab foundations shall be elevated a minimum of 16 inches above finished grade on all elevations and shall consist of brick/stone veneer. Crawlspace foundations shall consist of brick/stone veneer at a minimum height of 16 inches above finished grade on all elevations (zoning administrator may make exceptions considered for accessibility requirements).

f. Building Height: 30 feet maximum, as defined in **Sec. 2-11.10.**

g. Roof: Shall be gable or hipped with pitch between 3/12 and 14/12.

h. Eave Overhang: 12 inch minimum.

i. Roof Massing: All dwelling units shall have at least one gable or dormer facing the public street. Roof massing should be used to delineate each unit from one another.

j. Chimneys: Must be faced in stone or brick

k. Garages: Shall be provided only along the rear of the main dwelling structure and shall be accessed via a shared alley (no front-facing garages).

l. Accessory Structures: See **Div. 3-5.**

m. Porches: Each dwelling unit shall have a front porch at least 6 foot minimum depth and eight foot minimum width from edge of wall to edge of porch. Porches shall not be enclosed and have at least two columns with a minimum six inch nominal diameter each.

n. Doors: Each dwelling unit shall have a front door that faces the public street.

o. Exterior Walls: No concrete block masonry or metal panel is permitted. Stucco may be used as an accent.

p. Trim Details: Four inch nominal width minimum for siding or two inch minimum for brick masonry trim shall be used at windows, doors, corners, cornices, eaves, rakes, and fascias.

g. Fenestration: 25 percent minimum of the front facade and ten percent minimum of the rear facade shall be fenestrated. On end units only, ten percent minimum of the side facade shall be fenestrated.

(Add or update existing illustration)

Eliminate appendix containing –NR standards and incorporate existing provisions into code. No changes are proposed to the standards, beyond correcting out of date code references and modernizing illustrations.

Section 19-2.10.5. AIRPORT PROTECTIVE OVERLAY (-AP) (GDC pg. 2-80)

A. Purpose

The Airport Protective Overlay district (AP) is established to ensure against safety hazards, noise, and obstruction problems associated with aircraft using the Greenville Downtown Airport and Donaldson Field Airport / South Carolina Technology and Aviation Center (SCTAC).

Add Donaldson Field/SCTAC to –AP overlay to ensure federal airport regulations are accounted for.

Div. 19-2.11. Rules for Zoning Districts

Section 19-2.11.1. GENERAL PROVISIONS (GDC pg. 2-81)

B. Lot Line Designation

2. Primary Street Lot Line

c. For lots with frontage on multiple primary streets where adjacent lots have established frontages on both streets, new construction may meet primary street standards on one street and side street standards for the other street. The Administrator must approve the primary and side street designations.

~~e. d.~~ A lot line abutting a park, open space, river, trail, or pedestrian path may be designated as a primary street lot line if such designation promotes a logical and orderly development pattern and does not compromise the block requirements of **Sec. 4.3.1**. To be eligible for designation as a primary street, the following standards apply:

(Renumber subsequent paragraphs)

Clarify how to regulate lots for two or more street frontages.

D. Street-Facing Building Facades

1. Secondary building facades located more than 50 feet behind the primary or side street lot line are exempt from any street-facing requirements (e.g. transparency, entrances), provided the cumulative width of the exempted facade is no wider than 50% of the total building width.

Clarify facade exception language.

Section 19-2.11.1. LOT SIZE (GDC pg. 2-88)

B. Width

4. Measurement

a. Lot width is measured following the geometry of all primary street lot lines that bound the lot.

b. When lot widths do not equal a whole number, corresponding fractions less than 0.5 shall be rounded down to the nearest whole number and fractions corresponding to 0.5 or greater shall be rounded up to the next whole number. For example, a lot in a RH-C district with a width of 60.4 feet would round down to 60 feet for the purposes of establishing minimum side setbacks and maximum building width.

~~b-c.~~ Where a lot has 2 or more primary street lot lines facing different streets, all primary street lot lines must meet the minimum lot width standard.

Section 19-2.11.4. COVERAGE (GDC pg. 2-92)

B. Outdoor Amenity Space

2. Application

a. The outdoor amenity space requirements apply to all lots except for those whose principal use is single-unit living.

Provide exception from amenity space requirement to address single unit living uses in commercial districts.

3. Standards

a. All Outdoor Amenity Space

(Add additional illustration showing passive outdoor amenity space options)

~~iii. Outdoor amenity space may not be surrounded by walls for more than 2/3 of its perimeter, with the exception of knee walls, planter walls, and parapets 42 inches in height or less.~~

(Renumber subsequent paragraphs)

Remove 2/3 perimeter maximum for required outdoor amenity space. This will allow internal courtyards and similar to be credited as amenity space.

Section 19-2.11.5. BUILDING SETBACKS (GDC pg. 2-97)

E. Exceptions

1. Limited Encroachments

	ALLOWED ENCROACHMENT		
	Primary St./ Side St. Setback	Side/Rear Setback	Alley Setback
Unenclosed Structures (ground story)			
<i>Unenclosed structures having all finished floors and ground surfaces no more than 2.5 feet above grade and having a total structure height less than 15 feet.</i>			
<i>Examples: porches, decks, stoops, landing platforms, gazebos, trellises, arbors, pergolas. Does not include carports, which are subject to district setbacks.</i>			

Unenclosed Structures (above ground story)			
<i>Unenclosed structures having a total structure height of 15 feet or greater.</i>			
Encroachment (max)	5'	3'	5'
Distance from lot line (min)	0'	3'	1.5'

Mechanical/Electrical Equipment			

Examples: gas meters, electrical meters, water heaters, HVAC equipment, generators, cisterns, wind turbines and solar panels

Encroachment (max)	not allowed	0'	0'
Distance from lot line (min)	same as district	1.5'	same as district

Remove 15ft total structure height on unenclosed structure allowance and eliminate encroachment for unenclosed structures/features above 15 feet to condense allowance to only encroachments that are 2.5ft in grade or less. Specify that generators are included in electrical equipment.

Section 19-2.11.9. FENCES AND WALLS (GDC pg. 2-112)

Vertical structures separating the public realm from private property.

For requirements see ~~DIV.~~ Div. 19-4.9.

Clean up formatting for consistency across code document.

Section 19-2.11.10. HEIGHT (GDC pg. 2-113)

A. Overall Height

4. Measurement

a. Height in Stories

i. Height in stories is measured as the number of stories above existing grade from all sides of the building. The ground story and all upper stories are included in the calculation of maximum height in stories.

Codify existing interpretation on how to measure height in stories.

v. Any story located above the ground story is an upper story. Any floor exceeding the maximum floor height established by the district is considered an additional story. Any height above the top story of the building is considered an encroachment.

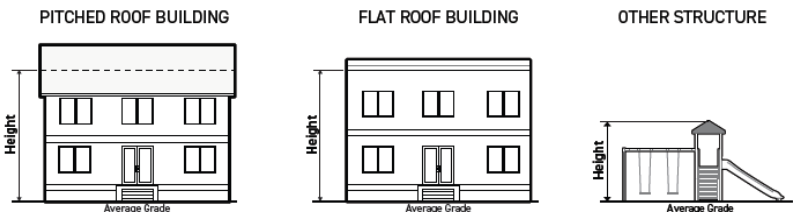
Clarify that height above a maximum floor height is considered another story.

b. Height in Feet

Height in feet is measured from the primary street-facing facades. Height in feet is the number of feet from average existing grade to:

Codify existing interpretation on how to measure height in feet.

iii. The topmost point of the structure, for all other structures.



Add clarification to the “Flat Roof Building” illustration that height does not include the building’s parapet.

Amend illustration to clarify how to measure height on a flat roof building.

5. Exceptions

a. Limited Encroachments

Safety Barriers and Screening

Used for safety, screening or protection.

Examples: fencing, walls, parapets, and railings and stairs

Encroachment (max)

Setback from roof edge (min)

Adjust language on height encroachments. Remove stairs from rooftop encroachment exceptions.

Section 19-2.11.11. MASSING (GDC pg. 2-119)

A. Building Width

3. Standards

b. ~~Open Space as~~ Building Break Alternative

~~An open space~~ One or more building breaks meeting the following standards may be used to establish a continuous structure as separate buildings for the purpose of meeting a maximum building width requirement:

~~i. The width of the open space can be no more than 1/2 the width of the widest adjacent building width provided and no less than 1/4 the width of the widest adjacent building width provided. The width of the open space must be at least 20'.~~

~~ii. The depth of the open space must be at least equivalent to the width of the open space.~~

~~(Existing building break illustration)~~

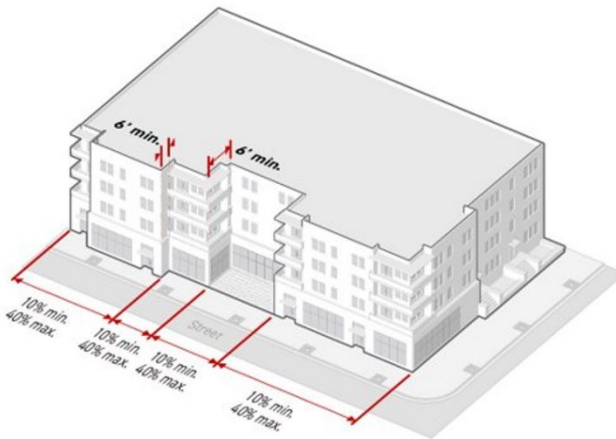
~~iii. The open space must meet the standards in Sec. 2.11.4.B.~~

~~iv. Only one building break is allowed.~~

i. Each building face contributing to the building width must be between 10% and 40% of the total building width, and must project or recede from the adjacent building face a minimum distance of 6 feet. If articulation does not vary by at least 6 feet, it is not considered a building face.

ii. The building articulation is required on all stories of the building.

iii. The building must not exceed the district maximum for building width by more than 1.5 times.



(Add new building break illustration)

Modify building width break requirements to increase applicability, particularly for smaller buildings. Decrease maximum building width allowed using the break but reduce required depth amount and remove open space requirement.

C. Active Depth

2. Applicability

- b. On primary streets, the active depthh applies to all stories.

Correct spelling error.

5. Exceptions

- a. For new construction of a multi-unit residential use, rear-loaded garages and on-site parking areas located within the active depth area of a side street lot line are exempt from active depth requirements, subject to the following standards:

- i. Garages and parking areas must still comply with parking setbacks.

- ii. Active depth must be met along the primary street lot line.

- iii. Ground floor transparency must be met along the side street lot line.

(Add illustration)

Add exception to active depth requirement for multi unit living (e.g. apartments and townhouses) garages on corner lots. This exception would ensure garages would be feasible for corner units.

Section 19-2.11.12. GROUND STORY (GDC pg. 2-126)

Section 19-2.11.12. GROUND STORY FLOOR HEIGHTS

A. Ground Story Height

Modify to refer to only ground story.

C. Upper Story Height

The floor-to-floor height of all stories of a building above the ground story.

1. Intent

To promote high-quality ground-story spaces that are adaptable and appropriate to their intended use and surrounding context.

2. Applicability

- a. Where minimum and maximum upper story heights are established by zoning district, upper story height standards apply to all buildings that contain habitable space within an upper story, and to the portions of any building that exceed the ground story maximum story height.

b. Where a zoning district regulates upper story height differently for residential and nonresidential uses, residential standards apply to all residential uses, and nonresidential standards apply to nonresidential uses.

3. Standards

a. The upper story height can be no higher than the maximum height required by the zoning district.

b. If a floor exceeds the maximum height required by the zoning district, it is considered an additional story.

4. Measurement

Upper story height is measured from the top of the finished floor of each story to the top of the finished floor of the story above.

(Add illustration/s)

Where there is no story above, upper story height is measured from the top of the finished floor to:

a. The mid-point of the roof, for a building with a roof having a pitch greater than 4:12;

b. The top of the roof deck, for a building having a pitch of 4:12 or less; and

c. The topmost point of the structure, for all other structures.

5. Exceptions

Limited encroachments are allowed beyond the topmost story in accordance with ***Sec. 2.11.10.A.5.a.***

6. Relief

a. No administrative relief is allowed.

b. A change to dimensional standards of this section may be requested in accordance with ***Sec. 6.2.15.***

Create upper story height section.

Section 19-2.11.14. ENTRANCES (GDC pg. 2-140)

A. Street-Facing Entry Spacing

3. Standards

b. ~~Street facing entries must not be located farther apart than the maximum entry spacing allowed by the zoning district. The number of street-facing~~

entries on each building must meet, at a minimum, the number of entries as required by the average spacing established by the zoning district.

c. Entrances satisfying the entry spacing requirement may not be located less than 20 feet apart. Entrances closer than 20 feet do not count toward the total number of required entrances.

(Renumber subsequent paragraphs)

i. For single-unit living uses, only one street-facing entry is required along the primary street.

Modify street facing requirements from maximum spacing to average spacing. Exempt single unit living from having to have more than one entrance per street facade.

4. Measurement

~~Entry spacing is measured horizontally and parallel to the street boundary line from the edge of a door to the edge of an adjacent door, or to the edge of the building.~~

a. The number of required entrances is measured by dividing the total length of the street-facing façade by the average entry spacing identified by the zoning district.

b. When the application of these regulations results in a fraction, fractions corresponding to less than 0.5 shall be rounded down to the nearest whole number and fractions corresponding to 0.5 or greater shall be rounded up to the next whole number. In no case shall rounding result in less than one required street-facing entry. Fractions that result in less than one street-facing entry on that facade must be rounded to one.

(Replace or update existing entry spacing illustration)

Amend street facing measurement to reflect proposed average spacing.

ART. 19-3. USE REGULATIONS

Div. 19-3.1. Applicability

No changes.

Div. 19-3.2. Permitted Use Table

Section 19-3.2.1. USE TABLE INTERPRETATION (GDC pg. 3-3)

B. Use Restrictions in All Districts

2. Hours of Operation Any use open to the public with hours of operation between 12:00 a.m. (midnight) and 5:00 a.m. requires a Special Exception permit and must comply with the standards of **Sec. 3.4.6.**

Reference new hours of operation use standards.

Section 19-3.2.2. USE TABLE (GDC pg. 3-5)

Use Category Specific Use	HOUSE-SCALE				NEIGHBORHOOD-SCALE				COMMUNITY-SCALE			MIXED USE				SHOPFRONT MIXED USE			BUSINESS		INDUSTRIAL		SPECIAL			Intensity	Use Standards												
	RH-A	RH-B	RH-C	RH-D	RN-A	RN-B	RNX-B	RNX-C	RC-2	RC-3	RC-5	MX-2	MX-3	MX-5	MX-D	MXS-2	MXS-3	MXS-5	MXS-D	BG	BH	IX	IG	CV	CM			PK											
RESIDENTIAL USES																																							
Household Living					Relocate ADU from Household Living to Accessory Uses																																		
Single-unit living	P*	P*	P*	P*	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	-	P	-	-	P	-	L	Sec. 3.4.2.A.											
Accessory dwelling unit	P*	P*	P*	P*																							L	Sec. 3.4.2.A.											
Multi-unit living	-	-	-	-	P	P	P	P	P	P	P	P	P	P	P	P*	P*	P*	P*	P	-	P	-	-	P	-	M	Sec. 3.4.2.A.											
Manufactured home park	-	-	-	-	-	-	-	-	-	P*	P*	P*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	H	Sec. 3.4.2.A.											

Remove 'Accessory dwelling unit' from Residential Uses (to be relocated).

Use Category Specific Use	HOUSE-SCALE				NEIGHBORHOOD-SCALE				COMMUNITY-SCALE			MIXED USE				SHOPFRONT MIXED USE				BUSINESS		INDUSTRIAL		SPECIAL		Intensity	Use Standards	
	RH-A	RH-B	RH-C	RH-D	RN-A	RN-B	RNX-B	RNX-C	RNX-C	RC-2	RC-3	RC-5	MX-2	MX-3	MX-5	MX-D	MXS-2	MXS-3	MXS-5	MXS-D	BG	BH	IX	IG	CV			CM
PUBLIC AND INSTITUTIONAL USES																												
Civic																												
General civic	S	S	S	S	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	-	P	P	-	M
Detention center	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	-	-	S	-	-	H
Religious assembly	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	M
Shelter	-	-	-	-	-	-	-	-	-	-	-	-	S*	S*	S*	-	-	-	-	-	P*	-	P*	-	P*	-	-	H

Change from - to P

Sec. 3.4.3.A

Change from - to P

Permit 'Religious assembly' by right in IG district to align with other allowed indoor assembly type uses in IG. This change will ensure compliance with federal laws.

Use Category Specific Use	HOUSE-SCALE				NEIGHBORHOOD-SCALE				COMMUNITY-SCALE			MIXED USE				SHOPFRONT MIXED USE				BUSINESS		INDUSTRIAL		SPECIAL		Intensity	Use Standards		
	RH-A	RH-B	RH-C	RH-D	RN-A	RN-B	RNX-B	RNX-C	RNX-D	RC-2	RC-3	RC-5	MX-2	MX-3	MX-5	MX-D	MXS-2	MXS-3	MXS-5	MXS-D	BG	BH	IX	IG	CV			CM	PK
Food and Beverage																													
General food and beverage (up to 6,000 SF)	-	-	-	-	-	-	S*	P*	P*	P*	P*	P	P	P	P	P	P	P	P	P	P	P	P	P	-	P	-	H	Sec. 3.4.4.C
General food and beverage (6,000+ SF)	-	-	-	-	-	-	-	-	-	-	-	-	P	P	P	P	P	P	P	P	P	P	P	P	-	P	-	H	
Bar or nightclub	-	-	-	-	-	-	-	-	-	-	-	-	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	-	-	-	-	H	Sec. 3.4.4.C
Brewpub	-	-	-	-	-	-	-	-	-	-	-	-	P	P	P	P	P	P	P	P	P	P	P	P	-	-	-	H	Sec. 3.4.4.C
Microbrewery, small winery or microdistillery	-	-	-	-	-	-	-	-	-	-	-	-	P	P	P	P	P	P	P	P	P	P	P	P	-	-	-	H	Sec. 3.4.4.C
Lodging																													

Change to P*

Add reference to new use standards for Brewpub and Microbrewery, small winery, or micro distillery.

Add P* to 'brewpub' and 'microbrewery, small winery or microdistillery' and reference new use standards.

Use Category Specific Use	HOUSE-SCALE				NEIGHBORHOOD-SCALE				COMMUNITY-SCALE			MIXED USE				SHOPFRONT MIXED USE				BUSINESS		INDUSTRIAL		SPECIAL		Intensity	Use Standards			
	RH-A	RH-B	RH-C	RH-D	RN-A	RN-B	RNX-B	RNX-C	RNX-C	RC-2	RC-3	RC-5	MX-2	MX-3	MX-5	MX-D	MXS-2	MXS-3	MXS-5	MXS-D	BG	BH	IX	IG	CV			CM	PK	
ACCESSORY USES																														
Accessory dwelling unit	P*	P*	P*	P*																								L	Sec. 3.4.2.A	
Drive-thru	-	-	-	-	-	-	-	-	-	-	-	-	S*	S*	S*	-	-	-	-	-	P*	P*	P*	-	-	-	-	-	-	Sec. 3.5.2.A
Drive-in	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	-	-	-	-	-	-	-
Home day care	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	-	P*	-	-	P*	-	-	-	Sec. 3.5.2.C
Home occupation	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	-	P*	-	-	P*	-	-	-	Sec. 3.5.2.D
Outdoor dining	-	-	-	-	-	-	P*	-	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	-	-	Sec. 3.5.2.E
Outdoor display	-	-	-	-	-	-	-	-	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	-	-	Sec. 3.5.2.F
Outdoor entertainment	-	-	-	-	-	-	-	-	-	-	-	-	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	-	-	Sec. 3.5.2.G
Outdoor storage	-	-	-	-	-	-	-	-	-	-	-	-	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	P*	-	-	Sec. 3.5.2.H
Outdoor video screen ³	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P*	-	-	-	-	-	-	P*	-	-	-	-	-	-	Sec. 3.5.2.I

KEY: P = Use allowed S = Use requires Special Exception approval * = Use standards apply - = Use not allowed

H = High Intensity Use M = Medium Intensity Use L = Low Intensity Use

Relocate ADU use type, replace "L" with "-", update use standard reference

Add 'Accessory dwelling unit' to Accessory Uses. Update land use intensity and use standard references.

Div. 19-3.3. Use Definitions

Section 19-3.3.2. RESIDENTIAL USES (GDC pg. 3-10)

A. Household Living Use Category

1. Single-Unit Living

One primary dwelling unit on a lot. May include ~~a one~~ accessory dwelling unit on the same lot that is detached, attached, or internal to the principal structure.

Clarify that only one ADU is permitted.

Div. 19-3.4. Use Standards

Section 19-3.4.2. RESIDENTIAL USE STANDARDS (GDC pg. 3-22)

A. Household Living

1. Single-Unit Living

~~a. Accessory Dwelling Units (ADUs)~~

~~i. During the first two years following enactment of this zoning code, each year staff will provide a report that shall be created and presented to City Council on the number and location of new accessory dwelling units. The report must include both new construction and conversions.~~

~~ii. The accessory dwelling unit gross square footage maximum shall be subject to the table at 19-3.4.2.A.1.a.x. When a unit is located above a garage or otherwise attached to the primary or an accessory structure, the square footage of that structure does not count towards the floor area of the accessory unit. The total area of primary and accessory structures must not exceed the maximum lot coverage of the zoning district.~~

~~iii. A lot may have no more than one primary street facing entry within 50 feet of the primary street lot line.~~

~~iv. Accessory dwelling units must comply with all district standards including setbacks, height, massing, side wall height, and building coverage. In addition, the accessory dwelling unit must not be located any closer to the side property lines than the primary dwelling unit.~~

v. ~~Detached units must be located at least 6 feet from the principal structure or any other accessory structure.~~

vi. ~~When approving an accessory dwelling unit, the Administrator may require the installation of Transition Screen L 1, M 1, or M 2 to reduce visual impacts to surrounding properties.~~ vii. ~~Pursuant to S.C. Code Ann. 6-29-1145, the City will not issue a zoning or building permit for an accessory dwelling unit if it has received notice of a restrictive covenant on a tract or parcel of land prohibiting such use.~~

viii. ~~An accessory dwelling unit must not occupy the second story of a detached accessory structure within 10 feet of a side or rear lot line. This standard does not apply to side street lot lines or rear lot lines with alley access. No rooftop or second story decks are permitted on a detached unit unless oriented towards the interior of the lot and designed to limit visibility from properties sharing a common side or rear lot line. This standard does not apply to side street lot lines or rear lot lines with alley access, or to stairway landings providing access to a second story entrance that are smaller than 36 square feet. The primary entry for a detached unit must be oriented towards the front or interior of the lot and shall not be located within 10 feet of a side or rear lot line. This standard does not apply to side street lot lines or rear lot lines with alley access.~~

ix. ~~Exterior lighting on the accessory dwelling unit must be shielded to prohibit light pollution from occurring at the property line, measured as 0.5 footcandles at the property lines adjacent to the ADU. Exterior lighting plans must be submitted at time of permit.~~

x. ~~Permitted ADU Size~~

Size of Primary Dwelling (Heated Square Feet)	Maximum of 80% (up to 1,000 Square Feet)	% of Primary Dwelling
600	480	80%
700	560	80%
800	640	80%
900	720	80%
1,000	800	80%
1,200	960	80%
1,400	1,000	71%
1,600	1,000	63%
1,800	1,000	56%
2,000	1,000	50%
Over 2,000	1,000	<50%

xi. ~~ADUs must comply with residential lighting standards in *Div. 19-4.12*.~~

xii. ~~To establish and maintain use of an accessory structure as an ADU, the property owner(s) of the legal lot of record must occupy, as their primary residence, either the principal dwelling unit or the ADU.~~

(Renumber subsequent paragraphs and update all references throughout code document)

Remove ADU use standards from the residential use standards section. ADU use standards will be amended and relocated to the accessory use standards section.

Section 19-3.4.4. PUBLIC AND INSTITUTIONAL USE STANDARDS (GDC pg. 3-24)

D. Utilities

1. Wireless Communications Facilities

c. Roof-mounted Communication Towers and Base Stations

ii. Height

In the MX-D and MXS-D districts, a roof-mounted communication tower or base station cannot exceed a height to which it is visible from the adjacent public rights-of-way. For all other districts except ~~BH~~ **BH** and ~~IG~~ **IG**, such roof-mounted facilities cannot exceed the height of 40 feet.

iii. Equipment

All elements of the wireless communications facility and any pole or tower must be of a color that will minimize their visual impact as determined by the Administrator unless concealed by a parapet. Additionally, the facility and any pole or tower must be located on the rear elevation or configured to have a minimal visual impact as seen from the street, public park, or existing residential development.

Correct zoning district abbreviations. Amend roof mounted collocation standards to state that color selected must minimize visual impact unless screened outright. Require the facility to be located to have minimize visual impact from streets and residential developments.

Section 19-3.4.4. COMMERCIAL USE STANDARDS (GDC pg. 3-30)

B. Entertainment and Recreation

2. General Outdoor Entertainment and Recreation

a. The Use Standards for General Indoor Entertainment and Recreation in part 1 of this subsection also apply to General Outdoor Entertainment and Recreation, as deemed applicable by the Administrator.

b. Outdoor entertainment stages must comply with **Sec. 3.5.2.G.**

Add outdoor stage setback requirement to align with accessory use standards.

C. Food and Beverage

1. General Food and Beverage

a. Permitted hours of operation are between 5:00 a.m. and 12:00 a.m. (midnight).

~~b.~~ a. In RNX- and RC- districts, hours of operation between 12:00 a.m. (midnight) and 5:00 a.m. ~~require a special exception permit~~ are prohibited. Where permitted in all other districts, hours of operation between 12:00 a.m. (midnight) and 5:00 a.m. require a special exception permit in accordance with **Sec. 3.2.1.B.2. and Sec. 3.4.6.**

Prohibit late night hours of operation for food/beverage uses in RNX- and RC-districts.

2. Bar or Nightclub

d. The applicant and all of its managers and employees responsible for serving any alcoholic beverage (current and future) must participate in the merchant education/server training program offered by the Phoenix Center or comparable program offered by other vendors approved by the City Police Department. Evidence of satisfactory completion of this training for each employee must be retained on-site and available for inspection by the Administrator and the City Police Department. Current personnel must receive training within 30 days of issuance of the certificate of occupancy and future personnel must receive training within 30 days of hiring.

e. The Administrator may require the applicant to retain outdoor security persons during operation of the establishment. The security persons must possess a security officer registration certificate pursuant to South Carolina

Code 1976, title 40, chapter 18, or, as an alternative, may be an off-duty sworn law enforcement officer. No other employee may serve in the capacity of a security person unless so certified.

f. Occupant capacity of the establishment must be established by the City building official ~~Codes Administrator~~. The applicant must designate staff at all ingress/egress points to be responsible for monitoring the flow of patrons.

g. Exterior sound amplification is prohibited except in areas specifically authorized on the approved site plan; all amplified sound must be directed inward toward the facility and away from any adjoining use or public property. Specified hours of exterior sound amplification are limited by the permit.

h. Interior sound amplification must be located only as reflected on the approved floor plan and must be directed away from the principal entrance or directed toward the interior of the building. Except to provide ingress and egress, exterior doors and windows must remain closed after 10:00 p.m.

i. Rooftop decks must have perimeter guard railing above table surfaces.

j. Loitering, solicitation, and disorderly conduct is prohibited at all times; rules consistent with the provisions of this Code must be posted in conspicuous locations on the building and throughout the parking lot and must be enforced by the proprietors.

k. The application must comply with City noise, smoking, ~~and~~ encroachment, and other applicable ordinances.

l. The Administrator may attach additional conditions which will protect nearby uses from any adverse impacts reasonably expected to occur as a result of the operation of the use ~~bar or nightclub~~.

Modify bar/nightclub provisions. Remove reference to specific training vendor. Allow security requirement to include indoor security. Other minor clean up.

3. Brewpub

a. The Use Standards for Bar or Nightclub in part 2 of this subsection also apply to Brewpub, as deemed applicable by the Administrator.

Add use standards for Brewpub.

4. Microbrewery, Small Winery or Microdistillery

a. The Use Standards for Bar or Nightclub in part 2 of this subsection also apply to Microbrewery, Small Winery, or Microdistillery, as deemed applicable by the Administrator.

Add use standards for Microbrewery and related uses.

E. Medical

1. General Medical

a. Permitted hours of operation are from 7:00 a.m. ~~and to~~ 9:00 p.m. in the RNX- and RC- districts.

b. In MXS-D districts fronting Main Street from Beattie Place/College Street to Markley Street and/or Augusta Street, general medical uses on the ground floor must not be located within 15 feet of the Main Street and/or Augusta Street building facade. Fronting includes parcels used as plazas.

i. The Administrator has the authority to waive the above requirement to preserve the architectural integrity of historic buildings.

Add ground floor medical use restriction on Main Street and Augusta Street in downtown.

F. Office

1. General Office

a. In MXS-D districts fronting Main Street from Beattie Place/College Street to Markley Street and/or Augusta Street, general office uses on the ground floor must not be located within 15 feet of the Main Street and/or Augusta Street building facade. Fronting includes parcels used as plazas.

i. The Administrator has the authority to waive the above requirement to preserve the architectural integrity of historic buildings.

(Renumber subsequent paragraphs)

Add ground floor office use restriction on Main Street and Augusta Street in downtown.

H. Personal Service

3. Tattoo Facility

a. Tattoo facilities must receive all required ~~DHEC~~ South Carolina Department of Public Health (DPH) permits. Issuance of a permit by ~~DHEC~~ the State of South Carolina for a tattoo facility does not constitute approval by the City of Greenville nor compliance with this Chapter.

Replace DHEC reference.

K. Vehicle Sales and Service

a. Minimum Site Size

~~Automobile sales uses shall be located on a site at least one acre in area. Contiguous or adjacent parcels including rights of way under the same ownership and used for automobile sales shall be counted as one parcel to meet the minimum lot size.~~

b. Screening

i. When abutting a common lot line of any RH- or RN- District, a Transition Type C is required.

ii. Standards set forth in ~~Sec. 19-4.6.3.C.8~~ apply.

c. Use Standards for Fueling Stations

i. Fueling stations that existed as of the effective date of this ordinance may perform facade modifications, minor renovations, and maintenance and repair activities under ~~Div. 19-2.1~~, without triggering the nonconforming use standards of ~~Div. 19-6.3~~.

ii. Additions and site modifications made to nonconforming fueling stations that trigger the nonconforming use standards of ~~Div. 19-6.3~~, must comply with the applicable standards of this chapter except the Build To Width requirements.

iii. Fueling stations that existed as of the effective date of this ordinance may demolish and reconstruct their facilities in the same general configuration.

iv. New construction must comply with all applicable standards of this Chapter.

d. Vehicle repair or service (over 10,000 lbs.) is permitted in the BH and CV districts for governmental entities only.

1. Vehicle Repair or Service

a. Screening

i. When abutting a common lot line of any RH- or RN- District, a Transition Type C is required.

b. Vehicle repair or service (over 10,000 lbs.) is permitted in the BH and CV districts for governmental entities only.

2. Vehicle Sale or Rental

a. Minimum Site Size

Must be located on a site at least one acre in area. Contiguous or adjacent parcels including rights-of-way under the same ownership and used for vehicle sale or rental are counted as one parcel to meet the minimum site size.

b. Screening

i. When abutting a common lot line of any RH- or RN- District, a Transition Type C is required.

ii. Standards set forth in ~~Sec. 4.6.3.C.8~~ apply.

3. Fueling Station

a. Fueling stations that existed as of the effective date of this ordinance may perform facade modifications, minor renovations, and maintenance and repair activities under *Div. 19-2.1*, without triggering the nonconforming use standards of *Div. 19-6.3*.

b. Additions and site modifications made to nonconforming fueling stations that trigger the nonconforming use standards of *Div. 19-6.3*, must comply with the applicable standards of this chapter except the Build-To Width requirements.

c. Fueling stations that existed as of the effective date of this ordinance may demolish and reconstruct their facilities in the same general configuration.

d. New construction must comply with all applicable standards of this Chapter.

Clean up formatting of existing regulations to clarify applicability.

Section 19-3.4.6. ADDITIONAL USE STANDARDS (GDC pg. 3-36)

Section 19-3.4.6. ADDITIONAL USE STANDARDS

A. Hours of Operation

Uses open to the public with hours of operation between 12:00 a.m. (midnight) and 5:00 a.m. must obtain a special exception permit per *Sec. 3.2.1.B.2*, and comply with the following:

1. On-site traffic must be directed away from abutting residential uses and residential districts between the hours of 12:00 a.m. (midnight) and 5:00 a.m.

2. Loitering, solicitation, and disorderly conduct is prohibited at all times; rules consistent with the provisions of the Greenville Code of Ordinances must be posted in conspicuous locations and enforced by the proprietors.

3. Exterior sound amplification is prohibited between the hours of 12:00 a.m. (midnight) and 5:00 a.m.

4. Interior sound amplification may be permitted but must be directed away from the principal entrance or directed toward the interior of the building. Sound baffling or other mitigations may be required.

5. Except to provide ingress and egress, exterior doors and windows must remain closed between the hours of 12:00 a.m. (midnight) and 5:00 a.m.

6. Outdoor dining and seating areas must be closed between the hours of 12:00 a.m. (midnight) and 5:00 a.m., unless otherwise modified by the Board of Zoning Appeals based on the criteria of *Sec. 6.2.15.D.2*.

7. Rooftop dining and seating areas must be closed between the hours of 12:00 a.m. (midnight) and 5:00 a.m., unless otherwise modified by the Board of Zoning Appeals based on the criteria of *Sec. 6.2.15.D.2*.

8. Establishments serving alcoholic beverages between the hours of 12:00 a.m. and 5:00 a.m. must retain at least one security person during those hours. The number of security persons may be increased by the Board of Zoning Appeals. The security persons must possess a security officer registration certificate pursuant to South Carolina Code 1976, title 40, chapter 18, or, as an alternative, may be an off-duty sworn law enforcement officer. No other employee may serve in the capacity of a security person unless so certified. The Board of Zoning Appeals may modify or waive the security requirement after the use has operated for at least six (6) months.

9. The Board of Zoning Appeals may require that an Applicant have a follow-up meeting with the Administrator 6-months after commencement of operation to verify that the Applicant is adequately addressing adverse impacts of the use.

10. The Board of Zoning Appeals may attach additional conditions which will protect nearby uses from any adverse impacts reasonably expected to occur as a result of the operation of the use during these hours. The Board may modify or add conditions that apply beyond 12:00 a.m. (midnight) and 5:00 a.m.

Add use standards for hours of operation after midnight.

Div. 19-3.5. Accessory Uses and Structures

Section 19-3.5.1. GENERAL (GDC pg. 3-37)

19-3.5.1. GENERAL STANDARDS

A. Allowed Accessory Uses and Structures

The permitted use table in ***Sec. 3.2.1*** establishes the allowed accessory uses and structures by district. Accessory structure includes those defined in ***Div. 19-7.2***. Multiple accessory uses are allowed on a lot when the uses are all allowed in the district and the standards for all uses on the lot can be met.

Add accessory structure definition reference.

C. Rules for All Accessory Uses and Structures

2. Accessory structures must comply with the dimensional requirements of the zoning district, unless listed as an allowed encroachment in ***Div. 19-2.11***.

4. Accessory structures may connect to the ground floor of the primary structure by an open breezeway up to 8 feet wide at its widest point.

Allow for a breezeway connection between primary and accessory structures.

D. Location of Accessory Structures

1. Accessory structures must also comply with the minimum applicable setbacks in each zoning district. In addition, accessory structures in RH- and RN- districts may only be located in the side or rear yard of the principal building.

2. Accessory structures in RH- and RN- districts may only be located in the side, side street, or rear yard of the principal building.

3. Accessory structures located in the rear yard do not need to comply with the side street setback, but must be setback a minimum of 5 feet from the side street lot line.

(Renumber subsequent paragraphs)

Allow accessory structures in side street yards in RH- and RN- districts, subject to new accessory structure setbacks.

Section 19-3.5.2. SPECIFIC STANDARDS (GDC pg. 3-37)

A. Accessory Dwelling Units (ADUs)

A dwelling unit providing complete, independent living facilities located on the same lot as a primary dwelling unit, which is intended for use by a separate household.

See *Div. 19-7.2* for definitions of “dwelling unit” and “household.” For clarification of these definitions as they apply to ADUs, a wet bar or partial kitchen, which does not include a range or 220V circuit, does not constitute “cooking facilities,” and a half-bath which does not include a shower or tub does not constitute “sanitation facilities.”

1. Each year from 2025-2028, staff will provide a report that shall be created and presented to City Council on the number and location of new accessory dwelling units. The report must include both new construction and conversions.

2. Pursuant to *S.C. Code Ann. 6-29-1145*, the City will not issue a zoning or building permit for an accessory dwelling unit if it has received notice of a restrictive covenant on a tract or parcel of land prohibiting such use.

3. Accessory dwelling units must comply with all district standards including setbacks, height, massing, side wall height, and building coverage.

4. Accessory dwelling units should ensure aesthetic continuity by maintaining similar architectural styles and elements as the primary structure.

5. The square footage of an accessory dwelling unit is limited to 80% of the primary dwelling, up to a maximum of 1,000 square feet.

6. No rooftop or second-story decks are permitted for an accessory dwelling unit unless oriented towards the interior of the lot and designed to limit visibility from properties sharing a common side or rear lot line. This standard does not apply to

side street lot lines or rear lot lines with alley access, or to stairway landings providing access to a second-story entrance that are smaller than 36 square feet.

7. When approving an accessory dwelling unit, the Administrator may require the installation of Transition Screen L-1, M-1, or M-2 to reduce visual impacts to surrounding properties.

8. An accessory dwelling unit may be rented but cannot be sold separately from the primary dwelling. Use of an ADU for a short-term rental is only permitted as provided in *Div. 19-3.2*.

9. Utilities for an accessory dwelling unit may be separately metered from the primary unit.

10. An ADU is eligible for a separate address from the primary unit.

11. To establish and maintain use of an accessory structure as an ADU, the property owner(s) of the legal lot of record must occupy, as their primary residence, either the principal dwelling unit or the ADU.

(Renumber subsequent paragraphs and update use standard references in permitted use table and throughout code.)

Relocate and modify ADU standards.

D- E. Home occupation

Allows for limited nonresidential activity in a dwelling unit or an accessory structure.

1. General

In RH- and RN- districts, home occupation uses must not exceed 25% of the floor area of the principal structure on a lot or 500 square feet within an accessory structure.

3. Exterior Appearance

a. All activities associated with the home occupation must be conducted completely within the dwelling unit or accessory structure, excluding activities or services that, by their nature, must be conducted off-site.

c. The dwelling unit, accessory structure, and lot must remain residential in appearance and characteristics. External changes that make the dwelling or structure appear less residential in nature or function are not allowed.

4. Prohibited Home Occupation Uses

The following uses are prohibited as home occupations:

- a. Landscaping business, other than office use;
- b. Commercial greenhouse;
- c. Contractor's business, other than office use;
- d. Automotive repair;
- e. Physician's or chiropractor's clinic;~~;- and~~
- f. Fortune telling;~~;-~~
- g. Furniture repair or cabinet shop; and
- h. Any use determined by the Administrator to be incompatible with the property's zoning district and neighboring dwelling units.

Allow use of accessory structures for home occupations. Clarify that the Administrator has discretion to determine use compatibility.

Div. 19-3.6. Temporary Uses and Structures

Section 19-3.6.2. SPECIFIC STANDARDS (GDC pg. 3-43)

F. Use of Motor Vehicle, Trailer, or Shipping Container for Sales, Service, Storage, or Other Business

1. The use of any motor vehicle, trailer, or shipping container in which, out of which, or from which any goods are sold, stored, services performed, or other businesses conducted is prohibited in all RH-, RN-, RC-, and IG Districts and on public property. However, this subsection does not prohibit the use of a motor vehicle, trailer, or shipping container for the following uses without benefit of a temporary use permit pursuant to *Div. 19-3.6.*:

2. Shipping containers are prohibited except when used for outdoor storage in an IG district pursuant to ~~Section 19-~~*Sec. 3.5.2.H.5.*

Clean up formatting for consistency across code document.

G. Mobile Food Units

6. A mobile food unit stored or parked at its affiliated restaurant or commissary kitchen must be kept in an approved parking area or other vehicle use area that meets the standards of ~~Section 19-~~*Sec. 4.6.4.* Electrical cables, hoses, and other

components cannot block or be placed across a sidewalk, trail, or vehicle travel lane. The mobile food unit must fit within the designated parking area and cannot obstruct or create a hazard for vehicular or pedestrian traffic.

Clean up formatting for consistency across code document.

H. Portable Storage Units

Portable storage units may be permitted subject to the following standards:

~~6. Portable storage unit vendors must file a monthly report with the Administrator indicating the location of each leased unit within the City and must include the lessee's name, mailing address, and installation date. Upon installation, the vendor must affix a placard to the exterior of the unit visible from the street indicating its date of installation.~~

Remove unused storage unit reporting provision.

ART. 19-4. DEVELOPMENT STANDARDS

Div. 19-4.1. Applicability

No changes.

Div. 19-4.2. Development Bonus

Section 19-4.2.1. AFFORDABLE HOUSING AND OPEN SPACE (GDC pg. 4-4)

B. Applicability

1. Dwelling Unit and Width Bonus

The dwelling unit bonus applies only to sites within the following zoning districts:

- a. *Neighborhood B (RN-B)*
- b. *Neighborhood Flex B (RNX-B)*
- c. *Neighborhood C (RN-C)*
- d. *Neighborhood Flex C (RNX-C)*

2. Height Bonus

The height bonus applies only to sites within the following zoning districts:

j. *Business General (BG)*

~~k. j.~~ *Industrial Flex (IX)*

Account for new building width bonus. Add BG to height bonus list.

C. Applicability

1. Residential Projects

a. Height, Width, or Density In Exchange for Affordable Housing

b. Height, Width, or Density In Exchange for Open Space

2. Nonresidential Projects

a. Height, Width, or Density In Exchange for Affordable Housing

Account for new building width bonus.

Div. 19-4.3. Blocks and Lots

No changes.

Div. 19-4.4. Streets

Section 19-4.4.1. STREET TYPES (GDC pg. 4-15)

C. Standards

3. Pedestrian Zone

b. Sidewalks

iii. Fee in lieu of sidewalk construction

a) The Administrator may, upon receiving an application for a Sidewalk Waiver, accept a fee in lieu of constructing a required sidewalk if at least one of the following conditions apply:

1) Existing physical constraints such as topography, waterways, drainage features, natural resources, buildings, etc. prevent the construction of standard sidewalks.

2) The sidewalk installation alone would require a Conditional Letter of Map Revision (CLOMR) for floodplain or floodway impacts.

3) The sidewalk would need to be removed or relocated within five years due to a publicly funded sidewalk improvements project. In this case,

easements sufficient for the publicly funded project must be provided.

4) The Administrator determines that the sidewalk is not within proximity, generally considered more than 1,000 feet from the closest completed sidewalk segment, measured along the right-of-way boundary. A sidewalk easement may be required to construct the sidewalk in the future.

b) The fee in lieu of amount shall be calculated in accordance with the *Sidewalk Construction Fee in Lieu of Schedule* included in the *Engineering Design and Specifications Manual*.

c) A public access easement must be recorded in sufficient width to accommodate a future sidewalk per the *Engineering Design and Specifications Manual*.

d) All fees collected for fee in lieu of sidewalk construction shall be used solely for the design and construction of pedestrian infrastructure within the City.

Add sidewalk fee in lieu option.

Div. 19-4.5. Multi-Modal Access and Parking

No changes.

Div. 19-4.6. Vehicle Access and Parking

Section 19-4.6.2. VEHICLE PARKING (GDC pg. 4-39)

C. Standards

1. Required Vehicle Parking

a. Vehicle parking must be provided in accordance with the following table:

Use Category	Use Type	Minimum Spaces Required	Maximum Spaces Allowed
PUBLIC AND INSTITUTIONAL USES			
<i>Parks and Open Space</i>			

COMMERCIAL USES			
<i>Lodging</i>	General lodging	0.75 per guest room	1 1.5 per guest room

Increase parking maximum for general lodging uses.

d. ~~Electric vehicle charging infrastructure including conduit, wiring, and electrical capacity must be provided for:~~

- ~~i. 10% of surface or garage parking spaces in a multi-unit dwelling development; and~~
- ~~ii. 10% of surface or garage parking spaces in a non-residential development with more than 25 parking spaces.~~

d. Electric Vehicle Charging Infrastructure

i. New construction (excluding major renovation) of a multi-unit living development or any structured parking must provide EV Installed parking spaces, as defined in *Div. 19-7.2.*, in accordance with the following table:

<u>Number of EV Installed parking spaces</u>	<u>Total number of parking spaces provided</u>
<u>2</u>	<u>50 to 74 spaces</u>
<u>3</u>	<u>75 to 99 spaces</u>
<u>4</u>	<u>100 or more spaces</u>

Total number of parking spaces provided applies to common parking areas. For lots with floodplain constraints, the Administrator may waive the EV infrastructure requirement.

ii. If at least 10 percent (10%) of the total number of parking spaces in a multi-unit living or a nonresidential development are EV Installed as defined in *Div. 19-7.2.*, the maximum number of parking spaces allowed per *Sec. 4.6.2.C.1.a.* may be increased by 10%. Alternatively, the minimum number of parking spaces required per *Sec. 4.6.2.C.1.a.* may be decreased by 10%.

Amend EV charging standard to reduce number of EV spaces but require installation of equipment. Also add an incentive-based approach to promote further EV installation.

Section 19-4.6.3. PARKING DESIGN (GDC pg. 4-46)

C. Standards

5. Parking Lot Surfacing and Curbing

~~d. Where a parking space abuts a landscaped island, the front 2 feet of the required parking space length may overhang the landscaped island, provided a wheel stop is provided.~~

Remove parking overhang allowance.

Section 19-4.6.5. GARAGE DESIGN (GDC pg. 4-55)

C. Standards

1. General

e. For sites with an alley, the garage door for alley-facing garages must be either:

- i. Less than 6 feet from the edge of the alley pavement, or
- ii. More than 20 feet from the edge of alley pavement.

2. Lots 40 Feet Wide or Greater

The following requirements apply to developments in House-Scale and Neighborhood-Scale zoning districts with a lot platted 40 feet wide or greater:

a. Front-facing garages must be positioned at least 10 feet behind the front building facade and are limited in width to no more than 40% of any street-facing facade.

b. Garages facing a side, side street, or rear property line must be positioned at least 4 feet behind the front building facade and are limited in width to no more than 40% of any street-facing facade.

~~b. c.~~ Garage doors are not allowed within 20 feet of the back of the sidewalk along the primary street

Separate garage regulations between front facing and side/side street/rear facing.

Div. 19-4.7. Utilities

No changes.

Div. 19-4.8. Transitions and Screening

Section 19-4.8.1. TRANSITIONS (GDC pg. 4-59)

B. Applicability

1. Required Transitions

IG ²	Type C	Type C	Type C	Type C	Type C	Type C	Type C	--	Type C
CM CV ²	Type B	--	--	--	--	--	--	--	--

- b. A transition is also required along the district boundary internal to a lot that is divided by two or more zoning districts. Such transitions are the same as indicated in the Applicability table in part 1.a. above.
- c. The Administrator may, in their discretion, modify or waive a required transition along the internal lot line of a site, as defined in Sec. 19-4.3.2.C.2.a, that is owned or functionally controlled by the same person or entity based on the nature, configuration, and intensity of the proposed development across the site.

Correct scrivener's
error

Add missing "--" to table.

Section 19-4.8.4. SITE ELEMENT SCREENS (GDC pg. 4-73)

C. Standards

1. Waste Receptacle Screening

- d. Access gates must be provided on the fourth side and must also be a minimum height of 6 feet. Access gates must remain closed, except during refuse pickup.

e. The wall or fence and gate access screening must be 90% opaque.

f. The screening enclosure must meet: ***Sec. 4.9.1.D.***

g. Chain-link fencing, styrofoam-backed and synthetic stucco, EIFS, and vinyl siding for any element of the screening enclosure is prohibited.

h. Exposed smooth-finished concrete block is limited to the interior of the screening enclosure.

Specify that dumpster enclosure gates are to remain closed and codify a standing interpretation that the enclosure cannot feature certain materials as well as smooth CMU block (on the exterior).

Div. 19-4.9. Fences and Walls

Section 19-4.9.1. FENCE TYPES (GDC pg. 4-78)

B. Applicability

2. Allowed fence and wall types for each zoning district are set out in ***Art. 19-2.***

4. When a property shares a side or rear lot line with another property that has a taller maximum fence height allowance along that shared lot line, the maximum fence height may be increased to match the abutting property's height allowance. Fencing using this increase cannot be setback greater than 2' from the shared lot line.

For example, if the maximum fence height in the rear yard of a residentially zoned property is 6', but the rear lot line abuts the side lot line of an industrially zoned property, which allows an 8' maximum fence height, then the residentially zoned property may erect an 8' tall fence within 2' of that shared property line.

Allow fencing to exceed maximum fence height allowances in certain scenarios (e.g. allow a residence to put up a taller fence on their property if they abut a nonresidential property).

Section 19-4.9.2. RETAINING WALLS (GDC pg. 4-85)

A. Intent

To prevent retaining walls from looming over neighboring properties and public rights-of-way, minimize mass-grading, and improve the aesthetic quality of large retaining walls.

Expand intent of retaining wall regulations to limit massing grading.

B. Applicability

1. Retaining wall standards are applicable to walls that meet all of the following criteria:
 - a. Located in a House-scale (RH-), Neighborhood-scale (RN-), Community-scale (RC-), Mixed Use (MX-), or Shopfront (MXS-) district, ~~or Industrial Flex (IX-) district;~~ or
 - b. Located on a lot developed or to be developed with dwelling units, or located on a lot abutting a lot developed or to be developed with dwelling units.
2. Unless specifically indicated by this Section, the Fence and Wall standards in **Sec. ~~19-4.9.1~~** do not apply to retaining walls.

C. Standards

1. General

a. In no case can the height of a wall located in a yard exceed the maximum height of the fence and wall type specified for the zoning district.

b. Where permitted, a maximum of one retaining wall can be built on any lot with a maximum height of 8 feet. However, two (2) or more retaining walls can be built if they comply with the following standards:

i. ~~a.~~ The minimum horizontal distance between the walls is 3 feet; and

ii. ~~b.~~ None of the walls can exceed a height of 6 feet; and

~~b. c.~~ In no case can the height of a wall located in a yard exceed the maximum height of the fence and wall type specified for the zoning district.

Clean up formatting to ensure that no retaining wall exceeds maximum height allowed by district.

Div. 19-4.10. Landscape Standards

No changes.

Div. 19-4.11. Signs

Section 19-4.11.2. PROHIBITED SIGNS (GDC pg. 4-95)

Unless specifically permitted elsewhere in this section, the following signs are prohibited:

F. Roof signs, except those permitted under *Sec. 4.11.4.Q., Alternative Design Signs.*

Q. Any permanent or temporary sign not allowed in *Div. 19-4.11.*

Section 19-4.11.3. SIGNS NOT REQUIRING A PERMIT (GDC pg. 4-95)

D. Flags

Flags are any fabric or other flexible material designed to be flown from a flagpole. Flags must meet the following standards:

1. A maximum of 3 flags poles are permitted per lot;
2. The flag area cannot exceed 1.5 times the height of the pole. For example, a 40-foot tall flag pole yields a maximum 60 square foot flag;
3. The maximum height of a flagpole is 25 feet in residential districts and 40 feet in all other districts, measured from the highest point of the flagpole to average adjacent grade; and
4. A freestanding flagpole must be set back a minimum of 5 feet from a residential lot line ~~a distance equal to the height of the pole. For example, a flagpole 40 feet in height must be set back at least 40 feet from a lot line.~~

Amend flag regulations to ease placement but limit height in residential districts.

I. Other Signs

4. Signs installed by the City within public parks associated with park identification and public events.

~~4.~~ 5. Small incidental signs which do not exceed 3 square feet in area, have a maximum height of 2 feet, and are placed within 3 feet of vehicular driveway entrances. Incidental signs may be illuminated, contain copy, and must be located outside of the right-of-way. For large developments, the Administrator may require the location of incidental signs be indicated as part of a comprehensive sign package.

Exempt certain city park signs from permitting.

Section 19-4.11.4. PERMANENT AND LARGE TEMPORARY SIGNS (GDC pg. 4-99)

H. Painted Wall Sign

2. GENERAL STANDARDS

A. If a painted wall sign is located within a mural, only areas including commercial text and images count toward the sign area.

Clarify that text and images that are commercial speech are limited.

J. Projecting Sign

2. GENERAL STANDARDS

b. Must be located within 5 feet of the building's corner.

~~b.-c.~~ Must contain dimensional copy that projects at least 0.5 inches through either sandblasting or projecting letters.

5. INDIVIDUAL SIGN DIMENSIONS

B. Height (min)

~~9~~ 12 feet

Amend projecting sign regulations to differentiate from pedestrian sign.

L. Monument Sign

4. INDIVIDUAL SIGN DIMENSIONS

A. Area (max)

Mixed Use District

25 SF for freestanding business or use.

For multi-tenant developments, an additional ~~4~~ 5 SF of area may be

	granted for each <u>additional</u> tenant. Not to exceed 40 SF.
Business District	32 SF for freestanding business or use. <u>48 SF for vehicle sale or rental uses.</u> For multi-tenant developments, an additional 4 SF of area may be granted for each <u>additional</u> tenant. Not to exceed 64 SF.

B. Height (max)	

Mixed Use District	6 feet for freestanding business or use. For multi-tenant developments, an additional foot of height may be granted for each <u>additional</u> tenant. Not to exceed 10 feet.
Business District	8 feet for freestanding business or use. <u>12 feet for vehicle sale or rental uses.</u> For multi-tenant developments, an additional foot of height may be granted for each <u>additional</u> tenant. Not to exceed 16 feet.

*Clarify that additional height and area is only granted for additional tenants.
Increase height and area allowance for vehicle sales/rental uses.*

Q. Alternative Design Signs

1. The sign must serve to enhance the streetscape or the cultural character of a neighborhood or the community at large. The Administrator will consider any applicable overlay district standards, surrounding design precedents, and applicable master plans as part of the review for Alternative Design Signs and may require modifications of color, font style, sign size, structure, lighting, location, or other content-neutral elements in order ~~to the~~ ensure consistency with these precedents.

Correct grammatical error.

R. Electronic Message Boards and Pre-Menu and Menu Boards

1. Electronic Message Boards

~~a. When such signs are to be located within a MX , MXS , BG, BH, IX, IG, CV, CM, or PK District, the area of the electronic sign face must not exceed 30 percent of the overall sign face, and the electronic message must maintain a static message for at least 6 seconds, and must not employ any of the techniques prohibited by Sec. 4.11.2.~~

a. Electronic message boards are only permitted in:

i. CV and CM districts; or for

ii. General indoor entertainment and recreation (6,000+ SF) and General outdoor entertainment and recreation uses located in the – DD overlay district.

b. Electronic message boards are not permitted in RH , RN , or RC districts. When such signs are allowed, the area of the electronic sign face must not exceed 30 percent of the overall sign face, and the electronic message must maintain a static message for at least 6 seconds, and must not employ any of the techniques prohibited by **Sec. 4.11.2.**

Amend EMB regulations to restrict signage to only certain uses and locations.

Section 19-4.11.6. OUTDOOR ADVERTISING SIGNS (GDC pg. 4-117)

A. Type I Signs (Billboards)

3. Maximum Area

No single sign face shall exceed 378 square feet in area. Extended advertising area ~~must not exceed 50 square feet in area is not permitted.~~ Extended advertising area means design elements that go beyond the established sign face of the billboard. Other terms include top-outs, cut-outs, extenders, or embellishments.

11. Special Exception Permit Required for Type I Sign

a. The owner of a Type I sign may apply to the Board of Zoning Appeals for a special exception permit under **Sec. 19-6.2.15**, to remove the sign and to replace it with ~~another~~ a conforming Type I sign at the same or different location.

b. The Board of Zoning Appeals in its discretion may also authorize the use of LED lighting, or comparable digital luminance, for the face of the sign in such instances with due regard to nearby land uses and the compatibility of the proposed luminance with those uses. If the application for the replacement of

Type I signs results in a reduction in the total number of sign faces in the City, then the Board of Zoning Appeals may allow an increase in the height and face size of individual replacement signs beyond what is otherwise permitted under this section.

c. No approval will be granted for a proposed new location of the replacement sign unless the sign owner first makes an affirmative showing that the replacement sign will be “aesthetically compatible” with the area where it is to be located and that the sign will not adversely impact public safety as a consequence of its design, construction, or placement. Approval for a replacement sign at the same location will consider factors similar to those provided in this section for a new location, but also take into consideration the benefits arising from the improved appearance of a nonconforming sign at the same location or the removal of signs at other locations.

12. Modifications to Existing Type I Signs

a. With the exception of changing an advertisement on an existing face, modifications to an existing Type I Sign must obtain a special exception permit from the Board of Zoning Appeals.

b. Modifications to an existing nonconforming Type I Sign must comply with the standards of **Sec. 6.3.4.**

c. The Board of Zoning Appeals in its discretion may also authorize the use of LED lighting, or comparable digital luminance, for the face of the sign in such instances with due regard to nearby land uses and the compatibility of the proposed luminance with those uses.

~~12-13.~~ Federal Aid Highways Implementation of this section are subject to federal and state statutes otherwise applicable to Type I signs.

Clarify changes allowed to existing billboards.

Div. 19-4.12. Lighting

Section 19-4.12.2. APPLICABILITY (GDC pg. 4-120)

B. Existing Fixtures

3. For site modifications, only site lighting needs to come into compliance. For additions and facade modifications, only building lighting needs to come into compliance.

Clarify that only site lighting is evaluated during site modifications and building lighting is evaluated during additions and facade modifications. Full lighting compliance is required for new construction and major renovations.

Section 19-4.12.3. STANDARDS (GDC pg. 4-120)

A. Prohibited Lighting Sources

The following light fixtures and sources cannot be used:

1. Cobra-head-type fixtures having dished or drop lenses or refractors, ~~which contain sources that are not incandescent.~~

Limit the use of cobra head lighting.

B. Design and Installation

2. Maximum point light level shall not exceed 20 footcandles anywhere on the site. Light level must be no greater than 0.3 footcandle when measured at the abutting property line to property improved with a residential use and one footcandle when measured at the property line abutting property improved with a ~~non-residential~~ nonresidential use or the public right-of-way.

5. Outdoor lighting for single family residential ~~single-unit living uses~~ is subject to a lumen per net acre cap of 10,000 lumens net. Total outdoor light output cannot exceed 10,000 lumens per net acre for single-unit living uses and 25,000 lumens per net acre for all other residential uses.

6. Total outdoor light output cannot exceed ~~15,000~~ 50,000 lumens per net acre for all ~~commercial-nonresidential~~ development, with the following exceptions:

a. Vehicle sale or rental uses cannot exceed 75,000 lumens per net acre.

b. General outdoor entertainment and recreation uses are exempt from the lumens per net acre requirement, however lighting for such uses must be designed using the lowest levels of lumens necessary and designed to minimize sky glow, glare, and other negative impacts to adjacent properties and streets.

Establish a maximum fc amount and increase the lumens per acre maximum by land use to better align with dark sky allowances.

C. Parking and Pedestrian Area Lighting

1. All streetlights and parking lot lights must utilize lamp types that are energy efficient and minimize sky glow and other negative impacts of artificial lighting. ~~They shall not exceed 10,000 the lumens per net acre.~~ Lighting shall meet safety concerns with a goal of using the lowest levels of lumens necessary.

Remove the lumens per net acre reference. Defer to new lumens allowances in section above.

Div. 19-4.13. Materials

Section 19-4.13.2. APPLICABILITY (GDC pg. 4-125)

The table below indicates materials that shall be limited in use within each zoning type. Associated allowable percentages of facade area on all facades visible from streets, adjacent parking areas, and residential dwellings are as follows:

MATERIALS	House-Scale	Neighborhood-Scale	Community-Scale	Mixed Use	Shopfront Mixed Use	Business	Industrial	Special
Corrugated Metal Siding	0	0	0	0	0	20	50	100
Exposed smooth-finished concrete block	0*	0	0	0	0	0	20	50
Styrofoam-backed and synthetic stucco; EIFS	0	0	0	0	0	0	0	0
Vinyl siding	100**	100**	0	0	0	0	0	0
Lap siding (ground floor) ⁴	100	100	60	0	0	60	0	60
Painted Polished or split-faced concrete masonry units	0*	0	0	25***	0	25***	100	100

*Above first finished floor on the front facade

**0 percent on multi-unit properties or in historic preservation overlay districts

*** Where buildings are more than 10,000 gross square feet, painted or split-faced concrete masonry units shall be prohibited on front facades or facades facing public streets.²

Amend to "multi-unit living properties"

Replace 'painted' CMU with 'polished' CMU and clarify multi-unit living. Clarify that multi-unit references to multi-unit living.

ART. 19-5. ENVIRONMENTAL PROTECTION

Div. 19-5.1. General

No changes.

Div. 19-5.2. Tree Protection

No changes.

Div. 19-5.3. Stormwater Management

Section 19-5.3.3. ORDINANCE ENFORCEMENT (GDC pg. 5-16)

B. Intergovernmental relationship

Included as part of this Section as ***Stormwater Appendix E*** is a delineation of requirements and duties required of and accepted by the Administrator or designee. Certain requirements or duties specified by FEMA and the South Carolina Department of ~~Health and Environmental Control (SCDHEC)~~ Environmental Services (SCDES) in Stormwater Appendix E relate only to the intergovernmental relationship between a community and FEMA, the South Carolina Department of Natural Resources (SCDNR), or ~~SCDHEC-SCDES~~ for the purposes of that community obtaining or maintaining eligibility for the National Flood Insurance Program (NFIP) and Qualified Local Program Status.

Replace all references to South Carolina Department of Health and Environmental Control (SCDHEC) with the correct successor agency.

Section 19-5.3.6. ALL DEVELOPMENT (GDC pg. 5-25)

A. Minor Stormwater Permit

The following requirements apply, at a minimum, for all development requiring a minor stormwater permit:

1. Application Requirements

c. A report to include:

ix. Any federal, state and local requirements, including, but not limited to, the applicable ~~SCDHEC~~ SCDES notice of intent, ACOE nationwide permit, FEMA letters of map change, jurisdictional wetland determination and endangered species permitting. Reference Appendix F for a partial list of additional permits that may be applicable.

2. Erosion Control Performance Standards

o. Handbooks. Standards and specifications contained in The ~~SCDHEC~~ SCDES stormwater management BMP field manual and the stormwater technical reference manual, as amended, are referenced in this Section as guidance for presenting soil erosion and sediment control plan specifications and delineating procedures and methods of operation under site development for soil erosion and sediment control. In the event of conflict between provisions of said manuals and this Section, the stricter governs.

3. Erosion Control Inspection Program Standards

a. Inspections must be conducted on all sites greater than one acre by qualified personnel as defined by ~~SCDHEC~~ SCDES.

Replace all references to South Carolina Department of Health and Environmental Control (SCDHEC) with the correct successor agency.

Section 19-5.3.7. SPECIAL MANAGEMENT AREAS (GDC pg. 5-36)

D. Buffer Areas

Buffer areas must be required for all areas known as waters of the United States, ~~or stream classified as~~ waters of the State, and wetlands as defined in the 1987 Corps of Engineers Wetlands Delineation Manual, collectively defined as "Aquatic Resources." Buffer areas are divided into two types, linear buffers and water body buffers.

1. The terms "waters of the United States" and "waters of the State" are defined in Stormwater Appendix A related to this Section and refer to areas that are under the jurisdictional authority and regulated by the U.S. Army Corps of Engineers or the South Carolina ~~department of health and environmental control~~ Department of Environmental Services, respectively.

a. Linear buffers must be designated along both sides of all channels meeting the definition of ~~waters of the United States or waters of the State~~ Aquatic Resources. The buffer width must be determined as follows:

b. Water body buffers must encompass all nonlinear bodies of water meeting the definition of ~~either waters of the United States or waters of the State Aquatic Resources~~. The buffer width is determined as follows:

3. Buffer areas for ~~water bodies meeting the definition of waters of the United States or waters of the State Aquatic Resources~~ must extend from the ordinary high-water mark. Buffer areas for wetlands must extend from the edge of the delineated wetland. A property may contain a buffer area that originates from ~~waters of the United States or waters of the State Aquatic Resources~~ on another property.

6. All roadside drainage ditches, existing excavated detention facilities, existing borrow pits, existing quarries and improvements to existing public road or trail developments or alignments not meeting the definition of Aquatic Resources are exempt from buffer requirements.

9. A minimum of a 5-foot temporary construction buffer from the limits of ~~the waters of the United States or waters of the State Aquatic Resources~~ must be required. The 5-foot temporary construction buffer must be marked by construction fencing and installed prior to the start of all other construction activities. All other construction activities, including soil erosion and sediment control features, must take place on the non- wetland side of the construction fencing.

Replace references to South Carolina Department of Health and Environmental Control (SCDHEC) as well as waters of the United States with replacement language.

Section 19-5.3.10. ACCESS AND INSPECTION: (GDC pg. 5-56)

B. Inspection

The City of Greenville adopts the inspections subsection of the most current ~~SCDHEC~~ SCDES construction general permit with amendments listed below:

Replace all references to South Carolina Department of Health and Environmental Control (SCDHEC) with the correct successor agency.

Section 19-5.3.11. ILLICIT DISCHARGES, CONNECTIONS, SPILLS AND NUISANCES (GDC pg. 5-56)

B. Illicit Discharges

4. The prohibition must not apply to any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency or ~~SCDHEC SCDES~~, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system.

Replace all references to South Carolina Department of Health and Environmental Control (SCDHEC) with the correct successor agency.

Div. 19-5.4. Environmental Protection Appendices

Section 19-5.4.1. APPENDIX A: DEFINITIONS (GDC pg. 5-62)

The following words, terms and phrases, when used in this appendix or applying the provisions thereof, shall have the meanings ascribed to them in this Article, except where the context clearly indicates a different meaning:

Aquatic Resources. Areas known as waters of the United States, waters of the State, and wetlands as defined in the 1987 Corps of Engineers Wetlands Delineation Manual.

Wetland. Lands that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation adapted for life in saturated soil conditions (known as hydrophytic vegetation)- defined as wetlands in the 1987 Corps of Engineers Wetlands Delineation Manual. A wetland is identified based upon the three attributes:

- a. Hydrology;
- b. Soils; and
- c. Vegetation as mandated by the current federal wetland determination methodology.

Wetland impact. ~~Waters of the U.S. or state~~ Aquatic Resources that are disturbed or otherwise adversely affected by flooding, filling, excavation, or drainage which results from implementation of a development activity.

Replace all references to South Carolina Department of Health and Environmental Control (SCDHEC) with the correct successor agency, where applicable.

Section 19-5.4.4. APPENDIX D: ADMINISTRATOR OR DESIGNEE DUTIES (GDC pg. 5-75)

This appendix delineates requirements or duties required of its designated administrator or designee. Certain requirements or duties specified by FEMA and ~~SCDHEC~~ SCDES are for the purposes of the city maintaining eligibility for participation in the National Flood Insurance Program and delegation of state permit authority. These certain requirements or duties relate only to the intergovernmental relationship between the city and FEMA or ~~SCDHEC~~ SCDES and they do not and are not intended to create any third party beneficial rights in or for applicants, property owners, or others.

C. The administrator or designee shall ensure that a ~~SCDHEC~~ SCDES dam safety permit or a letter stating that no dam safety permit is required is obtained if the development includes a dam before the issuance of a stormwater permit.

F. The administrator or designee shall ensure that proposed amendments to this article and appendices are done in accordance with applicable state or federal law and approved by ~~SCDHEC~~ SCDES and SCDNR.

K. The administrator or designee shall administer the submittal of the required data to the Federal Emergency Management Agency (FEMA) and the South Carolina Department of Natural Resources Land (SCDNR), water and conservation division, for proposed revisions to the base flood elevation of a regulatory floodplain study or a relocation of a regulatory floodway boundary. The administrator or designee shall submit reports as required for the National Flood Insurance Program.

L. The city will maintain a repository of stormwater management data for the city. Toward that end, the administrator or designee shall:

1. Maintain records for a period of five years from project completion for every stormwater permit application, permit, variance, hydrologic and hydraulic data, and enforcement action, and as-built drawings of the stormwater management system required by this chapter and shall allow periodic inspections of the records by FEMA or ~~SCDHEC~~ SCDES personnel.

Replace reference to South Carolina Department of Health and Environmental Control (SCDHEC) with the successor agency.

Section 19-5.4.5. APPENDIX E: PARTIAL LIST OF PERMITS REQUIRED (GDC pg. 5-77)

C. South Carolina Department of ~~Health and Environmental Control (SCDHEC)~~ Environmental Services.

Replace reference to South Carolina Department of Health and Environmental Control (SCDHEC) with the successor agency.

ART. 19-6. ADMINISTRATION

Div. 19-6.1. Authority

No changes.

Div. 19-6.2. Approval Processes

Section 19-6.2.17. MAJOR URBAN DESIGN CERTIFICATE OF APPROPRIATENESS (GDC pg. 6-38)

C. Public Notice and Hearing Requirements

1. Mailed Notice

a. When a mailed notice is required, ~~the Applicant is responsible for preparing and mailing the written notice.~~ notice must be mailed to the following:

Remove language that requires that the Applicant handle mailing.

Section 19-6.2.3. MINOR SUBDIVISION (GDC pg. 6-21)

A. Applicability

1. Summary Plat

May be used for a Minor Subdivision on an existing street where new infrastructure, including but not limited to right-of-way improvements, sidewalks, and utilities, is not required. A Summary Plat may be used for lot recombinations, re-subdivision of existing parcels, lot line adjustments, and recording of sublots meeting these criteria. A Summary Plat may be recorded following approval by the Administrator.

Correct typo.

Section 19-6.2.4. MAJOR SUBDIVISION (GDC pg. 6-25)

A. Applicability

Major Subdivision applies to the division of land into lots or sublots for the purpose of sale, lease, or building development when new publicly-dedicated or private streets are created to

~~serve the development, that is determined by the Administrator to not be a Minor Subdivision.~~

Section 19-6.2.17. HISTORICALLY SIGNIFICANT STRUCTURES (GDC pg. 6-53)

B. Demolition of Historically Significant Structures

3. Review and Action Process

b. 45-Day Public Notice Period

~~Within 45 days of the date of publication and posting of notice, any person may notify the owner of his interest in acquiring the structure and premises, acquiring the structure along with the right to move it from the premises, or acquiring fixtures and components of the structure~~

Remove incorrect reference to publication of demolition. Only sign posting occurs.

Div. 19-6.3. Nonconformities

No changes.

Div. 19-6.4. Enforcement

No changes.

ART. 19-7. DEFINITIONS

Div. 19-7.1. General

No changes.

Div. 19-7.2. Defined Terms

Architectural Metal Siding. Metal paneling used to cover the exterior of a structure that features clean, flat, or subtly profiled surfaces and features concealed fasteners (clip systems or interlocking joints). Metal siding not meeting this definition is generally classified as corrugated metal siding.

Corrugated Metal Siding. Metal paneling used to cover the exterior of a structure that features a wavy or ridged pattern formed by continuous corrugations. Fasteners may be exposed or concealed. Includes ribbed metal siding.

Crematory Incinerator. Any incinerator designed and used solely for the burning of human remains or animal remains pursuant to Department of Environmental Services (DES) ~~DHEC~~ Regulation 61-62.1, Section I. Such facility shall be properly licensed by ~~DHEC~~ DES and is considered a “High-impact industrial and manufacturing use” for the purposes of this Chapter.

Customer Service Area. Area inside and outside a facility where patrons and/or customers of the facility are provided service and includes fixed and non-fixed seating areas, waiting areas, and any other areas where customers are served. Excludes kitchens, offices, restrooms, and storage rooms.

Demolition. The razing of any structure, in whole or in part, including its ruin by neglect of maintenance or repairs. Includes removal of more than 50 percent of the roof and exterior walls of a building to its foundation.

EV Installed. A parking space served by a Level 2 or DC Fast Charging electric vehicle charging station.

Lumen (lm). The unit of measurement used to quantify the amount of light produced by a bulb or emitted from a fixture. For the purposes of this code, the lumen output values are the initial lumen output ratings of a lamp as defined by the manufacturer.

Lumens per net acre. The total number of lumens produced by all lamps utilized in outdoor lighting on a property divided by the number of acres, or part of an acre, with outdoor illumination on the property.

Repaving. To remove all layers of existing pavement and replace it in its entirety. Classified as a site modification.

Residential District. Property with a City zoning designation of RH-, RN-, RNX-, RC- or equivalent designation if located outside of the City limits.

Street. A thoroughfare designed to provide the principal means of access to abutting property or designed to serve as a roadway for vehicular travel, or both. Excludes alleys.

Total outdoor light output. The total amount of light, measured in lumens, from all outdoor light fixtures within the illuminated area of a property. The lumen value to be used in the calculation is the lumen value as defined in this Code. To get the total, add the lumen output attributed to each light fixture.

Add new definitions. Replace references to DHEC.

FORMATTING & MISCELLANEOUS CHANGES

Cover Page

The cover page (GDC pg. i) is amended by deleting “Amended following 18-month Code Review on February 10, 2025” and replacing it with adoption date of this text amendment by City Council:

Formatting

The adoption of this amendment includes incidental formatting and layout changes necessary to incorporate the approved changes into the code document.

Page Numbers

The adoption of this amendment authorizes updates to the document page numbers and Table of Contents that may be necessary to incorporate the approved changes into the code document.

Document Date

The date in the footer section on each page is updated by replacing “February 10, 2025” with the adoption date of this text amendment by City Council.



Planning and Engineering Staff Memo to
Greenville Planning Commission
for the August 7, 2025 Public Hearing

PUBLIC HEARING REQUIRED

Applications involving rezoning require a public hearing.

Docket Number: Z-13-2025

Applicant(s): City of Greenville

To: City of Greenville Planning Commission

From: Planning and Engineering Staff

Subject: Review of 2025 DSM Revision

Date: July 31, 2025

Dear Planning Commission ~~M~~members,

The Engineering Design and Specifications Manual (DSM) establishes minimum standards and provides guidance for the design and construction of land development projects and utility installations within the City of Greenville. This document is a revision to the January 2024 DSM. New information includes a sidewalk fee in lieu of schedule, updates to industry practices and processes as well as additional clarifications and error corrections.

This update to the DSM was a result of improvements identified after utilizing the major DSM update that occurred in 2024. Aspects of this update, including the sidewalk fee in lieu of construction option, were a result of input received from Planning Commission work sessions and public feedback.

An initial draft was posted on July 8, 2025, ahead of the August 7, 2025 Planning Commission meeting. This posting included a cover sheet that addressed comments and identified the revised sections ~~that included revisions.~~

Staff recommends approval of the DSM with the modifications as proposed in the attached cover letter.

Sincerely,

Planning and Engineering Staff

Throughout Document:

- Corrected typos, updated links,
- Changed references of SCDHEC to SCDES

Chapter 1: Introduction

- No changes

Chapter 2: Process and Scheduling

- Removed chapter

Chapter 3: Permitting Requirements

- Removed chapter

Chapter 4: Plat Requirements

- Renumbered to Chapter 2
- 4.1 (now 2.1) – Added “Right of Way and” Easement Plats
- Corrected Header
- Updated submittal process for electronic reviews
- Added Summary Plat Template
- Added Easement Plat Requirements

Chapter 5: Site Construction Administration & Site Construction Activities

- Renamed “Site Construction Activities” and renumbered to Chapter 3
- 5.6 (now 4.6) “Filter Cloth inlet protection”, change to “Inlet Protection”
- 5.8 (now 3.8) - Added additional language regarding laydown areas to be included in limits of disturbance and must be restored prior to issuance of CO

Chapter 6: Street, Sidewalk, and Trail Standards

- Renumbered to Chapter 4
- Neighborhood Low-Density Minimum Bike Access changed from Level 6 to Level 2
- 6.4 (now 4.4) H. Added Sidewalk Fee in Lieu Schedule
- A6.14 removed

Chapter 7: Traffic Management

- Renumbered to Chapter 5

Chapter 8: Landscape and Street Tree Standards

- Renumbered to Chapter 6

Chapter 9: Rights-of-Way Encroachments and Easements

- Renumbered to Chapter 7
- 9.1 (now 7.1) added: *This also includes formal encroachments such as surface, sub-surface, air rights and structural air rights. These include signs, building foundations, balconies, awnings, or any other part of a building extending into the right of way.*
- 9.2.2 (now 7.2.2) rewording of formal encroachment description
- 9.3.1 (now 7.3.1) replaced restoration language with: *Shall repair or replace the pavement in accordance with detail 23:01 PAVEMENT REPAIR FOR UTILITY CUTS in the Appendix of this manual. If pavement exceeds 20 feet in length or width, the city engineer may require the permittee to repave full widths of the street and up to 50 feet on either side of the repair. Pavement restoration shall match the existing pavement section. If concrete base exists, concrete shall be poured to match with dowels to tie in the new concrete to the existing concrete.*
- 9.6.3 removed
- 9.7.1 (now 7.7.1) added “and 1 space for a construction vehicle”

Chapter 10: Stormwater Standards

- Renumbered to Chapter 8
- 8.1.1 Added *“These measures are typically used in additional impervious of 100 square feet or greater.”*

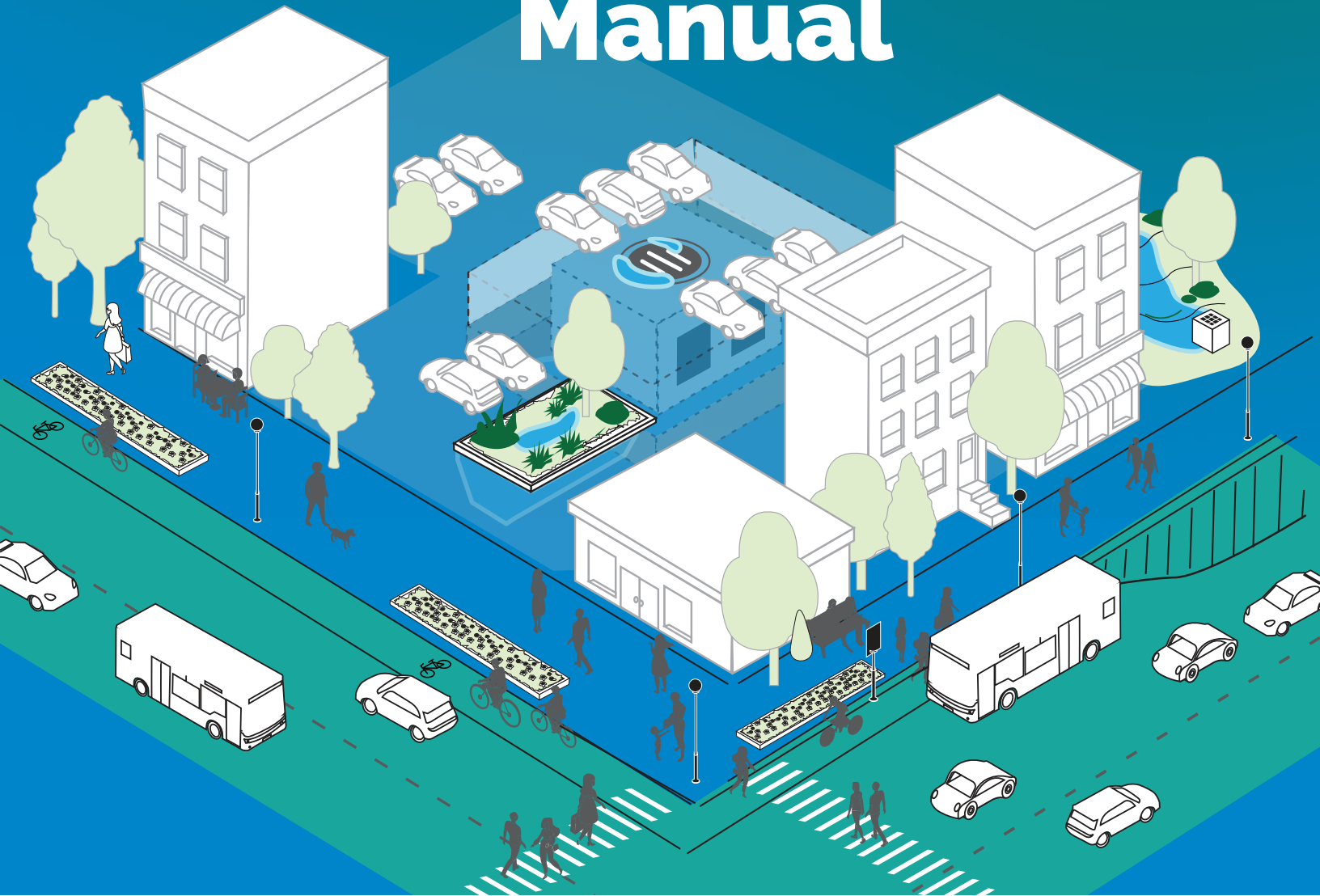
Chapter 11: Wastewater/Sewer Utility Standards

- Renumbered to Chapter 9
- 11.1 (now 9.1) Plat added: *The demolition of all structures requires that the existing service lateral be removed from the wastewater main. If wastewater lateral is to be reused, it shall conform to the pipe materials specification 9.2.7. Reuse of a vitrified clay lateral is prohibited when structure is being demolished. This applies to commercial and residential construction.*
- 11.6.4 (now 9.6.4) added: *All existing vitrified clay laterals shall either be replaced with new materials per 9.2.7 or lined and tested to prevent infiltration and exfiltration. A new cleanout shall be installed at the property line.*
- 11.7.3 (now 9.7.3) added: *The ReWa new account permit must be obtained prior to scheduling a pre-construction meeting.*
- 11.8.1 (now 9.8.1) added: *The Construction Engineering & Inspection Division shall be contacted to schedule all inspection and testing verifications at (864) 467-4400.*

Appendix

- Added the following construction details:
 - 13:03 Radial Residential Driveway
 - 30:00 Light Duty Manhole Stormwater Utility
 - 30:01 Heavy Duty Manhole Stormwater Utility
 - 31:00 Catch Basin Flume

Greenville Engineering Design and Specifications Manual



Executive Summary

Historically the Engineering Division has maintained a book of engineering standards known as the Design Standards Manual (DSM) that consists mostly of detail drawings that apply to the construction of utility and street infrastructure within the City. The DSM is updated periodically to delete some outdated references and add new information.

The purpose of the DSM is to establish minimum standards and provide guidance for the design and construction of land development projects and utility installations within the City of Greenville. The manual will assist developers, engineers, surveyors, contractors, inspectors and property owners in the best practical design for site development and redevelopment activities.

This manual is organized to guide one from the conceptual planning stage through construction.

It includes guidance on:



The permitting process



Resources available to applicants



Property regulations



Permitting responsibilities



General development requirements



Street Design Criteria



Wastewater Design Criteria



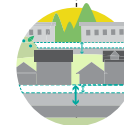
Stormwater Design Standards



Construction Inspection and Administration



Construction BMPs and Guidance



Right-of-Way and Encroachment Management

The appendices contain detailed information critical to design professionals including pre-approved details and notes, and links to current engineering forms and checklists.

The Engineering Division recognizes that this manual must be dynamic and must continue to evolve and adapt to new technology, materials, and experiences. As we continue to develop this manual in the light of new developments, we must be satisfied that our decisions are appropriate and will strengthen and enhance engineering. To do so will uphold our tradition of quality in the City of Greenville.

2025 June Addition of sidewalk fee in lieu rate table, plat template and requirements, removed previous Chapters 2 and 3, additional clarifications and construction details.

Revision History

2008	August	Initial release
2010	June	Chapter 8, Wastewater Utility adopted and included into the specifications. Additional Wastewater Utility details added to Appendix A, 2000 Division, Wastewater Utility
2012	April	Chapter 8, Wastewater Utility, revised to clarify warranty and bonding period. Updated warranty form and sample warranty bond included in Appendix D
2013	January	Updated standard Erosion Prevention and Sediment Control Notes, Detail 39:00, in Appendix A
2016	May	Updated standard Erosion Prevention and Sediment Control Notes, Detail 39:00, in Appendix A. Added Inside Drop Connection, Detail 21:07, in Appendix A. Updated Maintenance/Warranty Bond for Sanitary Sewer System in Appendix D. Updated Wastewater General Notes, Detail 29:00 in Appendix A. Updated Chapter 8 to updated percentage full, internal drop, force main testing, as-built definition, and close out documents
2017	July	Chapter 7.2, updated roadway construction and HMA paving requirements. Added field report form for HMA paving in Appendix D
2024	January	Major Re-write of all sections within the Design & Specification Manual in conjunction with the re-write of the City's Development Code (Chapter 19)

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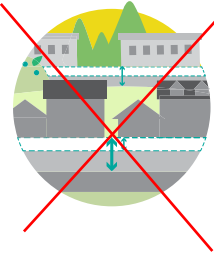


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Added "Appendix - Plant Lists"



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Chapter 1

Introduction

1.1

1.1

Purpose

The purpose of the Design & Specifications Manual (DSM) is to establish minimum standards for design and construction of land development projects and related infrastructure within the City of Greenville. The standards are intended to protect and promote the general welfare of all citizens and to support, through quality infrastructure and development, City Council resolutions intended to develop:

- A financially sound City with excellent services
- Livable neighborhoods with pedestrian oriented design concepts
- Responsibly managed quality development
- A vibrant downtown and revitalized corridors that preserve Greenville's identity

The DSM will assist developers, engineers, surveyors, contractors, inspectors and property owners in the best practical design for site development and redevelopment activities within the City and promote functional and sustainable low impact initiatives.

This DSM accompanies the City's Development Code regulations. The Development Code (also known as a zoning code) is the primary regulation for what is allowed to be built where. The DSM provides detailed guidance on how to comply with the Development Code.

1.2

1.2

Goals

Major objectives for the DSM are focused on providing sound, responsible infrastructure satisfying federal, state, and local requirements permitted through the City of Greenville Engineering Division. Goals of the manual include:

- Design/construction of safe and durable streets, driveways and parking lots
- Design/construction of durable wastewater systems with respect to design life, capacity, and pollution mitigation
- Design/construction of stormwater drainage systems to reduce flooding and other drainage problems
- Reduction and control of stormwater pollution through good design features
- Properly planned and installed measures for erosion prevention and sediment control
- Preparation of Complete and accurate plans to ensure grading, property, and utility issues are addressed

1.3

1.3

Scope

The scope of the DSM is limited to the procedures and criteria for the design and evaluation of wastewater and stormwater utilities, streets, land development plans, and related infrastructure. The manual also includes City of Greenville standards for construction, an explanation of the construction inspection process, and the requirements for successful project completion.

The Engineering Division is one part of the City of Greenville review process, as explained further in Chapter 2. As such, the DSM does not contain the complete requirements for site development design and construction, and should be used in concert with the Greenville Development Code. Also, building design and construction is governed by the adopted standards of the Building Codes Department, which are not presented herein.

Moreover, the design professional should be aware of regulatory requirements of Greenville Water System, ReWa, ~~South Carolina Department of Health and Environmental Control (SCDHEC)~~, South Carolina Department of Transportation (SCDOT), Army Corp of Engineers, and other entities that may apply to the proposed work. In addition to technical design, submitted projects must also meet federal and state standards for health and safety like Occupational Safety and Health Administration (OSHA) standards, American Association of State Highway and Transportation Officials (AASHTO) requirements, Federal Highway Administration (FHWA) regulations, and United States Access Board (ADA) guidelines.

The design professional is encouraged to employ the pre-approved, standard details and notes that are provided in Appendix A. The pre-approved standards are to be referred to by any individual or company designing, constructing or maintaining wastewater utility, stormwater utility, street improvement, and land development related infrastructure in the City of Greenville. The pre-approved standards meet federal, state, and local requirements; they follow sound, responsible, and current engineering practice; their use will expedite the review process; and they establish a standard of responsibility, clarity, and professionalism to be incorporated into all design. Every detail has been prepared with a key understanding of the land development process, and each has been authorized by the City Engineer. However, these standards are not intended to replace the judgment of the design professional who must thoroughly investigate field conditions and coordinate all design efforts.

The DSM is not intended as a textbook or a comprehensive engineering design reference. Most types of engineering calculations are not explained or defined either due to the very complex nature of the subject matter or the fact that the design equations and methods are well-known to most competent practicing engineers who claim expertise in the area of land development.

1.4

Design Flexibility

The intent of the DSM is to ensure that minimum standards are met with respect to development and redevelopment. These minimum requirements shall be enforced in a fair and impartial manner based upon sound engineering judgment and the objectives described herein. The design standards are presented with the realization that every case will not be covered. Unique conditions may preclude the practical application of the standard details and/or design criteria. Moreover, new technology, products, and techniques are encouraged and may be specified with approval of the City Engineer.

The design professional, along with the project owner, development team, and contractor,

Replaced with "South
Carolina Department
of Environmental
Services (SCDES)



1.4

1.5

are strongly encouraged to schedule a pre-design/pre-permit conference with the City Engineer to discuss the project scope and permitting requirements. The design professional must make every reasonable effort to meet the guidelines set forth in this manual, but in the case of restrictive conditions unique to the development parcel, deviations from the standards may be made with approval of the City Engineer. If the City Engineer and the design professional cannot agree on a reasonable exception to the design standards, application for a variance may be made to the Planning Commission. Rules and application forms may be obtained from the Planning and Development Office if a variance is necessary.

1.5

Authorization

The Greenville Development Code, effective July 2023 and as further amended, defines the applicability of this manual to the land development process. Other types of design procedures have been in effect for many years through policy mandates issued through the City Manager by City Council. City ordinances and resolutions also impact project design and have been considered herein. Moreover, ~~SCDHEC~~ delegated review authority provides much of the basis for wastewater utility design, and the Stormwater Ordinance, effective February 2008 and as further amended, provides the basis for much of the stormwater design criteria.

The City of Greenville, like many other cities across the United States, is required to have a National Pollutant Discharge Elimination System (NPDES) permit to discharge stormwater from the municipal separate storm sewer system (MS4). This requirement comes from the Clean Water Act administered by the U.S. Environmental Protection Agency (EPA). Because development activities contribute to the discharge of pollutants, the NPDES permit requires that the City of Greenville encourage, promote, and require implementation of certain practices and procedures for the purpose of reducing or limiting discharge of pollutants to stormwater channels. City ordinances and standards were developed and adopted specifically to address stormwater quality concerns. The Design and Specifications Manual is an important element in the City's effort to improve and promote consistent environmentally respective residential and commercial design and construction practices.

1.6

1.6

Land Development Design Objectives

Design objectives of projects constructed in the City must include:

1. Safe and functional design of roads, streets, driveways, and parking lots.
2. Safe and functional design of sidewalks, walkways, trails and other pedestrian routes.
3. Safe and functional design of stormwater inlets, culverts, pipes, open channels, and other conveyances.
4. Minimize flooding, interruptions of utility service, traffic inconvenience and potential water damage to residences and businesses.
5. Minimize the amount of public expenditures needed for maintenance of streets, wastewater systems, and stormwater facilities.
6. Minimize the amount of public expenditures needed for flood control projects and flood relief efforts.
7. Promote appropriate design life of wastewater systems and mitigate exfiltration and infiltration of the system.

8. Preservation of trees, woods, natural meadows and other green spaces as much as possible (in conjunction with allowable land uses and zoning codes).
9. Protect and enhance streams, wetlands, waterways and rivers for wildlife and plants by reducing stormwater pollution, erosion, and negative stormwater impacts.
10. Promote development of recreational facilities and design aesthetics along streams, waterways, wooded areas and other greenways to benefit local neighborhoods.
11. Promote sustainability and low-impact development initiatives.

1.7

1.7

Engineering Design Accountability

The DSM contains information to assist in the design and layout of most projects. However, this manual does not replace or otherwise excuse the need for professional engineering judgment and knowledge. The user of this manual is hereby cautioned that many aspects of engineering design must be considered, including but not limited to:

- Public health and safety
- Site-specific conditions or unusual features of a project site that warrant special designs
- Current versions of design texts, manuals, technical documents and research

Depending on the size and scope of the project, the plan documents must be sealed by a design professional, e.g., professional engineer, registered in the state of South Carolina. Plan documents include site plans, applicable details, calculations, construction specifications and other necessary technical documents. In all cases, the design professional must have sufficient education and experience to perform a complete design of each element shown on the construction plans, and s/he must also have complete control to change the plans during the design phase. The professional's stamp is a public guarantee that the design has the highest regard for health and safety, protects the environment (e.g., air, soil, water) to the maximum degree possible, and serves the interests of the general public.

For all development plan components, the design professional bears the ultimate accountability for proper, complete, and responsible design. Review and acceptance by the City of Greenville does not relieve the design professional from his obligation to protect the general welfare or his liability to meet all applicable regulatory requirements.

1.8

1.8

Future Changes and Revisions

These standards may be periodically updated as necessary to provide additional clarity or to reflect changes generally recognized as best practice in the appropriate professional and trade industries. The Office of the City Engineer will be responsible for amendments and revisions.

Revisions may be made by an act of the Administrator except to regulations and legal provisions adopted by an act of law.

Technical revisions and corrections to these standards shall be made as necessary in accordance with good engineering standards and practice. Technical revisions require the approval of the Administrator. If technical revisions are deemed necessary, the revisions may occur through either planned periodic revision or an accelerated process when it is determined that an immediate revision is necessary.

1.9

1.9

Language and Interpretation of Text

The following language rules are applicable to the Design and Specifications Manual:

1. The imperative case is always mandatory. The words "shall" and "must" are always mandatory. These actions must be performed unless sufficient engineering justification is submitted to city officials within the Engineering Division and written approval has been specifically granted.
2. The words "should" and "recommend" indicate an action that is highly recommended under most conditions. The words "may" and "suggest" indicate an allowable action or choice that is usually beneficial in meeting the minimum city requirements.
3. Use of the singular or plural case of a noun will not affect the applicability of this manual, or any other law, regulation, or ordinance, unless the context of the sentence specifically indicates that the singular/plural case affects the intended use or function on a scientific or engineering basis. The use of a singular or plural noun does not necessarily indicate whether to design or construct a single unit or multiple units.
4. The Administrator of the DSM is the Director of Engineering Services.
5. Any reference to the City Engineer shall also mean the duly authorized representatives, bureaus or employees under that supervision who have the delegated responsibility. Areas of delegated responsibility may include, but are not limited to, review and approval of plans, review and approval of survey plats, definition of standards or requirements, approval of special conditions, review and issuance of permits, inspections and field investigations, enforcement actions, issuing notices of violation, conduct of public meetings, etc.
6. Within the Design and Specifications Manual, the term "Greenville" or "City of Greenville" shall refer to an official of the Engineering Division with the appropriate responsibility and authority for the particular action or judgment.
7. The term "development" shall generally include changes or improvements to any property that has already been developed previously. In other words, this manual also applies to redevelopment, replacement, structural additions, paving, regrading, etc. Please refer to the applicable ordinance(s) as adopted for definitions of the term "redevelopment."
8. The terms "property", "lot", "parcel" and "plot" are generally used interchangeably to refer to a single undivided portion of land that is either legally recorded in the

Greenville County property records, or is being proposed in good faith by well-prepared plan drawings for the purpose of being legally recorded. In each instance, it is the responsibility of the property owner (or his agent) to see that property is legally recorded at the Greenville County Register of Deeds.

9. The terms "building" and "structure" are used interchangeably throughout the Design and Specifications Manual, even though there may be differences in the definitions listed in the adopted ordinance(s).

In general, all words in the Design and Specifications Manual (DSM) shall have the common dictionary meanings and definitions. Common abbreviations and acronyms are defined within the Design and Specifications Manual (DSM). In some instances, the abbreviation or acronym is only introduced once if in common usage; in other cases, the abbreviation or acronym is spelled out each time it is used.

Chapter 2

Process and Scheduling

2.1

2.1

Application Types

Applications for project work within the City may include projects may be divided in to three groups:

A. Planning & Development Projects such as:

- a. Subdivisions
- b. Annexations
- c. Site Planning or New Development

These projects are managed by the Planning & Development Department and information on these various types of Planning/Development projects is maintained on the City's website at:

<https://www.greenvillesc.gov/172/Planning-Development>

B. Building & Permit Center Projects such as:

- a. New Building (or Structure) Construction
- b. Demolitions
- c. Redevelopment of Existing Structures
- d. Building Renovations
- e. Site Plan Application Review
- f. Stormwater Applications (included with Site Plan Applications)
- g. Land Clearing and Grading

City code requires that any owner or owner's authorized agent who intends to construct, enlarge, alter, repair, move, demolish or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any electrical, gas, mechanical or plumbing system, the installation of which is regulated by this code, or to cause any such work to be performed, shall first make application to the Building Official and obtain the required permit. Information on the various types of building permits for smaller construction projects is maintained on the City's website at:

<https://www.greenvillesc.gov/656/Building-Permit-Center>

- C. Engineering Department Projects such as:
 - a. Work in the Public Right-of-Way - Street Construction and/or Repair
 - b. Aboveground or Underground Utility Work

Please consult the following website to obtain the most up to date application for each project type:

<https://www.greenvillesc.gov/334/Encroachments>

Chapter 3

Permitting Requirements

3.1

3.1 City of Greenville Permits

Application reviews within the City of Greenville fall within two basic categories:

Planning and Zoning (PZ) and Building Permits (BP)

3.2

3.2 Planning and Zoning (PZ)

PZ components include, but are not limited to, the following:

- Recombination, Mortgage, Closings, and Retracement Survey Plat Review
- Minor Subdivisions (Administrative Action)
- Major Subdivisions* (Planning Commission Action)
- Multi-Unit Residential Projects* (containing 12 or more units)
- Infrastructure Easements
- Encroachments into the Public Right of Way
- Temporary Use Permits
- Special Exemption Permits*
- Street Naming*
- Certificate of Appropriatenes
 - Minor Historic
 - Major Historic (Historic Review Board Action)
 - Minor Urban
 - Major Urban (Design Review Board Action)

PZ Board

The Board of Zoning Appeals (BZA) reviews land use issues, including proposed variations from the City's zoning ordinance; special uses that require review to determine compatibility with adjacent properties and appeals of decisions made by the zoning administrator.

The Historic Review Board (formerly DRB Neighborhood) Neighborhood Panel acts on applications for Certificate of Appropriateness in preservation overlay districts and Certification of Tax Assessment for Rehabilitated Historic Properties.

The Design Review Board Urban Panel acts on applications for Certificate of Appropriateness within the C4 zoning (Central Business District). The Board uses the Greenville Downtown Design Guidelines, adopted May 2017.

The Planning Commission makes recommendations to City Council on zoning and annexation issues; reviews and approves all new subdivisions and is involved in comprehensive planning to improve the health and welfare of the public.

- Legislative Review (Planning Commission and City Council Action)
 - Comprehensive Plan Adoption and Amendment
 - Master Plans and Neighborhood Plans Adoption
 - Design Guidelines Adoption and Amendment
 - Text Amendment
 - Rezoning*
- Annexations

(*Requires Project-Specific Public Meetings)

<https://www.greenvillesc.gov/172/Planning-Development>

3.3**3.3 Building Permits (BP)**

BP components include, but are not limited to, the following:

- Site Plan Review
 - Minor Site Plans
 - Major Site Plans
 - Land Disturbance Applications
 - Stormwater Delegated Review
 - Sanitary Sewer Delegated Review
- Demolition Permits
- New Building, Addition, and Alteration Permits
- Sign Permits
- Certificates of Occupancy
- Trade Permits (e.g., electrical, mechanical, plumbing, etc.)

<https://www.greenvillesc.gov/656/Building-Permit-Center>

3.4

It is possible that simultaneous PZ and BP processes are in process. For example, a new subdivision may have Planning Commission (PZ) approval based on the preliminary plat, however, site plan (BP) infrastructure improvements must be constructed and approved prior to the final plat approval (PZ).

3.4**City Review, Issuance, and Closure**

It is the responsibility of the applicant to identify and obtain any other required permits. Permits not issued by the City that may be required prior to site plan approval or Certificate of Occupancy include, but are not limited to, the following:

- State Permits:
 - South Carolina Department of Health and Environmental Control (SCDHEC)
 - South Carolina Department of Transportation (SCDOT)
 - Federal Permits:
 - United States Army Corps of Engineers (USACE)
 - Federal Emergency Management Agency (FEMA)
 - Utility Permits:
 - Renewable Water Resources (ReWa)
 - Greenville Water
 - MetroConnects
-

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Plat Requirements

Allow all references to 4 as chapter number to be changed to 2 and page numbers updated accordingly

4.1

Added "Right of Way and"

4.1

Plats Overview

There are four categories of plats:

1. Mortgage, Retracement or Closing Plats
2. Easement Plats
3. Combination and Recombination Plats
4. Subdivision Plats

Items #1 and #2 above are reviewed by the Engineering Department directly by emailing survey@greenvillesc.gov.

Items #3 and #4 are reviewed by both Planning and Engineering staff. ~~See here for the subdivision approval process: <https://www.greenvillesc.gov/DocumentCenter/View/344>~~

See here for subdivision permit applications and other Zoning applications: <https://www.greenvillesc.gov/257/Zoning-Permit-Applications>

The Engineering Department must provide a signature of approval on the plat prior to recording at the Greenville County Register of Deeds.

"Plat Requirements"**4.2****Format And Content Requirements For subdivision Plats
(Land Development Permits)**

Pursuant to Section 19-6 Administration, an applicant proposing to divide a parcel of land into lots or sublots for the purpose of sale or development shall submit a plan to the Administrator for review and appropriate action.

In the case of a Minor Subdivision (dividing a parcel into lots or sublots for the purpose of sale, lease, or building development when no new publicly-dedicated or private streets or rights-of-way are created to serve the development), an applicant shall submit a Summary Plat to the Administrator for review and approval. The plat shall reflect the information required of a Final Plat reflected below and any other information required by the Greenville County Register of Deeds Office.

In the case of a Major Subdivision (dividing a parcel into lots or sublots for the purpose of sale, lease, or building development that is determined to not be a Minor Subdivision), an applicant shall submit a Preliminary Plat to the Administrator for his review pursuant to Section 19-6.2.4 Major Subdivision. Pursuant to Section 19-6.2.4.(C), the Administrator shall review, prepare a staff report, and schedule (as appropriate) the Preliminary Plat for the consideration and action of the Planning Commission. The Preliminary Plat shall conform to, and reflect, the following:

Preliminary Plat Requirements

**Changed to "send plat for review
to: planning@greenvillesc.gov"**

- ~~1 Three (3) copies on a size of 27" x 22" or 24" x 36" bond paper.~~
- 2 Proposed name of subdivision and streets.
- 3 Name, address, and telephone of record owner and developer.
- 4 Tax map references for parcels being divided.
- 5 Record owner names and tax map references of all contiguous and adjacent parcels.
- 6 Date of survey, north arrow (and reference), graphic scale (not less than 1"=200'), data source, date of plat drawing.
- 7 Location sketch (not less than 1"=2,000'), illustrating the relationship of the property proposed for division with adjoining property and streets within 1,000' of the perimeter of the property.
- 8 Courses and distances of all exterior boundary lines of the subdivision.
- 9 Total area of land being divided and approximate lot widths and areas of all proposed lots being created.
- 10 Location of any incorporated area or district boundary within, or adjoining, the proposed subdivision.

"Plat Requirements"

- 11 Location of all existing and proposed legal features within, and adjoining, the proposed subdivision including:
 - a) street rights-of-way
 - b) lots (with dimensions)
 - c) lot lines
 - d) building lines (building envelopes/setbacks)
 - e) easements
 - f) areas proposed for public use
- 12 Location of any proposed phase line(s).
- 13 Location of all existing physical features within, and adjoining, the proposed subdivision including structures, freestanding signs, etc.
- 14 Location of all existing natural features within, and adjoining, the proposed subdivision (watercourses, marshes, floodplains, wooded areas, etc.). Watercourses shall reflect the direction of flow and, for watercourses flowing onto the proposed subdivision, the drainage area above the point of entry.
- 15 Location and size of all existing and proposed improvements within, and adjoining, the proposed subdivision including:
 - a) streets
 - b) curb and gutter
 - c) sidewalks and curb lawns
 - d) bridges
 - e) sanitary sewage
 - f) water
 - g) storm drainage (with inverts)
 - h) detention/retention systems
 - i) fire hydrants
 - j) If Requested by Administrator:
 - 1) gas lines, electric, cable, and telephone lines (and poles), and streetlights
 - m) recreation/open space areas
16. Contour lines and elevation data based on sea level data within, and adjoining, the proposed subdivision at intervals not to exceed five (5) feet (source specified).

Upon fulfillment of the conditions of Preliminary Plat Approval and, after installation (or bonding) of the required improvements, an applicant shall submit an application for Final Plat Approval to the Administrator pursuant to the requirements of Section 19-6.2.4.(C) Review and Action Process. The Administrator shall review the plat for conformance with the Ordinance, the Preliminary Plat, and the following requirements and, if found conforming, he shall endorse the Final Plat in behalf of the City and authorize its recordation at the Greenville County Register of Deeds Office.

Summary Plat and Final Plat Requirements

- 1 Three (3) copies on a size of 27" x 22" or 24"x 36" bond paper.
- 2 Title block containing the following:
 - a) Subdivision name
 - b) Name and address of record owner
 - c) Name and address of developer
 - d) Location (including County and State)
 - e) Date of survey
 - f) Numeric and graphic scale not less than 1" = 100'
 - g) Name, address, registration number, and seal of engineer or surveyor
- 3 Certificate of accuracy of the survey and references stating the origin of the information reflected on the plat with Deed Book, Page, and Date. Any lines reflected on the plat that were not surveyed by the engineer/surveyor must be clearly indicated and source cited.
- 4 Methods of area computation must be reflected; estimation or copying from other sources is not permissible.
- 5 Accurately-positioned North Arrow coordinated with all bearings reflecting true, magnetic, or grid.
- 6 All dimensions, both linear and angular, expressed in feet and decimals of feet and nearest minute for locating exterior boundaries of the subdivision, lots, streets, alleys, easements, etc.
- 7 Each curve shall be defined by a radius, central angle, tangent, and arc and chord distances and bearings. A curve data table shall be used to tabulate the curves reflected on the plat.
- 8 Names of adjacent landowners with lot, block, and subdivision citations.
- 9 All visible and apparent rights-of-way, watercourses, floodplains, public utilities, roadways, and other similar improvements shall be reflected with offset or traverse lines plotted in broken lines with azimuths or courses and distances where crossing or forming any boundary line within the subdivision.
- 10 One corner of the boundary must be tied by course and distance to the nearest street intersection. Steel or iron pipe survey markers shall be set at all lot corners and at all other survey points not marked by monuments.
- 11 A statement of private covenants or a reference to recorded book and page. 12) All building setback lines.
- 12 Signature blocks for Certificate of Ownership & Dedication, Certificate of Accuracy and Certificate of Approval for Recording.

CERTIFICATE OF OWNERSHIP AND DEDICATION

THE UNDERSIGNED HEREBY ACKNOWLEDGE THAT I AM (WE ARE) THE OWNER(S) OF THE PROPERTY SHOWN AND DESCRIBED HEREON AND THAT I (WE) HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY (OUR) FREE CONSENT AND THAT I (WE) ESTABLISH THE MINIMUM BUILDING RESTRICTION LINES AND HEREBY DEDICATE TO PUBLIC USE AS ROADS, STREETS, AND EASEMENTS FOREVER ALL AREAS AS SHOWN OR INDICATED ON SAID PLAT.

DATE_____ SIGNED _____

DATE_____ SIGNED _____

DATE_____ SIGNED _____

CERTIFICATE OF ACCURACY

I HEREBY STATE THAT TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, INFORMATION, AND BELIEF, THE SURVEY SHOWN HEREIN WAS MADE IN ACCORDANCE WITH THE REQUIREMENTS OF THE STANDARDS OF PRACTICE MANUAL FOR SURVEYING IN SOUTH CAROLINA, AND MEETS OR EXCEEDS THE REQUIREMENTS FOR A CLASS "A" SURVEY AS SPECIFIED THEREIN; ALSO THERE ARE NO VISIBLE ENCROACHMENTS OR PROJECTIONS OTHER THAN SHOWN.

DATE_____ PROFESSIONAL LAND SURVEYOR
S.C. REGISTRATION NO. _____

CERTIFICATE OF APPROVAL FOR RECORDING

I HEREBY CERTIFY THAT THE SUBDIVISION PLAN SHOWN HEREON HAS BEEN FOUND TO COMPLY WITH THE SUBDIVISION REGULATIONS FOR THE CITY OF GREENVILLE, WITH THE EXCEPTION OF SUCH VARIANCES, IF ANY AS NOTED IN THE MINUTES OF THE CITY OF GREENVILLE PLANNING COMMISSION OF GREENVILLE COUNTY, SOUTH CAROLINA, AND THAT IT HAS BEEN APPROVED FOR RECORDING IN THE OFFICE OF THE GREENVILLE COUNTY REGISTER OF DEEDS.

DATE_____ CITY ENGINEER - CITY OF GREENVILLE
OR AUTHORIZED REPRESENTATIVE_____

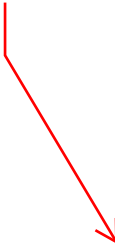
2.4

Format And Content Requirements For Utility and Easement Plats

Minimum Requirements for Plats of Utility Easements, Rights-of-Way and Public Access Easements for the City of Greenville.

- 1) All plats of Easements or Rights-of-Way shall conform to the requirements for a "Class A" survey as described in the Standards of Practice Manual for Surveying in South Carolina. (State of South Carolina Code of Regulations, Chapter 49, Article 4, Regulations 400-490). See exception set forth in item # 11 below.
- 2) The plat shall meet the requirements adopted by the State of South Carolina and Greenville County, South Carolina, for the recordation of plats .
- 3) The width of the Easement or Right-of-Way shall be shown on the plat.
- 4) For each Tax Map Parcel impacted, the metes and bounds of the exterior boundary of the Easement or Right-of-Way shall be shown on the plat.
- 5) For each Tax Map Parcel impacted, the Total Area (square feet and acreage) of the Easement or Right-of-Way shall be shown on the plat.
- 6) At least one corner of each Easement or Right-of-Way shall be tied to a property corner monument of the impacted tax map parcel. The monument to which the Easement or Right-of-Way is tied shall be a corner monument shown on the current plat, or referenced in the current deed, of the subject tax map parcel. The corner monument shall be described (size and type).
- 7) For each Tax Map Parcel crossed by, or adjacent to the Easement or Right-of-Way, Greenville County Tax Map Numbers shall be shown, along with the name(s) of the owner(s), and Plat and Deed references.
- 8) Any and all improvements located within a distance equal to 'Z' the total width Of the Easement or Right-of-Way to the exterior boundary of the Easement or Right- of-Way shall be shown and labeled on the plat.
- 9) Street, road and alley names (and/or identification numbers) of streets, roads and alleys crossed by, or adjacent to, the Easement or Right-of-Way shall be shown. The Right-of-Way width of the street, road or alley shall be shown (if known) .
- 10) In the case of a Utility Easement or Right-of-Way, the Easement or Right-of-Way shall extend for a distance equal to one half of the total width of the Easement or Right-of-Way beyond the terminating structure.
- 11) It is not necessary to place a monument at each corner of the Easement or Right-of-Way. However, sufficient information shall be shown on the plat, and sufficient monumentation shall be placed so that the Easement or Right-of-Way can be physically located on the properties involved.
- 12) In every case, the Utility Easement, Right-of-Way or Public Access Easement shall be labeled on the plat as being for (or granted to) "The City of Greenville."

Added page



← Added Summary Plat
Template after this page

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Chapter 5

Site Construction Administration & Site Construction Activities

"Activities"

5.1

5.1

Preconstruction Conference

A Preconstruction Conference will generally be required for projects which disturb a significant amount of ground, or add new structures. The need for a Preconstruction Conference will be identified by the City during the application process and the Applicant will be informed of the need.

5.2

5.2

Inspection Frequency

Inspections for clearing and grubbing, site grading, stormwater controls, excavations, building foundations, concrete work, compaction, framing, plumbing, electrical, and other items may be required for projects. The need for an inspection is typically tied to reaching a specific construction milestone, such as completion of rough framing. A list of inspections required will be identified by the City during the application process and the Applicant will be informed of the required inspections at the time the Building Permits are issued.

5.3

5.3

General Site Construction Activities

Construction projects within the City must follow certain guidelines in order to protect the safety and general welfare of the public. The entity controlling the construction activities must plan for and provide adequate safety measures at the site for the following types of risks:

- Falls resulting from uneven ground of excavations
- Collisions with machinery or materials being moved

- Cuts or impalement on sharp objects associated with the project
- Electrocution or exposure to unprotect electrical items
- Burns resulting from welding, grinding, of hot surfaces on vehicles or tools
- Impact from flying debris
- Hearing injuries caused by high noise levels
- Eyesight injuries caused by open welding
- Other risks not listed here

5.4

5.4 General Control Measures Required

All construction sites must conform to the State and Federal programs which deal with worker and general public safety. Each construction project must consider the following control measures and determine what local controls must be enacted for each:

- **Site Control.** Perimeter fencing or barriers to preclude access to the site during both active work periods and periods when the site may not be occupied.
- **Project Signage.** Signage which identifies the risks at the site, the required level of personal protective equipment, and contact information for the construction manager.
- **Appropriate Lighting.** If the site will be occupied during low light periods it must have a lighting system to allow visibility and safe movement about the site.
- **Good Housekeeping.** The site must be maintained in a neat and orderly manner, with appropriate storage of materials to minimize clutter, periodic site cleaning to control litter, and easily recognized access to safety equipment such as fire extinguishers or oil cleanup materials.
- **Fire Hazards.** Site processes must be in place to minimize the risk of fires starting from equipment, tools, welding and grinding and other hot work, or smoking.
- **Oil and Petroleum Safety and Spill Hazards.** Flammable fuels and lubricants must be stored in appropriate containers and cabinets to reduce fire risk, and appropriate spill cleanup materials must be present to address fueling spills or equipment leaks which may occur.
- **Required Building Permits, Stormwater Permits, and other required notices** must be displayed as required by regulations.

5.5

5.5 Waste management

The wastes generated from the construction project must be properly managed. This effort may include maintaining dumpsters for different types of waste products, storing some wastes indoors or under cover, and storing some wastes with secondary containment. Wastes requiring special disposal practices must be stored and handled in accordance with the applicable regulations.

5.6

5.6

Maintenance of Stormwater Facilities During Construction

Stormwater controls must be implemented and maintained per any City issued stormwater permit for the project, and per NPDES standards and guidance if no specific permit has been issued or is required. The following types of maintenance are typically required on projects disturbing soils:

- Construction Entrance/Exit – must be maintained to reduce the amount of soils or mud tracked out of the site.
- Perimeter Silt Fence – must be maintained and inspected frequently to keep it functioning properly.
- Detention and retention basins – must be checked periodically to determine if sediment has built up to a point where it must be removed.
- ~~Filter cloth inlet protection – must be checked periodically to determine if it is properly secured so that it will filter any stormwater entering the outlet.~~
- Land grading and stabilization must be checked during the project to maintain proper drainage and stabilize areas with vegetation.

- Single-Family residential lots shall comply with sediment and erosion control requirements as defined in the stormwater section of this document.

Added bullet

5.7

5.7

Soil Erosion & Sediment Control During Construction**5.7.1 Construction Phase Requirements:**

- Soil erosion and sediment control is required prior to any land/hydrologic disturbance and must be maintained for the duration of construction.
- Soil disturbance during construction shall minimize erosion. Ungraded areas shall be protected from construction traffic or other disturbances until final seeding. Time of year, site conditions, and use of temporary and/or permanent measures shall be considered prior to soil stabilization.
- Energy dissipation to be provided at discharge locations and along outfall channel lengths.
- Disturbed areas shall be stabilized within 14 calendar days following the end of active disturbance. All temporary control measures shall be removed within 30 days after final site stabilization.
- The following control measures shall be implemented based on amount of tributary drainage area:
 - < 1 acre (silt fence)
 - 1 acre < disturbed area < 5 acres (sediment trap)
 - > 5 acres (sediment basin). Basin volume sizing criteria for sediment trap 1,800 ft³/acre. If site will drain to an impaired waterbody, based on SCDHEC's 303d list, and construction activities will contribute to the impairment, then minimum sediment basin size shall be 3,600 ft³/acre.
- Storm sewers functioning during construction shall be protected by appropriate measures such as sediment traps, silt fencing, temporary coarse gravel, silt sacks, mat/roll-type barriers, fabric barriers, or storm drain inlet protection.
- Construction entrances shall be stabilized with an aggregate underlain with filter cloth. Any sediment or soil transported off-site shall be removed and disposed of at a

Replaced with "Inlet protection - must be checked periodically to determine if it is properly secured so that it will filter any stormwater entering the outlet"

controlled sediment disposal area. Construction entrances shall be 100 feet long unless staff determines otherwise.

- Earthen embankments shall be constructed with appropriate stabilization and maximum side slopes of 4H:1V preferred, 3H:1V required. Steeper slopes than 3H:1V may be constructed with approval by the City and stabilized with staked-in-place sod, erosion control matting, flexible growth medium or blanket in combination with seeding. Slopes 2H:1V require turf reinforcement matting.
- Stormwater conveyance channels and the outlet of all channels and pipes shall be designed and constructed to withstand flow velocity from the 10-year 24 Hour Storm without erosion. All channels shall be stabilized within 72 hours of disturbance.
- Temporary diversions shall be constructed to direct all runoff from disturbed areas to the appropriate sediment trap or basin.
- Soil stockpiles (> 100 yd³ of soil that remain in place > 7 days) shall not be located in a flood-prone area or a designated buffer protecting Waters of the United States or Waters of the State. Soil stockpile locations shall be shown on the Soil Erosion and Sediment Control Plan and shall have the appropriate measures to prevent erosion. The stockpile area must be surrounded by a silt fence or equivalent at all times.
- For sites draining more than 5-acres, release rates for the 2-yr and 10-yr, 24-hr storm events during construction shall be less than the pre-developed discharge rates.
- Applicant must hire a designated erosion control inspector for development with > 10 acres of hydrologic disturbance or with > 1 acre of hydrologic disturbance within a regulatory floodplain, Waters of the United States, or Waters of the State on-site or on an adjoining property
- Applicant shall identify the designated erosion control inspector to the Administrator at or before the pre-construction meeting or commencement of hydrologic disturbance. Notification to Administrator is required within 14 days of permanent change to the designated erosion control inspector.
- Inspections must be conducted by qualified personnel for projects that disturb greater than one acre. Qualified inspectors include the following:

Preparer of the C-SWPPP,

A person with a registration equivalent to the registration of the preparer of the C-SWPPP who is knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact stormwater quality and to assess the effectiveness of any BMPs selected to control the quality of stormwater discharges from the construction site; or

An individual who is under the direct supervision of an individual who is qualified to prepare a C-SWPPP based on section 3.1.2.B of this permit and who is knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact stormwater quality and to assess the effectiveness of any BMPs selected to control the quality of stormwater discharges from the construction site; or

An individual who has been certified through a Construction Site Inspector Certification Course that has been approved by DHEC.

5.8

5.8 Laydown Yard

Purpose. A laydown yard is intended for construction equipment and material only.

- A proposed laydown yard shall be associated with one or more specific projects with an approved building permit issued for grading, construction, remodel or demolition, an approved land use decision, or pending application for a building permit or land use decision. The location and size of the laydown yard must be approved by the City Engineer.
- A laydown yard is not a substitute for a contractor storage yard. If items are kept on site continuously for more than 8 months, the City may determine that a laydown yard no longer exists.
- All laydown yards must be kept in an organized fashion and shall not have any materials stacked in excess of six (6) feet without approval of the City Engineer.
- Laydown yards shall be supervised by the property owner who will be responsible for enforcing compliance with these standards.
- Where curbs exist, the contractor shall be required to provide curb cuts for all egress or ingress areas onto a paved street. To prevent mud or dirt from transferring from vehicles and equipment onto the paved street the contractor shall install pavement or other surface treatment approved by the City Engineer at all egress and ingress points from the yard. Dust and erosion control shall be in place to confine these materials to the subject property. Noise, vibration, dust, and odors cannot exceed local, state, or federal regulations.
- Site plans should indicate the construction laydown yards alongside the erosion and sedimentation control measures. **and included in the limits of disturbance.**

-Restoration of the laydown yard will be required prior to issuance of a certificate of occupancy permit

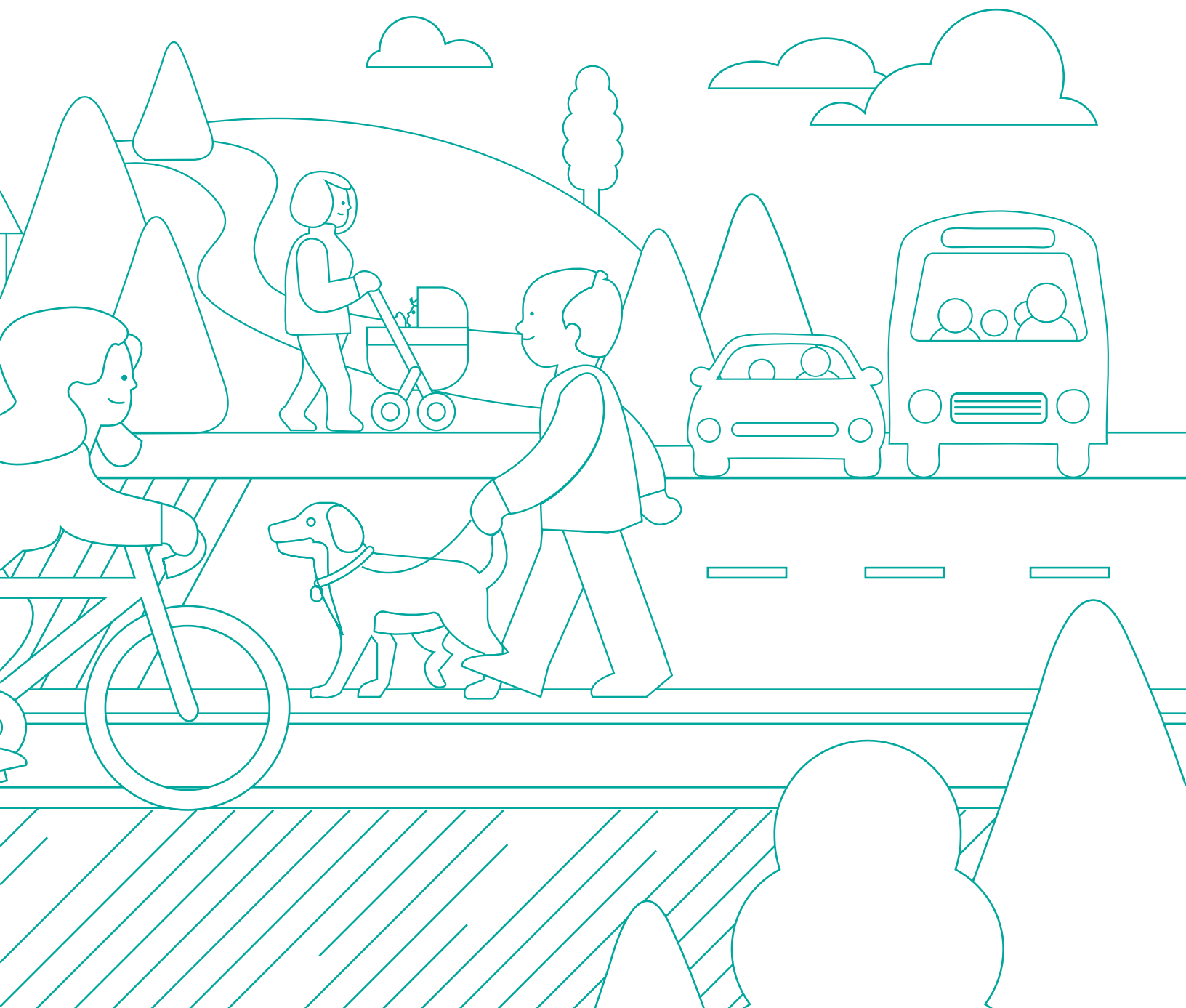
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another bullet

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Let all references to Chapter 6 be changed to Chapter 4 accordingly, as well as page numbers be updated

Street, Sidewalk and Trail Standards

Good street and sidewalk design accommodates a variety of users, improves public safety, reduces environmental impacts, and enhances community character. Urban, suburban and rural communities alike have, for decades adopted street-design standards that showed strong preference to cars. However, in recent years, there has been a rebalancing of transportation priorities, giving attention to streets and sidewalks that can safely accommodate a wide variety of people, uses, and needs. Greenville City Council endorsed a complete streets policy through Resolution 2008-49 to encourage the design, operation, and maintenance of a transportation system that promotes safe and convenient access through improved livability and accessibility, enhanced safety, and improved travel conditions, and choices for people of all ages and abilities. One of the three primary goals of the City's comprehensive plan, GVL2040, is to improve transit and mobility options throughout the City of Greenville to ensure new transportation infrastructure addresses all types of users—specifically pedestrians and bicyclists—in a manner that reflects the community's priorities.





Chapter 6

Street, Sidewalk and Trail Standards

6.1

6.1

Introduction

A. Purpose

The Regulating Street Map and Street Type Standards establishes the design and location of the existing and future public street network in Greenville. It is the intent of these street types and associated standards to help implement the adopted mobility policy as outlined in the City's comprehensive plan and other planning documents and provide safe and equitable multimodal options for all users of Greenville's streets.

B. Applicability

The Regulating Street Map and Street Type Standards defines the type, design, and location of existing and future streets as described in the Street Types below. The standards establish the required street components, cross-section, future back of curb location, and necessary right-of way. In addition, Required Streetscape for each street type is applicable for all zoning districts as outlined in the Greenville Development Code. Road ownership may also include County or SCDOT maintenance, encroachment, and permitting requirements.

C. Amendments and Modifications

1. Amendments

The Regulating Street Map and Street Type Standards is a city policy document. Amendments will be necessary to reflect local context and changing conditions. Changes and amendments to a street's classification (Street Type) or necessary components will require approval by the Administrator or their designee.

2. Modifications

Specific modifications to the design, location, and dimensions of individual street components may be approved by the Administrator or their designee when it is determined that:

- a) The modification reflects refined or more detailed technical information about a street or unique constraint related to a street or corridor; or
- b) Significant physical barriers, such as topographic conditions, environmental impacts, and/or utility conflicts, prevent the original component/dimension from being implemented; and
- c) The modification does not degrade the safety and functionality of the street.

6.2

6.2 Street Types

A. Street Types Summary

The Greenville street types and key characteristics are summarized in the table below.

City Thoroughfare These streets are major corridors that carry high traffic volumes into and through the city. They are often gateway streets. (e.g. S. Pleasantburg Dr., Laurens Rd., Mills Ave., etc.)	Primary land use	Commercial / Mixed-use
	Right-of-way	90-105 ft
	Curb-to-curb (face)	60-82 ft
	Traffic volume	20K+
	Functional class	Arterial
	Travel lanes	4-6
	Median space/TWLTL	 YES
	On-street parking	 NO
	Bike facilities	 YES
	Streetscape	 YES
District Street These streets connect city thoroughfares and neighborhood streets. They are often multimodal streets in mixed-use areas. (e.g. Augusta St., Park Ave., etc.)	Primary land use	Commercial / Mixed-use
	Right-of-way	70-100 ft
	Curb-to-curb (face)	42-64 ft
	Traffic volume	Less than 20K
	Functional class	Collector
	Travel lanes	2 (with TWLTL option)
	Median space/TWLTL	 YES
	On-street parking	 SOMETIMES
	Bike facilities	 YES
	Streetscape	 YES

Neighborhood Street

These secondary streets connect to district or thoroughfare streets and provide access to residential properties and neighborhood mixed-use areas.

Primary land use	Residential / Mixed-use
Right-of-way	50-65 ft
Curb-to-curb (face)	28-42 ft
Traffic volume	Less than 3K
Functional class	Local
Travel lanes	1-2
Median space/TWLTL	 NO
On-street parking	 SOMETIMES
Bike facilities	 SOMETIMES
Streetscape	 YES

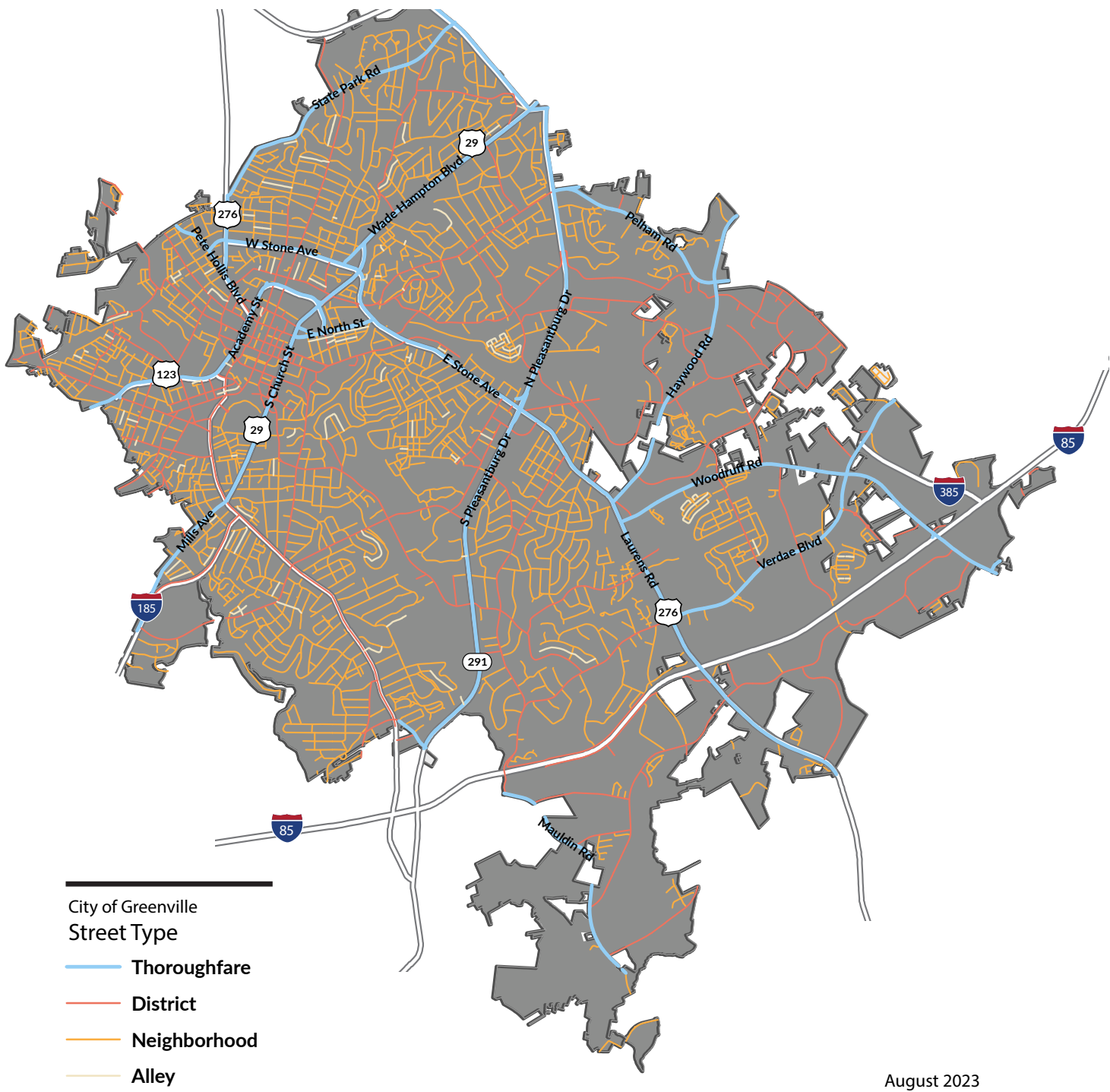
Alley

These passageways provide access to property and connect to parking, pedestrian ways, and district and neighborhood streets.

Primary land use	Residential / Commercial / Mixed-use
Right-of-way	25-30 ft
Curb-to-curb (face)	14-20 ft
Traffic volume	Less than 500
Functional class	Local
Travel lanes	1-2
Median space/TWLTL	 NO
On-street parking	 NO
Bike facilities	 SOMETIMES
Streetscape	 NO

B. Regulating Street Map

The Street types are included in the map below.





Travel Lanes



Median Space



On-Street Parking



Bike Space



Planting Zone



Pedestrian Zone

C. Street Components

To accomplish a "complete street" a combination of components must work together to create a balanced street that is comfortable for all users.

The components below, in various combinations, comprise the street standards. Refer to Table 6.1 for additional design criteria.

1. Travel Lanes

Travel Lanes provide space for motor vehicles and, on some streets, bicycles. The number of lanes will vary depending on street type and context, but most streets will have between 2 and 4 lanes. Generally, 10 ft is an adequate lane width for urban streets.

2. Median space

Median or center space provides for important safety elements like turn lanes and pedestrian refuge islands. In addition, this space can provide opportunities for green infrastructure, trees and other landscaping which helps to calm traffic and support Greenville's tree canopy and green space goals.

3. On-street parking

On-street parking not only serves adjacent land uses, but it also provides a buffer for pedestrians. On-street parking should be considered for all streets except for Throughfares. Depending on context and space availability, parking will be parallel or angled.

4. Bike space

Greenville streets will incorporate several different categories of bicycle facilities based on context and local conditions. Some bicycle facilities require more or less space than others, while other bike facilities might require the same amount of space but could be configured slightly differently based on various design and construction circumstances. Refer to Sec. 6.4 for Bike and Multimodal Space minimum requirements.

5. Required Streetscape (Required in the Greenville Development Code)

The streetscape is the transition area between moving and parked vehicles and adjacent land uses. It is the area of the street where trees are planted, and pedestrians are accommodated. A well-designed streetscape seamlessly integrates the public realm with adjacent land uses and private development.

Planting zone

The planting zone creates a buffer between the pedestrian facilities and the adjacent travelways and provides space for street trees, grass, and other landscaping as well as street furnishings, such as benches, trash receptacles, and bike racks. The planting zone, whether it includes tree pits, lawn or other plantings, can vary based on the adjacent land use context and the inclusion of on-street parking. See Sec. 8.3 for general landscape design guidelines for street tree plantings.

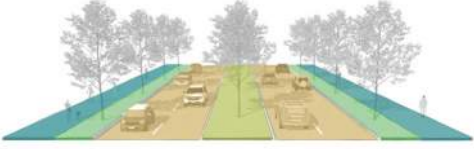
Pedestrian zone

Each street includes the type and width of the pedestrian facility located within the streetscape. The two types of pedestrian facilities are sidewalks and shared-use-paths (shared with bicyclists).

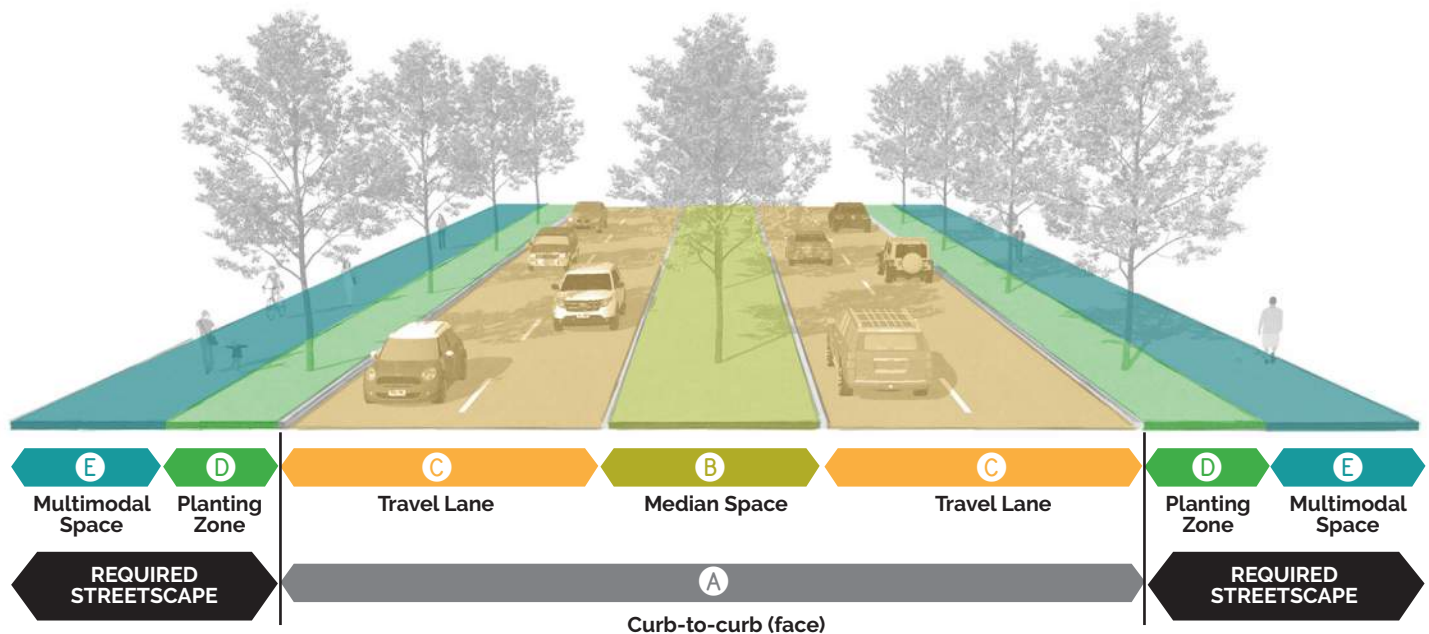
6.3

6.3
Street Standards

Each street type includes standards and a cross-section that is intended to illustrate an expected street design to serve all users.

City Thoroughfare Boulevard	City Thoroughfare Avenue
	
District Mixed-use (three-lane)	District Mixed-use (two-lane)
	
District Main Street	District One-Way ← Fixed typo
	
Neighborhood High-density	Neighborhood Medium-density
	
Neighborhood Low-density	Neighborhood One-way
	
Alley Mixed-use + Commercial	Alley Residential
	

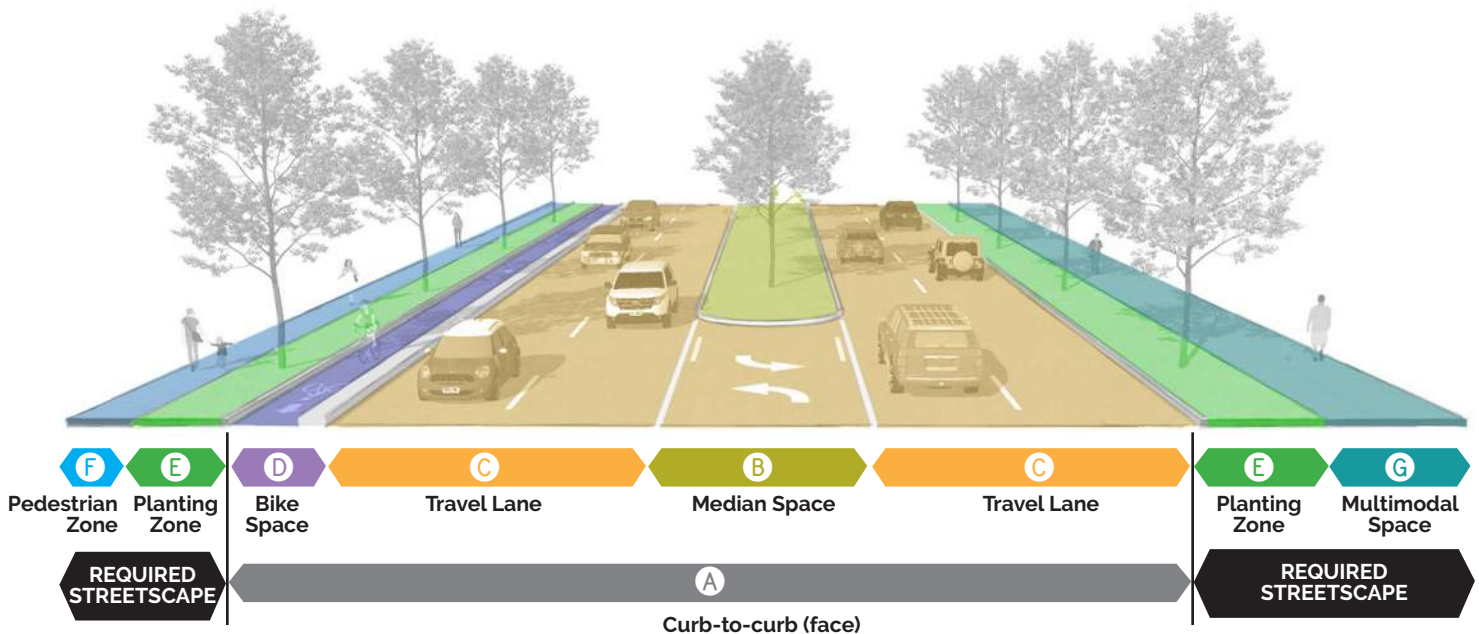
City Thoroughfare Boulevard



Boulevards provide city-wide multi-modal connectivity. They generally have higher vehicular volumes and speeds which requires pedestrian and bicycle facilities to be adequately buffered from travel ways. In some cases required streetscape will be accommodated outside of the public right-of-way.

A	Curb-to-curb (face)	Total width will be between 67 and 82 ft.
B	Median Space	Will typically include center space in the form of a continuous landscape median.
C	Travel Lanes	Will have between 4 and 6 travel lanes that are 12 ft. (or 11 ft. where permitted).
REQUIRED STREETScape		
D	Planting Zone	Tree lawn with a minimum width of 8 ft. Refer to Div. 19-4.4 for tree spacing and planting type requirements.
E	Multimodal Space	10 ft. minimum multimodal accommodations. Refer to Table 6.2

City Thoroughfare Avenue



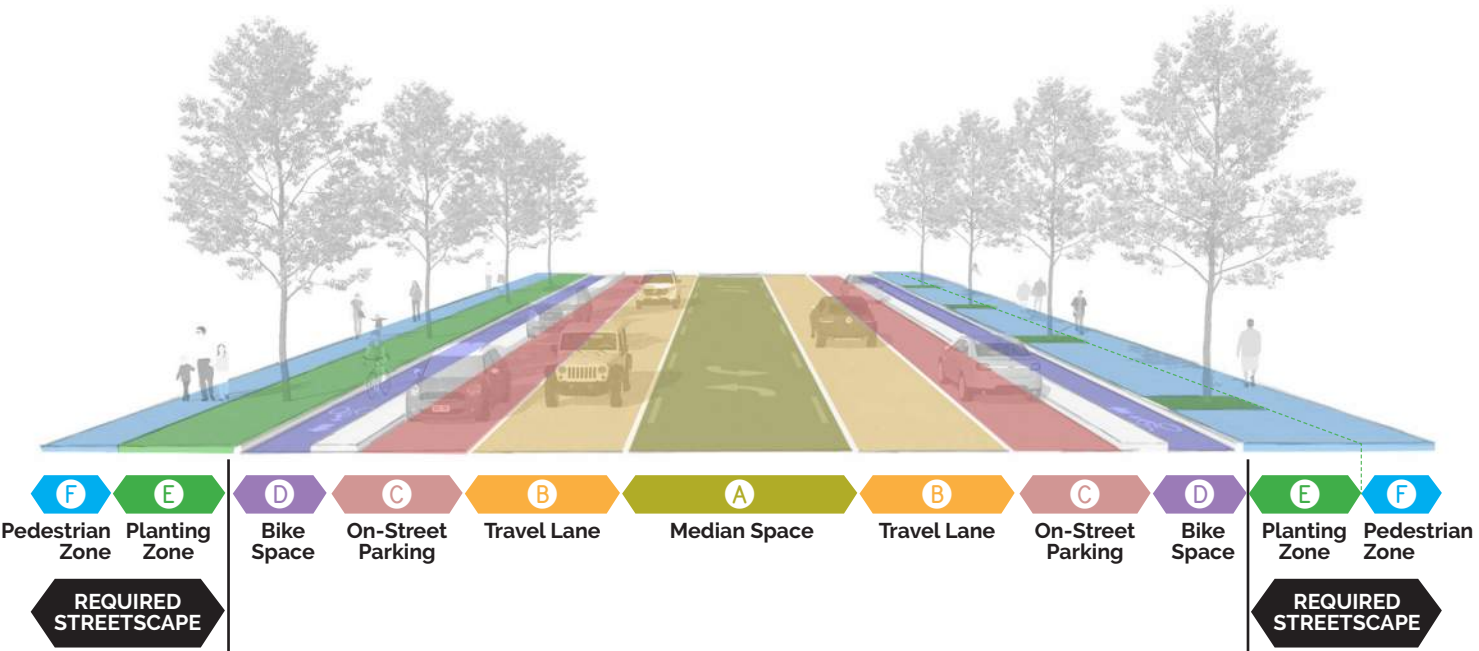
Avenues provide access between neighborhoods and activity centers in a range of land uses, balancing all modes of transportation. Center planted medians are generally provided and often include a two-way-left-turn-lane and a pedestrian refuge. In some cases required streetscape will be accommodated outside of the public right-of-way.

A	Curb-to-curb (face)	Total width will be between 60 and 70 ft.
B	Median Space	Avenues will typically include a center space [14 ft.] in the form of a continuous landscape median with a two-way-left-turn-lane [TWLTL] as needed.
C	Travel Lanes	Avenues will typically have no more than 4 travel lanes [11-12 ft.]. If 6 lanes are needed it should be designed to balance all modes.
D	Bike Space	A minimum of Level 6 Bike Access must be provided. Refer to Sec. 6.4
REQUIRED STREETSCAPE		
E	Planting Zone	Tree lawn with a minimum width of 8 ft. Refer to Div. 19-4.4 for tree spacing and planting type requirements.
F	Pedestrian Zone	Pedestrians will typically be accommodated on a sidewalk [5 ft min.].
G	Multimodal Space	10 ft. minimum multimodal accommodations. Refer to Table 6.2

OR



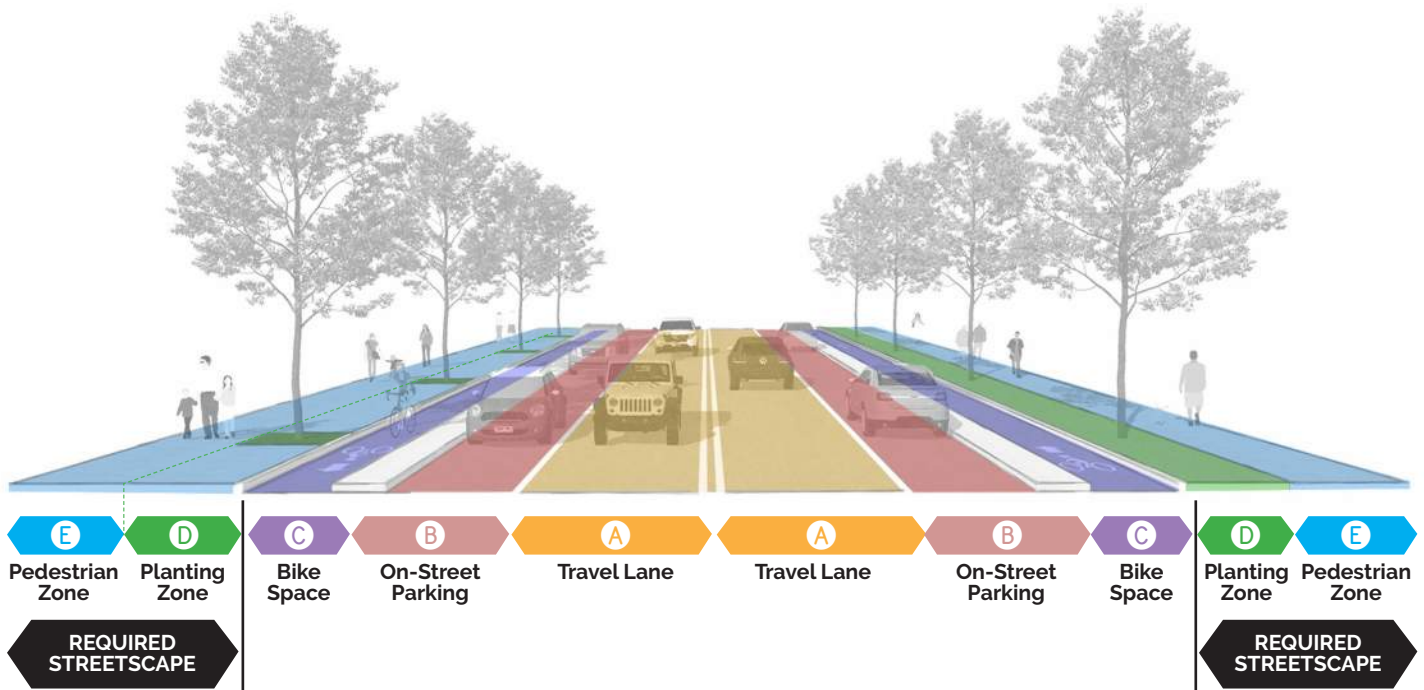
District Mixed-use (three-lane)



This two-way street accommodates left-turns and on-street parking for mixed-use areas. Center medians are generally provided and often include a two-way-left-turn-lane. In some cases required streetscape will be accommodated outside of the public right-of-way.

A	Median Space	Two-way-left-turn-lane [TWLTL] or landscape median [14 ft].
B	Travel Lanes	2 travel lanes that are 11 feet wide.
C	On-Street Parking	Parallel parking [8 ft min.] or angled will be provided as conditions allow.
D	Bike Space	A minimum of Level 4 Bike Access must be provided. Refer to Table 6.2
REQUIRED STREETSCAPE		
E	Planting Zone	Tree lawn or tree pits with a minimum width between 5 and 8 ft. Refer to Div. 19-4.4 for tree spacing and planting type requirements.
F	Pedestrian Zone	Pedestrians will be accommodated on a sidewalk [5 ft min.] on both sides of the street.

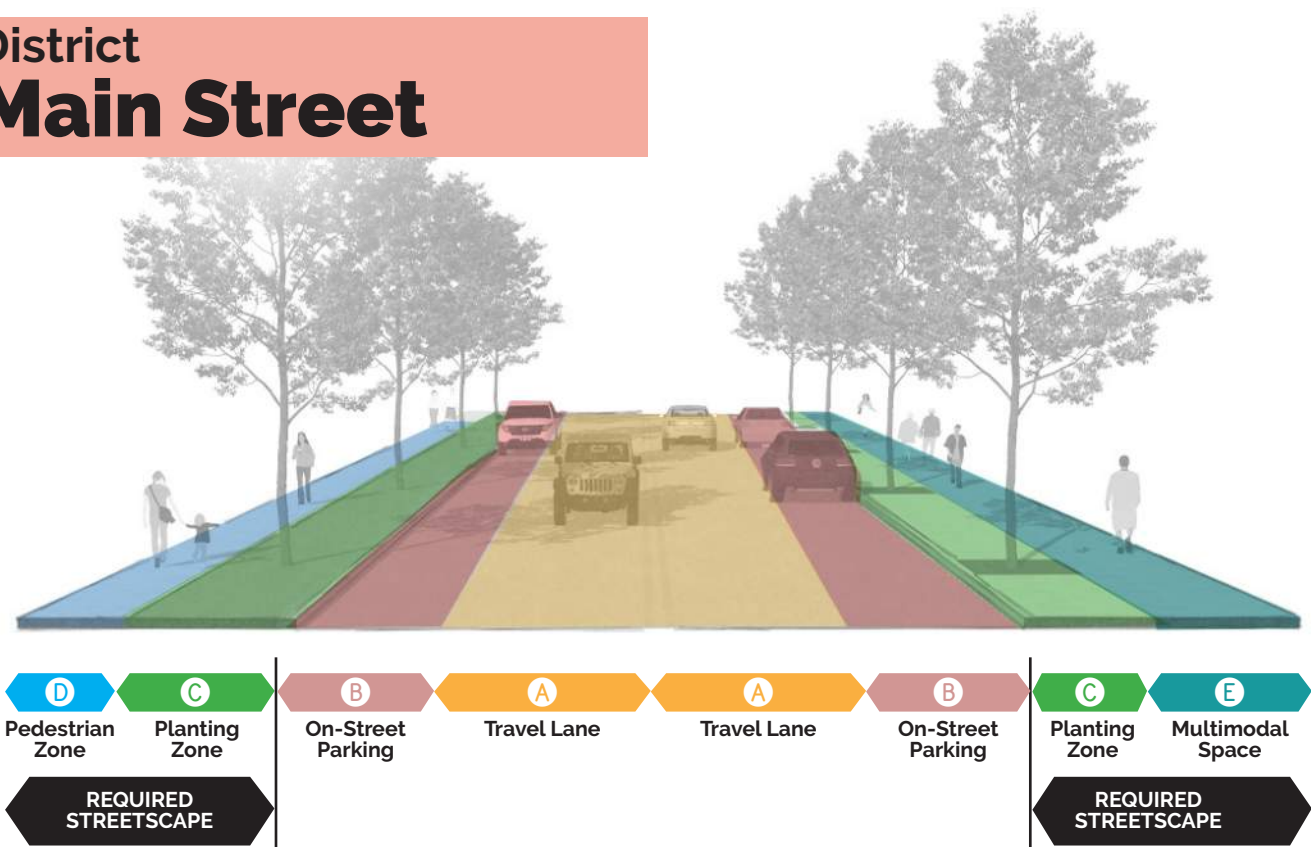
District Mixed-use (two-lane)



This two-lane street is most appropriate in mixed-use areas where active frontages are prevalent. Depending on need and available right-of-way, parallel or angled on-street parking should be included. Due to high anticipated pedestrian activity, design speeds are kept low. Bicycle space should be provided via buffered bikes lanes.

A	Travel Lanes	2 travel lanes that are 10 feet wide.
B	On-Street Parking	Parallel or angled parking [8 ft min.] will be provided as conditions allow.
C	Bike Space	A minimum of Level 4 Bike Access must be provided. Refer to Table 6.2
REQUIRED STREETScape		
D	Planting Zone	Tree lawn or tree pits with a minimum width of 5 ft. Refer to Div. 19-4.4 for tree spacing and planting type requirements.
E	Pedestrian Zone	Pedestrians will be accommodated on a sidewalk [8 ft min.] on both sides of the street. <i>*Note: If a Level 6 Bike Access is provided, the combined Shared Use Path and Pedestrian Zone must be a minimum of 12 ft. in width.</i>

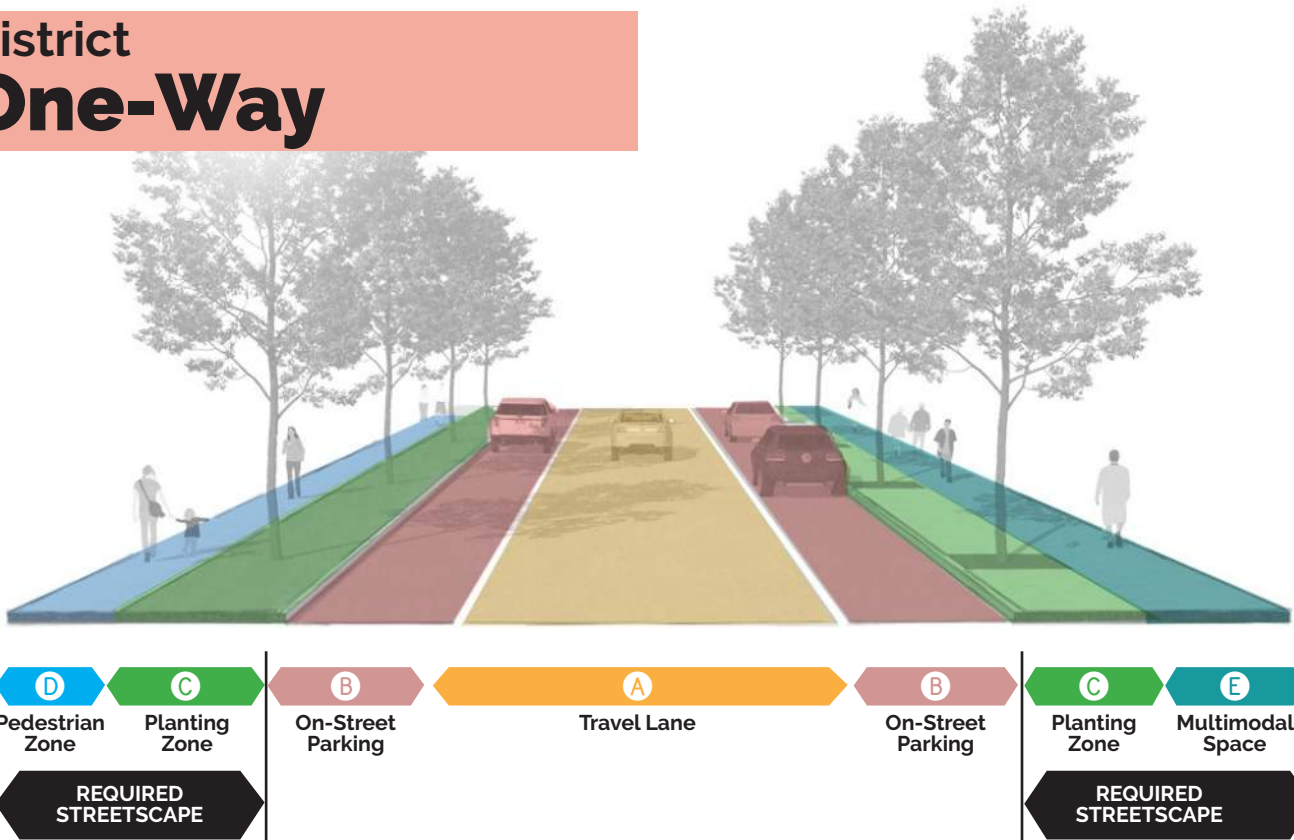
District Main Street



The district main street is a two-way street that serves a commercial or neighborhood-commercial business strip. This street accommodates on-street parallel parking on both sides of the street and includes two-shared use lanes for vehicular and bicycle use. Sidewalks and street trees (within tree wells) are required on both sides of the street.

A	Travel Lanes	2 - 12 ft. travel lanes.
B	On-Street Parking	Parallel - 8 ft [min] Angled - 18ft {min}
REQUIRED STREETScape		
C	Planting Zone	Tree lawn with a minimum width of 5 ft. Refer to Div. 19-4.4 for tree spacing and planting type requirements.
D	Pedestrian Zone	Pedestrians will be accommodated on a sidewalk [10 ft min.] on both sides of the street.
E	Multimodal Space	A minimum of Level 6 Bike Access must be provided. Refer to Table 6.2

District One-Way



The one-way district street serves mixed-use and commercial areas where anticipated travel demand is low and a two-way street is not feasible. This one-way street will accommodate on-street parallel parking on both sides and feature one travel lane for vehicular and bicycle use. Sidewalks and street trees (within tree wells) are required on both sides of the street. If fire access to the adjacent land uses is not provided through alternative means, a 20 ft. one-way lane must be provided and on-street parking may be removed subject to approval by the Administrator.

A	Travel Lanes	1 - 12 ft. travel lane
B	On-Street Parking	Parallel - 8 ft [min]
REQUIRED STREETScape		
C	Planting Zone	Tree lawn with a minimum width of 5 ft. Refer to Div. 19-4.4 for tree spacing and planting type requirements.
D	Pedestrian Zone	Pedestrians will be accommodated on a sidewalk [8 ft min.] on both sides of the street.
E	Multimodal Space	A minimum of Level 6 Bike Access must be provided. Refer to Table 6.2

Neighborhood High-density



The high-density neighborhood street is a two-way street serving residential areas zoned RN or as otherwise determined by the Administrator. These areas are likely to contain townhouses and apartment complexes and may be compatible within a mixed-use context. They will often include on-street parallel parking on both sides and two shared-use lanes for vehicular and bicycle use. Sidewalks and street trees are required on both sides of the street.

A	Travel Lane	2 - 10 ft. min. shared-use lanes. A minimum of Level 1 Bike Access must also be provided. Refer to Table 6.2
B	On-Street Parking	Parallel - 8 ft [min]
REQUIRED STREETScape		
C	Planting Zone	Tree lawn with a minimum width of 5 ft. Refer to Div. 19-4.4 for tree spacing and planting type requirements.
D	Pedestrian Zone	Pedestrians will be accommodated on a sidewalk [8 ft min.] on both sides of the street.

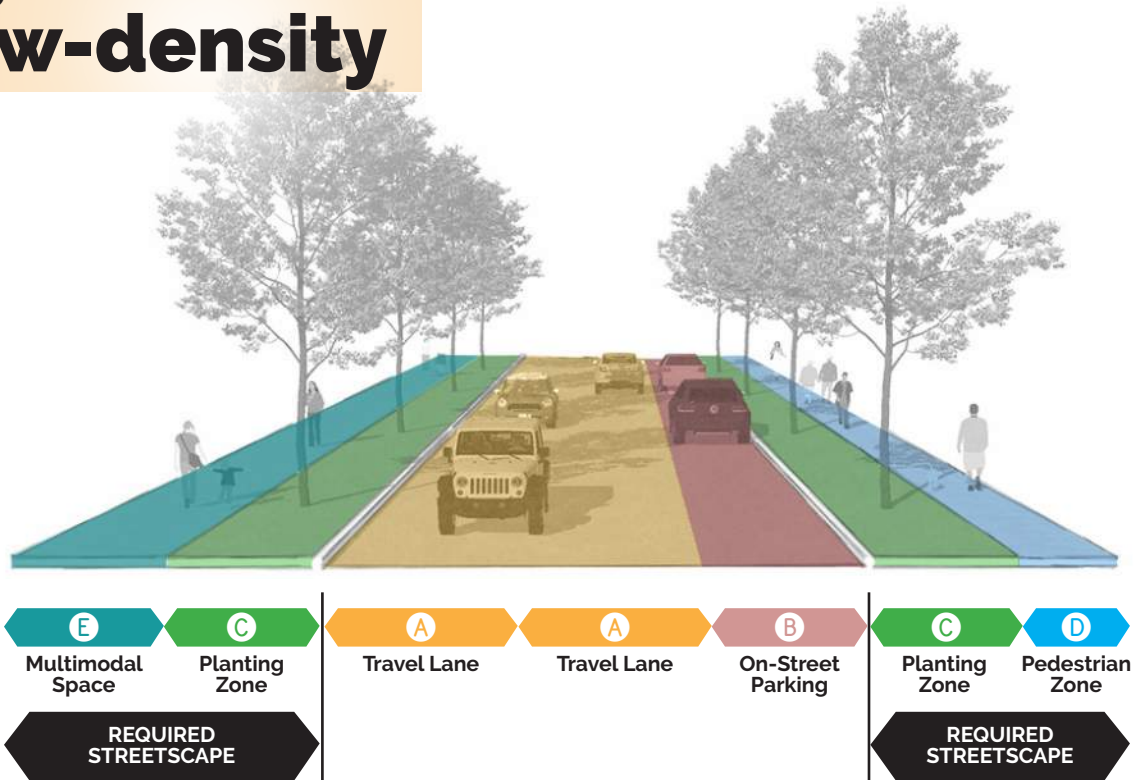
Neighborhood Medium-density



The medium-density neighborhood street is a two-way street serving residential areas zoned RH-C or RH-D or as otherwise determined by the Administrator. They accommodate on-street parallel parking on both sides and feature two shared-use lanes for vehicular and bicycle use. Sidewalks and street trees are required on both sides of the street.

A	Travel Lanes	2 - 10 ft. travel lanes.
B	On-Street Parking	Parallel - 8 ft [min]
REQUIRED STREETScape		
C	Planting Zone	Tree lawn with a minimum width of 5 ft. Refer to Div. 19-4.4 for tree spacing and planting type requirements.
D	Pedestrian Zone	Pedestrians will be accommodated on a sidewalk [5 ft min.] on both sides of the street.

Neighborhood Low-density

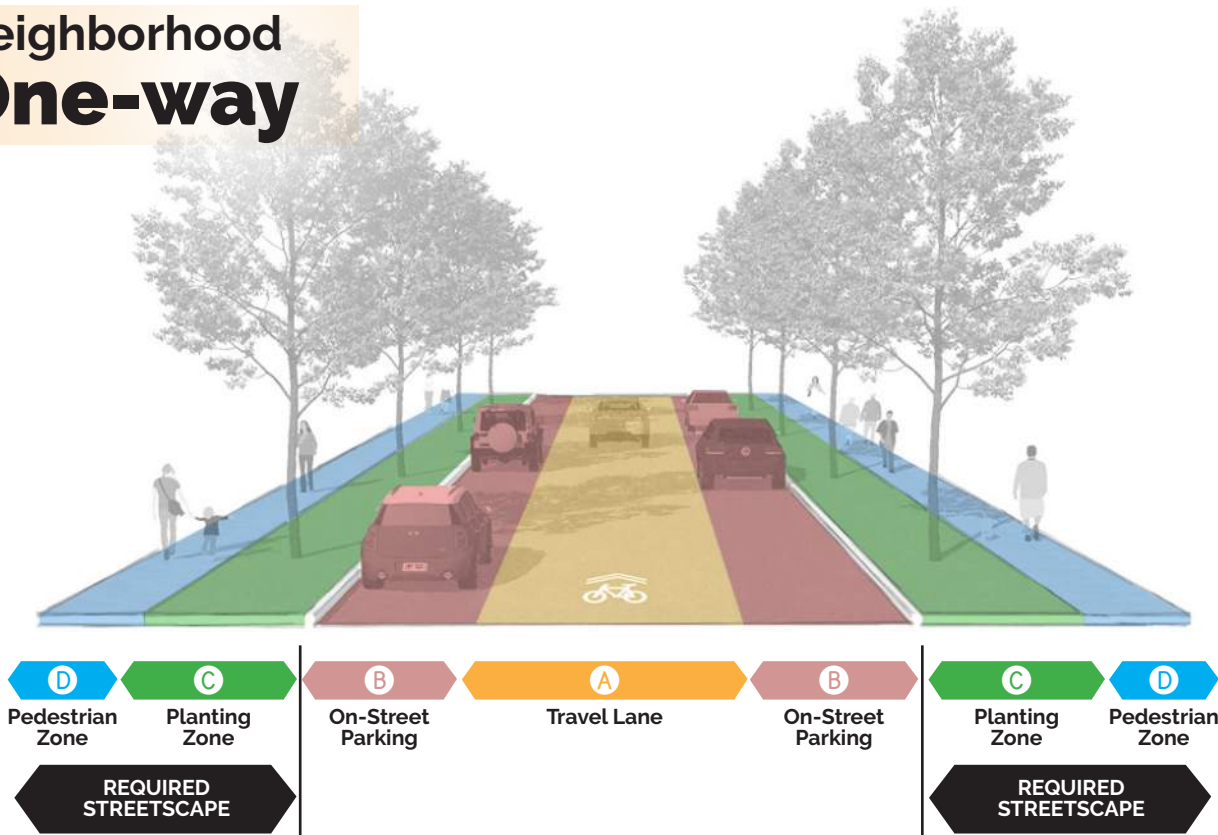


This low-density neighborhood street is a two-way street designed for low speed and volume conditions serving residential areas zoned RH-A and RH-B or as otherwise determined by the Administrator. As a yield street, it requires drivers to travel at low speeds and carefully negotiate park cars and on-coming cars. Sidewalks and tree lawns are required on both sides of the street; however, on-street parking is only required on one side of the street. These streets can also double as bicycle boulevards.

A	Travel Lane	2 - 10 ft. travel ways
B	On-Street Parking	Parallel - 8 ft [min] on one side.
REQUIRED STREETScape		
C	Planting Zone	Tree lawn with a minimum width of 5 ft. Refer to Div. 19-4.4 for tree spacing and planting type requirements.
D	Pedestrian Zone	Pedestrians will be accommodated on a sidewalk [5 ft min.] on both sides of the street.
E	Multimodal Space	A minimum of Level 6 Bike Access must be provided. Refer to Table 6.2

Level 6 changed to
"Level 2"

Neighborhood One-way

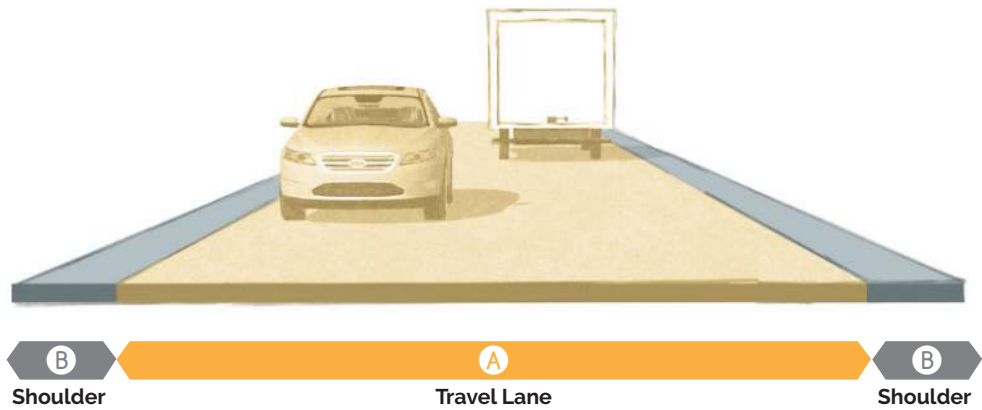


The one-way neighborhood street serves residential areas where densities are low and a two-way street is not feasible. This one-way street will accommodate on-street parallel parking on both sides and feature one travel lane for vehicular and bicycle use. Sidewalks and street trees are required on both sides of the street. If fire access to the adjacent land uses is not provided through alternative means, a 20 ft. one-way lane must be provided and on-street parking may be removed.

A	Travel Lane	1 - 14 to 20 foot travel lane. A minimum of Level 1 Bike Access must also be provided. Refer to Table 6.2
B	On-Street Parking	Parallel - 8 ft [min], optional.
REQUIRED STREETScape		
C	Planting Zone	Tree lawn with a minimum width of 5 ft. Refer to Div. 19-4.4 for tree spacing and planting type requirements.
D	Pedestrian Zone	Pedestrians will be accommodated on a sidewalk [5 ft min.] on both sides of the street.

Alley

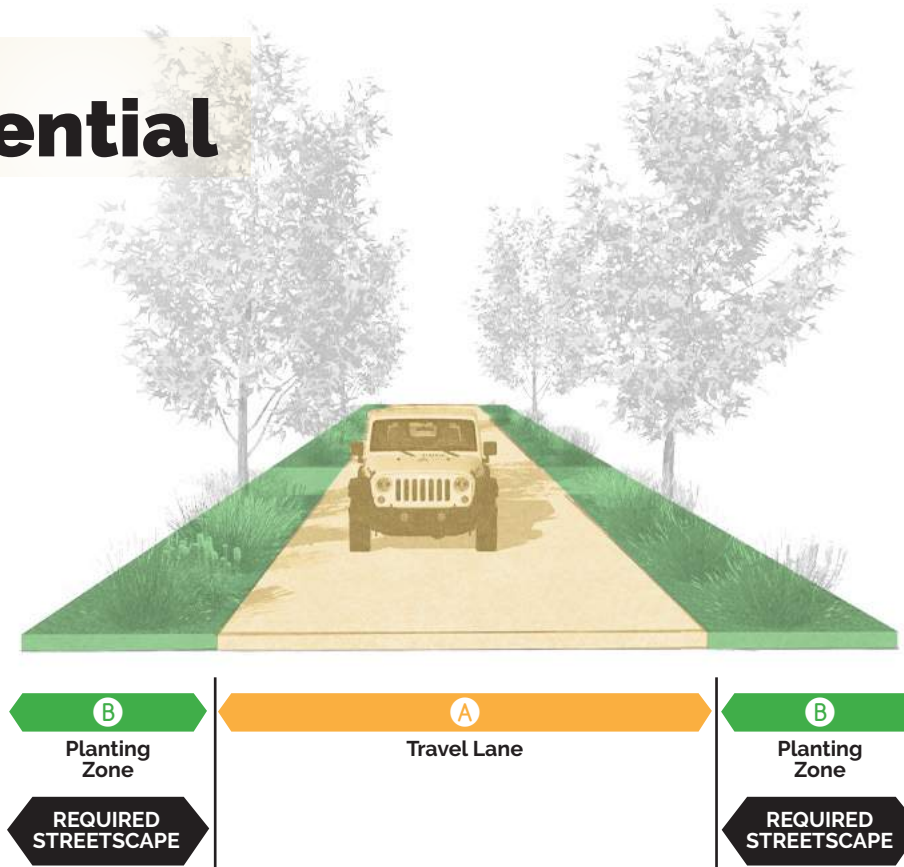
Mixed-use + Commercial



Mixed-use and commercial alleys provide access to service entries and parking areas located to the rear of buildings. They also provide a location for utilities and services such as refuse storage and pickup. Alleys can also function as pedestrian and bicyclist ways.

A	Travel Lane(s)	2 - 10 ft. travel ways. A minimum of Level 1 Bike Access must also be provided. Refer to Table 6.2
REQUIRED STREETScape		
B	Shoulder	2.5 ft. minimum width.

Alley Residential



Residential alleys serve as a secondary means of access, and provide access to housing units and parking areas that are located to the rear of buildings. They also provide a location for utilities and services such as refuse storage and pickup. Alleys can also function as pedestrian and bicyclist ways.

A	Travel Lane(s)	1 - 14 ft. travel way (one way) or 2 - 9 ft. travel ways (two-way). A minimum of Level 1 Bike Access must also be provided. Refer to Table 6.2
REQUIRED STREETSCAPE		
B	Planting Zone	Minimum width of 5.5 ft. (one way) or 4 ft. (two way) Landscaping required and green infrastructure encouraged.

Table 6.1: Street Design Criteria

[illegible]

Table 6.1: Street Design Criteria

Functional Classification	Local						Collector		Arterial	
Street Typology	Alley Residential	Alley Mixed-Use + Commercial	Neighborhood One-Way	Neighborhood Low Density	Neighborhood Med. Density	Neighborhood High Density	District Mixed-Use (two-lane)	District Mixed-Use (three-lane)	City Thoroughfare Avenue	City Thoroughfare Boulevard
Minimum Spacing of Breaks in Centerline Grade	100'	100'	300'	300'	300'	300'	300'	350'	400'	400'
Minimum Face of Curb Radius for Radius Returns	15'	15'	20'	20'	20'	20'	25'	30'	40'	40'
Minimum Sight Triangles at Street Intersection	20'	20'	25'	25'	25'	25'	25'	30'	40'	40'
Minimum Intersecting Angle of Centerlines at Intersections	80°	80°	80°	80°	80°	80°	80°	80°	80°	80°
Minimum Centerline Offset Jogs	--	--	125'	125'	125'	125'	200'	200'	300'	300'
Maximum Leveling Grade at Intersections (along centerline)	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	5.00%	5.00%	5.00%	5.00%
Minimum Leveling Grade Distance from Intersection of Travelway	50'	50'	50'	50'	50'	50'	75'	75'	75'	75'
Minimum Right of Way Radius of Cul-de-sac	--	--	--	50'	50'	50'	--	--	--	--
Minimum Pavement Radius F/C to F/C of Cul-de-sac*	--	--	--	42'	42'	42'	--	--	--	--

*Minimum radius for cul-de-sac is 48' if serving a fire apparatus access.

6.4

6.4 Sidewalk and Trail Standards

A. Introduction

The goal of providing pedestrian facilities is to ensure safe and accessible pathways that meet the needs of all users.

Pedestrian facilities must comply with the Americans with Disabilities Act (ADA) accessibility requirements. Buildings and facilities shall be designed and constructed in accordance with the International Building Codes (IBC) accessibility guidelines. This chapter addresses sidewalks within the public right-of-way, which must be built, at a minimum, in accordance with the Proposed Public Rights-of-Way Accessibility Guidelines (PROWAG). Site plans shall indicate accessible connections to building entrances within the site to serve public transportation stops, accessible parking, and public right-of-way sidewalks.

B. Sidewalk Design Considerations

Sidewalks shall be placed on both sides of all new streets that are not alleys.

The two types of pedestrian facilities are sidewalks and shared-use paths (e.g., multimodal space, etc.). Sidewalks have a minimum width of 5 feet and Multimodal Spaces have a minimum width of 8 feet. It is encouraged that minimum standards are exceeded, where feasible, as active pedestrian connections better serve businesses and neighborhoods.

To accommodate sidewalk, curb-lawn, and other street requirements, it may be required to obtain additional right-of-way or easements.

Finished floor elevations and pathways serving new buildings should be set to accommodate the cross-slope requirements for sidewalk components.

C. Sidewalk Waivers

Construction of sidewalks and other streetscape requirements typically apply to new construction, renovation, or reconstruction of existing structures that exceed 50 percent of the current fair market value of the structure. This shall be based on a market appraisal performed by a certified appraiser at the applicant's expense or shall be determined by the Greenville County Tax Office. This shall not be construed to require demolition of an existing structure in order to comply with these standards. In such cases, the Administrator may grant a waiver of the requirements if presented with a certification by a registered architect or engineer that compliance is not practicable on an existing building. These standards shall not apply to routine maintenance and repair of a structure or other feature on the surrounding site.

Adjustments to the sidewalk requirements may include a waiver from installing a sidewalk and curb lawn or a reduction in the required curb lawn width. The request for a waiver ~~must be accompanied by a fee in lieu of sidewalk implementation, based on market rates on a unit rate basis~~, or construction of sidewalks of equal or greater length at a location specified by the City. Conditions that may grant a sidewalk waiver include, but are not limited to:

- Existing sidewalks are sufficient and not in need of repair or replacement.
- Trees exist in the Pedestrian Zone that are identified for preservation and there are constraints (e.g., right-of-way, environmental, utility constraints, etc.) that prevent expansion of the sidewalk around the trees.
- Topographic conditions exist where the Administrator determines the construction is not feasible.
- Physical conditions exist such as existing structures, existing utility devices, or rock outcroppings that obstruct the installation of the proposed sidewalk.

replaced with "is accompanied by a review of an approved fee in lieu of sidewalk construction"

Added "as applicable"

Table 6.2: Corridor Bicycle Treatments

Description	Level	Min. Width	Max. Width	Min. Buffer	Intersections		Separator From Traffic
					Intersection Treatment	Turning Treatment	
Shared Lane	1	--	--	--	--	As needed	--
Bike Lane	2	4'	5'	--	Green Skips	Bike Box	6" Line
Buffered Bike Lane	3	4'	6'	2'	Green Skips	Bike Box	Two 4" Lines
				1'			Flex Posts
Protected Bike Lane	4	4'	6'	1'	Green Skips	Bike Box	Wheel Stops + Flex Posts
				1'			Poured / Manufactured Curb
				2'			Concrete Median
				4'			Planted Median
				2'			Jersey Barrier (with Administrator approval)
				3'			Parallel Parking
Protected 2-Way Cycle Track	5	8'	12'	2'	Green Skips	2-Stage Turn Box	Wheel Stops + Flex Posts
				2'			Poured / Manufactured Curb
				2'			Concrete Median
				4'			Planted Median
				2'			Jersey Barrier
				3'			Parallel Parking
Shared Use Path	6	8'	20'	--	Green / White High-Visibility Crosswalk	--	Curb
				2'			Curb + Lawn
				4'			Curb + Plant Bed
				--			Stand-alone Corridor (rail bed, etc.)

D. Typical Corridor Treatments

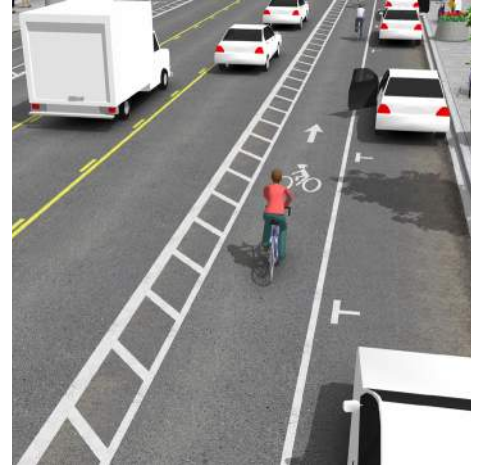
The below images are provided to aid in establishing a base understanding of the bike treatment levels for individuals with little or no prior knowledge. These are meant to be a single example of a treatment type, and are not intended to establish requirements or suggest implementation details for each of the treatment types. Exact treatment type will be situational and should be coordinated with City of Greenville Staff.



Level 1
Shared Lane



Level 2
Bike Lane



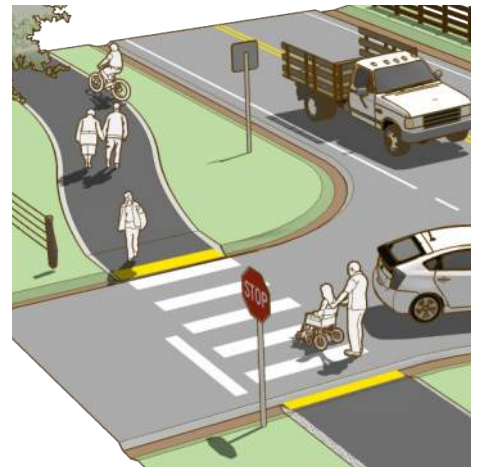
Level 3
Buffered Bike Lane



Level 4
Protected Bike Lane



Level 5
Protected 2-Way Cycle Track



Level 6
Shared Use Path

E. Industry Standards

Within this document, additional applicable standards and guidelines are specifically referenced and are excerpted below:



American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities (2012) provides guidance on dimensions, use, and layout of specific bicycle facilities. <https://njdotlocalaidrc.com/perch/resources/aashto-gbf-4-2012-bicycle.pdf>



The National Association of City Transportation Officials' (NACTO) Urban Bikeway Design Guide (2012) is the newest publication of nationally recognized bikeway design standards, and offers guidance on current design recommendations (a newer version is anticipated soon and, once available, should be referenced). <https://nacto.org/publication/urban-bikeway-design-guide/>

F. Corridor Treatment Design Standards

Description: Overall treatment type name/category

Level: Overall treatment type level of protection generally in order from least protected to most protected. Please see associated references to required bike treatment levels for each corridor within its details.

Min. Width: Minimum width the lane or path must be for each treatment type. On-street lane widths are measured from centerline of the lane edge line to the edge of pavement (gutter widths cannot be included in this width unless pavement material and slope is consistent to face of curb)

Max. Width: Maximum width the lane or path can be. This width maximum is established to encourage utilization of buffer and protection spaces for on-street infrastructure. Corridors with 6' or more of width for a bike facility must provide a buffer space.

Min. Buffer: Minimum width a buffer space must be to establish its associated 'separator from traffic' treatment. Examples: (1) a corridor with 6' of space for bike facilities must implement a 4' bike lane with a 2' buffer instead of a 6' bike lane. (2) a corridor with 8' of space for bike facilities could feasibly establish a 4' bike lane with a 4' planted protection zone or a 5' bike lane with a striped 3' buffer depending on the needs of the corridor. Any buffer space larger than 2' wide must also include diagonal hatching unless unfeasible due to protection treatment.

Intersection Treatment: Required pavement markings through intersection and other designated conflict zones such as driveways. Skips and crosswalks should properly oriented and aligned to allow for intuitive ingress and egress for associated bike infrastructure.

Turning Treatment: Required pavement markings at signalized intersections (required) and other stop-controlled intersections (as needed) to allow safe cyclist turning movements onto adjacent connecting corridors part of the bike network. Typically, these are required at every signalized intersection with Level 2 or above treatments but may be inappropriate at intersections that approach major corridors without established bike facilities, and therefore must be coordinated with City of Greenville Staff.

Separator From Traffic: List of possible treatment solutions that can be implemented within the established buffer space. Treatment selection will depend on corridor specific variables and therefore must be coordinated and approved by appropriate City of Greenville Staff on a case by case basis.

G. Existing Streets

Streets are intended to improve the safety of all transportation users throughout the City and to create a connective network that promotes an active public realm and the use of active transportation by creating safe and convenient facilities for pedestrians and bicyclists. The City of Greenville has established minimum standards for various street typologies that define the vehicular zone, pedestrian zone, and landscape zone of the street as defined in Section 19-4.4 of the Greenville Development Code and the Engineering Design and Specifications Manual. Street improvements are required for all development activities involving new construction, additions, site modifications, and a change of use. Street standards apply to new streets and existing streets in the City.

The majority of streets in the City of Greenville serve already developed areas where there may exist right-of-way limitations, difficult topographical conditions, non-conforming site conditions, and other constraints that involve significant challenges to improving the street to the City's desired minimum standards. Often the width of the right of way varies along existing streets, making the implementation of street improvements even more challenging. Improving existing streets with such constraints often involves balancing priorities for various required design elements.

Identifying the priorities for streetscape design for an existing street may involve exploring conceptual cross-section options that address the priorities for the typical range of widths available and understanding the issues that arise at the transition points from one cross-section to another. Where long-range plans have been established for existing streets and corridors, the street improvement process may be implemented in a phased approach beginning with a functional minimum design in the initial phase where most of the higher priority elements can be accommodated within the existing or new right of way available or where the design elements can be incorporated into the developments on private property. An example of this may be extending the streetscape and multi-use area of the street onto private property via public access easements.

The City has developed the following Street Design Priorities Chart to provide policy guidance for balancing the priorities of competing design elements when improving existing streets. This chart shall be used to aid in the decision-making process to relinquish lower priority elements in some situations and evaluated in conjunction with minimum street widths and streetscape design requirements to guide the appropriate use of design elements in various contexts. Design component trade-offs will be based on right-of-way impacts, existing building setbacks, site constraints (topographic, utility, environmental, etc.), and other engineering issues.

Table 6.3: Street Design Priorities

Street Type	Street Zone				Pedestrian Zone	
	Travel Lanes	Median Space	Parking	Bike Space	Planting/Buffer Space	Sidewalk/Multimodal Space
Thoroughfare						
Boulevard	4	3	6	5	2	1
Avenue	3	4	6	5	2	1
District						
Mixed-Use Three Lane	5	6	4	3	2	1
Mixed-Use Two Lane	5	6	4	3	2	1
Main Street	4	5	3	6	2	1
Neighborhood						
Residential High-Density	3	6	4	5	2	1
Neighborhood Medium-Density	3	6	4	5	2	1
Neighborhood Low-Density	3	6	4	5	2	1

General Notes:

1. The numbers rank various zones between 1 and 6 (1 being the highest priority and 6 being the lowest priority). The priority level is intended to guide decision-making when evaluating required improvements to existing streets.
2. Refer to Section 19-6.4 Corridor Treatments for Bicycles for additional guidance on bike space.
3. The Parking and Median Zones are not essential on all streets. A low-priority ranking implies that they can be eliminated. A high-priority ranking implies that it is desirable to include them even if minimum dimensions are used.
4. "Travel Lanes" minimum widths shall be maintained for each street type. Priority rankings in the table above refer to the priority for travel lane widths to exceed the minimum standard.

Street, Sidewalk and Trail Standards

Appendix A

Chapter 4 -

A6.1

A6.1 General

The minimum roadway construction and paving requirements for all streets and roads in the City of Greenville are presented here. In all cases not covered under these criteria, the SCDOT's most current Standard Specifications for Highway Construction shall apply.

A6.2

A6.2 Equipment

Equipment on all projects in the City of Greenville used for the placement and compaction of embankments, subgrades, graded aggregate bases (GAB), and hot mixed asphalt pavement shall comply as listed in SCDOT's most current Standard Specifications for Highway Construction manual.

A6.3

A6.3 Compaction Requirements for Embankments, Subgrades, and Graded Aggregate Bases

For embankments, subgrades and graded aggregate bases, contractors will be required to provide qualified 3rd party, independent personnel that can provide compaction density testing using the SCDOT's standard specifications. All definitions, equipment, materials, testing frequencies, and procedures will follow SCDOT's specifications unless specifically mentioned below. Testing results are to be provided to a City of Greenville construction inspector or engineer for review and approval prior to the placement of GAB or asphalt. A City of Greenville Construction inspector or engineer shall check all final grades with a string line for tolerance listed in Table A6-2.

Table A6-1: Requirements for Embankments, Subgrades, and GAB

	Embankments	Subgrades	GAB
Maximum Lift Thickness	8"	8"	10"
Required Density (% of maximum)	95%	95%	100%
Minimum Density Testing Frequency	1 per 2000 cubic yards, Minimum of 1 per lift	1 for each 1000 feet, per 2 lane width	1 for each 1000 feet, per 2 lane width, per lift
Minimum Proof Rolling Frequency	N/A	1	1 per lift
String Line Tolerance	N/A	+/- 1/2"	=/- 1/4"

A6.4

A6.4 Proof Rolling

After compaction test results have been reviewed and approved, proof rolling shall be performed in the presence of the City of Greenville's Construction Inspector. Contractors shall grant inspectors no less than 48-hours' notice to schedule a proof roll. In the event that a City inspector is not present for a proof roll, the subgrade and any subsequent work shall not be accepted by the City of Greenville. When proof rolling for subgrade, the entire roadway including 18" beyond the back of curb shall be monitored for acceptance.

A6.5

A6.5 Mix Designs

Prior to any paving work beginning, a SCDOT approved HMA mix design shall be submitted to the City of Greenville's Engineer or construction inspector for review and approval. All asphalt provided/placed on the project shall utilize the approved mix design(s). All load tickets shall identify the approved mix design number.

A6.6

A6.6 Weather and Temperature Restrictions

Do not apply HMA when the existing surface is wet or frozen. Place HMA in accordance with the following table (A6-2).

Table A6-2

Lift Thickness (inches)	Minimum Ambient Temperature °F
1.0 or less	55.0
1.1 to 2.0	45.0
2.1 to 3.0	40.0
3.1 to 4.5	35.0

All HMA mixes shall be between 265 and 325 degrees Fahrenheit when delivered to the job. Paving will not be allowed during the months of December, January, or February without written permission from a City of Greenville Engineer.

A6.7

A6.7 Resident Notifications

The contractor is required to place A-frame signs or pass out door hangers warning all property owners 48-hours prior to the beginning of milling or paving operations. Signs must be placed at each intersection and at each end of the road being paved.

A6.8**A6.8
Milling**

Roads that are milled in the City of Greenville are required to be paved within 5 business days of the surface being milled.

When paving operation will be tying into an existing roadway, butt joints will be required for each connection at an adequate width for that section as directed by a City of Greenville construction inspector or engineer.

A6.9**A6.9
Tack Coat Applications**

Before laying any HMA on existing pavements, uniformly apply a tack coat by use of distributor spray bars according to 401.4.18 of the SCDOT's most current Standard Specifications for Highway Construction. Tack coat applications shall be inspected by City of Greenville's construction inspector to ensure uniform and complete coverage on a clean surface prior to HMA being laid. In cases where asphalt trucks have tracked and removed tack from the roadway in front of the paver, reapplication will be required. This cost is incidental to the paving work. Tack coat should be placed at the rate of 0.05 to 0.15 gallons per square yard as measured by SC-T-86. When placing an overlay on top of an older street section or a milled surface, this rate should be between 0.10 to 0.15 gallons per square yard.

A6.10**A6.10
Construction in the Central Business District**

The Contractor shall protect all concrete cross-walks and pavers from any structural damage and aesthetic marking/discoloration caused from the construction operations (milling, tack application, tracking, paving, etc.), equipment, and delivery trucks. Any damage to the cross-walks or pavers shall be rectified by the Contractor to the City's approval at no additional cost to the City.

A6.11**A6.11
Lift Thickness**

Do not allow the compacted thickness of any single constructed course to exceed the following thicknesses:

- 4½ inches for HMA Aggregate Base Course,
- 3 inches for HMA Intermediate Course, or
- 2 inches for HMA Surface Course.

A City of Greenville construction inspector or Engineer shall monitor pavement thickness throughout paving to ensure compliance with the project plans and/or specifications. In no cases should the finished surface be more than ¼" above the gutter line in sections where curb and gutter exists.

A6.12

A6.12

Required Roadway QC Verifications by Contractor

Maintain an approved density gauge, on site, during all HMA placing and compaction operations and use the gauge to assist in the quality control of the compaction process for all paving projects in the City of Greenville. Require the proper number and type of rollers needed to obtain density as determined by SCDOT test method SC-T-65. Ensure that rollers meet the requirements in Section 401.3 of the SCDOT's most current Standard Specifications.

Maintain roller pattern documentation on site and perform new roller patterns when there is a change in underlying support, type of asphalt, thickness in mat or other elements (such as different rollers) that might affect the final density. Monitor the roller patterns, mixture placement, tack rate, slope of road, and mixture compaction during production on all projects except for driveways and full-depth patching. Verify and document the ambient air temperature and the HMA mix temperature at the roadway, at a frequency not less than that indicated in Table A6-3. Ensure that a City of Greenville construction inspector or engineer is on site to verify temperatures lay down thickness, slope of road, and tack coverage.

Table A6-3: Required Road QC Tests and Verifications

Parameter	Minimum Frequency	Test Method	Responsible Party
Density Monitoring	Continuous	SC-T-65	Contractor
Ambient Air Temperature	Before Paving Starts	SC-T- 84	City
Mixture Temperature	3 per day	SC-T-84	City
Laydown Thickness	Continuous	SC-T-85 or other	City
Tack Coverage	Continuous	N/A	City

A6.13

A6.13

Acceptance ~~and Payment~~

All pavement lifts 2" or greater in the City of Greenville shall be monitored for acceptance using SCT-65 when the street section is at least 1000 feet in length, one paving width wide. The contractor is responsible for recording target density and percent compaction readings and providing the Field Report for HMA paving form in Appendix D to City personnel. A City inspector or engineer is responsible for identifying locations for Average Random Readings, providing these locations to the contractor, and verifying that the information provided by the contractor is accurate. Average Random Readings will be taken at a rate as shown in Table A6-4 below.

Table A6-4: Average Random Reading Frequency

Length of Roadway (ft)	Average Random Reading Frequency
0-1000	N/A
1001-1500	4
1501-2000	6
2001-2500	8
>2501	10

The City of Greenville will require removal and replacement of asphalt for all streets where the average roadway density sampled does not meet 97% of the target density.

After paving has ended, the contractor shall submit the final plant report for all paving work to the City of Greenville's Engineer or construction inspector for review and acceptance.

The City reserves the right to conduct QA testing on any project to ensure quality prior to acceptance and payment.



A6.14

A6.14

HMA Payment

The City shall pay Contractor as follows:

- Liquid binder shall be paid as part of the total tonnage of asphalt and is incidental to paving operation.
- Fuel Adjustments for liquid binder will not be assessed.
- HMA Asphalt (Base, Int, & Surf): Will be paid by the Ton
- QC by Contractor: Will be Paid Lump Sum

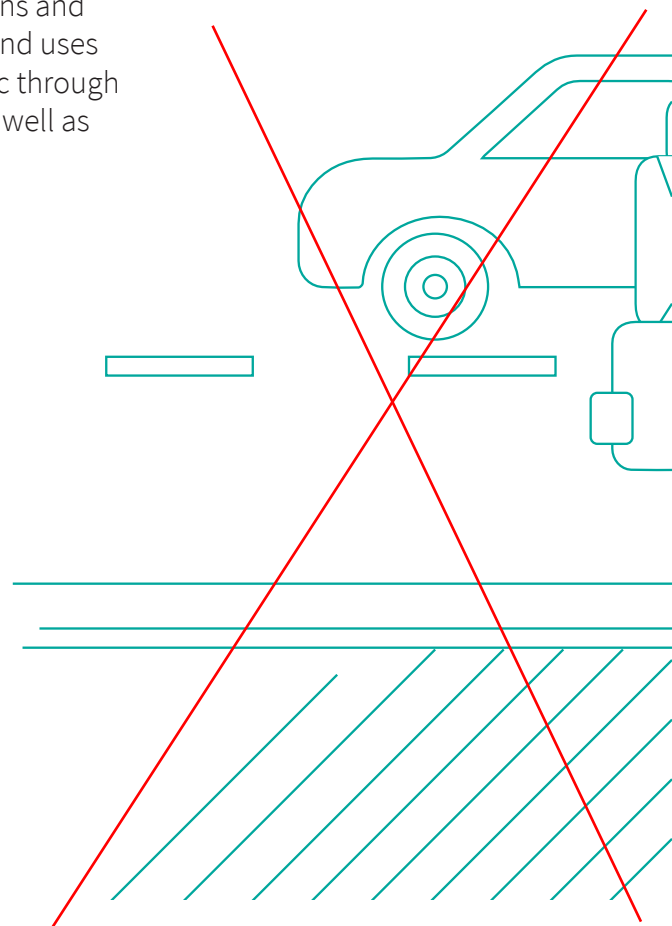
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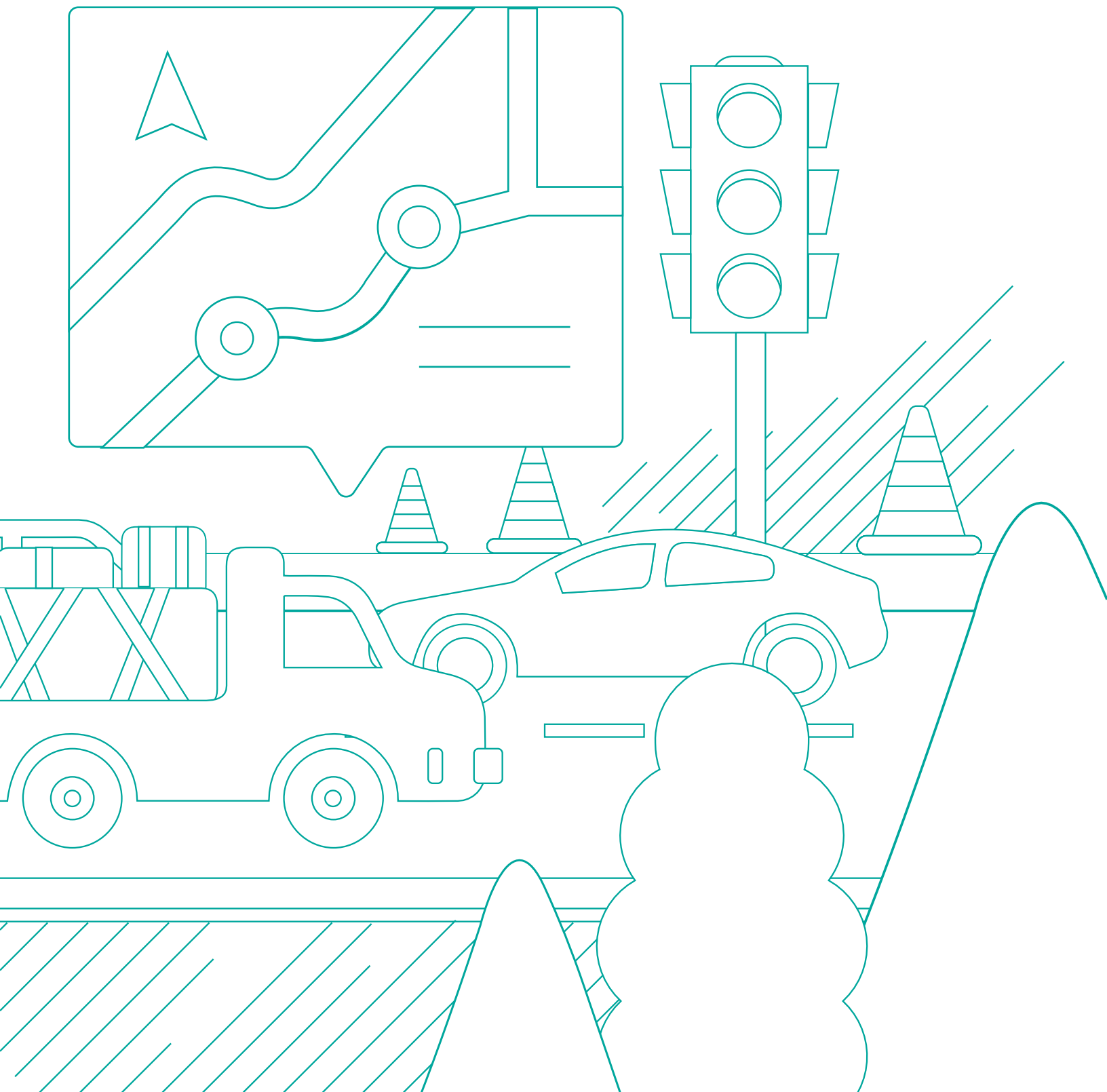
~~Chapter 7~~ Chapter 5

Let all references to Chapter 7 be changed to Chapter 5 and all page numbers updated accordingly

Traffic Management

A traffic impact analysis provides an assessment of existing and future conditions and is necessary to identify, review, and make recommendations for mitigation of the potential impacts a development may have on the roadway system. Physical and operational characteristics of the roadway are typically identified allowing the City Engineer, the public, and often, the Planning Commission and/or City Council to make informed decisions and recommend the means for proposed developments and land uses to minimize their external transportation costs to the public through traffic improvements necessitated by that development as well as making the fullest use of alternative travel modes.







Chapter 7

Traffic Management

7.1

7.1

Traffic Impact Analysis

A traffic impact analysis (TIA) assesses the effects of the projected traffic generation from a proposed development on the surrounding transportation network. These studies range in detail and complexity depending upon the type, size and location of the development. These studies are used to evaluate whether a development is appropriate for a site given its projected impact and the type of transportation improvements required to accommodate the development.

Traffic impact studies help communities to:

- Forecast additional traffic associated with new development, based on accepted practices
- Determine improvements that are necessary to accommodate the new development
- Allocate resources to areas which need improvements
- Reduce the negative impacts of development by helping to ensure that the transportation network can accommodate the development
- Assist decision makers in assessing any zoning change, which is requested in anticipation of the development

A developer must complete a "Traffic Impact Analysis Warrant Determination Form", which may be found online at <https://cityofgreenvillesc.formstack.com/forms/tia-use-and-intensity> for any project that is being proposed. Failure to submit this form prior to a preliminary subdivision plat or site grading permit application (whichever comes first) will result in an automatic denial of the application. A traffic impact analysis shall be submitted by a developer in support of an application if the administrator determines that an analysis is required per the volume thresholds shown in Table 7-1. If a proposed development fronts more than one street type, the lower threshold shall govern. The administrator's determination shall be based upon reasonable expectations of time-of-day usage of similar developments. When developments are projected to have an intensity of usage which varies from day-to-day, week-to-week, or month-to-month, the administrator shall base peak hour on maximum utilization of the site. The analysis shall be prepared by a registered engineer licensed in South Carolina. It shall use trip generation data reflected in the current edition of Trip Generation published by the Institute of Transportation Engineers; the administrator may approve/require the use of alternative data resulting from analyses deemed to be more consistent with the subject development.

Link changed to
<https://greenville-traffic-engineering-traffic-engineering.app.transform.civicplus.com/forms/tia-warrant-determination-form>

7.2

Table 7-1-1: Volume Thresholds by Road Type	
Type	Threshold (new peak hour trips)
Arterial	100
Collector	75
Local Residential	50
Local Low-Volume	25

7.2 Definitions

Average daily traffic (ADT) is the total volume passing a point or segment of a road facility, in both directions, during a 24-hour period. It is commonly obtained during a given period, in whole days greater than one day and less than one year, divided by the number of days in that period.

Level-of-service (LOS) uses qualitative measures that characterize operational conditions within a traffic stream and their perception by motorists and passengers. The descriptions of individual levels of service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

Six levels of service, from A to F, are defined by the Highway Capacity Manual 2000 for signalized intersections based upon available procedures, shown in Table 7-2-1 with LOS A representing the best operating conditions and LOS F the worst. Each level of service represents a range of operating conditions:

Table 7-2-1: Level of Service for Signalized Intersections	
Level of Service	Seconds Control Delay per Vehicle
A	<10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

Modal split refers to the distribution of all person trips generated by the proposed development among the various transportation modes available, i.e. automobile (single occupancy), shared ride, transit, motorcycle, bicycle, or walking.

7.3

**7.3
Traffic Study Criteria**

A traffic impact study shall be completed by the developer when the criteria defined in Section 7.1. are met.

Trip generation shall be based on data provided in the latest edition of the Trip Generation Manual, published by Institute of Transportation Engineers (ITE). The city traffic engineer may consider trip generation data provided by the applicant when it is prepared by a licensed PE. Redevelopment projects that are considered a change in use may receive a credit for trips generated by the previous use, provided the existing building has not been vacant for more than two (2) years. The engineer reserves the right to refuse granting credit for previous trip generation.

Notwithstanding the trip generation threshold, for the purposes of the Downtown Design Overlay District, as defined by the Downtown Design Overlay District map, a traffic impact study shall be required only when the number of either new entering or new exiting trips (generated by the development) exceeds 150 for any one hour based on the directional distributional model provided in latest edition of the Trip Generation Manual. The higher threshold is established in recognition that, under the city's future land use plan, this district is intended to have greater land use density with a significant amount of traffic, and the city regularly considers and evaluates traffic patterns in promoting economic development for the area.

The study, when warranted, is required to be submitted for review when a site plan application is submitted. If a traffic impact analysis is warranted but has not been submitted to the city traffic engineer's office, the site plan application will automatically be denied until a TIA has been submitted and approved. Additionally, any mitigation required by the TIA must be incorporated into the site plan application prior to submittal..

The city traffic engineer or designee shall determine the scope of the impact study, including the intersections to be analyzed, background growth rate, peak hours, and approved developments. Such determination shall be based upon reasonable expectations of time-of-day usage of like developments in this and other jurisdictions. When developments are expected to have an intensity of usage that varies from day-to-day, week-to-week, or month-to-month, the determination of peak hour shall relate to days, weeks, or months of maximum utilization.

7.4

7.4 Traffic Impact Study Outline

The traffic impact analysis shall be completed by the developer as described in Section 7.1.

- I. INTRODUCTION
 1. Purpose of Report and objectives
- II. EXECUTIVE SUMMARY
 1. Clear & concise summary including:
 - a) Description of the development
 - b) Detailed site location map
 - c) Principal Findings
 - d) Conclusions
 - e) Recommendations
- III. AREA CONDITIONS
 1. Information on the Existing site and surrounding conditions
 2. Information detailing existing daily traffic volumes and peak hour turning movement counts for study intersections. (Count data sheets shall be included in appendix and all raw data shall be submitted to the city on a spreadsheet template that will be provided).
 3. Information on any existing or proposed transit routes for the study area.
 4. Information on any existing or proposed pedestrian and/or bicycle facilities in the study area, and any other modes of transportation, if applicable.
 5. Information regarding proposed roadway improvements if any, in the study area. To be included in the traffic analysis, the proposed improvements must be scheduled for completion prior to occupancy of the new development.
- IV. PROPOSED DEVELOPMENT
 1. On-site development:
 - a) Detailed site plan
 - b) Timing and duration of project
 - c) Map of the study area
 2. Off-site development
 - a) Any pending off site development identified by the city traffic engineer or designee that lies within study area shall be identified on the study area map and shall be included in the traffic analysis
- V. TRAFFIC ANALYSIS

(Two or three peak hours, identified by the city traffic engineer will be examined)

 1. Trip generation - Provide a table showing ITE Trip Generation Codes for each proposed use, the independent variable used for development (i.e. number of employees, square footage, etc.), and the number of trips generated.
 2. Trip distribution - Provide a diagram showing distribution of all entering and exiting trips.

3. Modal split (if applicable).
4. Trip assignment - Provide a diagram showing all assigned trips from the development.
5. Total traffic - Provide diagrams showing existing traffic, background traffic, development traffic, and background plus development traffic. The city traffic engineer or designee shall provide an annual growth rate for background traffic up to the build-out year. Any pending off-site development traffic shall be included in the background traffic.
6. Capacity analysis - Provide a table detailing delay, v/c ratio, and level of service for all intersections in the study area (determined by the city traffic engineer) for existing conditions, for build-out year without development, and for build-out year with development. The level of service determinations must be done based on the city's most recently adopted Volume of the Highway Capacity Manual (HCM) of the Transportation Research Board National Research Council. The City Traffic Engineer may require a queuing analysis.

VI. RECOMMENDED IMPROVEMENTS

1. Discuss any recommended improvements (timing changes, lane additions, restriping, left turn phase, etc.) that will improve traffic flow for the additional traffic created by the development, and provide capacity analyses to document that improvement.

7.5

7.5 Infrastructure Improvements

Improvements by the developer to the existing transportation infrastructure will be required as a condition of permit issuance if the projected delay in the build scenario for any approach of an intersection is more than 10% over delay for the projected no-build scenario of that same approach. Additionally, improvements will be required if the v/c ratio in the build scenario increases above 0.90. If the projected background v/c ratio is greater than 0.90 and the build scenario increases it further, the developer shall be required to implement improvements to mitigate the increase in v/c ratio to 0.90.

7.6

7.6 Appeals

Whenever staff action is authorized by the provisions of this ordinance to approve or disapprove a study, the decision may be appealed to the city planning commission by any party of interest. The planning commission shall act upon the appeal within 60 days and the action of the planning commission is final. An appeal of the decision of the planning commission may be taken to circuit court within 30 days after notice of the decision. Whenever notice is attempted by reasonable means but not achieved, notice by publication in a newspaper of general circulation in the city shall thereupon constitute notice under this section.

7.7

7.7 Traffic Calming Measures

Traffic calming is the practice of combining physical measures to reduce the negative impacts of motor vehicle use (by altering driver behavior) and improve the environment for non-motorized street users.

The installation of traffic calming shall be coordinated with the City's Traffic Engineering Division. The location of traffic calming measures shall not interfere with any driveways, manholes, underground utility lines, or severely impact the storm water drainage of a street. The City has a formal process for addressing traffic concerns on local streets. More information on the traffic calming program can be found here: <https://www.greenvillesc.gov/498/Traffic-Calming>

If traffic calming is desired for proposed streets, the developers shall work with the Traffic Engineering Division to develop a traffic calming plan.

New development proposals that will disturb existing traffic calming devices are prohibited.

7.7.1 Landscaped Median

A landscaped median is a raised landscaped island located along the centerline of a street that narrows the adjacent travel lanes. Placed at the entrance of a neighborhood, the median can serve as both a neighborhood gateway and as a traffic calming measure.

Landscaped medians shall have standard curb on all sides. The width of the median shall allow for a minimum of 3' of landscape materials. Islands are typically 6' wide, but may range from 4' to 9' wide, depending on the width of the roadway. To accommodate a landscaped median, the minimum roadway width shall be 24'. The length of a landscaped median generally varies between 25' to 60', depending on the geometry of the roadway. Standard 'Keep Right' signs shall be posted at each end of the median.

The advantage of a landscaped median is an improved aesthetic value while providing a visual barrier into a neighborhood. Landscaped medians provide a psychological narrowing of the roadway. Along wider roadways, drivers feel more comfortable at higher speeds because they believe they have time to see and react to any obstruction in the street. When the width of pavement is reduced, driver comfort level is also reduced, thus resulting in slower speeds and more careful driving behavior.

Two disadvantages of a landscaped median are the somewhat limited speed-reduction effect due to the absence of any vertical or horizontal deflection and the possible elimination of some on-street parking.

7.7.2 Speed Humps

Speed humps are rounded raised areas of asphalt or rubber placed across the roadway. They are generally 14' long (in the direction of travel), and are about 4" high. The profile of a speed hump is parabolic with a tapered edge toward the curb to allow unimpeded drainage. Humps should be located no closer than 8' from a driveway. Signs shall be posted at the corners of the speed bump, if practicle, but no more than 50' before

a hump, to advise drivers of the presence of the hump(s) and the advisory speed for traversing the hump(s). One sign may be used to indicate multiple humps in some cases. Speed humps shall conform to the specifications outlined in the Standard Drawings and Details.

The main advantage of a speed hump is that it provides the most aggressive form of traffic calming and is beneficial in locations where low speeds are desired. A hump is relatively inexpensive to install and it slows down all vehicles that travel over it. A speed hump is most effective when installed on a long, straight stretch of roadway. This placement provides ample visibility to the motorist and effectively targets the most probable place of high speed.

The disadvantages of a speed hump include the rougher ride it creates for all drivers, a possible increase in noise, and less than desirable aesthetics. A speed hump may also delay emergency response as much as eight seconds per hump, as emergency vehicles will have to slow for the humps. A speed hump is also limited in its placement along steep roadways; due to its shape, a speed hump can be a safety concern when located on grades greater than 8%.

7.7.3 Other Measures

Table 7-3 below lists other available traffic calming devices. The Traffic Engineering Division must approve installation of these devices.

Table 7-3 Traffic Calming Device Categories		
Neighborhood Vote	Engineering Approval	Council Approval
Diverters (semi/diagonal/forced)	Circles with or without outer rings	Textured Pavements
Curb Extensions	Alternate Parking	Chicanes ("s" shapes)
Speed Humps (parabolic, full or split)	General Use Signs	Lane Reductions
Speed Cushions	"Psycho-perceptive" Controls/Tricks	
Lateral Shifts		
Narrowing/Neckdowns		
Adjacent Landscaping or Streetscaping		
Temporary Measures		
Traffic Islands		

In addition to the physical infrastructure measures listed above, certain traffic management problems may lend themselves to solutions that involve obtaining permission or accommodation from other units or levels of government (such as state and federal agencies) or negotiation with private interests (such as owners of adjacent property). These activities may be carried out, as appropriate, by senior management staff or elected officials of the City government.

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Let all references to Chapter 8 be updated to Chapter 6 accordingly and update all page numbers as needed

~~Chapter 8~~ Chapter 6

Landscape and Street Tree Standards

The City of Greenville takes pride in its efforts to preserve and/or enhance the natural landscape. Whether it's the creation of a boulevard as you enter the City from I-385 or the reclamation of the Reedy River and the creation of pathways and parks within the public spaces, the integration of the natural environment into the many neighborhoods and along the transportation corridors is a fundamental component of the City's comprehensive plan, GVL2040. Street trees, such as those that define Main Street, are essential to the City's future and represent a strong commitment to sustainability, green infrastructure, and community health.





Chapter 8

Landscape and Street Tree Standards

8.1

8.1 General

The landscape guidelines included in this chapter are primarily intended for use by property owners, developers, and applicants seeking approvals of plans such as grading plans, development site plans, building permits, etc. within the City of Greenville.

This chapter provides information regarding the expectations and procedures associated with the landscape and site planning approval processes pursuant to Divi. 19-4.10 and Div. 19-5.2 of the City's Development Code.

Information included in this chapter is not intended to replace, but rather to supplement, applicable codes, ordinances, and development procedures. In any given development application, the City may require additional information, improvements, and plantings beyond the standards set forth herein.

8.2

8.2 Landscape Plan Submission Requirements

The landscape plan shall be prepared by a landscape architect, a professional landscape designer, or a plant nursery. All landscape plan submissions shall include, but not be limited to, documentation of the following:

- 1 Existing Conditions Plan:
 - i. Limits of project site, property line(s), and context including neighboring sites, vegetation, and buffers. A tree inventory per Sec. 19-5.2.2.A must be provided,
 - ii. Location(s) of above and below grade site utilities and service connections including easements and access requirements.
 - iii. Location(s) and direction(s) of service openings on above grade utilities; specifically indicate perimeter clearance/ safety zones.
 - iv. Slope areas in excess of four-to-one (4:1) or twenty-five (25) percent.
- 2 Proposed Landscape Plan:
 - i. Limit of project site and property line(s).
 - ii. All land disturbing activities and limits of disturbance (LOD), including utility work.
 - iii. Phasing, future development, temporary uses and timing of construction if applicable.
 - iv. Location, size, and species (botanic and common names) of proposed vegetation.
 - v. Trees to be preserved must be shown on the landscape plan and labeled as "existing to be protected in place."

- vi. All landscape plans must identify methods for protecting existing vegetation that will remain. Construction materials and debris may not be stockpiled within the drip line perimeter of all trees being retained. This protection area must be clearly marked with tree protection fencing per Sec. 19-5.2.2.F.
 - vii. Grass areas and limits, including identification of sod and/or seed areas.
 - viii. Drainage ways, yard inlets, area drains and overflow areas.
 - ix. Locations(s) of stormwater BMPs.
 - x. Location(s) of proposed above and below grade site utilities, including trash and mechanical units, and service connections including easements and access requirements.
 - xi. Location(s) and direction(s) of proposed service openings on above grade utilities; specifically indicate perimeter clearance/ safety zones.
 - xii. Specification and location for landscape accessories such as temporary or movable planters, street and site lighting, site furnishings, paving, pervious emergency vehicle access, etc.
 - xiii. Landscape irrigation/water management system.
 - xiv. Existing, required and proposed open space, and/or applicable contributions in square feet and/or acres.
 - xv. Vision clearance areas/zones for vehicles, pedestrians and traffic control devices.
 - xvi. All necessary dimensions, distances, quantities and clearances required by the Development Code.
- 3 A plant legend/index or schedule that indicates the plan species with botanic and common names, height/size at the time of planting, and total quantity of all proposed plantings at time of installation.
 - 4 Planting details including dimensioned design sections and specifications for all proposed work, including location, details and specifications for all ground level work, tree wells, landscape strips and plantings above structure.

8.3

8.3

General Landscape Design Guidelines

- Plants should be grouped in strategic areas and not spread thinly around the site.
- Trees must be planted to allow for maximum growth in height and shape without the need for pruning in excess of that required to maintain the health of the plant.
- All landscaped areas shall incorporate a ground cover to tie the landscaping together and to discourage weed growth.
- A mix of deciduous and evergreen plant materials is desired. Invasive species should not be considered - refer to Sec. 19-4.10.C.2.
- New vegetation shall be selected, planted, and maintained so that at maturity it will not interfere with utility lines, vehicular parking, pedestrian circulation, traffic sight visibility at driveways and street intersections, and will not cause damage and upheaval of sidewalks and pavement.

- Landscape materials within established sight triangles shall have a clear trunk height of six (6) feet from grade level; mature shrubs, groundcover, or other materials shall not exceed three (3) feet in height from grade level.
- Trees shall be located away from underground utilities to avoid conflict with mature tree roots. A root barrier or other method is an acceptable means to avoid conflict.
- Refer to Sec. 19-4.10.C.3 for plant selection requirements.
- Street Trees:
 - o Species shall be selected to avoid or minimize potential conflicts with infrastructure and utilities.
 - o Trees under power lines shall have a maximum mature height (at 25 years of age) not greater than 25 feet. Street trees shall, when possible, be planted within the right-of-way adjacent to the curb and between the pedestrian lane/sidewalk and curb. When this is not possible or a different location would better achieve the intent, street trees may be located elsewhere within the right-of-way, including behind the sidewalk, in street medians, parking strips or bulbouts. If neither of these preferred locations is possible, such as when existing infrastructure prevents trees from being planted within the right-of-way, trees located within 10 feet of the right-of-way may be counted as street trees.
 - o New tree plantings shall be a minimum of 2 feet from pavement (curb, sidewalk, alley, street), 5 feet from a structure, 5 feet from underground utilities, and 10 feet from light fixtures. Distances may be reduced, with staff approval, upon a demonstration that the species selected will not cause infrastructure conflicts.
 - o Manufacturers of proprietary tree stormwater BMP's such as Silva Cells tree soil systems or comparable systems, are required for street trees proposed in urban districts where adequate soil volume is not available in open planters and the trees will be located in grates.



Source: Deeproot.com, Town of Oakville, Lakeview Drive (<https://www.deeproot.com/case-studies/silva-cell/lakeshore-road/>)

8.4

8.4

Street Tree and Shrub Planting Details

The following standards (Contractor Specs and BMPs), reprinted and modified with permission by the City of Knoxville, Tennessee's Public Service Director, apply to street trees and landscaping within the City of Greenville's rights-of-way.

8.4.1 Tree/Shrub Planting Specifications

- 1 **Planting Hole:** Planting hole shall be excavated with sloped side 2 - 3 times the diameter of the container or rootball. Mechanical diggers such as augers may be used but sloped sides of the planting hole must be excavated and scarified with

a hand tool to remove glazed surfaces. Before placing the rootball in the hole the contractor shall determine if the depth of the hole is the same as, or slightly less than the distance between the topmost structural root and the bottom of the rootball. In no case shall the topmost structural root be lower than the adjacent grade. Installations with root balls planted too deep will be rejected. All trees/shrubs shall be set upright and oriented to give the best relationship to adjacent traffic, structures, and trees. The top of the rootball does not denote the topmost structural root, in some instances the top of the rootball shall be removed to expose the root flare or topmost structural root.

- 2 **Backfill:** After putting $\frac{1}{4}$ of the backfill soil in the hole, all burlap, twine, rope, and wire baskets shall be cut off and removed at least 8 to 10 inches below the topmost structural root. If roots are circling or girdling, they shall be cut and removed. The hole shall be backfilled with the same soil removed from the hole. Soil shall be tamped slightly to pack rootball firmly within the planting hole. When the hole is $\frac{2}{3}$ full, water should be applied to eliminate air pockets, and tamping of the soil shall not occur once the soil has been watered. The remaining portion of the rootball shall be filled with remaining excavated soil. No soil shall be placed above the topmost structural root. If excess soil is not necessary for the backfill of the rootball as determined by the Administrator, it shall be removed from the site by the contractor. Excess soil shall not be used to create a planting berm.
- 3 **Staking:** Trees/shrubs should not be staked unless necessary. If staking materials are installed, they should be removed by contractor within one year of installation and/or before trunk girdling can occur. If staking materials are used, they must be approved by the Administrator.
- 4 **Mulch:** Mulch shall be temperature stabilized hardwood and shall not exceed 4" in length and $\frac{1}{2}$ " in width. No recycled woodwaste, fine composted, or dyed mulches shall be used. Mulch shall be installed and maintained according to the American National Standards Institute (ANSI) A300 Standards for tree care operation, and shall be installed on top of the root system and planting hole and extend to the dripline of the canopy. Mulch shall be 2 to 4" in depth, uniform in appearance and shall not touch the tree/shrub trunk. Under no circumstance shall mulch cover the root flare or root crown. Mulch shall be supplied by the contractor. Alternate forms of mulching may be considered by the Administrator as needed.
- 5 **Containerized Trees and Shrubs:** Containerized trees and shrubs shall be removed from the container before installation. All four sides and the bottom of the root ball shall be cut with a hand saw or electric saw in order to cut circling roots. Cuts should be made approximately 1 to 2 inches from the sides of the root ball.
- 6 **Watering:** All trees and shrubs should be watered by the contractor immediately after they are installed unless a rain event is projected to occur within 24 hours after the tree/shrub is installed.
- 7 **Final Acceptance:** The Administrator or their representative may be present when trees/shrubs are installed. The City shall perform a final inspection of completed

work. The City will inspect the tree/shrub species, condition, and installation to determine and note any discrepancies with this specification. The Installer will be notified of any discrepancies and must repair, replace, or fix any discrepancies before the work is accepted. Discrepancies that are amended will be reinspected during the following inspection. Work may be accepted in parts, if the City determines that the work completed to be in the best interest of the installer and the City.

- 8 Time Frame:** Planting should be from September 1 through May 1 of each year. If planted outside of these time periods, a watering regime shall be in place at the contractor's expense.
- 9 Maintenance:** The owner of the property where landscaping is required shall be responsible for the maintenance and protection of all plant and screening material for the entirety of the premises.
 - a All landscape material, maintenance, and management shall conform to the minimum standards of the American National Standards Institute (ANSI) A300 Standards for Tree Care Operations.
 - b Landscaped areas shall be maintained in good condition and kept free of dead plants, weeds, or debris. Failure to maintain or replace dead, damaged or diseased plant material or to repair a broken wall or fence within 30 days of notification shall constitute a violation of this section. If a catastrophic event occurs which destroys a large quantity of vegetation, the owner or lessee shall replant within a reasonable time period determined by the administrator, normally during the next planting season, which is November through March. Replaced plant material must be in compliance with the minimum size, spacing, and quantity standards of this section.
 - c Trees may only be pruned according to the standards of ANSI A300 Standards for Tree Care Operations. If aggressive trimming occurs, the property will be considered nonconforming and required to replace the trees with trees meeting the minimum size, spacing, and quantity standards of this section.

8.4.2 Tree/Shrub Selection Specifications

- 1. Inspection:** The Administrator may choose to inspect nursery planting depth, tree/shrub health and vigor, pruning practices, and tree/shrub form.
- 2. Qualification:** The supply of the trees/shrubs shall be performed by a nursery that grows and produces trees/shrubs according to the "American Standard of Nursery Stock".
- 3. Plant Materials:** All plant materials shall comply with the specifications set forth in the American Standard for Nursery Stock ANSI Z60.1-2004.
- 4. Quality and Size:** Sizes and methods for sizing height, caliper, and root ball shall be in accordance of "American Standard for Nursery Stock". Trees/shrubs should have a straight trunk and leader with well-spaced branching and wide angled branch unions. Certain plant material may be exceptions of the single leader and well-spaced branching requirement, but only when determined to be allowable by the Administrator. Plant materials shall be free of injuries or abrasions, fresh pruning cuts not showing woundwood response, and pruning cuts shall be less than 1" in diameter. The crown of the tree/shrub shall be typical for the species, and free of irregular

pruning cuts. Trees/shrubs that have numerous irregular pruning cuts in the crown of the tree/shrub will be rejected. Trees that have been staked during the growing season preceding digging shall not be accepted. Tree/shrub caliper shall be taken on the trunk six inches above the root collar.

5. **Root Ball:** All trees/shrubs provided shall have a firm, freshly dug root ball that is standard size according to "American Standard of Nursery Stock". The root ball should be sufficient in size to encompass a fibrous root system necessary for the recovery of the tree/shrub after the transplant. Root balls shall be wrapped with non-synthetic, biodegradable burlap and rope or twine. The root collar or the first order of structural roots should be apparent at the surface of the ball. The Administrator may inspect the depth of the tree/shrub within the root ball and may reject any tree/shrub that has been planted too deep in the nursery. The tree/shrub should be free from adventitious roots above the root collar or first order of structural roots. Root balls that have been cracked, frozen, broken, or softened are subject to rejection by the Administrator.
6. **Containerized/ Bare Root Trees/Shrubs:** Containerized trees/shrubs shall not be pot bound or have girdling roots. Root collars should be apparent at the surface of the container. Bare root trees/shrubs shall have a healthy, well branched root system that is characteristic of the species.
7. **Transportation:** Root balls shall be protected against freezing, softening, cracking, and breaking. Branches should be tied with sisal or jute twine to avoid breaking branches during transport. Trunk protection shall be installed during the handling and transport to avoid scraping and damaging bark. Trees/shrubs shall be protected during transport to prevent wind and sun from drying out trees/shrubs. Trees/shrubs subjected to injury, damage, or other conditions unfavorable to plant recovery and growth will be rejected by the Administrator.

8.4.3 Soil Specifications for Tree Planting

1. **Soil Volume:** Unless specified differently by the Administrator, the minimum soil volume for small, medium, and large maturing trees shall be 400, 600, and 800 cubic feet respectively. When calculating soil volume only the first three feet of soil depth should be used for calculations. Alternatively, contiguous growing areas for small, medium, and large maturing trees should be 130, 200, and 250 square feet. The use of pervious pavements, root paths, and structural soil cells should be used to reach recommended soil volumes unless a different methodology is approved by the Administrator. Structural soils should not be used in planting areas unless otherwise approved by the Administrator.
2. **Soil Depths:** Trees must have at least 3 feet of soil depths to accommodate root growth. The use of top soil and subsoil can be used to reach the recommended soil depth. Subsoil shall be installed in 10 to 12 inch lifts, and soil should be stratified between each lift.
3. **Soil Texture:** The recommended soil texture will vary based on the location and species of trees being installed. The top soil and subsoil should be consistent and range from a loam to sandy loam in texture. Large clay clods greater than 1 inch in

length should not make up over 10% of the soil volume and clods over five inches or prohibited.

- 4. Soil Debris and Contaminants:** Soil used for tree planting shall be free of heavy metals, toxins, and debris including brick, concrete, wood, glass, metal, stones, and plastic. Never shall an area designated for tree planting be used as a washout area for concrete or other construction material. Unless approved by the Administrator, no stones, rocks and gravel shall exceed 5% of the soil volume and be larger than 1 inch. The use of limestone in backfill is strictly prohibited without the approval of the Administrator.
 - 5. Organic Matter:** The top soil should have 10-20% organic matter by weight. Compost and wood chips may be used to increase organic matter. The subsoil should have at least 1% organic matter by volume.
 - 6. Soil Density:** The density of the soil may be variable based on applications. Backfilled soil and soil within planting areas shall not be machine compacted and shall not exceed 75% of maximum dry density as determined by ASTM D1557. If hand compacting is used, soil should be compacted in 6 to 20 inch lifts based on application.
 - 7. Drainage:** Water should be readily drained from the soil. Soil amendments or drainage pipes should be used if percolation tests show drainage rate less than 1 inch per hour. Target percolation rate is 1 to 3 inches per hour based on species of trees being planted.
 - 8. Soil pH:** The pH of the soil is an absolute must when determining an acceptable soil. The general pH range for trees is 5.8 to 7.4. Never shall the pH of the soil test higher than 7.0 without the consent from the Administrator. Soil may be tested by the Administrator, and soil that does not meet the recommended pH range must be replaced.
-

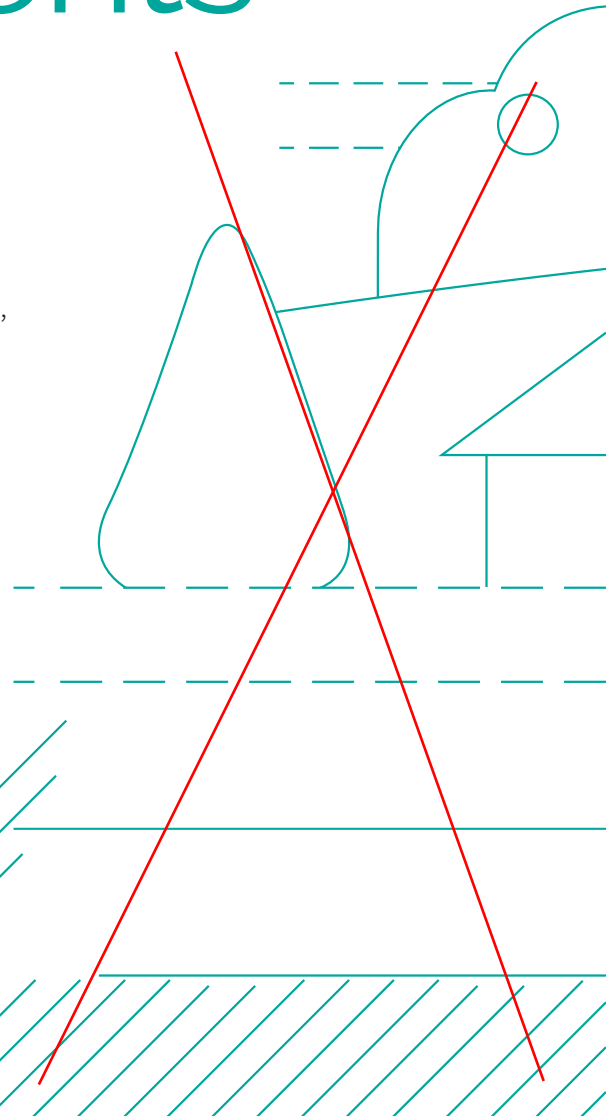
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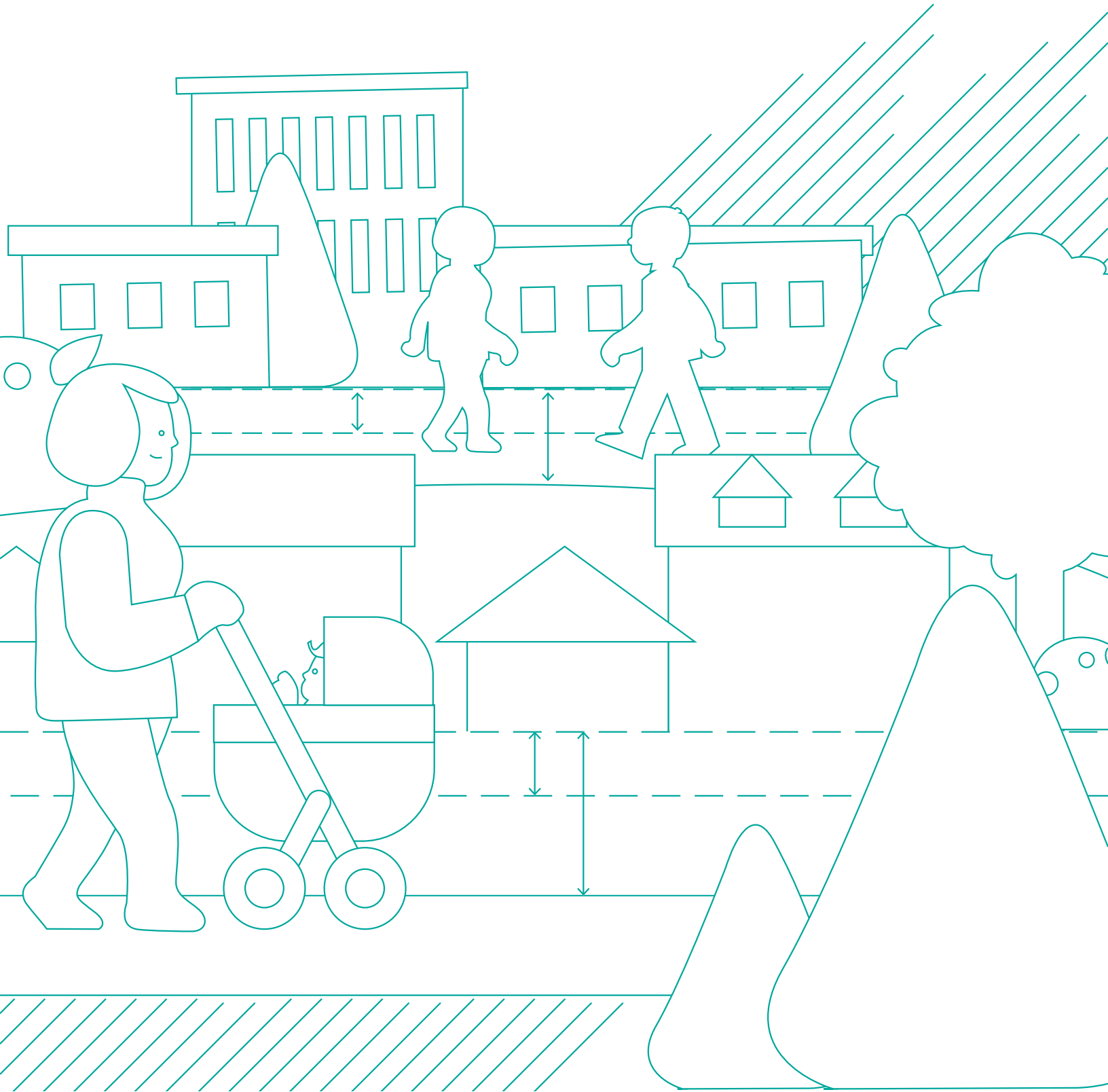
Let all references to Chapter 9 be changed to Chapter 7 accordingly and update page numbers

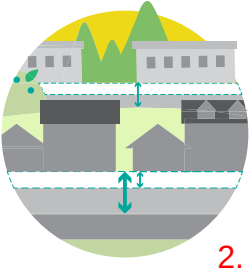
~~Chapter 9~~ Chapter 7

Rights-of-way Encroachments and Easements

The City of Greenville's street network occupies approximately 20% of the City's total land area and is the location of almost all connection points between public land and private land. These connection points are often blurred in terms of easily identifying the public side vs. the private side and take the form of driveways, tree lawns, sidewalks, trails and parking. Development activities over the past century has often been inconsistent with either prior or future City standards and has resulted in many non-conforming circumstances. The situation might be one where a City street requires an easement on private property or, conversely, a historic building sits over the property line into a City right-of-way. Either way, a protocol to remedy these conditions is necessary and is outlined in the following chapter.







2.

9.1

Added "This also includes formal encroachments such as surface, sub-surface, air rights and structural air rights. These include signs, building foundations, balconies, awnings, or any other part of a building extending into the right of way."

Chapter 9

Right-of-way Encroachments

In continuation, "A formal encroachment permit is a legally binding agreement between applicant, and requires approval by City Council or the City Manager. As a result, review the application and final action will take several weeks. Formal encroachment permits for sub-surface, air rights and structural air rights. A separate application must be submitted by address. The follow is a a brief explanation of each category along with links to applications.

9.1

General

Construction projects and development sometimes require the use of City owned property. Any use of the City's property or public right-of-way requires an encroachment permit. Any work within the Central Business District (CBD) requires coordination with the Construction Engineering Department and City Events staff. Applicants may apply to utilize City property using the Encroachment Application forms found on the City website at:

<https://www.greenvillesc.gov/334/Encroachments>

These forms are used to apply for any construction or blockage in the City's Right of Way (ROW). Some examples include: dumpsters, construction material storage, construction material loading/unloading, construction staging space, moving vans, single parking space usage associated with construction activities, temporary access to private property, building maintenance, water/sewer taps, utility installation, utility maintenance, driveway construction, sidewalk construction, landscaping/irrigation installation and any other construction activity.

1.

9.2

Replaced with: "The City issues formal encroachment permits to authorize the installation, in the City right-of-way, or projecting under/over the City right-of-way, of the following: portions of buildings, signs, awnings, canopies, facades, footings, walls, and planters."

9.2

Encroachment Permit Process

There are two types of encroachment permits: General and Formal, described below.

9.2.1 General Encroachment Permits

General encroachment permits grant permission to work in or block any portion of City Right-of-Way (ROW). General encroachment permit forms may be filled out using the General Encroachment Application ([GEA](#)) form at the City's website. General encroachment permit fees are calculated using the linear footage of cut or disturbance in the ROW.

9.2.2 Formal Encroachment Permits

Formal encroachment permits are issued to allow a portion of a building to be built under, in, or over a City ROW or to attach components to a building which will project into or over a City ROW. Only original forms are allowed to be submitted as the application must contain original signatures. Applications may be dropped off at the Construction Engineering office in City Hall or mailed directly to Construction Engineering. Since these

~~applications will generate a legal agreement that requires formal action by Council and/or the City Manager, these permits will take a minimum of 4-6 weeks to process.~~

A. Formal Encroachment Supporting Documents

~~In addition to completing the Formal Encroachment Permit Application, applicants must also submit PE stamped drawings, delineation of property lines, specific dimensions for each projection into the right of way and a properly endorsed certificate of insurance form. Since original documents are required for formal encroachment permits, original applications can only be submitted by mail or in person.~~

B. Types of Formal Encroachments

- 1 [Surface Encroachment Application \(PDF\)](#) - Use this form to request authorization to build a portion of a building or ground-mounted sign within public right-of-way.
- 2 [Sub-Surface Encroachment Application \(PDF\)](#) - Use this form to request authorization to build a portion of a building underground in the ROW, like a footing, when the encroachment is part of the structure.
- 3 [Air Rights Encroachment Application \(PDF\)](#) - Use this form to request authorization to attach a component to a structure which projects over / into public right-of-way. Awnings or blade signs are examples of this. The encroachment attaches to the building.
- 4 [Structural Air Rights Encroachment Application \(PDF\)](#) - Use this form to request authorization when any structural portion of a building above the ground projects over / into the public right-of-way. Examples would be: a canopy or portion of the facade. The encroachment is actually a part of the structure.

9.2.3 Traffic Control Requirements

Some encroachment permits entail special conditions. If the proposed work involves closing sidewalks, parking spaces, traffic lanes, or streets, a US Department of Transportation Manual on Uniform Traffic Control Devices ([MUTCD](#)) or South Carolina Department of Transportation ([SCDOT](#)) compliant Vehicular & Pedestrian Traffic Control Plan is also required to be submitted with the application.

9.3

9.3

Excavations, Backfilling & Restoring

All cuts, openings or excavations in the pavement or sidewalks shall be properly made and shall be restored by being backfilled with approved material, which may include selected backfill, aggregate base backfill, or flowable backfill, up to the level of the bottom of the base course by the permittee or its agents in accordance with the city specifications, and any excess materials remaining after construction shall be removed by the permittee prior to final inspection by the city.

9.3.1 Pavement Repairs

~~When pavement is disturbed or removed by any person making excavations therein pursuant to a permit obtained under subsection (a) of section 9.2.2 the person making such excavation, or causing the excavation to be made, shall repair or replace the pavement in accordance with the requirements of the city engineer. The replacement shall be done according to specifications furnished by either the City Engineer or the~~

3.

Replaced with

"The application may be filled out and signed either electronically or with blue ink and scanned. Applicants must also submit the approved certificate of appropriateness from the Planning office, PE stamped drawings, delineation of property lines, specific dimensions for each projection into the right-of-way and a properly endorsed certificate of insurance form. Instructions are included with the associated permit type."

Replace striked with "detail 23:01 PAVEMENT REPAIR FOR UTILITY CUTS in the Appendix of this manual."

Replaced with "Pavement restoration shall match the existing pavement section. If concrete base exists, concrete shall be poured to match with dowels to tie in the new concrete to the existing concrete."

9.4

Construction Engineering Manager or their deputy.

If pavement repairs exceed 20 feet in length or width, the city engineer may require the permittee to repave a full or half lane, up to 50 feet on either side of the area to be repaired instead of patching the pavement.

Surface Restoration shall match the existing pavement structure including surface, base, and where applicable, subbase. However in no case shall asphalt be considered an acceptable material for restoring sidewalks.

See the Appendix for relevant construction details.

9.4

Driveway Construction

Commercial and Residential Driveways within the City require an encroachment permit and should be constructed using the standard details provided in Appendix A, where possible. Driveway construction shall conform to the following specific requirements, plus any special conditions noted on the permits issued:

- City requires a 24-hour notice before concrete shall be placed.
- Location must be confirmed in the field by City inspector prior to construction.
- Driveways shall be between 10' and 24' wide, unless specifically approved otherwise.
- Contraction joints shall be placed in all driveways wider than 15'.
- Sidewalks and curbs disturbed by driveway installation shall be replaced per City approved standard details.

Note: Exceptions to these requirements are permitted in certain instances with written approval on the encroachment permit.

9.5

9.5

Temporary Street and Sidewalk Closures

These actions require an Encroachment Permit and will also require public notices to be posted in advance of the closures, as dictated by the permits issued. The required forewarning signage must be procured and posted by the Applicant.

9.5.1 Sidewalks

A general encroachment permit can be issued to allow City sidewalks to be blocked to accommodate construction, moving or maintenance.

- If permitted, sidewalk closures in the central business district shall allow for a minimum 5 foot clearance for pedestrian passage through the blockage area. Otherwise, the entire sidewalk shall be closed.
- Proper signage shall be required for sidewalk blocking and/or closure. The alternate pedestrian route signage shall be installed as indicated on the approved permit and must remain clearly visible.
- If necessary, a temporary structure shall be erected to protect pedestrians from overhead dangers, such as falling debris, tools, water, etc.
- At any time, including special events, the City may request that the sidewalk closure area be removed or modified

9.5.2 Streets

A general encroachment permit can be issued to allow City streets to be blocked to accommodate construction, moving or maintenance.

- No Blockage of a street shall be permitted if it allows less than ten feet of road width for travel in each direction in residential areas or for less than full road width in the CBD. No blockage of a sidewalk or pedestrian area of a road without a sidewalk shall be permitted if it allows for less than three feet of usable pedestrian space.
- No opening or excavation in any paved public street shall be permitted to obstruct the flow of traffic without providing for an appropriate detour around such opening or excavation by either temporarily restoring the street surface, covering the opening or excavation with adequate steel plates, or other appropriate measures which would aid the flow of traffic thereon.

9.5.3 Notification Procedure**A. Public Notification Requirements**

Unless exempted below, all providers of utility services performing work in the right of way shall notify all adjacent property owners no less than 72 hours in advance to the commencement of said work. Notification should be placed in a non-destructive method on the front door of each dwelling, office space, or place of business.

B. Content of Notice (Signage)

The notice required above shall contain the following information: (a) dates of activity (start and end); (b) description of activity; (c) the name of the provider of utility services performing the work; (d) a 24 hour contact name and phone number for both the provider of utility services and any contractor(s) performing the work on its behalf; and (e) right of way management permit number. If the work includes more than 500 feet of underground work, the provider of utility services must provide roadside

signage at each end of the work zone. Roadside signage will be a minimum of 30 inches wide by 36 inches tall with the aforementioned information legibly depicted.

C. Pre-Construction Meeting Requirement

For utility work in the right-of-way requiring the installation of more than 500 feet of underground work or requiring a total road closure, a pre-construction meeting is required with the City Engineer's office. This meeting will occur no less than 72 hours in advance of beginning the work and requires, at a minimum, one representative each from the provider of utility services and any contractor(s) performing work on its behalf. Meetings may be conducted via web-based conference.

D. Emergency Repairs to Existing Facilities Exempted

The above provisions shall not apply to any emergency repair of existing facilities within the right-of-way.

9.6

9.6 Right-of-Way Use Restrictions

9.6.1 Noise Ordinance

The sound produced by construction machinery, heavy duty equipment, and machines and equipment used for construction, repair, cleaning, and maintenance of buildings, streets, or public or private premises are permitted between the hours of 7:00 a.m. and 9:00 p.m. Monday through Friday, between the hours of 8:00 a.m. and 7:00 p.m. on Saturdays, and between the hours of 9:00 a.m. and 7:00 p.m. on Sundays. Such Devices shall nevertheless be subject to the administrative stop order provisions of section 16-98.

9.6.2 Holiday Moratorium

The City of Greenville has a Holiday Moratorium, prohibiting construction within the right of way in the Central Business District, Woodruff Rd and Haywood Rd from Thanksgiving to January 2nd.

9.6.3 Working in the Central Business District

Information pertaining to work being done in the Central Business District can be found in the City's Ordinance: ([Sec 36-121](#))

9.7

9.7 Construction Container Management

Added "...and 1 space for a construction vehicle."

9.7.1 Dumpsters

Contractors may be granted 1 parking space for a dumpster. Any additional parking spaces may be requested from the Construction Engineering Department during the permitting process. Some additional guidelines on the permitting of dumpsters is as follows:

A. Guidelines

- Dumpsters in the CBD are restricted to 12 CY maximum. Containers shall not block driveways or pedestrian access.
- Food and household waste are not allowed in dumpsters.
- Dumpsters placed near restaurants shall be covered at night to discourage food and household waste placement.
- At any time, including special events, the City may require removal of dumpsters.
- Dumpsters installation and service shall not damage any surface and a protective mat must be installed to protect existing finished surfaces.
- Reflective safety cones shall be placed around dumpsters when facing traffic.
- Dumpsters must have the owner's name and telephone numbers, as well as applicants name and number attached for notification purposes.
- Dumpsters shall not be filled over the top of the container. Areas around dumpster shall be kept clean at all times.
- In residential areas, containers may be placed on streets, provided the existing street width is sufficient. City Code requires that 20 feet of usable street width remain after the container and all safety devices are placed. If the Code required minimum pavement width does not remain/exist, the application will be denied and the container will not be allowed to be placed in the street.
- At any time the dumpster becomes a nuisance, the permit will be terminated and the container must be removed. In the event that the dumpster is not removed, whether by refusal of the applicant, or due to lack of applicants contact information, the City will remove the dumpster, confiscate the dumpster, and all City incurred expenses to confiscate the container shall be reimbursed prior to release of the container to it's owner.

9.8

9.8 Small Cell Wireless Facilities

For detailed information pertaining to the permitted use, application process, and fees associated with the installation and use of a small cell wireless facility see [Section 36-133](#) of the City of Greenville's Code of Ordinances.

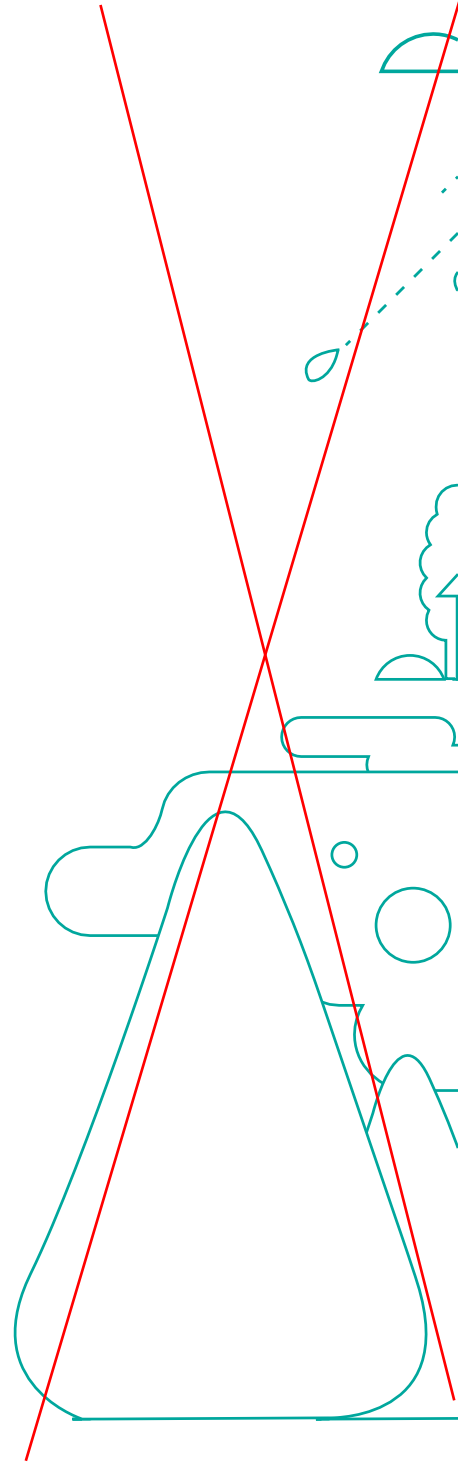
- [Application Form for Wireless Facility](#)
- [Small Cell Wireless Facility Design Catalogue](#)

Let all references to Chapter 10 be changed to Chapter 8 and update page numbers as needed.

~~Chapter 10~~ Chapter 8

Stormwater Standards

As Greenville continues to grow and develop, natural areas with old growth vegetation will gradually disappear. This has both aesthetic and functional consequences – the loss of mature trees, shrubs and established grasslands transforms a once natural area into a likely development site. Beyond the loss of a beautiful landscape is also the loss of a ‘natural sponge’ to capture stormwater runoff in the City. New development with additional impervious surfaces in the form of pavement and buildings means increased quantities of stormwater runoff with fewer natural areas to absorb it before it runs off into the Reedy River where contaminants and pollutants negatively impact the quality of water. This chapter provides a number of best practices to address and mitigate the impacts of stormwater runoff.







Chapter 10

Stormwater Standards

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10.1

10.1 Introduction

10.1.1 Purpose

The City of Greenville (City) Design Specifications Manual (referred to as DSM) is intended to provide information to the general public on the City's stormwater policies and design practices. In particular, the Manual will provide guidance to assist developers and engineers in the selection and design of stormwater best management practices (BMPs) to manage both quantity (control and conveyance) and quality of stormwater runoff. This Manual will reinforce and expound on the requirements and methodologies in the City's Stormwater Management Ordinance (Ord. No. 2008-07), and Stormwater Management Plan (2007) or most current. In addition, the Manual will be updated as necessary to reflect currently accepted standard practices in stormwater management.

Measures taken to control stormwater impacts shall assure that new development minimizes impacts to downstream infrastructure and receiving waters. The following principles apply to all new developments and modifications to existing land uses:

- Design for the minimum amount of downstream, upstream, and peripheral impact.
- Design a stormwater collection and conveyance system that can be maintained in perpetuity.
- Design a site plan that minimizes erosion and sedimentation.
- Existing stormwater flows that originate from outside of a property and flow onto the property must be managed with new construction. Furthermore, any new stormwater flow patterns as a result of construction must be mitigated to avoid adverse conditions prior to discharge onto adjacent properties.

In addition, design principles for site development and related infrastructure as described in the City's Development Code (Article 19-5.3) shall apply. These include the following:

- Conform to all applicable federal and state regulations along with design and specifications manual.
- Minimize alteration of site topography.
- Preserve and enhance natural resources such as waterways, wildlife, and other sensitive ecosystems.
- Preserve and enhance the natural hydrologic, hydraulic, water quality, and other functions of wetlands within and downstream of the development.
- Minimize alteration of natural drainage patterns, infiltration rates, and storage characteristics of the site.
- Maximize the use of "green infrastructure" to manage stormwater, reduce flooding, capture pollution, and improve water quality.
- For examples of small-scale stormwater management, see Appendix A for the City of Greenville Guidelines for Green Infrastructure & Low Impact Development.

The design of stormwater drainage systems needs to be site-specific, because topography and the availability of adequate outlets for stormwater runoff vary with the site. It is recommended that each proposed development project be discussed with the City's Engineering staff during the initial planning stage to obtain early input and feedback regarding stormwater management issues.

Added "These measures are typically used in additional impervious of 100 square feet or greater." to bullet

10.1.2 Description and Use

A. Applicability

The City of Greenville requires design expertise in stormwater calculations and flooding analyses. Stormwater design criteria are based upon current scientific knowledge and engineering judgment. It should be realized that flooding may occur at any time due to any number of factors beyond the reasonable control of the City, such as greater amounts of precipitation or different rainfall patterns than used in design storms, wet soil conditions, debris or blockage of key stormwater channels, high groundwater tables, etc. However, the engineer is not excused from performing a thorough upstream and downstream analysis in the design of stormwater elements to eliminate flooding issues to the greatest extent practical.

B. Compliance with other Standards

Compliance with the standards of this Manual does not eliminate the need to comply with other applicable City, County, State, and Federal ordinances and regulations. This includes, but is not limited to, the submission and approval of preliminary and final subdivision plats, approval for construction in a regulated floodplain/ floodway, building and zoning permits, construction inspections, construction encroachment permitting, site development permit, site plan permit and coordination with other administering authorities.

C. Conflicting Standards

The provisions of this document shall be deemed as additional requirements to minimum standards required by other applicable ordinances and standards. In the case of conflicting requirements, the most restrictive shall apply.

D. Variance from Standards

Alternative drainage methods and materials on occasion may be warranted, and a variance from these standards may be permitted by the City. A written request for a variance must be made to the City Engineer. The request must be based upon sound engineering practice and judgment and must be supported by adequate justification and data. If a variance is granted, it will apply only to the specific circumstance for which approval is sought. Variances granted by the City shall apply only to the stormwater design standards. Variance from other local, State, and Federal regulations and standards cannot be granted by the City.

E. Requirements for Inlet and Drainage Structures

Inlet types to be determined based upon standard SCDOT structure types as depicted in Inlet Type Guidance Section of this document (Adapted from

<https://www.scdot.org/business/pdf/planPreparation/chapter09.pdf> and ~~http://206.74.144.33/falconWebV3/documents/Section_700.pdf~~).

10.2

10.2
Ordinance Review

10.2.1 Purpose

This chapter presents a review of regulatory guidance provided in the City's Stormwater Ordinance related specifically to detention basins, water quality treatment, and soil erosion and sediment control.

10.2.2 Ordinance Review Summary

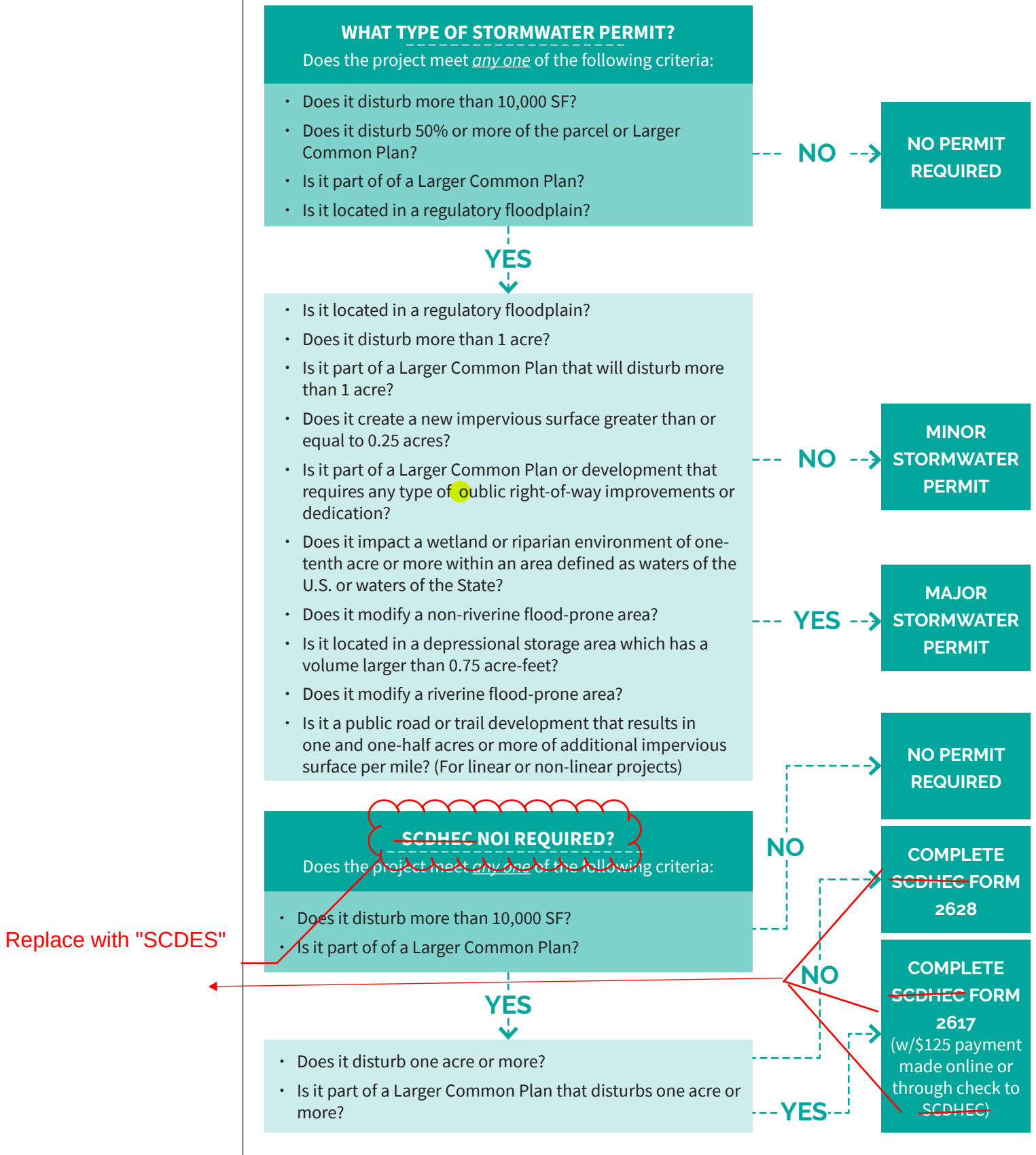
Figure 10.2.1 provides an organized flow chart for Stormwater Permitting within the City of Greenville. Table 10-2-1 provides a summary of requirements included in the City's Stormwater Ordinance for the following:

- Detention basins
 - Water quality
 - Soil erosion and sediment control
 - Regulatory floodplains
 - Wetland provisions
- Replaced with "the SCDES Storm Water Management Best Management Practices Handbook (<https://des.sc.gov/programs/bureau-water/storm-water/best-management-practices-bmps/bmp-handbook>)

In addition, South Carolina Department of Transportation (SCDOT) specifications shall be used for grassing, and concrete drainage structures. South Carolina Department of Health and Environmental Control (SCDHEC) specifications shall be used for erosion and sediment control. Additional guidance can be found in SCDOT's 2007 Standard Specifications for Highway Construction (http://www.scdot.org/business/pdf/2007_full_specbook.pdf) and the ~~SCDHEC Storm Water Management Best Management Practices Handbook (<http://www.scdhec.gov/Environment/WaterQuality/Stormwater/BMPHandbook/>)~~ or most current editions.

Table 10-2-1: Summary of Stormwater Ordinance	
Applicability	Regulatory Section
Soil Erosion & Sediment Control	19-5.3.6 (A)(2)
Water Quality Treatment	19-5.3.6 (B)(2)
Detention Basins	19-5.3.6 (C)(2)
Floodplain Management	19-5.3.7 (A)
Wetlands	19-5.3.7 (B)

Figure 10.2.1



10.3

10.3 Hydrology

10.3.1 Purpose

This section outlines the hydrologic design guidelines that must be adhered to when determining the quantity of on-site and off-site stormwater runoff for a given site and the impact on upstream and downstream stormwater facilities.

10.3.2 General Criteria

The City's Stormwater Ordinance establishes rules and regulations to assure that developments do not increase flooding, drainage hazards, and water quality degradation and to protect, conserve and promote orderly development. This section presents general criteria for meeting this goal.

A. Off-Site Tributary Area

Stormwater runoff from off-site tributary areas that discharge to or across a development site shall be accommodated within the stormwater facilities planned for the development site. The stormwater management plan should demonstrate that off-site runoff will be adequately conveyed through the development site in a manner that will not cause or contribute to upstream and downstream flooding and erosion. Estimation of off-site runoff must be done separately from the estimation of on-site runoff for post-construction analysis.

B. On-Site Stormwater Conveyance

Stormwater runoff generated from the proposed development site shall be accommodated within the stormwater facilities planned for the development. On-site stormwater runoff shall be conveyed through the development site and treated prior to discharge off-site by adequate stormwater control facilities and best management practices (BMPs) detailed in this Manual.

C. Downstream Analysis

On-site stormwater systems must discharge to one of the following off-site stormwater systems:

- Streams,
- Open channel systems, or
- Storm sewer systems adequately sized for the intended flows.

For the purposes of this Manual, streams are defined as surface watercourses with well-defined beds and banks, natural or man-made, which convey baseflow all or part of the year. Open channels are defined as linear watercourses, natural or manmade, that do not have baseflow any part of the year and convey flow only resulting from stormwater runoff. If none of the options above is feasible, then the applicant must demonstrate that only sheet flow is being discharged with adequate quantity and quality controls in place, since concentrated flow may cause off-site erosion unless it is discharged into a conveyance system. In general, sheet flow occurs at the upstream end of an overland flow path, and shall not exceed a length of 100 feet for purposes specified in this Manual. Flow that has become concentrated must be converted to sheet flow using a level spreader or other similar device. Flow from drainage areas with overland flow paths greater than 100 feet must be discharged into one of the defined conveyance systems or converted to sheet flow using a level spreader or other similar device prior to discharge from the site.

The applicant shall use one of the hydrologic methods defined in Section 10.3.8 to demonstrate that the downstream stormwater system can convey existing off-site flows and projected on-site flows in a manner that does not increase downstream peak water surface elevations, flows, and velocities up to and including the 25-year storm event, and may include the 100-year storm event without causing or increasing damage to adjoining properties and to a point downstream from the outlet of the on-site system known to the City to be a restriction causing significant backwater, such as a culvert at a road crossing in the downstream stormwater conveyance system.

Downstream tailwater conditions must be considered and can be established through one of the following:

- Previous studies or models approved by the City,
- FEMA Flood Insurance Rate Maps (FIRM) and data, and/or
- Calculations prepared by a Professional Engineer using standard engineering practice.

The applicant must prepare a Stormwater Management Report as indicated in the City's ordinance to clearly demonstrate how the proposed development project will comply with the requirements of this Manual.

D. Design Storm Criteria

The design storm criteria are related to the allowable risk of structure or facility, flooding or overtopping. When selecting a frequency, consideration should be given to the protection of the structure and to the potential upstream and downstream consequences in the event of failure. The criteria presented in Table 10-3-1 shall be used when designing a facility within the City's Stormwater Utility jurisdiction.

The minimum design frequency refers to the design requirements that must be maintained in order to keep a facility serviceable. In addition to the minimum design frequency, critical structures such as buildings or bridges must be protected from structural flooding damage during larger storm events.

It is recognized that conformance with design storm criteria may not be feasible in certain circumstances, such as retrofit or redevelopment projects. In such cases, the designer shall consult with the City to determine the acceptable level of service to be provided at the site.

Table 10-3-1: Design Storm Criteria

Infrastructure	Minimum Design Frequency	Protect Against Structural Flood Damage
Storm sewers and inlets on grade	10-year	None
Storm sewers and inlets in sump	10-year	100-year
Bridges	100-year	500-year
Culverts crossing Arterial Roads	100-year	500-year
Culverts crossing Collector Roads	50-year	100-year
Culverts crossing Local Roads	25-year	100-year
Open Channels	10-year	100-year
Ponds	25-year	100-year
Emergency Spillways	100-year	100-year
Water Quality BMPs	10-year	N/A
Offsite Stormwater Conveyance	25-year	100-year

10.3.3 Hydrologic Design Approach

A hydrologic study of the development site is required to develop appropriate input data for hydraulic calculations and form the basis for evaluation of the impact of land development. Increasing impervious surface results in reduced infiltration and decreased travel time resulting in increasing runoff volume, peak flow rates and runoff velocities. This section describes techniques for estimating peak discharges and hydrographs. A systematic approach to arrive at the required results is presented below:

- 1 Based on control requirements (peak flow only, peak flow and runoff volume, or complete runoff hydrograph) and watershed characteristics (area, length, slope, and land cover), select an appropriate hydrologic procedure from Section 10.3.4.
- 2 Identify rainfall data requirements for appropriate design storm conditions. If hydrograph generation is required, develop a rainfall hyetograph for each design storm event to be analyzed.
- 3 Estimate rainfall excess using Rational method runoff coefficients, where permitted, or Natural Resources Conservation Service (NRCS) curve numbers.
- 4 Compute the watershed time of concentration using the procedure described in Section 10.3.5a.
- 5 Compute the peak runoff rate using methods described in Section 10.3.5, as appropriate for the procedure selected in Step 1. If required, generate a complete runoff hydrograph using the method in Section 10.3.8d.
- 6 Based on watershed characteristics, such as existing detention storage, open channel flow path, length, slope, and channel roughness, determine if detention storage or channel routing is required. If required, conduct appropriate hydraulic routing based on procedures outlined in 10.4.
- 7 For projects proposing greater than 0.25 acres of new impervious, the pre-development SCS Curve Number shall not exceed 75 for the contributing drainage areas to the Stormwater Control Measures.

10.3.4 Hydrologic Procedure Selection

Table 10-4-2 indicates which method must be used to design various components of the stormwater system. In general, the peak flow calculation methods (the maximum runoff flow rates at a given point as a result of a storm event) presented in Section 10.3.8 shall be used for designing conveyances such as stream crossings, storm sewer systems, small open channel systems, swales, roadside ditches, overland flow, shallow concentrated flow, roadway curbs, and storm sewer inlets. The fundamental hydrologic components defined herein shall be used in each of these methods.

Hydrograph methods better account for the timing of runoff in larger watersheds and storage provided by detention facilities and/or floodplains. Therefore the hydrograph methods may be used to size any drainage component, but must be used for downstream analysis and to design detention facilities. Section 10.3.8d defines acceptable hydrograph methods.

Table 10-3-2: Guidelines for Selecting Hydrologic Methods

Hydrologic Method	Section of Manual	Drainage Basin Size Limitations	Comments
Rational	10.3.8.a	0-20 acres	Method can be used to estimate peak flows and the design of small conveyance systems; shall not be used for storage design.
NRCS Curve Number Run-off Estimation	10.3.8.b	>20 acres	Method can be used to estimate peak flows and the design of larger conveyance systems; shall not be used for storage design.
Unit Hydrograph	10.3.8.d	None	Method can be used to estimate peak flows and hydrographs for all design applications including storage.

10.3.5 Time of Concentration

The time of concentration is the time required for water to flow from the most hydrologically remote point of the basin to the outlet or collection point being analyzed. The value for the time of concentration is the maximum time for water to travel through the watershed, which is not always the maximum distance from the outlet to any point in the watershed.

For typical urban areas, the time of concentration is calculated as the summation of an overland flow time, followed by shallow concentrated flow time, plus the time of travel through a constructed conveyance facility, such as a storm sewer, gutter, open ditch/

channel, or similar conveyance. This method as described in TR-55 is defined in this section. Time of concentration for existing conditions shall be based on existing land use while time of concentration for future land use shall be based on ultimate build-out land use for the tributary area. The minimum time of concentration shall be 5 minutes.

A. TR-55 Method of Time of Concentration Calculation

Overland Flow Travel Time: Overland flow, or sheet flow, is the shallow runoff from a gently sloping surface with a uniform depth generally less than 0.1 feet, occurring in the upper reaches of a basin over a relatively short distance. In general, sheet flow occurs at the upstream end of an overland flow path as long as no concentrated flow features are present. For the purpose of calculating time of concentration, the maximum length of overland flow shall be 100 feet. Sheet flow is estimated with a version of the kinematic wave equation derived from Manning's equation as follows:

$$T_T = \frac{0.007 (nL)^{0.8}}{(P_2)^{0.5} S^{0.4}}$$

Where:

- T_T = Travel time of overland or sheet flow segment (hr)
- n = Manning's roughness coefficient for Sheet Flow (Table 10-3-3)
- L = Flow length (ft)
- P_2 = 2-year, 24-hour rainfall (in) (3.59 in for Greenville, SC) (Table E-1)
- S = Average slope of the flow path (ft/ft)

Shallow Concentrated Flow Travel Time: Beyond the maximum overland flow length defined in the previous section, sheet flow becomes shallow concentrated flow. The velocity for such flows is calculated from Figure 10.3.1.

Table 10-3-3: Manning's n Roughness Coefficients for Sheet Flow

Surface Description	n^1
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated Soils:	-
Residue Cover $\leq$ 20%	0.06
Residue Cover $>$ 20%	0.17
Grass:	-
Short grass prairie	0.15
Dense grasses ²	0.24
Bermuda grass	0.41
Range (natural)	0.13
Woods: ³	-
Light underbrush	0.40
Dense underbrush	0.80

Source:

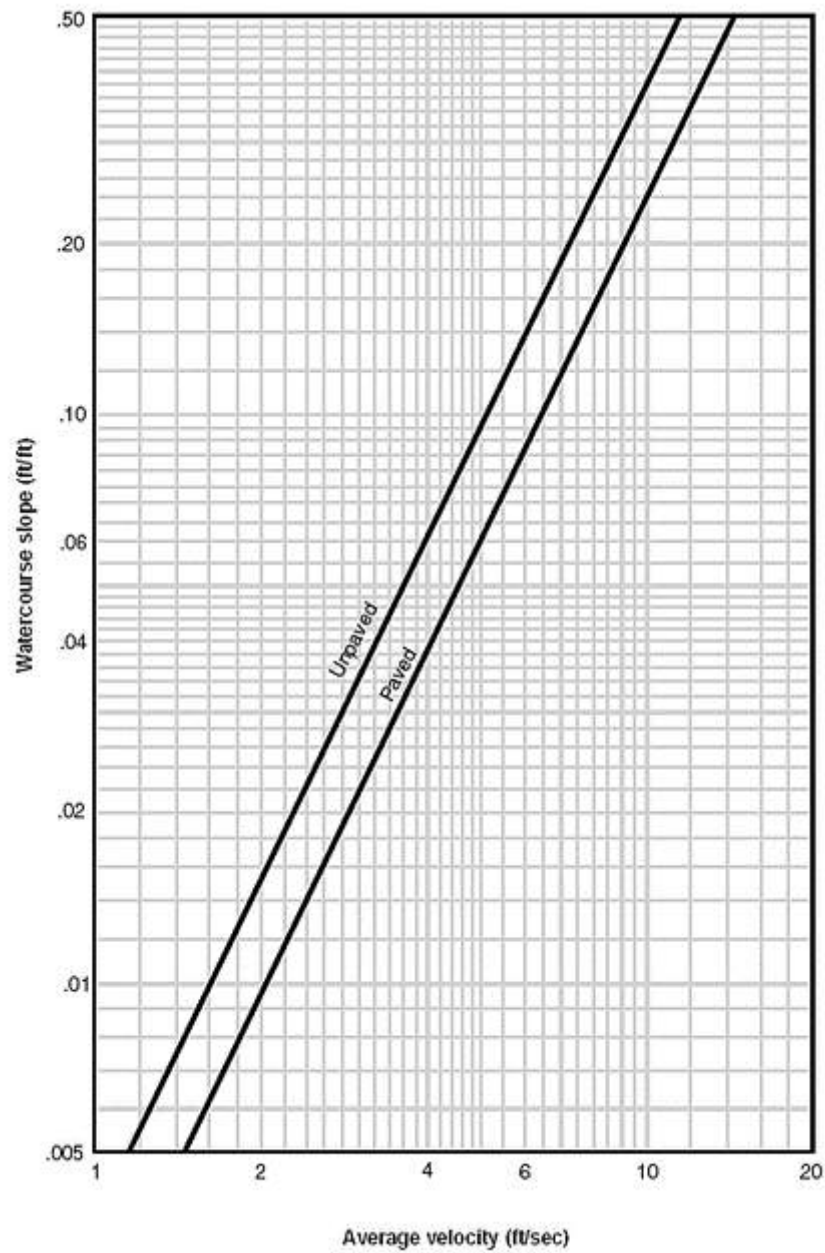
NRCS (SCS), TR-55
Second edition, June
1986

¹ The n values are a composite of information compiled by Engman (1986)

² Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass and native grass mixtures

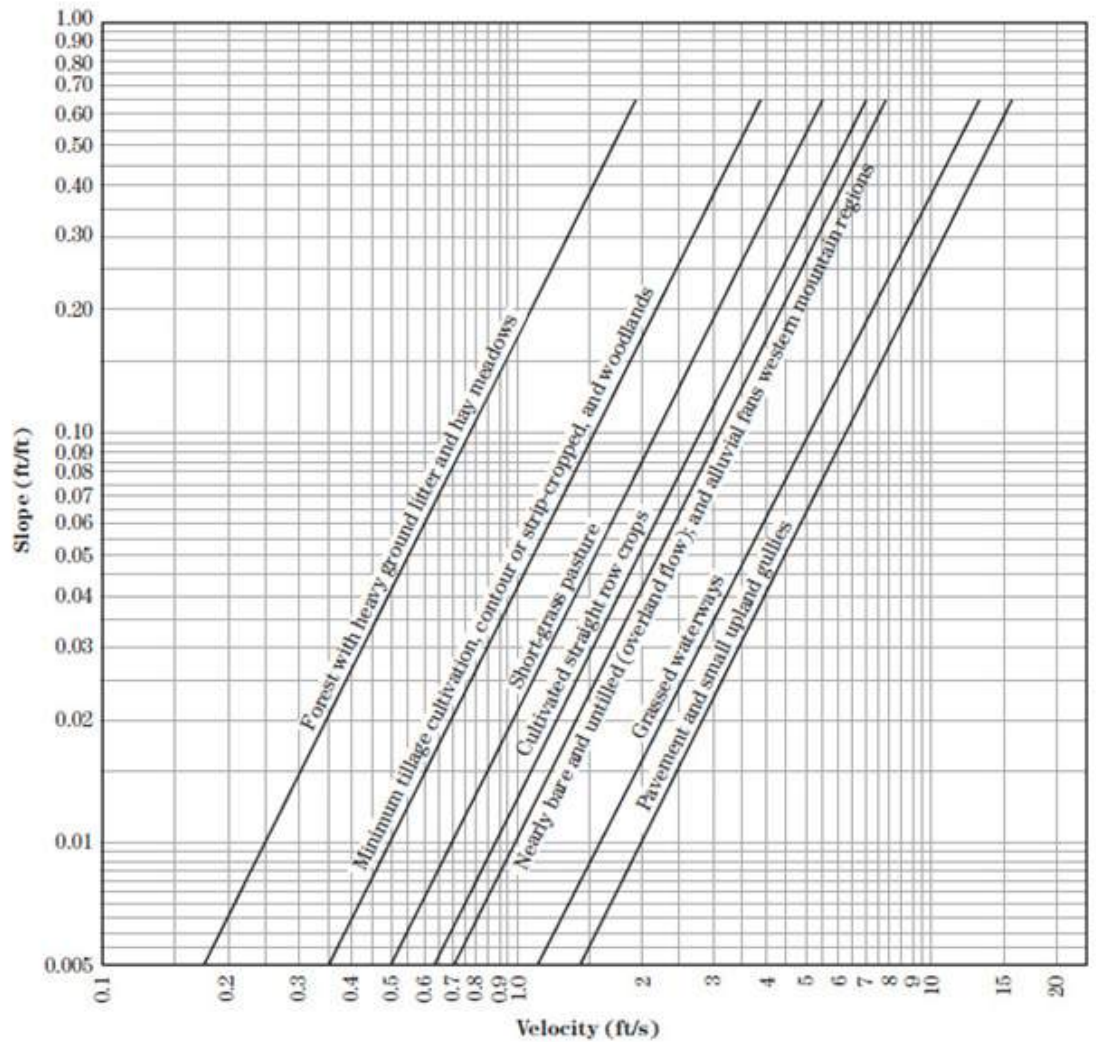
³ When selecting n , consider cover to height about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow

Figure 10.3.1



Source:

Source: NRCS (SCS),
TR-55, Second Edition,
June 1986



Source:

U.S. Dept. of
Agriculture (2010)
National Resources
Conservation Services.
National Engineering
Handbook Part 630
Hydrology Chapter 15
Time of Concentration

For slopes less than 0.005 ft/ft the velocity is calculated using the following equations:

$$\begin{aligned} \text{Unpaved: } V &= 16.1345 (s)^{0.5} \\ \text{Paved: } V &= 20.3282 (s)^{0.5} \end{aligned}$$

Where:

V = average velocity for the flow segment (ft/sec)
s = slope (ft/ft)

Open Channel and Pipe Flow Travel Time: Shallow concentrated flow typically discharges into pipes, ditches, gutters, and channels and becomes open channel and pipe flow. Manning's Equation can be used to estimate the average velocity for the flow regime as follows:

$$V = \frac{1.486 R^{2/3} S_o^{1/2}}{n}$$

Where:

- V = Average velocity for the flow segment (ft/sec)
- R = Hydraulic radius (ft)
- S_o = Channel or pipe slope (ft/ft)
- n = Manning's roughness coefficient

The travel time can be determined as follows:

$$T_{si} = \frac{L}{3600V}$$

Where:

- T_{si} = Travel time of the shallow concentrated flow segment i (hr)
- L = Flow length for the flow segment (ft)
- V = Average velocity for the flow segment (ft/sec)
- 3600 = Conversion factor from seconds to hours

Pond Flow Travel Time: It is sometimes necessary to estimate the travel time through a water impoundment. The travel time through a pond or reservoir is generally negligible, and shall be assumed as zero for the purpose of calculating time of concentration.

10.3.6 Rainfall Characteristics

Estimating the amount of rainfall on a particular site for a given time period is an essential component in the hydrologic analysis of a watershed. The amount of rainfall can be defined by the duration of the storm event, total amount of rainfall occurring during the storm duration, or the average rainfall rate.

Rainfall Depth and Intensity: Rainfall depth-duration-frequency estimates and intensity-duration estimates for Greenville, South Carolina are presented in Tables E-1 and E-2 (Appendix E of the DSM). These tables can also be found in "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14 Volume 2, Version 3, by NOAA and the National Weather Service (NWS). These data can be accessed over NOAA's Precipitation Frequency Data Server (PFDS) available at http://hdsc.nws.noaa.gov/hdsc/pfds/orb/sc_pfds.html. This publication supersedes the NWS's Technical Paper 40, NWS Hydro-35, and Technical Paper No.49.

Duration: Storm durations used in runoff hydrograph analyses and routing methods for the design of stormwater facilities shall be chosen to maximize the peak discharge. This is achieved by setting the storm duration equal to the time of concentration for the watershed.

Distribution: Storm distribution for hydrograph computation shall be determined by applying the SCS Type II distribution data.

10.3.7 Hydrologic Soil Groups

Infiltration rates of soils vary widely and influence the relationship between rainfall and runoff. Based on the infiltration rates of bare soil after prolonged wetting, the NRCS has classified soils into one of four Hydrologic Soil Groups (HSGs). The four HSGs and their associated infiltration rates and runoff potentials are indicated in Table 10-3-4. Published soil survey databases for Greenville County can be found at the Web Soil Survey website (<http://websoilsurvey.nrcs.usda.gov/app/>).

Developers should be aware of the soils native to the project site, the associated infiltration parameters, and re-gradation, compaction, or other factors that alter the hydrologic characteristics of the soil. The use of different HSGs that reflect the changes in post development soil hydrology shall be considered when determining runoff estimates for post development conditions. Areas of the development that are hydrologically disturbed and compacted shall be assigned that soil type's highest runoff potential/soil group classification and hence the lower infiltration rate. Alternatively, till/rip methods can be implemented to restore the hydrologic characteristics of disturbed soils to a moderately well drained soil classification. Areas that are deed or plat restricted for native planting areas may be determined to have lower runoff characteristics.

Table 10-3-4: Hydrologic Soil Groups			
Hydrologic Soil Group	Soil Type	Runoff Potential	Infiltration Rate (in/hr)
A	Well-drained soils and gravels	low	0.30
B	Moderately well to well-drained soils with moderately fine to moderately coarse textures	low	0.15-0.30
C	Soils with moderately fine to fine textures, with a layer near the surface that impedes infiltration	high	0.05-0.15
D	Clays with high swelling potential, soils with high water tables, soils with claypan, clay layer, or bedrock at or near the surface	high	0-0.15

10.3.8 Computation Methods

This section provides guidance for standard hydrologic methods used to determine runoff rate and volume. Runoff quantities shall be computed for the watershed under development as well as the upstream contributing watershed flowing into the development site. Runoff quantities shall be computed for both existing and proposed site conditions. Design runoff rates shall be calculated using a City-approved hydrograph. The runoff calculation is based upon rainfall amount and distribution, hydrologic soil group, land cover, and topography using the calculation methods prescribed in the TRM. The Modified Rational Method, NRCS Curve Number Method, and the Unit Hydrograph Method for computing runoff are outlined below.

A. Modified Rational Method

The Modified Rational Method may be used for estimation of peak runoff rate when the total tributary area is 20 acres or less. The steps involved in the calculation of runoff using this method are listed below:

- 1 Collect necessary tributary area data
- 2 Calculate time of concentration using procedure outlined in Section 10.3.5a
- 3 Use Appendix Table A.10.2 to determine the rainfall intensity for the desired design storm event and duration equal to the time of concentration calculated in Step 2
- 4 Determine the appropriate Large Storm Factor from Table 10-3-5
- 5 Obtain a Runoff Coefficient from Table 10-3-6 based on the characteristics of the drainage area. Note that selection of the Runoff Coefficient is dependent on the area's Hydrologic Soil Group.
- 6 Compute the peak runoff rate based on the equation presented below

The peak runoff rate according to the Modified Rational Method is calculated based upon the following equation:

$Q = FCIA$

Where:

- Q = Peak runoff rate (cfs)
- F = Large Storm Factor (values provided in Table 10-3-5)
- C = Runoff Coefficient
- I = Rainfall Intensity (in/hr)
- A = Drainage area (ac)

Large Storm Factor (F): The large storm factor is a factor applied to the runoff coefficient to account for the limited impacts of existing depressional storage and infiltration on pervious land areas during extreme storm events. The following factors shall be applied to the modified rational formula when applicable:

Table 10-3-5: Large Storm Factors for Modified Rational Method	
Storm Event	Large Storm Factor
100-year	1.25
50-year	1.20
25-year	1.10
10-year or less	1.00

Runoff Coefficient (C): The Runoff Coefficient, or "C" factor, represents the fraction of rainfall that is converted to runoff, and therefore should be between 0 and 1. Runoff coefficients account for absorption of rainfall into the surface, thereby reducing the total runoff.

The primary factors utilized to determine the "C" factor are HSG and ground cover type where distinctive and varying land features are identifiable. Where a site contains more than one HSG, a weighted runoff coefficient shall be used for the watershed. Large areas should be separated into subareas, based upon common soil and ground cover characteristics. The percentages of each ground cover and soil type should then be applied to determine the net weighted coefficient. Table 10-3-6 contains acceptable "C" values for different surface types for each HSG.

Table 10-3-6: Runoff Coefficients for Hydrologic Soil Group

Ground Cover Description		Runoff Coefficients			
Cover Type and Hydrologic Condition	Avg. % Impervious Area	A	B	C	D
Lawns, Open Space, Parks, Golf Courses, Cemeteries, etc.:					
Flat Slope (0 to 1%)		0.04-0.09	0.07-0.12	0.11-0.16	0.15-0.20
Average Slope (2 to 7%)		0.09-0.14	0.12-0.17	0.16-0.21	0.20-0.28
Steep Slope (>8%)		0.14-0.18	0.17-0.24	0.21-0.31	0.28-0.38
Parking Lots, Roofs, and Driveways		0.95	0.95	0.95	0.95
Streets and Roads:					
Paved w/curbs & storm sewers excl. ROW		0.95	0.95	0.95	0.95
Gravel including ROW		0.62-0.67	0.65 - 0.70	0.66 - 0.73	0.67 - 0.75
Dirt including ROW		0.56 - 0.62	0.58 - 0.65	0.59 - 0.68	0.61 - 0.71
Paved w/open ditches including ROW		0.72 - 0.76	0.73 - 0.78	0.74 - 0.79	0.75 - 0.81
Commercial and Business Areas	85	0.81 - 0.84	0.82 - 0.85	0.83 - 0.86	0.84 - 0.87
Industrial and Manufacturing Districts	72	0.70 - 0.74	0.71 - 0.75	0.72 - 0.78	0.73 - 0.79
Residential:					
1/8 acre lot or less, Apartments, and Townhomes	65	0.64 - 0.68	0.65 - 0.70	0.66 - 0.73	0.67 - 0.75
1/4 acre lot	38	0.39 - 0.48	0.41 - 0.51	0.43 - 0.56	0.46 - 0.60
1/3 acre lot	30	0.31 - 0.41	0.34 - 0.45	0.37 - 0.51	0.39 - 0.56
1/2 acre lot	25	0.27 - 0.38	0.29 - 0.42	0.32 - 0.47	0.35 - 0.53
1 acre lot	20	0.23 - 0.34	0.25 - 0.39	0.28 - 0.44	0.31 - 0.50
2 acre lot	12	0.15 - 0.28	0.18 - 0.33	0.22 - 0.39	0.25 - 0.45
Developing Areas:					
Newly-graded without vegetation or control measures		0.63 - 0.69	0.67 - 0.73	0.71 - 0.76	0.77 - 0.83
Newly-graded with established erosion control measures		0.59 - 0.65	0.60 - 0.67	0.62 - 0.70	0.63 - 0.73
Agricultural Land Uses:					
Pasture or Range Land:					
Flat Slope (0 to 1%)		0.04 - 0.09	0.07 - 0.12	0.11 - 0.16	0.15 - 0.20
Average Slope (2 to 7%)		0.09 - 0.14	0.12 - 0.17	0.16 - 0.21	0.20 - 0.28
Steep Slope (>8%)		0.14 - 0.18	0.17 - 0.24	0.21 - 0.31	0.28 - 0.38
Cultivated land without conservation treatments		0.56 - 0.62	0.58 - 0.65	0.62 - 0.70	0.67 - 0.75
Wood or Forested Land:					
Flat Slope (0 to 1%)		0.01 - 0.04	0.02 - 0.07	0.06 - 0.11	0.10 - 0.15
Average Slope (2 to 7%)		0.04 - 0.09	0.07 - 0.12	0.11 - 0.16	0.15 - 0.20
Steep Slope (>8%)		0.09 - 0.14	0.12 - 0.17	0.16 - 0.21	0.20 - 0.28

Source:

NRCS (SCS), Second Edition, June 1986

The storm duration used for determining the rainfall intensity for a particular design storm return period shall be the watershed's time of concentration at the point where the design flow is being computed. When using the Modified Rational Method, the applicant shall compute a new time of concentration at each location where a design flow is required.

Rainfall Intensity (I): The variable "I" is the rainfall intensity, in inches per hour, applied to the watershed area for a given design storm return period. When using the Rational Formula, the intensity shall be determined using the Intensity - Duration - Frequency Appendix Table A.10.2.

Area (A): The variable "A" is the watershed area, in acres, for which the peak runoff rate is to be determined. This value must include all drainage area contributing runoff to the point of calculation, both on-site and upstream of the site.

B. The NRCS Curve Number Runoff Estimation Method

The NRCS Curve Number (CN) Runoff Estimation Method developed can be used to determine peak runoff rate and shall be used when:

- The total watershed area tributary to the design point is greater than 20 acres (may also be used for watersheds less than 20 acres)
- Analysis of upstream and downstream stormwater facilities is required
- Specifically requested by the City

The CN method uses the HSG, cover type, rainfall depth, and the soil moisture to estimate runoff volumes.

Drainage Area and Curve Number Estimation: Field surveys and topographic maps can be used to determine the drainage area. Larger drainage areas must be sub-divided into sub-drainage areas such that changes in land use and soil are adequately captured. Soil types in the drainage area must be identified using available soil surveys described in Section 10.3.7. Runoff curve numbers vary with the intensity and duration of rainfall, total rainfall depth, cover density, stage of growth, and temperature. These causes of variability are collectively called the Antecedent Runoff Condition (ARC). ARC II describes average conditions, while I and III describe dry and wetter conditions. Average ARC is recommended for most hydrologic analysis, and ARC III is used for the design of dams or locations where a high water table is noted. Table 10-3-7 presents curve numbers for different ground cover and HSGs under average runoff conditions. If ARC I or ARC III conditions are requested for design, Table 10-1 in USDA, NRCS, NEH-4, July 2004 for curve numbers shall be referenced. Where distinctive and varying land features are identifiable, or where a site contains more than one HSG, a weighted CN shall be used for the watershed. Large areas should be separated into subareas, based upon common soil and ground cover characteristics. The percentages of each ground cover and soil type should then be applied to determine the net weighted CN.

Table 10-3-7: SCS Runoff Curve Numbers¹

Ground Cover Description		Curve Number			
Cover Type and Hydrologic Condition	Avg. % Impervious Area ²	A	B	C	D
Lawns, Open Space, Parks, Golf Courses, Cemeteries, etc. ³ :					
Good Condition (75% or more grass coverage)		39	61	74	80
Fair Condition (50% to 75% grass coverage)		49	69	79	84
Poor Condition (<50% grass coverage)		68	79	86	89
Parking Lots, Roofs, and Driveways		98	98	98	98
Streets and Roads:					
Paved w/curbs & storm sewers excl. ROW		98	98	98	98
Gravel including ROW		76	85	89	91
Dirt including ROW		72	82	87	89
Paved w/open ditches including ROW		83	89	92	93
Commercial and Business Areas	85	89	92	94	95
Industrial and Manufacturing Districts	72	81	88	91	93
Residential:					
1/8 acre lot or less, Apartments, and Townhomes	65	77	85	90	92
1/4 acre lot	38	61	75	83	87
1/3 acre lot	30	57	72	81	86
1/2 acre lot	25	54	70	80	85
1 acre lot	20	51	68	79	84
2 acre lot	12	46	65	77	82
Developing Areas:					
Newly-graded without vegetation or control measures		77	86	91	94
Newly-graded with established erosion control measures		74	83	88	90

Source:

NRCS (SCS), TR-55,
Second Edition, June
1986

Table 10-3-7: SCS Runoff Curve Numbers¹ (continued)

Ground Cover Description		Curve Number			
Cover Type and Hydrologic Condition	Avg. % Impervious Area ²	A	B	C	D
Agricultural Land Uses:					
Pasture or Range Land:					
Good Condition (<i>protected from grazing</i>)		39	61	74	80
Fair Condition (<i>some grazing, mowed for hay</i>)		49	69	79	84
Poor Condition (<i>used for grazing</i>)		68	79	86	89
Cultivated land with conservation treatments		62	71	78	81
Cultivated land without conservation treatments		72	81	88	91
Wood or Forested Land:					
Mature stand with good cover		25	55	70	77
Mixed specimens with average cover		36	60	73	79
Thin stand with poor cover		45	66	77	83

Source:

NRCS (SCS), TR-55,
Second Edition, June
1986

1 Average runoff condition and $I_a = 0.2S$ (See below for equation definition)

2 The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: impervious areas are directly connected to the drainage system, and pervious areas are considered equivalent to open space in good hydrologic condition. CNs for other combination of conditions may be computed using methods specified in TR-55.

3 CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space

Rainfall-Runoff Rate Estimation: The NRCS runoff equation estimates total storm runoff from total storm rainfall. This rainfall-to-runoff relationship separates total rainfall into direct runoff, retention, and initial abstraction, yielding the following equation:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$$

Where:

Q	=	Volume of direct runoff (in)
P	=	Precipitation depth (in)
I_a	=	Initial Abstraction (in) (Incl. interception and existing depressional storage)
S	=	Potential Maximum retention after runoff begins (in)

I_a is approximated by the following empirical relationship:

$$I_a = 0.2S$$

Substituting the above relationship results in:

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

The maximum potential retention, S may be related to the curve number with the following equation:

$$S = \frac{1000}{(CN)} - 10$$

C. NRCS Graphical Method for Peak Discharge Estimation

Conventional SCS Methods can underestimate the volume and rate of runoff for rainfall events less than 2" and can lead to situations where a significant amount of runoff by-passes the filtering treatment practice due to an inadequately sized diversion structure or leads to the design of undersized grass channels. The following procedure is a variation of the methodology presented in TR-55 to calculate storm runoff volume, peak rate of discharges and hydrographs and is applicable to small storm events.

The direct runoff, WQ_v is calculated by the following equation:

$$WQ_R = 1.2" AQF_P$$

Computation using the NRCS graphical peak discharge method proceeds as follows:

1. The 24-hour rainfall depth P for the desired storm event is determined from Table E-1.
2. The runoff CN and runoff Q are calculated using the equation listed in the previous section.
3. The CN is used to determine the initial abstraction I_a from Table 10-3-8 and the ratio I_a/P is then computed.
4. The time of concentration is calculated as outlined in Section 10.3.5a.
5. The time of concentration and the ratio I_a/P are used to estimate the unit peak discharge for a Type II rainfall distribution using Figure 10-3-2.
6. The peak discharge is then computed using the equation listed below.

The peak discharge by the NRCS graphical method is calculated by the following equation:

$$q_p = q_u AQF_P$$

Where:

q _p	=	Peak Discharge (cfs)
q _u	=	Unit peak discharge (cfs/mi ² /in; also referred to as csm/in) (Figure 3-2)
Q	=	Runoff (in)
A	=	Drainage Area (mi ²)
F _p	=	Pond and Swamp Adjustment Factor (Table 10-3-9)

The accuracy of peak discharge computation by this method decreases if I_a/P values outside the range given in Figure 10-3-2 are used. Detailed information on limitations of this method is available in TR-55 and must be considered when this method is used.

Table 10-3-8: Initial Abstraction Values for Runoff Curve Numbers

Curve Number	I _a (in.)	Curve Number	I _a (in.)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247
60	1.333	90	0.222
61	1.279	91	0.198
62	1.226	92	0.174
63	1.175	93	0.151
64	1.125	94	0.128
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

Source:

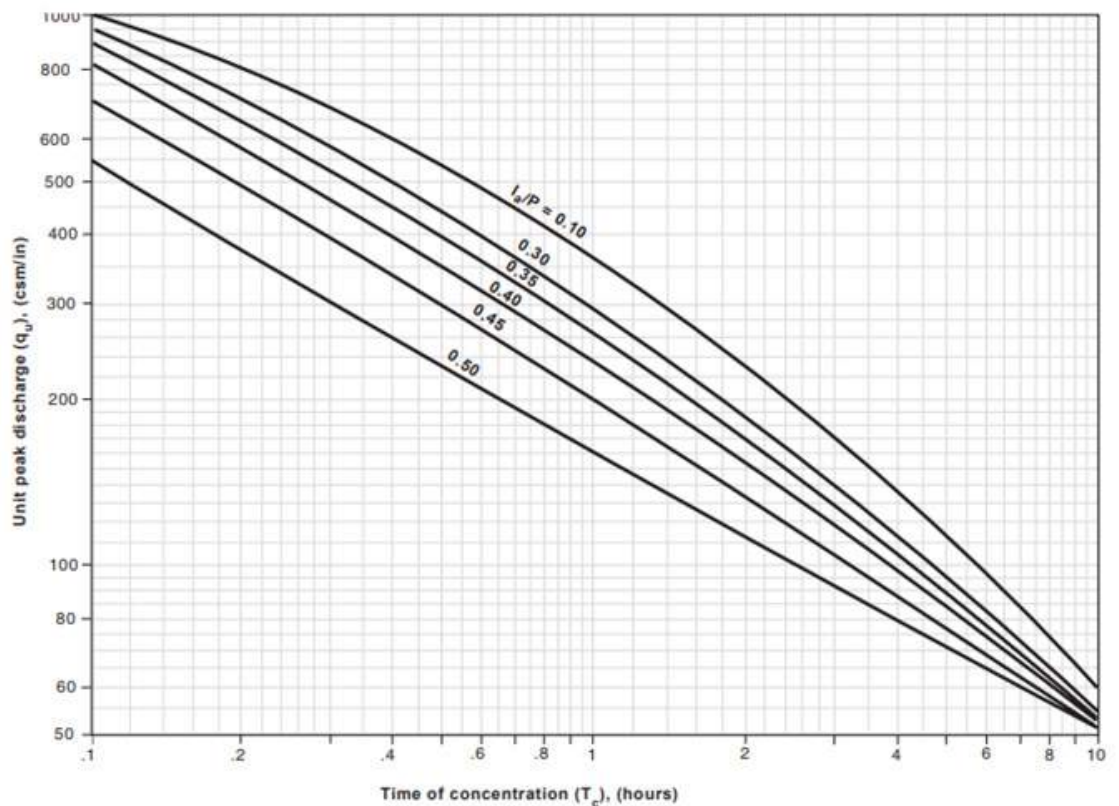
NRCS (SCS), TR-55,
Second Edition, June
1986

Table 10-3-9: Adjustment Factor (F_p) For Pond and Swamp Areas

Percentage of Pond and Swamp Areas	F_p
0	1.00
0.2	0.97
1.0	0.87
3.0	0.75
5.0	0.72

Source:

NRCS (SCS), TR-55,
Second Edition, June
1986

Figure 10-3-2: Unit Peak Discharge (q_u) for NRCS Type II Distribution

Source:

NRCS (SCS), TR-55,
Second Edition, June
1986

D. Runoff Hydrograph Development methods

Peak flow methods, including the Rational Method and the NRCS CN Runoff Estimation Method, alone are not appropriate for designing stormwater detention basins, evaluating downstream impacts in streams, and designing major conveyances with large drainage areas. In these cases, the City requires that a hydrograph be developed and routed through the system to support design and evaluation. Hydrograph methods may also be used to design other elements of the drainage system as part of a comprehensive hydrologic/hydraulic evaluation supported by computer models or other appropriate means. The peak flow calculations presented earlier in this section shall be used in designs in conjunction with hydrograph methods described in this section.

Several methodologies are available for defining runoff hydrographs and routing them through the drainage system. The City will accept the unit hydrograph methodology presented below or other equivalent methods that are supported by proper documentation and have a demonstrated record of successful application for drainage system design. Hydrograph methods available in commonly available engineering software such as NRCS TR-20, HEC-1 (HEC-HMS), SWMM, or similar software can be used for computation.

Rainfall Hyetographs and Abstractions from Rainfall: The rainfall hyetographs to be used in the runoff hydrograph methods shall utilize the 24-hour design storm volume based on the SCS Type-II distribution. Abstractions consist of interception (or surface wetting), existing depressional storage, and soil infiltration rate, which is based on the soil type and land cover characteristics of the drainage area. Abstractions shall be based on average antecedent runoff conditions (unless otherwise specified), and changes in abstraction must be tracked as available existing depressional storage and soil infiltration capacity is filled. The NRCS CN methodology presented in this section can be used for calculation of abstraction.

Unit Hydrographs: A unit hydrograph is the hydrograph of direct runoff that results from one inch of excess rainfall generated uniformly in a watershed over a defined time period. The NRCS curvilinear dimensionless unit hydrograph method was derived from many natural unit hydrographs from watersheds varying widely in size and geographical locations. Figure 10-3-3 shows the unit hydrograph and mass curve. The NRCS curvilinear method uses Table 10-3-10 along with the equations defined below to develop a unit runoff hydrograph from each drainage area. The procedure for developing the unit hydrograph is outlined below:

1. Estimate the time of concentration using method defined in Section 10.3.5a
2. Calculate the incremental duration of runoff producing rainfall using the equation:

$$\Delta D = 0.133 t_c$$

Where:

ΔD = Incremental duration of runoff producing rainfall (min)

t_c = Time of concentration (min)

3. Calculate the time to peak, t_p using the equation:

$$t_p = \frac{\Delta D}{2} + 0.66t_c$$

Where:

t_p = time to peak (min)

4. Calculate the peak flow rate, q_p using the equation:

$$q_p = \frac{K A Q_D}{t_p}$$

Where:

- q_p = Peak flow rate (cfs)
 K = Hydrograph shape factor, which ranges from 300 (flat swampy areas) to 600 (steep terrain). The NRCS standard value of 484 for the City shall be used unless another value is specifically approved by the City.
 A = Drainage area (mi²)
 Q_D = Volume of direct runoff (in)
 t_p = Time to peak (min)

5. List the hydrograph time, t , in increments of ΔD and calculate t/t_p ratio.
 6. Use Table 10-3-10 or Figure 10-3-3 to find the q/q_p ratio for the appropriate t/t_p ratio from the previous step
 7. Calculate the appropriate unit hydrograph ordinates by multiplying the q/q_p ratios by q_p
 8. Determine the volume under the unit hydrograph to ensure that it is equal to 1 inch

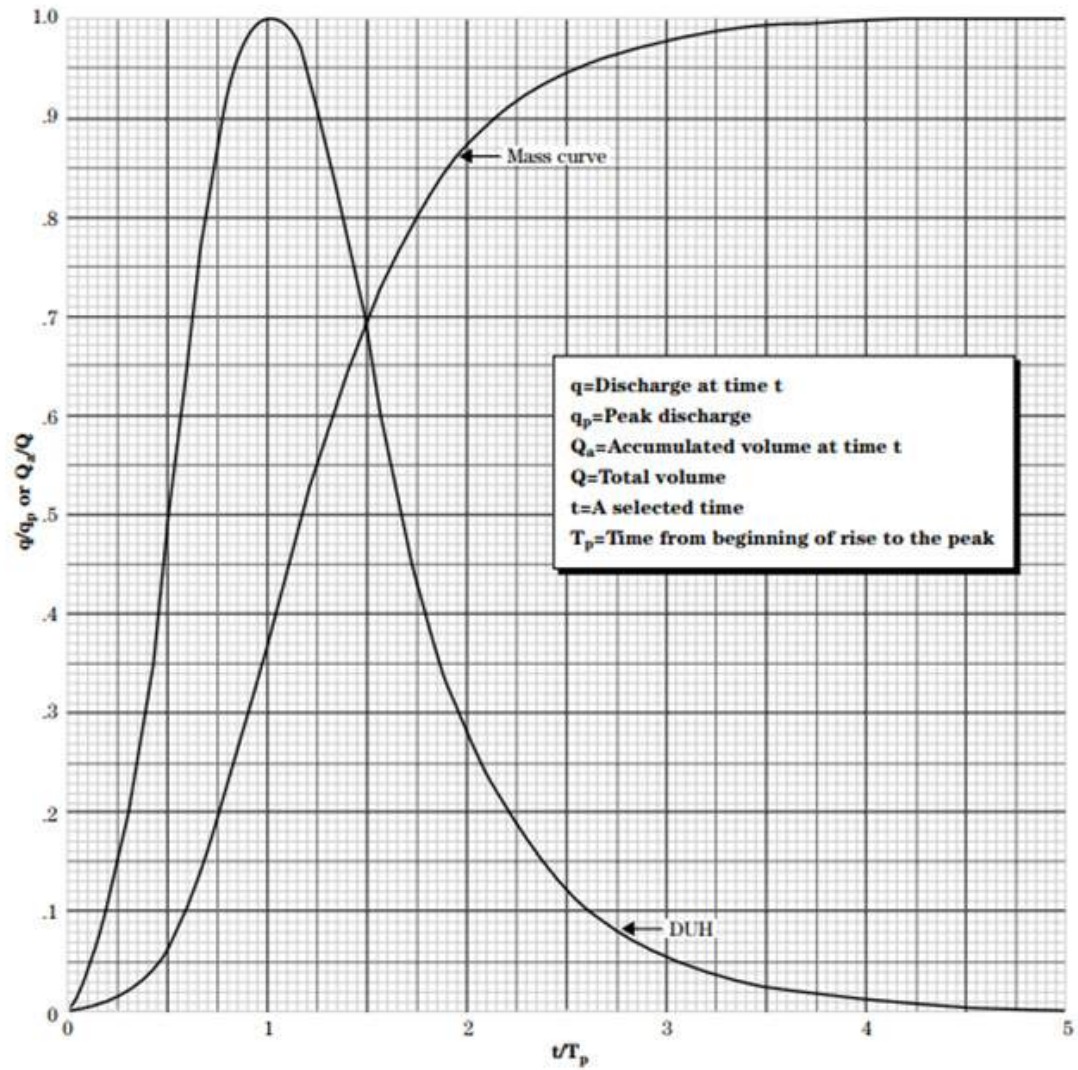
Table 10-3-10: Ratios for Dimensionless Unit Hydrograph and Mass Curve

Time Ratios	Discharge Ratios	Mass Curve Ratios	Time Ratios	Discharge Ratios	Mass Curve Ratios
(t/T_p)	(q/q_p)	(Q_a/Q)	(t/T_p)	(q/q_p)	(Q_a/Q)
0.0	0.000	0.000	1.7	0.460	0.790
0.1	0.030	0.001	1.8	0.390	0.822
0.2	0.100	0.006	1.9	0.330	0.849
0.3	0.190	0.017	2.0	0.280	0.871
0.4	0.310	0.035	2.2	0.207	0.908
0.5	0.470	0.065	2.4	0.147	0.934
0.6	0.660	0.107	2.6	0.107	0.953
0.7	0.820	0.163	2.8	0.077	0.967
0.8	0.930	0.228	3.0	0.055	0.977
0.9	0.990	0.300	3.2	0.040	0.984
1.0	1.000	0.375	3.4	0.029	0.989
1.1	0.990	0.450	3.6	0.021	0.993
1.2	0.930	0.522	3.8	0.015	0.995
1.3	0.860	0.589	4.0	0.011	0.997
1.4	0.780	0.650	4.5	0.005	0.999
1.5	0.680	0.705	5.0	0.000	1.000
1.6	0.560	0.751			

Source:

USDA, NRCS,
 National Engineering
 Handbook, Part 630,
 Chapter 16

Figure 10-3-3: Dimensionless Unit Hydrograph and Mass Curve



Source:

USDA, NRCS,
National Engineering
Handbook, Part 630,
Chapter 16

Hydrograph Development from Unit Hydrograph: The entire hydrograph can be developed from the unit hydrograph through the following steps:

1. Develop the unit hydrograph using procedure outlined in Section 10.3.8d.
2. Develop a design storm hyetograph using the time interval for which the unit hydrograph was developed
3. Develop a rainfall excess hyetograph
4. Route the rainfall excess hyetograph through the subject watershed by multiplying the ordinates of the unit hydrograph by the respective rainfall excess increments. Each increment of rainfall excess will produce a routed incremental hydrograph. The routed incremental hydrograph is delayed by the design storm interval.
5. Develop the runoff hydrograph by summing ordinate of each routed incremental hydrograph from Step 4 at each time interval of the hydrograph
6. Check to ensure the volume of the runoff hydrograph is equal to the volume of rainfall excess using the equation:

$$V = \frac{12 \Delta t \Sigma q_i}{A(43,560)}$$

10.4

Where:

V	=	Volume under the hydrograph (in)
Δt	=	Time increment of the runoff hydrograph ordinates (sec)
Σq_i	=	Sum of the runoff hydrograph ordinates (sec)
A	=	Drainage area (ac)

10.4 Hydraulics

10.4.1 Purpose

The purpose of this section is to outline the hydraulic requirements for the proper design and analysis of stormwater conveyance systems. Guidelines for the design of culverts, storm sewers, gutters, and open channels are presented herein and reflect the requirements for the design of new storm sewer systems in the City of Greenville.

10.4.2 Pipe Design Guidelines

Guidance for the proper design of lateral gravity flow conveyance systems is provided as follows:

Level-of-Service: Peak runoff calculation guidance is provided in 10.3.

Minimum Easement Widths:

Nominal Pipe Size (inches)	Trench Depth			
	4' and less	4' to 7'	7' to 10'	10' and greater
8 to 12	15'	15'	20'	25'
15 to 24	15'	20'	20'	25'
27 to 36	20'	20'	20'	25'

Materials: Reinforced Concrete Pipe (RCP) and high performance polypropylene (meeting AASHTO M330 / ASTM F2881) shall be used in the right-of-way. Smooth or corrugated High Density Polyethylene (HDPE) may be used outside of the right-of-way. Otherwise, pipe material shall conform to the requirements of the South Carolina Department of Transportation (SCDOT) Supplemental Technical Specifications for Permanent Pipe Culverts (2009), or most current publication. Other pipe material may be proposed and approved by the City.

Size: The minimum diameter for any storm sewer pipe shall be 15 inches with the exception of storm sewer serving any single parcel. For any system built within a public right-of-way, the minimum pipe size shall be 18 inches.

Manholes: Manholes are to be placed wherever a change in pipe size or lateral alignment is specified, wherever a significant change in grade is observed, and wherever an intersection of pipes is to occur. Additionally, manholes shall be placed along straight reaches at regular intervals of 300 feet. Based on stormwater delineations additional manholes may be needed and required due to inlet control. Manholes shall be designed such that head loss

through the structure is minimized. No blind boxes are permitted. All manholes shall meet the City's standard detail.

Slope and Velocity: Storm sewers shall provide sufficient slope to provide a scour velocity of at least 3 feet per second when flowing full. For the pipe sizes and materials permitted by the City of Greenville, the minimum design slopes to provide scour velocity are provided in Table 10-4-1. The minimum slope shall be 1% or as otherwise directed by the City. Decreased slopes will be considered only when there are significant adverse conditions as determined by the City. A summary of the slopes to achieve the maximum velocity is provided in Table 10-4-2.

Source:

*Adapted from
Georgetown County,
South Carolina Storm
Water Management
Design Manual, 2006.*

Table 10-4-1: Minimum Slope Required for Scouring Velocity

Pipe Size (inches)	RCP and Smooth HDPE Manning's $n=.013$ Slope (ft/ft)	Corrugated HDPE Manning's $n=0.024$ Slope (ft/ft)
12	0.0044	0.0149
15	0.0032	0.0111
18	0.0025	0.0087
24	0.0017	0.0059
30	0.0013	0.0044
36	0.0010	0.0034
42	0.0008	0.0028
48	0.0007	0.0023
54	0.0006	0.0020
60	0.0005	0.0017

Source:

*Adapted from
Georgetown County,
South Carolina Storm
Water Management
Design Manual, 2006.*

Table 10-4-2: Maximum Slope Allowed for Maximum Velocity in Storm Sewer¹

Pipe Size (inches)	RCP and Smooth HDPE Manning's $n=.013$ Slope (ft/ft)	Corrugated HDPE Manning's $n=0.024$ Slope (ft/ft)
12	0.1093	0.3727
15	0.0812	0.2768
18	0.0637	0.2170
24	0.0434	0.1479
30	0.0322	0.1098
36	0.0253	0.0861
42	0.0206	0.0701
48	0.0172	0.0587
54	0.0147	0.0502
60	0.0128	0.0436

¹ Maximum allowable velocity is 15 feet per second when flowing full.

Construction: In order to prevent damage to the storm sewer system after construction, a minimum of 1 foot of cover shall be provided above the top of the pipe at the bell. Pipe bedding shall conform to the requirements of the SCDOT Supplemental Technical Specifications for Permanent Pipe Culvert (September 2009).

A. Storm Sewer Calculations

Calculations to demonstrate conveyance capacity as well as computation of the hydraulic grade line are presented below.

Manning's Equation: Manning's equation shall be used to size storm sewer pipes for the design flow. A properly sized storm sewer pipe shall have a full-flow capacity equal to or greater than the peak runoff of the appropriate design storm.

$$Q_{max} = \frac{1.486 AR^{2/3} S_o^{1/2}}{n}$$

Where:

- Q_{max} = maximum flow in conduit (cfs)
- A = cross-sectional area of pipe (ft²)
- R = hydraulic radius (ft) = cross-sectional area of pipe (ft²)/wetted perimeter (ft)
- S_o = Slope (ft/ft)
- n = Manning's roughness coefficient (See Table 10-4-3)

Table 10-4-3: Manning's *n* Values for Storm Sewer, Culvert, Gutter, and Open Channel Flow¹

Description	n
Reinforced Concrete or Smooth HDPE Pipe	0.013
Corrugated HDPE Pipe	0.024
Gutters	
Concrete Pavement and Gutter	0.013
Asphalt Pavement and Gutter	0.016
Asphalt Pavement with Concrete Gutter	0.015
Brick	0.016
Open Channel	
Grass-lined	0.030
Concrete	0.013
Asphalt	0.016
Rip-Rap (D50 = 6 in.)	0.069
Rip-Rap (D50 = 12 in.)	0.078

¹ For further guidance in the selection of an appropriate Manning's *n*, refer to HEC-15 (referenced in Section 10.4.4a Materials), and (Arcement and Schneider, 1989).

Hydraulic Grade Line: The hydraulic grade line (HGL) is indicative of the anticipated water surface elevation in the storm sewer system. The storm sewer shall be designed such that the hydraulic grade at each manhole and inlet does not exceed grate elevation for the appropriate design storm.

In order to calculate the HGL, the tailwater elevation at the outlet of the storm sewer needs to be determined from hydraulic modeling or empirical observations (i.e., FEMA Flood Insurance Study). The sum of major and minor head losses in the storm sewer system is added to the tailwater elevation to estimate the water surface elevation in an upstream junction.

Major Losses: Major losses are defined as the head losses due to friction in the pipe. Major losses can be calculated from the following modification to Manning's Equation.

$$H_{major} = \frac{Q^2 n^2 L}{2.208 A^2 R^{4/3}}$$

Where:

H_{major}	=	Major head loss due to friction (ft)
Q	=	Design flow (cfs)
n	=	Manning's roughness coefficient
L	=	Length of pipe (ft)
A	=	Cross-sectional area of pipe (ft ²)
R	=	Hydraulic radius (ft)

Minor Losses: Minor losses are defined as head losses incurred through local disturbances, such as fittings, manholes, bends, inlets and outlets. There may be several individual minor losses along a segment of storm sewer; these minor losses need to be individually calculated and summed and added to the major losses to calculate the hydraulic grade line.

$$H_{minor} = \sum \frac{K_i V^2 L}{2 g}$$

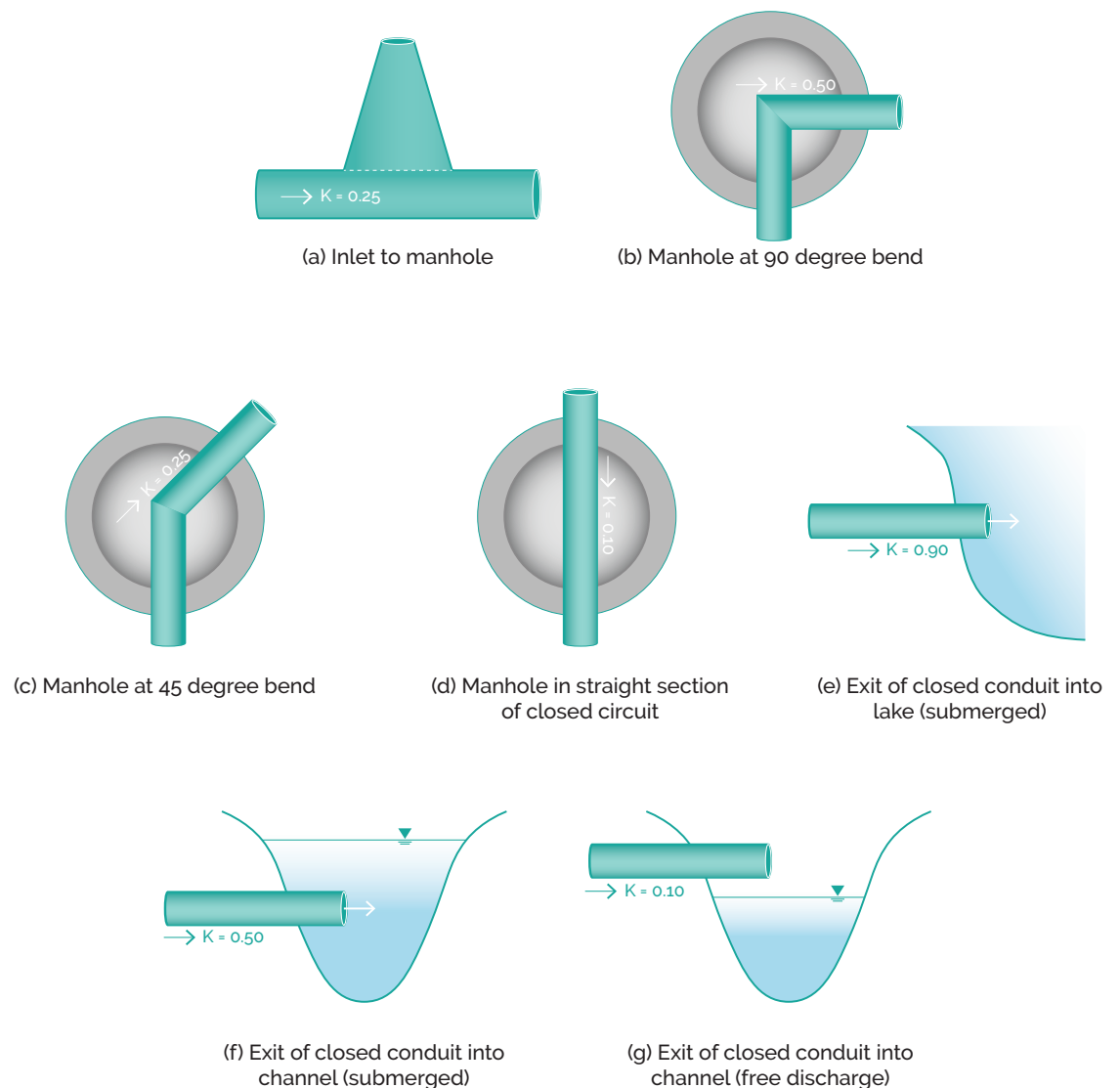
Where:

H_{minor}	=	Minor head loss (ft)
K_i	=	Minor loss coefficient for specific fitting (See Table 10-4-4 and Figure 10-4-1)
V	=	Velocity (ft/sec)
g	=	Acceleration due to gravity = 32.2 ft/sec ²

Table 10-4-4: Minor Loss Coefficients

Type/Description of Structure	Coefficient K
(a) Inlet to manhole	0.25
(b) Manhole in straight section of closed conduit	0.10
(c) Manhole at 45 degree bend	0.25
(d) Manhole at 90 degree bend	0.50
(e) Exit of closed conduit into lake (submerged)	0.90
(f) Exit of closed conduit into open channel (submerged)	0.50
(g) Exit of closed conduit into open channel (free discharge)	0.10

Computer-Based Numerical Models: Many well-documented computer-based numerical models can simulate the hydraulics of storm sewer systems. Models can be used in addition to or in lieu of the calculations listed above, but are not limited to those presented in the SCDOT Requirements for Hydraulic Design Studies (May 2009).

Figure 10-4-1. Structure Schematics for Minor Loss Coefficients

B. Gutter and Inlet Design

Gutters and inlets comprise the collection component of the storm sewer systems. Provided in this section are guidelines and requirements for the proper design of the storm water collection system, within the public or private street system.

Level-of-Service: Curb-and-gutter systems and inlets shall be designed to accommodate the peak runoff from the appropriate design storm for the particular road classification as defined in Section 10.4.2.

Spread Requirements: Spread is defined as the flow width in the triangular channel formed by a curb, gutter, and roadway. The larger the spread value, the wider the flow channel and hence the greater the encroachment into the roadway. Gutters and inlets shall be designed such that encroachment does not reduce the clear width of the travel lane below 8 feet in the design storm. For example, for a road with 10 foot travel lane, spread would be permitted up to 2 feet inside the travel lane. Encroachment is permitted within bicycle lanes and street parking.

Flow Depth: The collection system shall be designed such that gutter and inlet flow depth does not exceed 5 inches (1 inch below top of curb) for the appropriate design storm.

Gutter Flow: Spread can be calculated using the following modification of Manning's Equation for flow in a triangular gutter.

$$T = \frac{Q^{0.375} n^{0.375}}{0.80 S_x^{0.625} S_L^{0.187}}$$

Where:

T	=	Spread, or width of flow (ft)
Q	=	Design flow (cfs)
n	=	Manning's roughness coefficient (See Table 10-4-3)
S_x	=	Pavement cross-slope (ft/ft)
S_L	=	Gutter longitudinal slope (ft/ft)

Depth of flow in a triangular gutter can be calculated as follows.

$$D = T S_x$$

Where:

D	=	Depth of flow (ft)
T	=	Spread (ft)

Inlet Spacing: Inlets should generally be spaced as to satisfy the spread requirements described in Section 10.4.2b. Spread Requirements. Furthermore, the following should be considered when placing inlets:

- Inlets shall be placed such that the maximum drainage area to a single inlet is no greater than one acre.
- Inlets shall be placed at all sag locations.
- Inlets shall be placed at an intersection of any street if runoff would cross any leg of the intersection.

- Inlets shall be placed at non-single family residential drive cuts when deemed necessary by the City Engineer or designee to significantly reduce runoff from the drive from entering the public right of way.
- Inlets shall be placed immediately upstream of pedestrian walkways and handicap ramps and shall be designed so that maximum spread produces less than 1 inch water depth in front of walkway.

Inlet Capacity: The flow capacity of an inlet can be calculated using weir and orifice flow equations and is dependent on the depth of water over the grate. The designer shall assume weir flow for depth above the grate of less than 3 inches.

The inlet capacity can be calculated as follows:

$$Q = 2.6 P D^{1.5}$$

Where:

Q	=	Flow into inlet (cfs)
P	=	Perimeter of inlet (ft)
D	=	Depth of water over grate (ft)

The designer shall assume orifice flow for depth above the grate of greater than 3 inches. Inlet capacity can also be calculated assuming orifice flow, as shown below.

$$Q = 4.81 A D^{0.5}$$

Where:

Q	=	Flow into inlet (cfs)
A	=	Net open area of grate (ft ²)
D	=	Depth of water over grate (ft)

10.4.3 Culvert Design

Presented in this section are the requirements and calculations for the design and analysis of culverts, which are defined as structures conveying stormwater under roadways, railroads, and other public rights-of-way.

A. Culvert Design Guidelines

Level-of-Service:

- For minor roads and residential streets, the culvert shall be designed to convey the peak runoff from the 25-year design storm.
- To satisfy level-of-service requirements, the culvert must be designed such that the headwater associated with the design flow is at least 1 foot below the top of road subgrade.
- Additionally, the culvert must be designed such that the 100-year maximum headwater is 2 feet below the finished floor elevation of the nearest existing or proposed permanent building.

Materials: Reinforced Concrete Pipe (RCP) and high performance polypropylene (meeting AASHTO M330 / ASTM F2881) shall be used in the right-of-way. Smooth or corrugated High Density Polyethylene (HDPE) may be used outside of the right-of-way. Otherwise, pipe material shall conform to the requirements of the South

Carolina Department of Transportation (SCDOT) Supplemental Technical Specifications for Permanent Pipe Culverts (SC-M-714, September 2009) Other pipe material may be proposed and approved by the City.

Size: The minimum diameter for all culverts shall be 18 inches.

Slope and Velocity: Culverts shall provide sufficient slope to provide a scour velocity of at least 3 feet per second when flowing full. For the pipe sizes and materials permitted by the City, the minimum design slopes to provide scour velocity are provided in Table 10-4-1.

Construction: For culverts installed outside of the public right of way, a minimum of 1 foot of cover (or the minimum manufacturer suggested cover, whichever is greater) shall be provided above the top of the pipe. Culverts within the public right of way must accommodate the 24-inch cover requirement of "Sec. 36-105. - Depth of facilities installed under street or sidewalk" of the Development Code.

B. Culvert Design Calculations

Culvert analysis requires calculations beyond Manning's Equation to determine the headwater conditions associated with the design flow. Two sets of calculations shall be performed to determine whether the culvert is inlet-controlled or outlet-controlled, and the larger of the calculated headwater elevations governs flow domain.

Inlet and outlet control calculations shall be performed using the nomograph method provided in the Federal Highway Administration (FHWA) Hydraulic Design Series Number 5 (<https://www.fhwa.dot.gov/engineering/hydraulics/pubs/12026/hif12026.pdf>).

10.4.4 Open Channel Design

Open channels may be used in stormwater conveyance systems and shall adhere to the guidelines summarized herein.

A. Open Channel Design Guidelines

Level-of-Service:

- Ditches and swales specifically designed for roadway drainage shall conform to the level-of-service guidelines, previously specified in Section 10.4.2. Level of Service, for road classification.
- All other open channel systems shall be designed to convey the peak flow from the 10-year design storm.
- To satisfy level-of-service requirements, the open channel shall be designed such that six inches of freeboard below top of bank are maintained for the design flow.

Materials: All open channels are to be vegetated with grasses well adapted to the climate of Zone 7b, South Carolina. Channels that are expected to receive high flows or are to be placed on a steep grade will likely require flexible or rigid linings to prevent channel erosion. Lining materials may include, but are not limited to, rock rip-rap, erosion control matting, geogrids, or concrete; however, vegetated channels are preferred where feasible. Further guidance on the selection of channel material may be found in Hydraulic Engineering Circular 15 (FHWA, 2005).

Slope and Velocity Considerations: In order to prevent insect nuisances and other issues associated with persistent standing water, the open channel shall be designed with a minimum slope of 0.50%, unless the designer can provide supporting calculations to demonstrate that no standing water will remain in the channel longer than 72 hours after a storm.

Maximum allowable velocity in an open channel is dependent on the lining material. Open channels shall be designed such that the velocity associated with the design flow does not exceed the maximum recommended velocity for the selected channel liner. Refer to HEC-11 and HEC-15 referenced above, as well as Table 10-4-5 for further guidance on determining maximum allowable velocity.

Table 10-4-5: Maximum Allowable Velocities for Vegetated Channels

Vegetation Type ¹	Slope = 0-5%	Slope = 5-10%
Bermuda Grass	6	5
General Mixed Grasses	4	3
Tall Fescue Grass	4	4
Kentucky Bluegrass	5	4
Buffalo Grass	5	4
Sod	4	4
Big Bluestem	4	4
Red Fescue	4	4
Redtop (<i>argustas alba</i>)	4	4
Switch Grass (<i>panicum</i>)	4	4

¹ For water quality efficiencies refer to 10.6.

² Matting recommendation: RoLanka International, Inc. BioD-StrawCoCo™ or equal

Geometry: Trapezoidal and parabolic cross-sectional geometries are preferred. Side slopes shall not exceed 3H:1V for grass-lined channels. Rock-lined or paved channels shall not exceed side slopes of 1.5H:1V. Paved channels shall be considered 100% impervious for calculation purposes.

B. Open Channel Design Calculations

Manning's Equation: Manning's equation shall be used to size open channels for the design flow. The designer must demonstrate that the channel geometry, incorporating the 6-inch freeboard requirement, can convey a maximum flow equal to or greater than the design flow.

Please refer to Section 10.4.2a. Manning's Equation and Table 10-4-3 for further information on Manning's Equation and roughness coefficients, respectively.

Channel Lining: The FHWA Hydraulic Toolbox, Version 4.2 software package (<http://www.fhwa.dot.gov/engineering/hydraulics/software/toolbox404.cfm>) uses the guidelines and equations included in HEC-11 and HEC-15 to provide quantitative support for the selection of a channel liner. The designer shall use this program in conjunction with HEC-

11 and HEC-15 guidance to demonstrate that the selected liner can withstand the shear stresses associated with the design flow. Other proprietary software may be submitted with appropriate documentation.

10.4.5 Pond Outlet Structure Routing

Stage-area curves or tables shall be generated for all ponds (wet or dry) that are proposed for detention and shall be used to calculate the peak depth in the pond for all required storm events (Table 10-2-1). Stage-discharge routing calculations shall be performed on all proposed pond outlet structures to demonstrate that they meet the required release rates for the water quality volume and peak shaving.

Outlet structures may include multiple levels and combinations of weirs and/or orifices to control release rates of various storm events. Stage-discharge routing calculations shall be prepared and presented for each component of the outlet structure using the weir and orifice equations. Routing calculations for complex outlet structures (those incorporating more than one weir or orifice) shall be performed in a spreadsheet format or modeling software.

A. Weir Flow Equations

The two most common types of weirs found in an outlet riser are broad-crested and V-notch weirs. Equations for calculating flow through these weirs are provided below:

Broad-Crested Weir:

$$Q = CLH^{1.5}$$

Where:

Q	=	Flow through weir (cfs)
C	=	Weir coefficient (typically 3.0 – 3.2)
L	=	Length of crest (ft)
H	=	Height of water above crest (ft)

V-Notch Weir:

$$Q = 2.5 \tan(\theta/2) H^{2.5}$$

Where:

Q	=	Flow through weir (cfs)
θ	=	Angle of V-notch (degrees)
H	=	Height of water above crest (ft)

B. Orifice Flow Equations

Orifices are most commonly rectangular or circular in shape. Orifice flow is dependent on the head above the centroid of the orifice opening and the orifice edge treatment.

$$Q = C' a(2gH)^{0.5}$$

Where:

Q	=	Flow through orifice (cfs)
C'	=	Orifice coefficient: 0.60 for sharp-edged orifices, where the material thickness is less than the orifice diameter; 0.82 where material thickness is greater than the orifice diameter, or 0.92 where orifice edges are rounded
a	=	Area of opening (ft ²)
g	=	Acceleration due to gravity = 32.2 ft/sec ²
H	=	Height of water above centroid of orifice opening (ft)

10.5

10.5 DETENTION REQUIREMENTS

10.5.1 Introduction

The purpose of this section is to define the operational and physical requirements for storage facilities to control peak runoff rates and associated impacts caused by land altering activities. Where feasible, on-site depressional storage shall be incorporated in the design of the proposed best management practice (BMP). Design guidelines are presented for the following BMPs for use in the City of Greenville however other detention methods may be considered:

- Dry Detention Basin
- Wet Detention Basin
- Underground Detention
- Bioretention

The dry detention basin and wet detention basin BMPs in many cases may also serve as water quality BMPs, and in that case may be referred to as multi-purpose basins. By the City's Stormwater Ordinance, on-stream detention is limited to detention only and is not to be designed for water quality treatment. Underground detention storage and parking lot storage BMPs may provide limited water quality benefit, particularly if detained water is released through infiltration into the soil. The detention benefits of these BMPs will be mainly considered in this Manual.

BEST MANAGEMENT
PRACTICE EXAMPLE

Dry Detention Basin

Source:
Susdrain



Figure 10-5-1. Typical Dry Detention Basin

10.5.2 Dry Detention Basin

A. Description

A dry detention basin is an impoundment formed by constructing a dam or embankment with an outlet structure to temporarily detain stormwater during and immediately following a storm event. Figure 10-5-1 presents an example of a typical dry detention basin. This BMP provides peak attenuation by regulating the outflow peak discharge and storing flood volumes within the detention basin. An emergency spillway is designed to pass peak flows from extreme flood events to protect the dam from damage due to overtopping.

B. Applicability

The applicability of a dry detention basin to a particular site generally depends on the topography, drainage area, space availability, and accessibility.

C. Planning Considerations

A single-stage dry detention basin is typically used for flood control, whereas, a two-stage dry detention basin (i.e., multi-purpose basin) can be sized to achieve both water quality and erosion/flood control benefits. Sizing criteria to achieve water quality control plus required erosion/flood control goals and/or policies must be considered in sizing the detention storage zone and outlet structure for multi-purpose basins. Appropriate security devices (i.e., fences, access gates with locks, etc.) may be required for public safety.

D. Design Criteria

The design criteria presented in the next section will be applicable regardless of whether the pond is a single purpose (detention only) or multi-purpose (detention plus water quality control) basin. Best design practices for BMPs that are not strictly quantity or attenuation only ponds, include creating large surface area basins with a minimum length/width ratio of 2L:1W or internal diversions that avoid short-circuiting pathways through the basin. Design criteria specific to the dry detention basin for water quality treatment are presented in 10.6.

Peak Flow Detention Storage Volume and Dimensions: Detention storage capacity shall be provided for the control of post-development peak runoff from the 2-, 10-, and 25-year, 24-hour storm events. An offsite downstream capacity analysis may be required by the administrator or designee when downstream flooding exists. The necessary storage capacity and peak release rate shall satisfy the peak runoff performance standard for the development site. An emergency spillway shall be designed to pass runoff from the basin's entire drainage area without damage to the impoundment structure. The design storm for the emergency spillway shall be the 100-year, 24-hour storm event. Additional guidance on flow control requirements is provided in 10.2.

Basin Side Slopes: The side slopes of the dry detention basin should be no steeper than 3H:1V in order to reduce erosion potential, minimize safety hazards, improve aesthetics, and facilitate maintenance access and activities. The City may approve steeper side slopes in cases where site constraints do not allow a 3H:1V slope. The City shall only approve steeper side slopes if additional stabilization measures such as staked-in-place sod, mat, or blanket are provided in combination with seeding. Side slopes shall be covered with a minimum of six inches of topsoil prior to placement of seed or sod. Seed application rate shall be sufficient to achieve a minimum 70% coverage per square yard.

Here is a list of recommended seed mixes for these systems.

- ERNMX-126 or equal
- ERNMX-183 or equal
- ERNMX-309 or equal
- Bermuda
- Fescue
- Big Bluestem
- Red Fescue
- Redtop (*Argostis alba*)
- Switch Grass (*Panicum*)

Matting recommendation: RoLanka International, Inc. BioD-StrawCoCo™ or equal

Low Flow Channel: The pond floor should have a minimum slope of 2% toward the outlet to ensure the detention basin fully drains between storm events. To prevent standing water conditions, a low flow channel should be provided to carry runoff from minor storms through the top stage to the bottom stage (two-stage design) or through the upper end of the extended detention zone to the outlet works (single stage design). For a two-stage design, erosion protection should be provided at the location where the low flow channel discharges into the bottom stage. An underdrain may be substituted in lieu of a low flow channel.

Embankment Cross-Section:

- 1 Minimum Top Width: The embankment shall have a minimum top width of five feet.
- 2 Side Slopes: The embankment shall have side slopes no steeper than 3H:1V, and shall be planted with turf-forming grasses. The City may approve steeper side slopes in cases where site constraints do not allow a 3H:1V slope. The City shall only approve steeper side slopes if additional stabilization, such as staked-in-place sod,

mat, flexible growth medium, or blanket, is provided in combination with seeding.

- 3 Freeboard: The elevation of the water surface in the basin with the emergency spillway flowing at design depth shall be at least one foot below the minimum elevation at the top of the settled embankment.

Outlet Structure(s):

- 1 Water Quality Outlet: The dry detention basin shall include a water quality outlet, or extended dry detention outlet.
- 2 Peak-Attenuating Outlet: The dry detention basin shall include an outlet to release stormwater discharges that satisfy the peak attenuation requirements specified by the City. This outlet structure shall consist of a vertical riser pipe or box joined by a watertight connection to a horizontal pipe (barrel) extending through the embankment and discharging beyond the downstream toe of the fill. The design elevation(s) of the peak-shaving outlet(s) shall be set at the elevation(s) required to satisfy the peak-shaving performance standards. Exit velocity should not exceed 12 ft/s.
- 3 Base: The base of the riser and the peak-shaving riser shall be firmly anchored to prevent flotation and is recommended to perform the appropriate calculations.
- 4 Anti-Vortex Device/Trash Rack: An anti-vortex device and trash rack shall be attached to the top of the peak-shaving riser pipe or box to improve the flow of water into the riser or box and to prevent floating debris from being carried out of the detention basin.
- 5 Anti-Seep Collars: Seepage control or anti-seep collars shall be provided for all outlet pipes.

Emergency Spillway: Each dry detention basin shall be provided with an emergency spillway designed to pass runoff from the basin's entire drainage area (i.e., including off-site areas) produced by the 100-year, 24-hour storm event. Earthen emergency spillways should have a trapezoidal cross-section and designed for non-erosive velocities. The spillway should be constructed in such a manner as to prevent the discharge through the spillway from having a negative effect on the toe of the dam or principal embankment structure. It is preferred that the emergency spillway not be located in the fill section of the pond berm.

Inflow/Outflow: At points of inflow to the dry detention basin, energy dissipaters such as riprap must be used to reduce the flow velocity. The outflow channel below the horizontal pipe outfall must be designed to protect against erosion and scour from high velocities and turbulence. Riprap or approved equal should be provided at the points of discharge as necessary. These should be provided at a sufficient vertical angle so as to inhibit clogging. Bar spacing on all racks shall be designed to consider the diameters of inlet and outlet piping.

Forebay: A sediment forebay is preferred and can be located near the inlet to the dry detention basin to trap coarse sediment particles, trash, and debris in stormwater discharges. The deposition of sediment near the inlet will reduce the frequency of required sediment clean-outs within the main basin, although major clean-outs will still be required per the maintenance plan. Where feasible, the forebay storage capacity should be at least 20% of the water quality volume to accommodate sediment accumulations over approximately a 15 to 20-year period.

E. Maintenance

In order to provide effective stormwater pollution control on a continuing basis, periodic maintenance of a dry detention basin is necessary. Maintenance schedules should be modified to be site specific. Maintenance requirements can be classified into two categories:

Routine Maintenance: This involves preventive tasks that are performed on a regular basis during the year to preserve the aesthetic quality and operational effectiveness of the basin. Examples are periodic site inspections, grass mowing, debris and trash removal, clearing around the extended detention outlet structure to prevent clogging, bank stabilization, weed control, insect or mosquito control, and fence repair. At a minimum, the site should be inspected annually to assess damage, sediment accumulation, and ensure proper operation. The remaining tasks listed above should be completed on a frequency basis recommended by the South Carolina DHEC Storm Water Management BMP Handbook or as stipulated by a executed stormwater maintenance agreement. Records shall be kept to identify the dates and maintenance performed and shall be made available to the City at the City's request.

Because debris/trash and sediment tend to accumulate within visible sections of the dry detention basin, this BMP will typically require more frequent routine maintenance to maintain the aesthetic quality of the basin.

Non-Routine Maintenance: This involves tasks that are performed once every specified number of years to correct problems, which might reduce the basin's structural integrity or effectiveness. Examples of structural repairs, which may be required at 10 to 15 year intervals on average, include the replacement of outlet structures and endwalls. Major clean-outs are intended to maintain the peak shaving storage capacity, and also to eliminate the build-up of accumulated sediments and debris, which might significantly detract from the basin's appearance. Clean-out operations typically include material removal, stabilization of the detention basin, and off-site hauling for sediment disposal.

A dry detention basin shall be evaluated every two years to assess the need for a major clean-out. If more than 25% of the design volume has been depleted by sediment accumulation, then a major clean-out should be performed.

BEST MANAGEMENT
PRACTICE EXAMPLE

Wet Detention Basin

Source:

South Carolina DHEC
Storm Water Manage-
ment BMP Handbook.



Figure 10-5-2. Typical Wet Detention Basin

10.5.3 Wet Detention Basin

A. Description

A wet detention basin is an impoundment formed by constructing a dam or embankment, or by a combination of excavation and an embankment, with an outlet structure to maintain a permanent pool and regulate the outflow of upstream stormwater discharges. In the general literature and State/Federal regulations for stormwater pollution control, a wet detention basin BMP is also sometimes referred to as a "wet pond" or a "retention basin."

Figure 10-5-2 presents an example of a typical wet detention basin. The permanent pool is maintained to provide stormwater pollution control benefits. Wet detention basins provide peak attenuation (i.e., reductions in peak runoff flows from upstream areas) by regulating the outflow peak discharge and temporarily storing excess flow volumes above the permanent pool storage zone. An emergency spillway is required to pass 100 year flood events to protect the embankment from damage due to overtopping.

B. Applicability

A wet detention basin is an appropriate detention BMP option for both residential and non-residential development. This BMP is restricted to sites with a minimum drainage area of 10 acres, since dry weather flow is required to minimize the drawdown of the permanent pool during extended dry periods.

The applicability of a wet detention basin to a particular site will depend on topography, drainage area (e.g., 10 acre minimum), soil conditions, wetlands constraints, space availability, and accessibility. Where possible, wet detention basins should conform to the existing topography with a minimal amount of excavation required. Soils should not be highly permeable to facilitate maintenance of a permanent pool. Consideration should also be given to the depth to bedrock, to the location of existing underground utilities, and to minimizing impacts on low marshy areas where wetland permits may be required. New wet detention basins may be restricted within a one-mile radius of an airport property.

C. Planning Considerations

Wet detention basins can provide both water quality and erosion/flood control benefits. Permanent pool sizing criteria to achieve required water quality control are presented below. Erosion and flood control goals and/or policies must also be considered in sizing the detention storage zone and outlet structure for multi-purpose basins.

D. Design Criteria

The design criteria presented in the next section will be applicable regardless of whether the pond is a single purpose (detention only) or multi-purpose (detention plus water quality control) pond. Design criteria specific to a wet detention basin for water quality treatment are presented in 10.6.

Peak Flow Control Storage: Storage capacity shall be provided above the wet detention basin's permanent pool for the control of post-development peak runoff from the 2-, 10-, and 25-year, 24-hour storm events. The necessary storage capacity and peak release rate shall satisfy the peak runoff performance standard for the development site. An emergency spillway shall be designed to pass runoff from the basin's entire drainage area without damage to the impoundment structure. The design storm for the emergency spillway design shall be the 100-year, 24-hour storm event. Additional guidance on flow control requirements is provided in 10.2.

Embankment Cross-Section:

- 1 Minimum Top Width: The embankment shall have a minimum top width of eight feet.
- 2 Side Slopes: The embankment shall have side slopes no steeper than 3H:1V, and be planted with turf forming grasses listed in Appendix PL 1.0. The City may approve steeper side slopes in cases where site constraints do not allow a 4H:1V slope. The City shall only approve steeper side slopes if additional stabilization, such as staked-in-place sod, mat, or blanket, is provided in combination with seeding.
- 3 Freeboard: The elevation of the water surface in the basin with the emergency spillway flowing at design depth shall be at least one foot below the minimum elevation at the top of the settled embankment.

Outlet:

- 1 Outlet Structures: The outlet shall consist of a solid (non-perforated), vertical riser pipe or box of reinforced concrete joined by a watertight connection to a horizontal pipe (barrel) extending through the embankment and out letting beyond the downstream toe of the fill.
- 2 Crest Elevation: The crest of the outlet riser shall be set at the elevation required to maintain the permanent pool storage capacity specified herein.
- 3 Flow Capacity: The capacity of the outlet riser/horizontal pipe shall be based upon the performance standard for post-development peak runoff specified by the City.
- 4 Base: The base of the outlet riser shall be firmly anchored to prevent floatation.
- 5 Anti-Vortex Device/Trash Rack: An anti-vortex device and trash rack shall be attached to the top of the outlet riser to improve the flow of water into the riser and to prevent floating debris from being carried out of the basin.
- 6 Anti-Seep Collars: Seepage control or anti-seep collars shall be provided for all outlet pipes.
- 7 Drain Pipe: A pipe with a suitable valve shall be provided to completely drain the permanent pool for maintenance or pump out option must be accommodated.

Emergency Spillway: Each wet detention basin shall be provided with an emergency spillway designed to pass runoff from the basin's entire drainage area (i.e., including off-site areas) without damage to the impoundment structure. The design storm for the emergency spillway design shall be the 100-year, 24-hour storm event. Earthen emergency spillways should have a trapezoidal cross-section and designed for non-erosive velocities. The spillway should be constructed to prevent the discharge through the spillway from impinging on the toe of the dam or principal embankment structure. The 100-year water surface elevation shall be designed at a minimum of one foot below the top of the embankment.

Inflow/Outflow: At points of inflow to the wet detention basin, energy dissipaters such as riprap should be used to reduce the flow velocity. The outflow channel below the horizontal pipe outfall should be designed to protect against erosion and scour from high velocities and turbulence. Riprap should be provided at the points of discharge, as necessary.

Forebay: To provide pre-treatment and facilitate major clean-out activities, a sediment forebay should be located upstream near the inlet to the permanent pool (space permitting) to trap coarse sediment particles as well as some of the trash and debris in stormwater discharges. The forebay storage capacity should be 10% of the permanent pool storage volume to accommodate sediment accumulations over approximately a 20-year period. Access for mechanized equipment should be provided to permit the removal of sediment deposits during major facility clean-outs. Exit velocities from the forebay must be non-erosive. The bottom of the forebay may be hardened (e.g., concrete, paver blocks, etc.) to facilitate sediment removal. A permanent vertical sediment depth measurement system must be installed in the forebay to measure sediment deposition over time. The system must be designed such that it remains intact during the forebay cleanings.

The forebay can be distinguished from the permanent pool by one of several means: a lateral sill with wetland vegetation listed in Appendix PL 1.0; two ponds in series; differential pool depth; rock-filled gabions or a retaining wall; or a horizontal rock filter placed laterally across the permanent pool.

Safety Shelf: Safety ledges must be constructed on the slopes of all wet detention with a permanent pool greater than 3 feet deep. Two ledges must be constructed, each 4 to 6 feet in width. The first or upper ledge must be located between 1 and 1.5 feet above the permanent pool level with plants listed in Appendix PL 2.0. The second or lower ledge must be located approximately 2.5 feet below the permanent pool level with plants listed in Appendix PL 3.0. Alternative safety designs shall be considered by the Administrator but the littoral zone requirements shall be met at a minimum.

Easement for Maintenance: Pond design should facilitate maintenance and emergency ingress and egress. All detention systems shall be located and described within a deed or plat restriction. Detention systems that service a single parcel of property may be excused from this requirement upon approval of the Administrator or designee. Modifications to a deed or plat restriction for the detention system shall be approved by the Administrator or designee.

The flat embankment around the basin should have a 5% slope to avoid ponding.

An additional easement shall be dedicated for access to the wet detention basin. This easement should have a 15% maximum slope and the slope for an access point into the facility should be 3H:1V or flatter and 8 feet wide. The Owner should retain easements

for maintenance and access if maintenance is to be performed by the Owner. If a wet detention basin is to be owned and maintained by a HOA, then the basin should be on its own parcel, not a single family lot.

Infiltration: Applicant shall perform infiltration calculations to determine whether or not native soil at the location of the proposed wet detention basin are suitable for maintaining a permanent pool, given the volume and frequency of flow coming into the basin as determined from supporting hydrologic calculations. Should the applicant determine that native soil conditions are unsuitable for maintaining a permanent pool, additional measures such as compaction or a liner will be required to limit infiltration.

E. Maintenance

In order to provide effective stormwater pollution control on a continuing basis, periodic maintenance of the wet detention basin is necessary. Maintenance schedules should be modified to be site specific. Maintenance requirements can be classified into two categories:

Routine Maintenance: This involves preventive tasks that are performed on some regular basis during the year and are intended to enhance the aesthetic quality of the facility. Examples are periodic site inspections, grass mowing, debris and invasive vegetation removal, bank stabilization, weed control, insect or mosquito control, fence repair, and record-keeping. At a minimum, the site should be inspected annually to assess damage, sediment accumulation, and ensure proper operation. The remaining maintenance tasks listed above should be completed on a frequency basis recommended by the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook. Records shall be kept to identify the dates and maintenance performed and shall be made available to the City at the City's request.

Non-Routine Maintenance: This involves tasks that are performed once every specified number of years to correct problems, which might reduce the pond's structural integrity or effectiveness. Examples of structural repairs, which may be required at 10 to 15 year intervals, on average, include the replacement of outlet pipes and endwalls. Major clean-out operations to remove accumulated sediment and debris are typically required once every 15 to 20 years. A major clean-out is intended to maintain the required pollution removal efficiency and eliminate the build-up of sediments. Clean-out operations typically include material removal from the forebay (after 50% of total forebay capacity is filled) and permanent pool, stabilization of the detention basin, and off-site hauling for sediment disposal. The permanent pool shall be evaluated every 5 to 10 years to assess the need for a major clean-out. The volume of the permanent pool shall be determined based on a bathymetric survey of the pond bottom and compared to the design pool volume. If more than 25% of the design pool volume has been filled by sediment accumulation, then a major clean-out shall be performed.

Replaced with "DES"

BEST MANAGEMENT
PRACTICE EXAMPLE**Underground
Detention**(Large Pipe and
Vault Systems)**Source:***Left: South Carolina
DHEC Stormwater
Management BMP
Handbook, 2005.**Right: Georgia
Stormwater
Management Manual,
2001.***Detention Requirements:**
Underground Detention
(Large Pipe and Vault Systems)*Figure 10-5-3. Typical Underground Large Pipe Detention System**Figure 10-5-4. Typical Underground Detention Vault***10.5.4 Underground Detention (Large Pipe and Vault Systems)****A. Description**

An underground detention system is an off-line stormwater detention alternative that directs stormwater to an underground system to be temporarily stored and then released at a regulated rate. Underground detention vaults are typically box-shaped storage basins constructed with reinforced concrete, whereas underground large pipe storage basins are made of pre-cast concrete, polyethylene, or fiberglass. These systems serve as an alternative to surface dry detention for stormwater quantity control at sites where making the most of aboveground space is essential.

Figures 10-5-3 and 10-5-4 show examples of an underground large pipe detention system and an underground vault system, respectively. Stormwater flows through catch basins in the drainage area and then into the detention system where it is stored. Underground detention can be designed as a flow-through system providing extended detention of channel protection volumes and peak flow control through normal detention.

B. Applicability

In no case shall permanent structures be constructed over an underground detention system. In addition, an underground detention system shall not receive water during construction, but rather only after the contributing area has been 70% stabilized.

Depending upon the material used and the manufacturer's recommendation, the pipe systems can be installed at shallow depths with as little as 1.5 to 2 feet of cover. A single pipe or vault detention system shall store the runoff from a tributary area no greater than 25 acres.

For shallow groundwater tables, it is recommended to use both a geotextile and a liner when installing large pipe systems to minimize the intrusion of groundwater into the system and maximize storage volume.

C. Planning Considerations

Evaluation of the soil's bearing capacity at the site should be performed to ensure that the soil can support the actual load of the pipe system material, load of the design storage volume of water, overburden load, and active load above ground. Providing proper pipe bedding as specified in 10.4 in addition to isolating it from the local soil with a geotextile may be necessary to meet the required bearing capacity.

For stormwater runoff that is expected to carry a significant amount of suspended solids, pre-treatment measures to remove suspended solids shall be implemented to reduce the level of maintenance required in the underground detention system. At a site where water quality treatment is to be provided, it should be located upstream of the underground detention system in a treatment train fashion.

In areas with high infiltration, an underground detention/infiltration system should also be considered given the added value of infiltration/treatment. These systems consist of either perforated pipes or open bottomed chambered systems. Any underground detention system designed to include infiltration must be at least 3 feet above the seasonal water table or an analysis showing that water mounding will be at least 1 foot below road subgrades and underground utility trenches.

D. Design Criteria

Detention Volume: Underground detention systems are sized to provide extended detention of the channel protection volume and temporarily store the volume of runoff for the 2-year through 25-year, 24-hr storm events, thereby reducing the post-development peak flow to the pre-development flow rate. Hydraulic calculations shall be required to demonstrate that sufficient detention volume is provided to comply with the release rates dictated by the pre-development conditions.

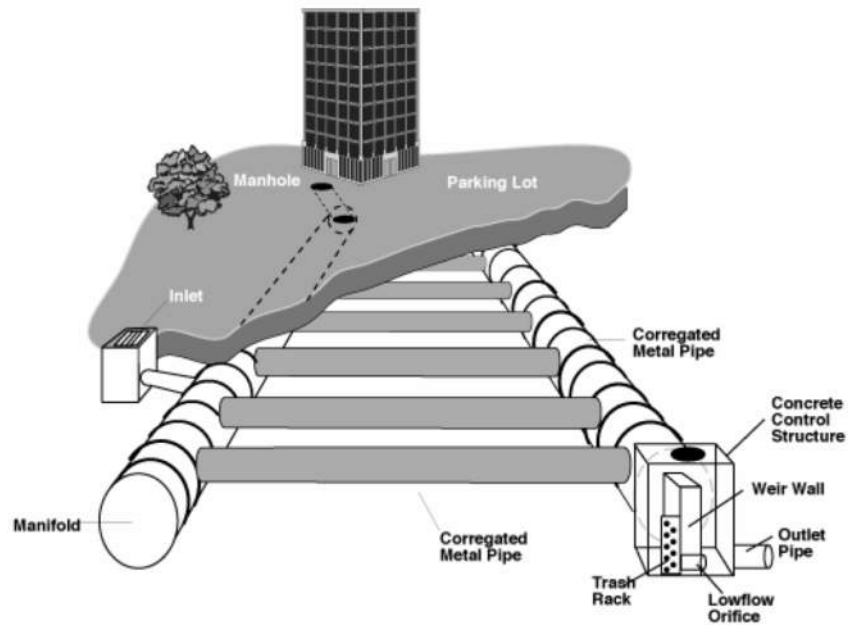
As determined by modeling, the resulting maximum water surface elevation in any catch basin, shall have a minimum 1-foot of freeboard below the catch basin grate for the 2-year through 25-year, 24-hour events.

Underground detention systems must provide the necessary volume through the design life of the structure. A typical design life is recognized as 50 years. The system is to account for lost volume due to sedimentation. The underground detention system is to be designed based on the number of total suspended solids (TSS) that will accumulate in the system over a 50-year design life. Systems that demonstrate a proven ability and accessibility for maintenance and removal of sediment (e.g., isolator rows or equivalent) may forgo the 50-year design TSS accumulation calculation if the maintenance plan is approved by the Administrator. Alternately, underground detention systems shall be designed with 25% more volume than the required detention volume to allow the systems to continue to function properly with sediment accumulation.

Inlet Structures: In the case where the site is to provide both water quality and quantity using a treatment train configuration, a separate vault designed to treat the required water quality volume shall be installed before the detention system. The water quality volume to treat at the site should be estimated as defined in 10.6.

Outlet Structure: The outlet structure includes a two-stage outlet configuration, and the structure itself is divided in two chambers, one for each outlet. One outlet shall provide the appropriate flow for channel protection. The invert of this outlet should be located at an elevation that prevents clogging and in a different chamber than the overflow outlet chamber. Both chambers are divided by an overflow control structure that may consist of a weir, orifice, or outlet pipe. The dimension and elevation of both the channel protection outlet pipe and the overflow control structure shall be set using the methods described in 10.3 to control the 25-year storm, 24-hour event. The outflow chamber shall also have an additional outlet for high flow bypass to safely evacuate extreme flow conditions. Figure 10-5-5 shows a typical outlet structure for underground detention.

Figure 10-5-5. Typical Outlet Structure for Underground Detention



Materials: Acceptable materials for underground pipe systems are pre-fabricated concrete, polyethylene, or fiberglass. Metal, aluminum, or steel pipe shall not be used. For underground detention vaults, a minimum 4,000 pounds per square inch (psi) structural reinforced concrete should be used for construction of these types of facilities. Other materials may be approved at the discretion of the City Engineer.

Structural Stability: The structural stability of underground detention systems shall depend on the material used for detention, underlying soils, and expected overburden load and live loads above surface. Among these loads, traffic loads of maintenance trucks shall be considered. Consolidated, stable soils with suitable bedding should be placed below the underground detention system. These systems shall not be constructed in fill slopes unless geotechnical testing indicates the soil is suitable. The structural design of wall sections must be signed and sealed by a structural civil engineer. All underground detention systems must meet structural requirements for overburden support and H 20 traffic loading (See Standard Specifications for Highway Bridges, 1998 Interim Revisions, American Association of State Highway and Transportation Officials).

Detention Requirements: Underground Detention (Large Pipe and Vault Systems)

Buoyancy: Buoyancy should be considered with the structural stability of an underground detention system. Solutions for buoyancy problems may be ballasting with suitable backfill or concrete backfill, providing concrete anchors, or increasing the total weight.

At sites with a shallow groundwater table, underground detention systems shall be designed to account for possible groundwater intrusion.

Access: Access into the detention system shall be designed for maintenance and sediment removal and approved on a case by case basis. All access locations shall be designed to meet Occupational Safety and Health Administration (OSHA) requirements for confined spaces. Access for maintenance shall be provided to all access locations within the detention system.

Setbacks: Any underground detention basin must be located a minimum of 20 feet away from a septic system tank and septic system leachate field. All facilities must meet minimum ~~SCDHEC~~ requirements or other reputable published guidelines.

Maintenance: The pipe network of the detention system requires less frequent maintenance than the rest of the components of the underground detention system. Trash/debris and sediment removal from the pipe network is required once every two years. Catch basins, inlet and outlet structures, pretreatment units, and/or water quality units shall be maintained with sediment removal at least once per year. Maintenance for other components of the system should include inspections for plugged air vents, joints between pipes and inlet/outlet structures, manhole lids/covers, and unsafe ladders. Records shall be kept to identify the dates and maintenance performed and shall be made available to the City at the City's request.

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BEST MANAGEMENT
PRACTICE EXAMPLE

Bioretention Underground Detention

(Large Pipe &
Vault Systems)**Source**Virginia Association
of Soil and Water
Conservation Districts

10.5.5 Bioretention

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*(adapted from ~~SCD/EC~~ BMP Field Manual, 2005.)***A. Description**

Bioretention areas are designed to mimic natural forest ecosystems with a combination of soil filtration and plant uptake by utilizing a planting soil layer, mulch, plantings, and an underdrain system. Bioretention areas appear as landscaped or natural areas giving this BMP an appealing image. Storm water runoff enters the Bioretention area and is temporarily stored in a shallow pond on top of the mulch layer. The ponded water then slowly filters down through the planting soil mix and is absorbed by the plantings. As the excess water filters through the system it is temporarily stored and collected by an underdrain system that eventually discharges to a designed storm conveyance system.

Bioretention areas, when appropriately designed, can provide attenuation to mitigate runoff from additional impervious areas. They can serve up to 2 acres and need to receive drainage from well-stabilized areas in order to not be compromised from excessive sediment. Appropriate applications for the use of bioretention areas for peak runoff control include parking lots, residential sites, small commercial facilities, and streetscape implementations.

The volume of water served by one bioretention area is typically less than a stormwater basin. However, bioretention areas are best used in a decentralized manner, where the sites' subwatersheds are routed to multiple bioretention cells that ultimately connect to the stormwater conveyance system leaving the site. The volume from several bioretention areas can be added to attenuate new runoff from the site.

B. Applicability

Bioretention areas are applicable for small sites where storm water runoff rates are low and typically are received into the Bioretention area as sheet flow. Bioretention drainage areas range from 1-2 acres and are well stabilized to prevent excessive debris and sediment from collecting in the Bioretention area. Because Bioretention areas are sensitive to fine sediments, they are not be placed on sites where the contributing area is not completely

stabilized or is periodically being disturbed. Applicable sites include:

- Parking lots,
- Individual residential home sites, and
- Small commercial facilities.

C. Design Criteria

Bioretention areas work best when constructed off-line, capturing only the water quality volume. Divert excess runoff away from Bioretention areas or collect it with an overflow catch basin. Design Bioretention areas to fit around natural topography and complement the surrounding landscape. Design Bioretention areas with any reasonable shape that fits around sensitive areas, natural vegetation, roads, driveways, and parking lots. The minimum width of Bioretention areas is 10 feet in order to establish a strong healthy stand of vegetation.

Surface Area: The Bioretention surface area may be calculated by the following equation from research by the North Carolina Extension Service, 1999:

$$BSA = \frac{(DA)(R_v)}{D_{avg}}$$

Where:

- | | | |
|------------------|---|--|
| BSA | = | Bioretention surface area (feet ²) |
| DA | = | Contributing drainage area of Bioretention area (feet ²) |
| R _v | = | Runoff volume (feet)
0.083-feet (1-inch) for SCDHEC |
| D _{avg} | = | Average ponding water depth above ground (feet) |

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The Bioretention surface area may also be calculated by the following equation from research by Prince George's County, MD:

$$BSA = 0.1 (R_v) (DA)$$

Where:

- | | | |
|----------------|---|--|
| BSA | = | Bioretention surface area (feet ²) |
| 0.1 | = | Empirical conversion factor |
| R _v | = | Runoff volume (inches)
1-inch for SCDHEC |
| DA | = | Contributing drainage area of Bioretention area (feet ²) |

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Pre-treatment: Pre-treatment of storm water runoff is required to reduce the incoming velocities, evenly spread the flow over the entire Bioretention area, and provide for removal of coarse sediments. The pre-treatment may consist of the following:

- Gravel, landscape stone, or geotextile level spreader located along the upstream edge of the Bioretention area.
- Gently sloping vegetated filter areas along the upstream edge of the Bioretention area.
- Vegetated swale along the upstream edge of the Bioretention area.

The level spreader option is the most desirable because level spreaders successfully reduce incoming energy from the runoff and convert concentrated flow to sheet flow that is evenly distributed across the entire Bioretention area.

Planting Mix: Install the planting mix of the Bioretention area at level grade (0%) to allow uniform ponding over the entire area. The maximum ponding depth should be set at 6-inches to 12-inches to allow the cell to drain within a reasonable time and to prevent long periods of submerging the plantings. The planting mix provides a medium for physical filtration for the storm water runoff plus a source of water and nutrients for plant life. Select a soil mixture with a minimum hydraulic conductivity or permeability of 0.5 in/hour.

The planting mix has a significant amount of organic content to support plant life. The average porosity of the planting mix is 0.45.

The planting mix is approximately 60-75 percent sand, 25 percent silt or topsoil, and 10 percent organic or leaf compost. The maximum clay content is less than 5 percent. The minimum depth of the planting mix is based on the following:

- 1.5-foot Bioretention areas utilizing grass as the only vegetative media,
- 3.0-feet for Bioretention areas that utilize shrubs, and
- 4.0-feet for Bioretention areas that utilize trees.

Mulch Layer: The mulch layer provides an environment for plant growth by reducing erosion of the filter bed, maintaining soil moisture, trapping fine sediments, and promoting the decomposition of organic matter. The mulch layer plays an important role in pollutant removal. Liberally apply shredded hardwood mulch 2- to 3-inches deep. Shredded hardwood mulch is the mulch of choice because it resists floatation better than other landscape covers. Pine needles are also applicable for certain situations. Avoid pine bark mulch due to its ability to float.

Water Draw Down Time: The under drain system is designed using the draw down time. The general equation used to determine draw down time is Darcy's Equation:

$$Q = 2.3e^{-5} K A \frac{\Delta H}{\Delta L}$$

Where:

Q	=	Flow rate through Bioretention (cfs)
K	=	Hydraulic conductivity of the planting mix (in/hr)
		This value will vary based on the actual planting mix used
A	=	Surface area of Bioretention (feet ²)
ΔH	=	Maximum ponding depth above bottom of soil mix (feet)
ΔL	=	Depth of soil mix (feet)

General Hydraulic Conductivity of Soils: Determining the total draw down time is a three-step process.

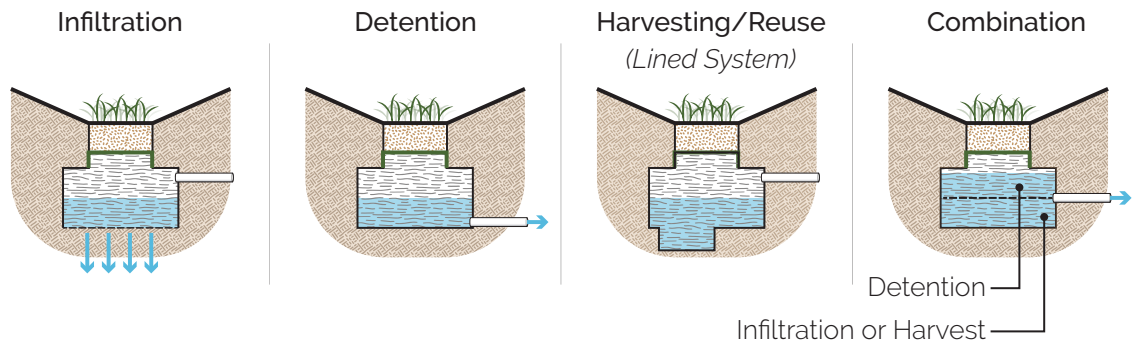
- 1 Determine the time it takes to drain the ponded water.
 - Utilize Darcy's Equation to calculate the flow rate (cfs).
 - Calculate the total ponded water volume (feet³) by multiplying the Bioretention area (feet²) by the ponded water depth (feet).
 - Divide the total ponded water volume (feet³) by the flow rate (cfs) to calculate the time to drain the ponded water (seconds)
- 2 Determine the time it takes to drain the saturated planting mix.
 - Calculate the total volume of water contained in the planting mix (feet³) by

multiplying the Bioretention area (feet²) by the planting mix depth (feet) by the porosity (dimensionless) of the planting mix.

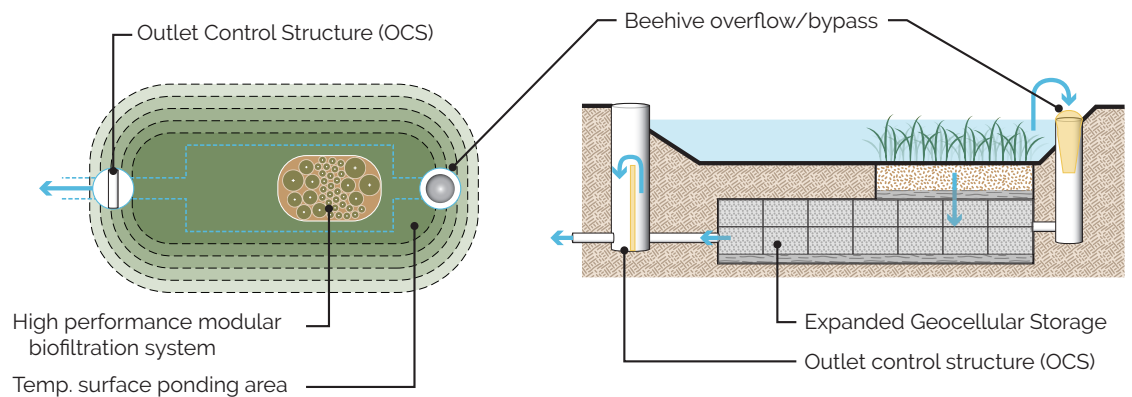
- Divide the planting mix water volume (feet³) by the flow rate from Darcy's Equation (cfs) to calculate the time to drain the ponded water (seconds).
- 3 Add up the time to drain the ponded water with the time that it takes to drain the planting mix to calculate the total Bioretention area draw down time.

Water Quantity/Major Storm Peak Flow Sizing:

Additional drainage modules (e.g., geocellular storage systems) or other forms of storage can be provided to manage the peak flow rates from the 2- year, 10-year, and 25-year storm events (see below).

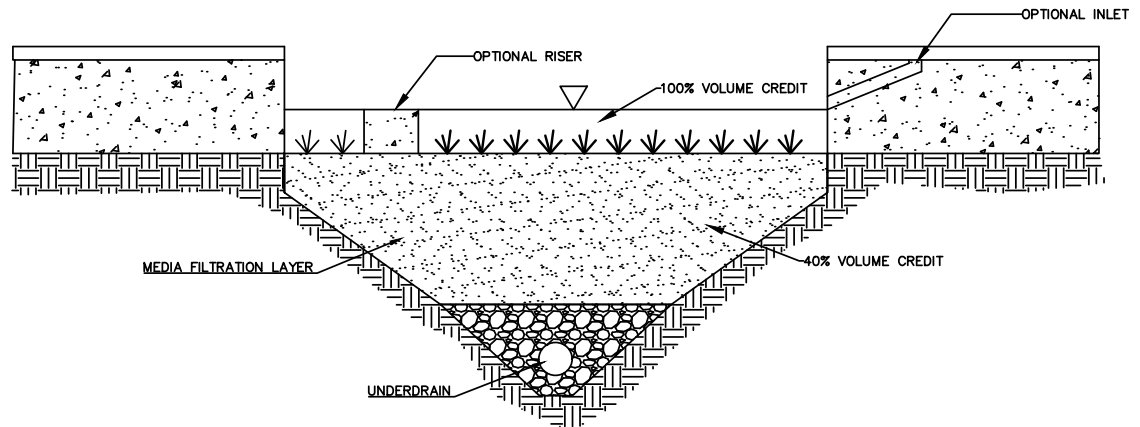


To control the release rate from the storage system, an outlet control structure can be designed and sited just beyond the perimeter of the downstream end of the storage system. The outlet control structure will be site specific, but often comprise a series of orifices and weirs to throttle the peak post development flow rates down to the established predevelopment peak flow rates for the 2-year, 10-year and 25-year storm. The schematic below illustrates how the system is typically configured:



Volume Storage Credit: The City of Greenville provides 100% volume storage credit for the design of a bioretention area that stores water above the filter media. A 40% volume credit is provided for the area of filter media above the underdrain invert. See Figure 10-5-6 for bioretention volume credits.

Figure 10-5-6 Volume Credit for Bioretention



1. 100% WATER VOLUME CREDIT IS PERMITTED FOR THE RETAINED AREA ABOVE THE MEDIA FILTRATION LAYER AND 40% WATER VOLUME CREDIT IS PERMITTED FOR THE MEDIA FILTRATION LAYER.
2. THIS DETAIL IS PROVIDED TO DISPLAY WATER VOLUME CREDIT AND IS NOT TO BE USED AS A DESIGN GUIDELINE. THE DESIGN ENGINEER IS ENCOURAGED TO REFERENCE THE CITY OF GREENVILLE'S BIORETENTION DETAILS AND NACTO'S *URBAN STREET STORMWATER GUIDE* FOR FURTHER DESIGN CONSIDERATIONS.
3. WATER VOLUME CREDIT SHALL NOT BE GIVEN ABOVE THE ELEVATION OF THE RISER OR

Bioretention cells can vary depending on their function and placement. The dimensions of each cell should be sized based on the comparison to the pre-development and post-development modeling while allowing large storm events (e.g., greater than 10 or 25-year storm events) to safely convey overflow through the system. See [here] for NACTO guidance on bioretention cell sizing.

The City of Greenville does not typically have soils with high infiltration rates. Therefore, a minimum default for the design of bioretention is to include an underdrain system that ties to a stormwater conveyance network.

Under Drain System: Many of the native soils found in South Carolina do not allow for adequate infiltration. Therefore, all Bioretention cells require an under drain system placed beneath the planting mix.

- A high capacity underdrain can be achieved by use of an geocellular module with > 90% void space. The modular underdrain is more efficient at collecting and conveying the runoff than a typical crushed stone and pipe configuration which is important when considering the rate at which the runoff is passing through the media (discussed below).
- A layer of open mesh microgrid. The microgrid is not as restrictive as a traditional non woven separation fabric and clog proof. The purpose of the microgrid is to prevent the bridging stone layer from the underdrain system.
- A layer of "bridging stone" designed to assist with the transition from the finer media to the underdrain. The bridging stone shall be clean and selected to pair well with the media above – creating a nesting effect of the media over the stone.

The under drain system consists of a minimum 4-inch diameter perforated PVC pipe (AASHTO M 252), an 8-inch minimum gravel jacket filter layer, and non-woven geotextiles to separate the piping from the native soils and the gravel from the planting mixture. Design the under drain system to safely pass the peak draw down rate calculated.

Select perforated, continuous closed-joint conduits of corrugated plastic pipe, placed on top of an underlying geotextile fabric. The longitudinal slope of the drain pipe is a

minimum of 0.5 percent. The Select perforated, continuous closed-joint conduits of corrugated plastic pipe, placed on top of an underlying geotextile fabric. The longitudinal slope of the drain pipe is a minimum of 0.5 percent. The perforated drain pipe may be connected to a structural storm water conveyance system or receiving natural water system.

Place filter gravel around the drainage pipe at a minimum depth of 8-inches. Place a geotextile between the boundary of the gravel and the planting mix to prohibit the planting mix from filtering down to the perforated drain pipe.

Several non-perforated PVC pipes should vertically connect to the under drain pipe and extend to the surface of the planting mix to provide access to clean out the perforated drainage pipe.

Overflow System: Design an overflow system to pass runoff volumes greater than the water quality volume away from the Bioretention area. If the Bioretention area collects sheet flow from a parking area, design a catch basin at the elevation of the maximum 6-inch to 12-inch ponding depth of the Bioretention area to carry the excess runoff from the Bioretention area to the storm sewer system or receiving natural water system.

- Recommended Accessories:

While from a water quality treatment standpoint a high flow biofilter is capable of functioning as a standalone practice. There is a small group of accessories that provide a vital function in the long term performance, protection and ease of maintenance of these smaller footprint systems.

Pretreatment / Inlet point screening

High flow biofilters are often deployed in locations that are high urban and space limited. As a result, there is generally insufficient space for a traditional sediment forebay. To avoid the maintenance complexities and associated labor cost of maintaining a stone or cobble inlet apron, it is recommended that a high flow biofilter system be accompanied by a shallow precast dry sump inlet screening box to collect sediment and trash and dissipate erosive energy from the curblane flow entering the biofilter area.



Overflow / bypass protection

For events that exceed the water quality storm or when the high flow biofilter is overwhelmed often a PVC domed riser structure is provided to convey the excess flow to the downstream discharge location. Often times this domed riser is a location prone to the accumulation and passing of floatables like mulch and trash.

As such it is recommended that all overflow risers be equipped with a high flow geotextile based filter bag/insert to collect any of the material that passes through the overflow to simplify maintenance and minimize the potential for downstream clogging.



Planting Plan: A Bioretention landscape plan includes all vegetation types, total number of each species, and the location of each species. A description of the contractor's responsibilities including a planting schedule, installation specifications, initial maintenance, a warranty period, and expectations of plant survival.

Include long-term inspection and maintenance guidelines in the planting plan. Have a qualified landscape architect, botanist or qualified extension agent prepare the planting plan.

See Plant List in Appendix PL 5.0.

Construction Sequence

Most High Flow biofilter systems are installed using typical construction equipment and tools.

- Base of excavation shall be smooth, level and free of lumps or debris, and compacted unless infiltration of storm water into subgrade is desired. A thin layer (3") of compacted base material is recommended to establish a level working platform (may not be needed in sandy soils). If the base of the excavation is pumping or appears excessively soft, a geotechnical engineer should be consulted for advice. In many cases, a stabilization geotextile and 6" of compactable material that drains well will be sufficient to amend the bearing capacity of the soil.
- Most applications require nonwoven geotextile with a min nominal weight of 6 oz per square yard to line the excavation to separate in situ soils and the high flow biofilter system. Geotextile, when utilized, should be placed on the bottom and up the sides of the excavation. Absolutely no geotextiles should be used in the water column. If an impermeable liner is specified, it shall be installed according to manufacturer's instructions and recommendations.



- Specified backfill material must be free from lumps, debris and any sharp objects that could penetrate the geotextile. Material is used for backfill along the sides of the system as indicated in engineering detail drawings.
- The high flow biofilter components should be placed in accordance with the selected system manufacturer's guidance. This generally starts with the underdrain module, followed by the micro grid, bridging stone, filter media and finally the mulch surface layer.
- Once all components are installed and prior to installation of plantings, the system should be protected by a temporary geotextile cap/cover until the denuded tributary watershed/catchment area is stable – i.e. side slopes vegetated or stabilized by other methods (riverstone, riprap), pavement placed etc. Once the tributary area is stable the temporary cap can be removed and the plants can be installed according to the landscape plan for the system.



D. Inspection and Maintenance

Regular inspection and maintenance is critical to the effective operation of Bioretention areas as designed.

Maintenance responsibility of the Bioretention area should be vested with a responsible authority by means of a legally binding and enforceable maintenance agreement that is executed as a condition of plan approval.

The surface of the ponding area may become clogged with fine sediments over time. Core aeration or cultivating unvegetated areas may be required to ensure adequate filtration. Other required maintenance includes but is not limited to:

- Conduct pruning and weeding to maintain appearance as needed.
- Replace or replenish mulch as needed.
- Remove trash and debris as needed.

Source:

South Carolina ~~DHEC~~
Storm Water Manage-
ment BMP Handbook.

Replaced with "DES"

Source:

South Carolina ~~DHEC~~
Storm Water Manage-
ment BMP Handbook.

Table 10-5-1: Average Pollutant Removal Capability

Pollutant Type	Avg. Percentage of Removal	Pollutant Type	Avg. Percentage of Removal
Total Suspended Solids	50-85%	Metals	N/A
Total Phosphorus	55-70%	Lead	50-90%
Pathogens/Bacteria	10-60%	Copper	35-70%
Total Nitrogen	35-55%	Zinc	35-90%

Table 10-5-2: Summary of Maintenance Requirements for Bioretention Basins

Required Maintenance	Frequency
Pruning and weeding	As needed
Remove trash and debris	As needed
Inspect inflow points for clogging. Remove any sediment.	Semi-annual (every 6 months)
Repair eroded areas. Re-seed or sod as necessary.	Semi-annual (every 6 months)
Mulch void areas.	Semi-annual (every 6 months)
Inspect trees and shrubs to evaluate their health.	Semi-annual (every 6 months)
Remove and replace dead or severely diseased vegetation.	Semi-annual (every 6 months)
Remove invasive vegetation.	Semi-annual (every 6 months)
Nutrient and pesticide management.	Annual, or as needed
Water vegetation, shrubs, and trees.	Semi-annual (every 6 months)
Remove mulch, reapply new layer.	Annual
Test planting mix for pH: • Apply lime if pH < 5.2 • Add iron sulfate + sulfur if pH > 8.0	Annual
Place fresh mulch over entire area.	As needed
Replace pea gravel diaphragm.	Every 2 to 3 years if needed

10.6

10.6 Water Quality Requirements

10.6.1 Purpose

This section was developed to establish the minimum design guidelines for water quality best management practices (BMPs) for use in the City of Greenville. Stormwater runoff carries pollutants into our storm drains, which can lead to detrimental effects on our water quality. The City encourages strategic use of the proposed BMPs below with appropriate use varying by location and project.

10.6.2 Overview of Water Quality BMPs

The primary pollutant removal mechanisms for water quality BMPs are gravitational settling, physical removal through filtration, percolation, and biological uptake. The use of one or more specific BMP types depends on specific site conditions and needs, including water quality protection, flood control, aquifer recharge, and/or volume control. In many cases, there are multiple goals or needs for a given project. The City of Greenville encourages alternative BMP designs with supporting documentation to those presented below, and will individually evaluate submittals. The City of Greenville promotes the implementation of natural BMPs that provide additional benefits such as wildlife habitat and aesthetic features.

The WQv for various BMPs is provided as follows. The storage capacity of dry detention basins, WQv, will be calculated based on the first inch of rain over the required treatment area with a release rate of at least 24 hours, as specified in the City's Stormwater Ordinance (see also Table 10-2-1). The WQv for wet detention basins (the combined permanent pool and extended storage zone above the permanent pool) will be calculated as the first $\frac{1}{2}$ inch of rain over the required treatment area with a release rate of at least 24 hours, as specified in the City's Stormwater Ordinance (see also Table 10-2-1). For alternate water quality methods (i.e., mechanical water quality), water quality treatment will be provided for a volume equal to the first inch over the required treatment area as specified in the City's Stormwater Ordinance.

10.6.3 Stormwater Pollutants of Concern

The City of Greenville focuses their BMP recommendations based on the pollutants that are most frequently associated with urban stormwater. These pollutants and their potential impacts on water quality and aquatic habitat are described below.

Sediment: Sediment is the most common stormwater pollutant discharged to surface waters. Excessive sediment loadings can lead to the destruction of habitat for fish and aquatic life and to the depletion of the storage capacity of lakes and reservoirs. Total Suspended Solids (TSS) is the parameter used to test for this in our water. TSS is a laboratory measurement of the amount of sediment particles suspended in the water column. In developing areas, excessive sediment loadings are primarily associated with poor erosion and sediment controls at construction sites or unstable channels. In developed (built out) areas, sediment pollution is caused primarily by streambank erosion resulting from high runoff peaks (MWCOG, 1987). Sedimentation occurs when a reduction in stream velocity allows sediment to settle out of the water column onto the stream bed. This process also traps heavy metals and other toxicants (human introduced toxic substances) adsorbed to sediment particles. These toxic pollutants may later be remobilized into the water column.

Nutrients: Within a receiving water, excessive concentrations of nutrients (such as phosphorus and nitrogen) can result in the undesirable overproduction of algae and other aquatic vegetation. These excessive nutrients are the result of a multitude of human activities including but not limited to increased impervious surface, fossil fuel generation, and animal manure and excess fertilizer utilized on agricultural lands. Excessive levels of algae in a receiving water, known as an algal bloom, typically occur during the summer when sunlight and water temperature are ideal for algal growth. Water quality problems associated with algal blooms range from simple nuisance or unaesthetic conditions, to oxygen depletion in the water column and fish kills due to the lack of oxygen. Also recreational activity can be halted during algal blooms due to health concerns. Collectively, the problems associated with excessive levels of nutrients in a receiving water are referred to as eutrophication impacts. The control of stormwater discharges of nutrients to the City's receiving waters can reduce algal productivity and potential eutrophication.

Heavy Metals: Heavy metals in stormwater discharge can be toxic to aquatic life and may bioaccumulate in fish making them toxic for humans consumption. Lead, copper, zinc, and cadmium are the metals that typically exhibit greater concentrations than other metals found in urban runoff. The presence of these heavy metals in tributary streams in the watershed may also be indicative of problems with a wide range of other toxic chemicals, like synthetic organics, that have been identified in previous field monitoring studies of urban runoff pollution (USEPA, 1983). Similar to nutrients, a wide variety of human activity can lead to heavy metal pollution in our waters, including but not limited to agricultural, industrial, domestics, and pharmaceuticals.

Fecal Indicator Bacteria: In addition to the elevated concentrations of the pollutants described above, bacteria and viruses in urban stormwater typically exceed public health standards. In some areas, domestic pets and birds can contribute to the source of contamination in stormwater. Leaking sanitary sewers, cross connected sanitary sewer lines, and malfunctioning septic tanks are also potential sources. E.coli and fecal coliform are frequently monitored as an indicator organism to provide evidence of recent fecal contamination, most commonly from warm blooded animals and humans. The test for E.coli and fecal coliform does not distinguish between human and animal contamination. Although many pathogens found in water are not toxic for humans, some can make us very sick or die. Excessive amounts of fecal pollution can deplete oxygen levels in our waters, which can be detrimental for aquatic species.

Hydrocarbons (Oil, Grease, and Fuels): These products are widely used and can be spilled/leaked/dumped on the ground where they can wash into waterways. Sources include leakage during normal vehicle use, hydraulic line failure, spills during fueling, and inappropriate disposal of drained fluids. These products can cause harm to plant and animal life.

10.6.4 BMP Pollutant Removal Efficiencies

Table 10-6-1 summarizes the anticipated percent pollutant removal for some of the structural BMPs described in this section. For each BMP, a range of BMP efficiencies is presented based on literature citations of laboratory and field measurement of BMP effectiveness. Pollutant removal efficiencies for mechanical BMPs are not included in this table since their performance has not been widely studied or published. However, swirl concentrators (which help to concentrate pollutants by creating a vortex) are limited to removing sediment and particulate pollutants, and are expected to have removal efficiencies similar to dry detention basins. As shown in the table, infiltration controls provide the greatest removal efficiency across all analyzed pollutants. The percent removal

assigned to infiltration controls depends upon the fraction of stormwater runoff that the controls will capture and the pollutant removal efficiency of the facility.

A comparison of dry detention basin and wet detention basin efficiencies reflects the additional biological and physiochemical processes that enhance pollutant removal in wet detention basins. For TSS and metals such as lead and cadmium, which are primarily associated with particulates (microscopic solids in water), the efficiencies of dry detention basins and wet detention basins are similar. For more soluble pollutants such as Total Dissolved Solids (TDS) and dissolved Nitrogen and Phosphorus, wet detention basins have greater removal efficiency. Bioswales, which remove pollutants through filtration of particulate pollutants and infiltration of dissolved pollutants, typically have removal efficiencies similar to dry detention basins.

Table 10-6-1: Typical Percent Removal Estimates for Referenced BMPs

BMP	TSS	Total-P	Total-N	Heavy Metals	Pathogens/ Bacteria	Hydrocarbons
Dry Detention Basin	45-68% ¹	14-25% ¹	19-29% ¹	50% ²	20-50% ¹	-
Wet Detention Basin	65-80% ¹	50-70% ¹	30-45% ¹	30-90% ³	45-75% ¹	85% ⁴
Stormwater Wetlands	68-78% ¹	42-53% ¹	28-39% ¹	50% ²	58-78% ¹	80% ¹
Vegetated Filter Strips	70% ³	10% ³	30% ³	40-50% ³	-	62% ⁴
Bioswales	70% ¹	10% ¹	30% ¹	40% ²	10-60% ¹	65% ¹
Bioretention	50-85% ¹	55-70% ¹	35-55% ¹	95% ²	95% ²	62% ⁴
Natural Infiltration	75% ³	50% ³	40% ³	45% ³	-	-

1 Average pollutant removal efficiencies listed in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook

2 Average pollutant removal efficiencies listed in the Georgia Stormwater Management Manual

3 Average pollutant removal efficiencies listed in the Greenville County Storm Water Management Design Manual

4 Comparative Pollutant Removal Capability of Stormwater Treatment Practices, Schuler, T.

Source:
Susdrain

Notes:

* Removal efficiencies for stream buffers are considered equivalent to vegetated filter strips

* Removal efficiencies for pervious pavement are variable

Replaced with "DES"

Source:

https://www.hydrologystudio.com/help/stage_discharge.htm

BEST MANAGEMENT
PRACTICE EXAMPLE

Dry Detention Basin



10.6.5 Dry Detention Basin

A. Description

A dry detention basin is a reservoir formed by constructing a dam or embankment with an outlet structure to temporarily detain stormwater during and immediately following a storm event. An example of a typical dry detention basin is presented in Figure 10-5-1. Dry detention basins provide water quality treatment by capture and extended detention of runoff from small and medium storms, which provides treatment for the captured "first flush" of stormwater runoff, to enhance settling of solids, and particulate pollutants. The detained runoff is drawn down through a control structure at a rate that is slow enough to achieve maximum pollutant removal via sedimentation, following the storm event.

Dry Detention Basins can also be designed for flooding and erosion control, as well as stormwater runoff pollution control. The major difference between the performance of wet and dry detention basins is the greater removal of dissolved pollutants (e.g., nutrients) in wet detention basins (discussed below).

B. Applicability

A dry detention basin is an appropriate detention BMP option for tributary areas more than 10 acres, if the area imperviousness is in the range of 5 to 20 percent. For larger tributary areas or areas with greater imperviousness, more effective BMPs such as wet detention basins are preferable if the basin is designed to provide water quality treatment as well as detention. The applicability of a dry detention basin to a particular site generally depends on the site topography, drainage area, space availability, and accessibility.

C. Planning Considerations

A single-stage dry detention basin is typically used for flood control, whereas, a two-stage dry detention basin can be sized to achieve both water quality and erosion/flood control benefits. Sizing criteria to achieve water quality control plus required erosion/flood control goals and/or policies must be considered in sizing the detention storage zone and outlet

Water Quality Requirements:
Dry Detention Basin

structure for multipurpose basins.

Dry detention basins designed for water quality treatment must be designed to capture the appropriate water quality volume, and detain that volume for an extended period to enhance settling of solids and particulate pollutants.

D. Design Criteria

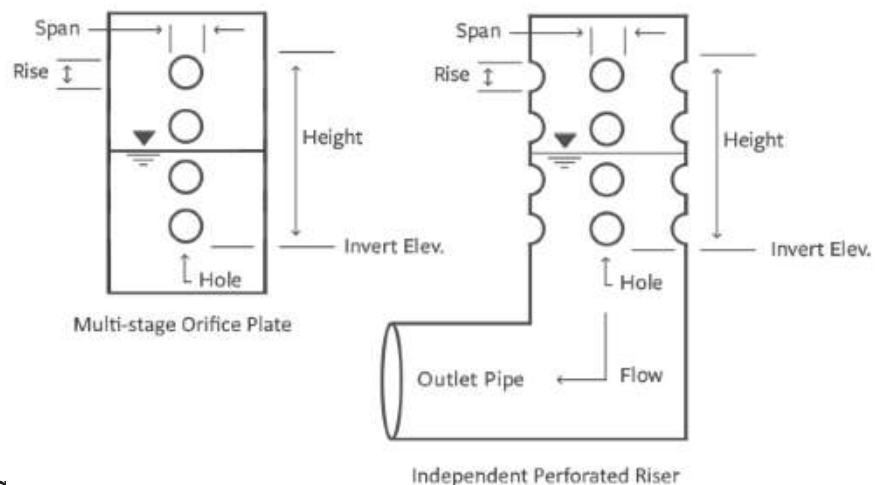
The design criteria presented in the next section will be applicable to the water quality treatment aspect of dry detention basins only. Design criteria specific to the dry detention basin for peak flow control only, or multiple purpose control (water quality plus peak attenuation) are presented in 10.5.

Length/Width Ratio: By maximizing the distance between the inlet and outlet points, the greatest opportunity for suspended solids settling is obtained. Therefore, a minimum length/width ratio of 3L:1W is recommended, where feasible, as a planning goal for the dry detention basin water quality storage zone. The length is defined by the distance from the inflow point to the outflow point, and width is defined as the surface area at the 2-year design storm divided by the length. In addition, the location of the outlet structure should maximize travel time from the inlet to the outlet. In instances where site constraints limit the layout of the basin such that a length to width ratio of 3L:1W cannot be achieved, berms, or a raised bank, may be constructed within the basin to artificially lengthen the flow path of water through the basin.

Extended Dry Detention Outlet: The required dewatering period for the design water quality storage volume can be achieved by a number of different outlet configurations based on adaptations to conventional outlets for peak-shaving detention basins (MWCOG, 1987). Vertical riser pipes are preferred to achieve the required extended detention times because they have less severe clogging problems than horizontal perforated outlets with a gravel jacket (MWCOG, 1992). The minimum diameter of riser perforations should be 0.75-inch to 1.0-inch to minimize clogging problems. A trash rack of sufficient size should be provided.

Any outlet that can satisfy the extended detention and dewatering time requirements specified herein shall be acceptable to the City, although the use of vertical perforated/slotted risers is preferred. A low flow orifice with a 3-inch minimum diameter shall be provided to release the water quality volume over 24 hours, however release times may be less than 24 hours for smaller applications. Single-pipe outlets shall have a minimum inside diameter of 12 inches. Stage-discharge routing shall be performed on the dry detention basin outlet using the methods described in 10.4.

Figure 10-6-1. Typical Extended Dry Detention Outlet



A low flow orifice size can be calculated using the following equation. If a different equation is used or different type of low flow orifice is used, supporting calculations shall be provided.

$$a = \frac{2A (H-H_o)^{0.5}}{3,600 CT (2g)^{0.5}}$$

Where:

a	=	Area of orifice (ft ²)
A	=	Average surface area of the basin (ft ²)
C	=	Orifice coefficient, 0.66 for materials thinner than orifice diameter, 0.80 for materials thicker than orifice diameter
T	=	Drawdown time of basin (hrs), must be greater than 24 hours
g	=	Gravity (32.2 ft/sec ²)
H	=	Elevation when basin is full (ft)
H _o	=	Final elevation when basin is empty (ft)

Two-Stage Design: To allow for water quality benefits from a dry detention basin, a two-stage design is recommended, where feasible. With a two-stage design, the majority of deposited materials will accumulate in the bottom stage, which can be sized to accept regular inundation from minor rain storms. The top stage is intended to be dry except for stormwater runoff from larger, infrequent storm events. The bottom stage typically can be 1.5 to 3 feet deeper than the top stage and should be sized to store up to 50% of the water quality volume. A bottom stage storage volume equivalent to 50% of the water quality volume should capture stormwater discharges from more than 50% of the storm events each year, thus keeping the top stage dry most of the time.

Sediment Forebay: A sediment forebay, a settling basin, is sized for each inlet (as space may allow), unless the inlet provides less than 10% of the total design storm inflow to the basin. The forebay should be sized to contain 0.1 inches per impervious acre of contributing drainage and should be 4 to 6 feet deep. The forebay storage volume counts toward the total WQv requirement and may be subtracted from the WQv for subsequent calculations.

$$Fv = 0.1 \times AI \times 3,630$$

Where:

Fv	=	Forebay volume (ft ³)
AI	=	Impervious area of drainage basin (acres)
3,630	=	Conversion factor from acre-inch to cubic feet

Other Features: Any other feature not explicitly discussed above shall be consistent with the dry detention basin description in 10.5. This would include basin side slopes, low flow channel, embankment, outlet configuration, emergency spillway, and maintenance easement.

Recommended Seed Mix for These Systems:

- ERNMX-126, 183, and 309 or equal
- Bermuda
- Fescue, Red Fescue
- Big Bluestem
- Redtop (*Argostis alba*)
- Switch Grass (*Panicum*)

Replaced with "DES"

Matting recommendation: RoLanka International, Inc. BioD-StrawCoCo™ or equal

E. Maintenance Requirements

In order to provide effective stormwater pollution control on a continuing basis, periodic maintenance of a dry detention basin is necessary. Maintenance schedules should be modified to be site specific. Maintenance requirements can be classified into two categories:

Routine Maintenance: This involves preventive tasks that are performed on a regular basis during the year to enhance the aesthetic quality and operational effectiveness of the basin. Examples are periodic site inspections, grass mowing, debris and trash removal, clearing around the extended detention outlet structure to prevent clogging, bank stabilization, weed control, insect or mosquito control, fence repair, and record-keeping. At a minimum, the site should be inspected annually to assess damage, sediment accumulation, and ensure proper operation. The remaining tasks listed above should be completed on a frequency basis recommended by the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook. Records shall be kept to identify the dates and maintenance performed and shall be made available to the City should the City's request this information.

Because debris/trash and sediment tend to accumulate within visible sections of the dry detention basin, this BMP will typically require more frequent routine maintenance to maintain the aesthetic quality of the basin.

Non-Routine Maintenance: This involves tasks that are performed once every specified number of years to correct problems, that have the potential to reduce the basin's structural integrity or effectiveness. Examples of structural repairs, which may be required at 10 to 15 year intervals on average, include the replacement of outlet structures and endwalls. Major clean-outs are intended to maintain the peak shaving storage capacity, and also to eliminate the build-up of accumulated sediments and debris, which might significantly detract from the basin's appearance. Clean-out operations typically include material removal, stabilization of the detention basin, and off-site hauling for sediment disposal.

A dry detention basin shall be evaluated every two years to assess the need for a major clean-out. If more than 25% of the design volume has been depleted by sediment accumulation, then a major clean-out should be performed. Based on typical annual sediment loading rates in urban stormwater discharges, approximately 5 to 10 years will usually be required to deplete 25% of the water quality volume (assuming limited or no sediment removal in an upstream forebay). However, to minimize the risk of clogging the extended detention outlet structure, major clean-out operations may be required as frequently as every 3 to 5 years. If the facility is not cleaned out at the required intervals, it is likely that the extended detention outlet will clog and that the facility will begin to operate as an undersized wet detention basin (i.e., a small permanent pool will form).

BEST MANAGEMENT
PRACTICE EXAMPLE

Wet Detention Basin

Source:

South Carolina DHEC
Storm Water Manage-
ment BMP Handbook.



10.6.6 Wet Detention Basin

A. Description

A wet detention basin is a constructed stormwater detention basin that has a permanent pool (or micropool). Runoff from each rain event is captured and treated in the pool primarily through settling and biological uptake mechanisms. Refer to 10.5 for a more detailed description and photo (Figure 10-5-2).

B. Applicability

A wet detention basin is an appropriate detention BMP option for both residential and non-residential development. This BMP is restricted to sites with a minimum drainage area of 10 acres, since dry weather flow is required to minimize the drawdown of the permanent pool during extended dry periods.

The applicability of a wet detention basin to a particular site will depend on site topography, drainage area (e.g., 10 acres minimum), soil conditions, wetlands constraints, space availability, and accessibility. Where possible, wet detention basins should conform to the existing topography with a minimal amount of excavation required. Soils should not be highly permeable to facilitate maintenance of a permanent pool. Consideration should also be given to the depth to bedrock, to the location of existing underground utilities, and to minimizing impacts on low marshy areas where wetland permits may be required. No wet detention basins shall be constructed within a one-mile radius of an airport property.

In wet detention basins, pollutant removal occurs during the period of time between storm events, primarily within a permanent pool commonly sized to provide a two-week hydraulic residence time. The primary mechanism for the removal of particulate forms of pollutants is sedimentation. Wet detention basins can also achieve substantial reductions in dissolved pollutants due to biological and physiochemical processes within the permanent pool. These processes include uptake of nutrients by algae and rooted aquatic plants, nutrient sedimentation, adsorption of nutrients and heavy metals onto bottom sediments, and biological oxidation of organic materials. A typical wet detention basin is shown on Figure 10-5-2.

C. Planning Considerations

Wet detention basins can provide both water quality and erosion/flood control benefits. Permanent pool sizing criteria to achieve required water quality control are presented below. Erosion and flood control goals and/or policies must also be considered in sizing the detention storage zone and outlet structure for multi-purpose basins.

A wet detention basin can be designed in several different ways, including the following:

Traditional Wet Detention Basin: In the traditional design, the permanent pool volume, or dead storage, is equal to the required water quality volume. Stormwater runoff displaces the water already in the pool. Temporary storage shall be provided above the permanent pool elevation for attenuation of larger storm events.

Wet Extended Detention (ED) Basin: In a wet extended detention (ED) basin, the water quality volume is split evenly between the permanent pool and ED storage provided above the permanent pool. During storm events, water is detained above the permanent pool elevation for 24 to 48 hours. This design is expected to provide similar removal efficiency to the traditional design, but requires less space.

Micropool Extended Detention Basin: In this variation of the ED basin, a micropool is maintained at the outlet of the basin. The micropool volume is calculated as 0.1 inch per impervious acre or 20% of the WQv, whichever is greater. The remainder of the required water quality volume is stored above the micropool in the live pool storage. The micropool prevents re-suspension of solids and prevents clogging of low flow orifices. The live pool storage above the micropool may also be used for the attenuation of larger storm events. The water quality volume stored in the live pool area must be detained for 24 hours. This basin most resembles the "dry detention basin" design. The difference in this style basin and the wet ED basin is the storage location of the water quality volume.

Multiple Basin Systems: Multiple basins in series, that provide longer flow paths and two or more storage cells for water quality and quantity treatment, may also be implemented.

D. Design Criteria

The design criteria presented in the next section will be applicable to the water quality treatment aspect of wet detention basins only. Design criteria specific to the wet detention basin for peak flow control only, or multiple purpose control (water quality plus peak shaving) are presented in 10.5.

Mean Depth: Mean depth of the permanent pool is calculated by dividing the permanent pool storage volume by the permanent pool surface area. The mean depth should be small enough to minimize the risk of thermal stratification, but large enough to ensure that algal blooms are not excessive and to minimize re-suspension of settled pollutants during major storm events. The prevention of significant thermal stratification will help minimize short-circuiting and maintain aerobic bottom waters. Aerobic conditions at the bottom of the permanent pool will maximize the trapping of phosphorus and heavy metals within bottom sediments and minimize pollutant releases from the sediments into the water column. Since basins that exhibit significant thermal stratification are more likely to exhibit anaerobic bottom waters during the summer and fall months, relatively shallow permanent pools that maximize vertical mixing are preferable to relatively deep pools. However, the permanent pool should be deep enough to minimize the re-suspension of bottom sediments.

A mean depth of 4 to 6 feet should maintain an acceptable environment within the permanent pool for the required storage volume.

Maximum Depth: The maximum depth of the permanent pool shall be no greater than 8 feet to minimize thermal stratification.

Length/Width Ratio: An adequate length/width ratio can help maximize plug flow conditions in order to enhance sedimentation, minimize short-circuiting, and also help prevent vertical stratification. A minimum length/width ratio of 3L:1W is recommended, where feasible, for the permanent pool of a wet detention basin BMP. In addition, the location of the outlet structure should maximize travel time from the inlet to the outlet. Baffles, basin shaping, or islands can be added to the permanent pool area to create a longer flow path.

Side Slopes Along Shoreline: In order to promote the growth of wetland vegetation along the shoreline, the basin shall have a littoral shelf that is 5-15 feet wide sloped no steeper than 10H:1V 0.5 to 1.5 feet below the surface of the permanent pool. The littoral shelf and side slopes shall also be top soiled (minimum of 6 inches), mucked, or planted from 1 or 2 feet below to 1 foot above the permanent pool elevation to promote wetland vegetation. Wetland vegetation along the perimeter of the permanent pool improve the aesthetic qualities of the detention facility and help minimize the proliferation of free-floating algae. The nutrient uptake achieved by wetland vegetation will reduce algae concentrations by limiting the amount of nutrients available for phytoplankton. Wetland vegetation in the littoral zone will also trap trash and debris along the shoreline for easier cleanup.

All wet detention with a permanent pool depth greater than 3 feet must be constructed with two safety ledges 4-6 feet in width. The upper ledge must be 1 to 1.5 feet above the permanent pool level and should use plants listed in Appendix PL 2.0 and the lower ledge must be approximately 2.5 feet below the permanent pool level and should use plants listed in Appendix PL 3.0. The administrator may consider alternative safety designs. The safety ledges must be designed such that an individual can walk to a traversable exit point. The safety bench area will also facilitate maintenance activities.

Sediment Forebay: All stormwater basins must incorporate a sediment forebay or pre-treatment device at the point or points of inflow. The forebay is a pre-treatment BMP that allows heavier sediments to settle out before they reach the permanent pool. Often, the floor of the forebay is concrete or other hardened surface so that periodic sediment removal is easier. The forebay treatment area can provide for a portion of the required water quality treatment volume for a site. The forebay is detailed in 10.5.

Outlet Structure: The outlet shall consist of a solid (non-perforated), vertical riser pipe or box of reinforced concrete joined by a watertight connection to a horizontal pipe (barrel) extending through the embankment and out letting beyond the downstream toe of the fill. Regardless of the type of wet detention basin (traditional, extended detention, or micropool), the water quality control crest shall be set at the elevation required to maintain the permanent pool storage capacity specified herein.

In the case of wet ED basins and micropool ED basins, there is an additional riser outlet (usually an orifice) that is sized to pass the extended detention water quality volume on top of the permanent pool. Flow will pass through this orifice, which is sized to release the water quality ED volume in 24 to 48 hours.

Anti-seep collars must be installed on the outlet barrel and an anti-vortex device must be incorporated into the outlet barrel. An energy dissipater must be installed at the stormwater basin pipe outlet to prevent scour at the outlet.

Landscaping: Aquatic vegetation can play an important role in pollutant removal in a stormwater basin. In addition, vegetation can enhance the appearance of the basin, stabilize the side slopes and serve as wildlife habitat. Therefore, wetland plants are encouraged in a basin design, along with the aquatic bench (fringe wetlands), the safety ledges and side slopes, and within shallow areas of the pool. The best elevations for establishing wetland plants, either by transplantation or volunteer colonization, are within six inches (plus or minus) of the permanent pool elevation. Woody vegetation must not be planted on the embankment or allowed to grow within 15 feet of the toe of the embankment and within 25 feet of the principal spillway. Emergent species such as *Scirpus validus* (softstem bulrush), *Sagittaria latifolia* (duck potato), *Peltandra virginica* (arrow-arum), and *Pontederia cordata* (pickerel weed) may be planted up to one foot deep. *Scirpus pungens* (common three-square) may be planted up to six inches deep. Additional guidance for appropriate native plants that can be used in wetlands or similar environments can be found in "Design of Stormwater Wetland Systems: Guidelines for Creating Diverse and Effective Stormwater Wetlands in the Mid-Atlantic Region" (Schuler, 1992).

Appendix PL 4.0 provides a list of acceptable aquatic plants.

Appendix PL 2.0 provides a list of specifically acceptable upper ledge plants.

Appendix PL 3.0 provides a list of specifically acceptable for lower ledge plants.

Fish: Species such as *Gambusia affinis* (mosquito fish) can be stocked for mosquito control if necessary.

Fountains/Aerators: Considerations must be given in the design of this fountain or aerator not to disturb settling within the basin or prevent settling. Use of such fountains is discouraged during storm events.

Other Features: Any other feature not explicitly discussed above shall be consistent with the wet detention basin description in 10.5. This would include embankment, peak shaving outlet configuration, emergency spillway, and maintenance easement.

E. Maintenance Requirements

Access to the forebay, permanent pool, and spillways must be considered in the planning and design. Permanent access must be provided from a public road and maintained throughout the life of the structure. Inspection of the embankment and spillway components, removal of sediment deposits from the forebay and permanent pool area and removal of spillway blockages or dead vegetation are maintenance requirements in addition to those described in 10.5 Maintenance schedules should be modified to be site specific.

BEST MANAGEMENT
PRACTICE EXAMPLE

Stormwater Wetlands



Figure 10-6-1. Typical Stormwater Wetlands

10.6.7 Stormwater Wetlands

A. Description

A stormwater wetland is similar to a wet pond that uses wetland vegetation to remove pollutants through filtration, chemical reactions and settling. Unlike wet ponds, stormwater wetlands use varying depth zones (forebay, outlet micropool, and shallow water zone) to increase pollutant removal efficiency and to encourage plant diversity. An example of a stormwater wetland can be seen in Figure 10-6-11. While offering effective pollutant removal, stormwater wetlands also offer habitat and aesthetic benefits.

Stormwater Wetlands: This BMP utilizes the features of a wetland to achieve water quality. Pollutants are primarily removed through filtration, plant uptake, biological processes, oxidation/reduction reactions, and settling as the stormwater runoff passes through multiple zones within the wetland. Wetlands are highly effective if designed correctly and offer both aesthetic and habitat value. This BMP typically requires a large amount of land; it is not recommended in densely developed or urban areas.

B. Applicability

A stormwater wetland is an appropriate BMP choice for most regions, excluding highly urbanized and arid environments. Stormwater wetlands need a sufficient watershed to maintain the permanent pool. This is typically at least 25 acres. The stormwater wetland should be placed where there is enough of an elevation difference between the inlet and outlet for hydraulic conveyance due to gravity to be achieved. It is important to note that when determining whether a stormwater wetland is an appropriate BMP option, the topography of the site will affect the design and applicability. More detail on regional applicability can be found on the EPA Pollution Prevention & Control website.

Water Quality Requirements:
Stormwater Wetlands

C. Planning Considerations

Stormwater wetlands can provide flood control, channel protection, and pollutant removal. When designing a wetland, including an emergency spillway or flood storage above the water level of the permanent pool can mitigate the peak flow from the drainage area from large storm events. A stormwater wetland can be designed in multiple ways, including the following:

Storm Water Wetland: This wetland is designed to treat stormwater runoff and also control runoff volume. Pollutant removal is achieved through settling and filtration as the water flows through the wetland.

Shallow Wetland: This wetland requires a large amount of land in order to store the desired volume. Instead of flowing through multiple deep sections, the treatment occurs in the high marsh or low marsh depths. The only deep sections are the forebay and the micropool.

Extended Detention Shallow Pool: This wetland is similar to the shallow wetland, but can treat a larger volume of stormwater in a smaller area. This design features an extended detention above the surface of the marsh where water is temporarily ponded and released over a period of at least 24 hours.

Pond/Wetland System: This features two separate areas, a wet pond and a shallow marsh. The wet pond traps sediment and reduces runoff velocities while the shallow marsh serves as the pollutant removal structure. This design requires less land than the shallow wetland and extended detention shallow wetland.

Pocket Wetland: This wetland design is intended for smaller areas (5-10 acres), and requires excavation to the water table for a continuous source of water for the permanent pond.

D. Design Criteria

Stormwater wetland designs can vary widely depending on the site, however there are certain features that should be incorporated into most designs.

When designing a stormwater wetland, the preferred size is a 3:1 length ratio. By maximizing the distance between the inlet and outlet, the flow length is increased and offers higher pollutant removal efficiency. Creating varying depth zones will also increase pollutant removal efficiency. These depth zones can be classified as follows:

Shallow Water Zone: The shallow water zone has depths ranging from 0-18 inches. It is designed to promote the growth and diversity of vegetation. A short level bottom elevation prevents short circuiting or the creation of stagnant areas.

- **High Marsh:** The high marsh is located within the shallow water zone and should be designed as one-half of the total zone. It extends 6 inches below the permanent pool water level. This zone promotes dense growth of a diversity of wetland species.
- **Low Marsh:** The other half of the shallow water zone should consist of the low marsh. The low marsh extends 6-18 inches below the permanent pool water level. It is suitable for several wetland plant species.

Appendix PL 2.0 provides a list of specifically acceptable upper ledge plants.

Appendix PL 3.0 provides a list of specifically acceptable for lower ledge plants.

Deep Water Zone: The deep water zone has depths from 1.5-6 feet. While this zone does not necessarily support most wetland vegetation, it may support submerged or floating plant species. Appendix PL 4.0 provides a list of acceptable aquatic plants.

- **Forebay:** The forebay should be designed to reduce velocities into the wetland. It restricts the amount of suspended sediments entering the constructed wetland by providing an initial settling area. The forebay should be designed as a level spreader, allowing the distribution of flow evenly across the wetland area. It is typically about 10% the volume of the permanent pool. All inlets to the constructed storm water wetland should discharge to the forebay and be include a Turf Reinforcement Mat (USEPA, 1983).
- **Low Flow Channels:** The design shall incorporate a flow path from the inlet to the outlet at least 6" in depth that includes the shallow and deep water zones.
- **Outlet Micropool:** This zone features a small pool incorporated at the outlet in order to reduce the potential for clogging. The outlet micropool should range from 4-6 feet deep. A drain should be included in the micropool to drain the wetland when necessary.
- **Semi-Wet Zone:** This zone includes vegetation that can thrive during flooding. Certain areas above the pool that will be submerged during large storm events are considered semi-wet. Appendix PL 5.0 provides a list of bioretention and riparian plants.
- **Water Quality Treatment Orifice:** Include a low flow orifice to release the water quality volume over an extended period of time (at least 24 hours). The orifice should be no less than 3 inches in diameter. A trash guard should be included that extends 6 inches below the pool surface of the wetland. This will help prevent clogging. Acceptable trash guards include a reverse flow pipe, weir outlet with a trash rack, or hoods that extend 6 inches below the permanent pool elevation.

A principle and emergency spillway should be included in areas prone to large storm events. The principle spillway should be designed to safely pass a 2, 10, and 24-hour storm event and be equipped with a trash rack. The emergency spillway should be designed with a minimum surface elevation of 1 foot below the top of the embankment in order to safely discharge water from the 100 year and 24-hour storm event. Based on the site, the emergency spillway may be incorporated into the principle spillway.

E. Maintenance Requirements

The inspection and maintenance of a stormwater wetland is key to its success as a pollutant removal water quality system. Table 10-6-2 includes a list and schedule of when and how often certain maintenance activities should be performed.

Table 10-6-2: Summary of Maintenance Requirements for Stormwater Wetlands

Required Maintenance	Frequency
Replace wetland vegetation to maintain at least 50% surface area coverage in wetland plants.	Once every 6 months during the first three years of establishment
Clean and remove debris from inlet and outlet structures.	Frequently (3 to 4 times/year)
Mow side slopes.	Frequently (3 to 4 times/year)
Monitor wetland vegetation and perform replacement planting as necessary.	Semi-annual (every 6 months)
Examine stability of the original depth zones.	Annual
Inspect for invasive vegetation and remove where possible.	Annual
Inspect for damage to the embankment and inlet/outlet structures.	Annual, repair as needed
Monitor for sediment accumulation in the facility and forebay.	Annual
Inspect for operational inlet and outlet structures.	Annual
Repair undercut or eroded areas.	As needed
Harvest wetland plants that have been "choked out" by sediment buildup.	Annual
Removal of sediment from the forebay.	Per design cycle, as needed, after 50% of total forebay capacity is filled
Remove sediment accumulations in the main permanent pool.	5- to 10-year cycle, after 25% of the permanent pool volume is filled

Source:

South Carolina DHEC
Storm Water Management BMP Handbook.

Replaced with "DES"

BEST MANAGEMENT
PRACTICE EXAMPLE

Vegetated Filter Strip



Source:
Flows to Bay website,
Donnelly Avenue, City of
Burlingame, CA

10.6.8 Vegetated Filter Strip

A. Description

Vegetated filter strips are uniformly graded section of land that are densely vegetated and are designed to treat runoff through vegetative filtering and infiltration of stormwater runoff. Water enters the filter strip along its width and runs across the length of the filter strip. Additional nomenclature for this BMP includes buffer strips, grass filters/buffer strips, or vegetated buffer zones. The vegetation provides water quality treatment through filtering and plant uptake. Vegetation can be grasses or other deep-rooted plants. Vegetated filter strips should also include a level spreader to ensure runoff over the vegetated filter is in sheet flow (shallow, uniform flow length) as opposed to concentrated (channelized) flow. Appendix PL 2.0 provides a list of suitable upper ledge plants.

Bioswales and Vegetated Filter Strips: These BMPs are a combination of infiltration and filtration controls. A bioswale is a channel similar to, but wider than, a ditch that is designed only for transporting peak flows. The bioswale is wide enough to reduce stormwater runoff flow velocities and maintain the depth of flow within the vegetation under typical wet-weather conditions, to enhance filtration of sediment and particulate pollutants. Infiltration of dissolved pollutants may also occur in the bioswale, if the soil infiltration rate and water table depth are suitable. Vegetated filter strips primarily serve the same functions as bioswales and are placed along the edge of an impervious area, and designed so that sheet flow from the impervious area flows across the filter strip. Appendix PL 1.0 provides a list of grasses suitable for these strips.

Riparian Buffer: This BMP should be applied to areas along waterbodies. A stream buffer protects and separates a stream or other waterbody from disturbance or encroachment. It can also act as a floodplain during flood events. Once a stream buffer is put into place, development is restricted from that area. Appendix PL 5.0 provides a list of bioretention and riparian plants.

Water Quality Requirements:
Vegetated Filter Strip

B. Applicability

Vegetated filter strips are suited for treating runoff from roads and highways, small parking lots, pervious areas, and roof downspouts. They are also well-suited as the outer zone of a stream buffer and as pre-treatment for other structural controls. This BMP is applicable to land with gradual slopes, as minimal slopes allow for some amount of water quality treatment through infiltration. Vegetated filter strips require low maintenance once ground cover and/or trees are established and strips are incorporated into new construction/development designs. Figure 10-6-2 presents an example of a typical riparian vegetated filter strip.



Figure 10-6-2. Typical Riparian Vegetated Filter Strip

Source: "Animal Feeding Operation: Assessment of Best Management Practices as they Affect Water Quality." (2005).

C. Planning Considerations

Filter strips should be used to treat small drainage areas, ordinarily with a maximum overland flow length upstream of the filter strip of 75 feet for impervious surfaces, and 150 feet for pervious surfaces (CWP, 1996). Uniform sheet flow must be maintained through the filter strip to provide pollutant reduction and to avoid erosion. To obtain sheet flow when discharging runoff from a developed area, a level spreader may be required. Dense vegetation that can withstand relatively high velocity flows should be used in vegetated filter strips. While beneficial, vegetated filter strips cannot meet the 80% TSS goal without another BMP in the treatment train. Pollutant removal efficiencies are based upon a 50-foot flow length across the strip, which is assumed to achieve 50% TSS removal. Filter strips with shorter flow lengths are considered to have lower removal efficiencies and should be used as coarse sediment settling areas for other structural controls. A 25-foot strip used as a pre-treatment control is assumed to achieve 10% TSS removal. The filter strip and level spreaders also have limited drainage areas, and it can be difficult to construct a level lip on the level spreaders.

D. Design Criteria

Location and Contributing Area: Vegetated filter strips should be integrated into site designs and should be constructed outside the natural stream buffer area whenever possible to maintain a more natural buffer along the stream bank.

Maximum contributing area to the filter strip is dependent upon the nature of the contributing area. If the contributing area upstream of the filter strip is largely pervious, then the maximum contributing area should be 150 feet parallel to the flow path. A maximum contributing impervious area should be 75 feet parallel to the flow path.

Length and Slope: Vegetated filter strips should be at a minimum 25 feet wide (perpendicular to flow path) and 25 feet long (along flow path) to provide filtration and contact time for water quality treatment. Longer flow lengths provide higher pollutant removal efficiencies. A minimum length (along flow path) of 50 feet is required for a 50% TSS removal. A 25-foot filter strip typically can provide up to 10% TSS removal as a pre-treatment BMP. For longer flow paths, special provisions must be made to ensure design flows spread evenly across the filter strip. Flow must enter the filter strip as sheet flow spread out over the width of the strip, generally no deeper than 1 to 2 inches.

The area must also be uniformly graded with 2% to 6% slopes. Steeper slopes would encourage the formation of concentrated flow, while flatter slopes would encourage standing water. Both the top and toe of the slope should be as flat as possible to encourage sheet flow and prevent erosion.

The length and slope of the filter strip should be selected to provide a minimum contact time of five minutes. The following equation, adapted from the TR-55 travel time equation (NRCS, 1986), should be used to demonstrate appropriate sizing.

$$L_f = \frac{(T_t)^{1.25} (P_2)^{0.625} (S)^{0.5}}{3.34 n}$$

Where:

L_f	=	Length of filter strip parallel to flow path (25 ft minimum)
T_t	=	Travel time through filter strip (5-minute minimum)
P_2	=	2-Year/24-Hour Rainfall (3.59 in)
S	=	Slope of filter strip (2%-6% preferred)
n	=	Manning's roughness coefficient (use 0.15 for medium grass, 0.25 for dense grass, and 0.35 for very dense Bermuda-type grass)

Vegetation Cover: Filter strips should not be used on soils that cannot sustain a dense grass cover with high retardance. Designers should choose a grass that can withstand relatively high velocity flows at the entrances, and both wet and dry periods. Examples include: *Panicum virgatum* (switchgrass) and *Festuca arundinacea* (tall fescue).

Designers need to ensure that flows in excess of design flow move across or around the strip without damaging it. Often a bypass channel or overflow spillway with protected channel section is designed to handle higher flows. See additional design criteria for vegetated filter strips in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

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Level Spreader: To encourage sheet flow across the vegetated filter strip, a flow or level spreader can be incorporated. An effective flow spreader is a pea gravel diaphragm located at the top of the slope (ASTM D 448 size no. 6, 1/8" to 3/8"). The pea gravel diaphragm is a small trench running along the full length of the upstream edge of the filter strip. It acts as a pre-treatment device, settling out sediment particles before they reach the filter strip and as a level spreader, maintaining sheet flow as runoff flows over the filter strip. Other types of flow spreaders include long timbers, a concrete sill, curb stops, or curb and gutter with "sawteeth" cut into it.

The grade top of a level spreader shall be 0%. The grade for the last 20 feet of channel or ground surface upstream of the level spreader must be less than or equal to 1% and designed to provide a smooth transition into the spreader. The depth of a level spreader as measured from the lip must be at least 6 inches. The level spreader lip must be constructed on undisturbed soil (not fill material) to uniform height and zero grade over the length of the spreader (perpendicular to flow). Contributing area to the level spreader should be governed by the guidelines prescribed for the filter strips. The maximum flow rate into the level spreader must be 30 cfs or less. Design criteria are presented in Table 10-6-3.

Table 10-6-3: Design Criteria for Level Spreaders		
Design Flow (cfs)	Depth of Spreader (ft)	Spreader Width (parallel to flow path, ft)
0-10	0.5	10
10-20	0.6	20
20-30	0.7	30

E. Maintenance Requirements

Vegetated filter strips should be managed to maintain a dense, healthy stand of grass and other vegetation by frequent mowing. Grass heights of 3 to 5 inches should be maintained, with a maximum grass height of 8 inches. Inspections should be performed routinely to verify that no short circuiting of flow or significant erosion is occurring. Periodic erosion repair and sediment removal should be performed to maintain capacity, as well as re-vegetation if needed. Maintenance schedules should be modified to be site specific. Refer to the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook for additional information on vegetated filter strips.

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BEST MANAGEMENT
PRACTICE EXAMPLE

Bioswale

Source:
Flows to Bay website,
Donnelly Avenue, City of
Burlingame, CA



10.6.9 Bioswale

A. Description

A bioswale is a BMP that treats stormwater runoff by direct contact with the soil and vegetation. The stormwater runoff can also be ponded in an area containing emergent wetland plants, but this approach can result in maintenance problems. Unlike a traditional swale BMP, a bioswale does not include check dams. In a bioswale, pollutants such as sediments, nutrients, and metals can be reduced by biological uptake and infiltration through the soil. By providing sufficient residence time for the stormwater runoff, some pollutant removal through sedimentation and infiltration can be accomplished. A typical bioswale is shown on Figure 10-6-33.

B. Applicability

A bioswale is intended for removing stormwater runoff pollutants from relatively small drainage areas. The maximum area served by individual swale systems typically should be less than 10 acres; otherwise the swale will become excessively large in cross-section. Bioswales are most feasible in single family residential areas, which exhibit manageable peak flows for a reasonable swale cross-section. Bioswales may also be suitable as supplemental pre-treatment BMPs for primary BMPs including dry and wet detention basins.



Figure 10-6-3. Typical Bioswale

Source: USDA National Resource Conservation Service.

C. Planning Considerations

Bioswales are primarily used as a low impact development water quality feature and drainage conveyance systems for small drainage areas. This BMP is typically not used as a primary method to achieve flooding/erosion control performance standards because a prohibitively large cross-section would be required for peak-shaving detention storage. A bioswale is recommended for sandy loam and silt loam soils (infiltration rates ranging from 0.3 inches per hour to 1.0 inch per hour). According to the Soil Survey of Greenville County, South Carolina (USDA Soil Conservation Service, 1975), the majority of the soils in the City consist of Cecil soil (sandy loam and sandy clay loam soils) and urban lands, which are areas covered by pavement and residential, industrial, and commercial buildings. Appropriate soils and percolation rates should be field confirmed.

The seasonal high groundwater table should be taken into consideration during the design of the bioswale. The groundwater table should be high enough to provide moisture to the vegetation during the dry season, but not high enough to create long periods of saturation. In areas with high saturation, emergent wetland plants can be planted.

D. Design Criteria

Length and Width: A bioswale should have a hydraulic length of at least 600 feet, with a bottom width between 2 and 8 feet. A swale of this length and width with appropriate slope and vegetation will provide sufficient residence time to allow settling of sediments and vegetative uptake of nutrients. If the length is less than 600 feet, the swale bottom width shall be large enough to provide the equivalent hydraulic residence time of approximately 10 minutes at the design depth of flow. Hydraulic residence time is calculated using the following equation.

$$HRT = \frac{V}{60Q}$$

Where:

HRT	=	Hydraulic residence time (min)
V	=	Volume of bioswale at design depth (ft ³)
Q	=	Flow through bioswale (cfs)

Assuming trapezoidal dimensions, the volume of the bioswale at design depth can be calculated as follows:

$$V = L(BD + ZD^2)$$

Where:

L	=	Length of bioswale (ft)
B	=	Bottom width of bioswale (ft)
D	=	Design depth of flow (ft)
Z	=	Side slope (ft/ft)

Side Slopes: Side slopes should be as flat as possible and no steeper than 3H:1V.

Longitudinal Slope: Longitudinal slopes should be less than 4%. Slopes less than 2% can be used with underdrains to avoid persistent pooling of runoff.

Vegetation Cover: Vegetation in a bioswale should consist of native, deep rooted, close-growing grass species tolerant of wide fluctuation in soil moisture with high surface area (wide blade) that will stand upright during water quality level flows. The type of vegetation selected depends on the type of underlying soil. Emergent wetlands can also be used in the bottom portion of the channel. Maintenance requirements should also be considered in selecting the type of vegetation. Appendix PL 2.0 provides a list of suitable upper ledge and bioswale plants.

Shape: Initially, the swale channel can be constructed as a trapezoid. With time, trapezoidal shapes tend to become parabolic due to the growth of vegetation and sedimentation. A parabolic cross-section is preferred for bioswales.

Depth of Flow: The design depth of flow should be at least 2 inches less than the expected winter vegetation height.

An earthen berm protected by stone can be installed at the end of the bioswale to ensure shallow ponding of the stormwater runoff in the bioswale. The height of the berm should be the design depth of flow and freeboard. Stone protection of the berm should prevent erosion under overflow conditions. Provisions for dewatering the swale following a rain storm can also be made by providing a notch in the berm.

Velocity: Based on the slope parameters of the biofilter selected, the velocity of stormwater runoff within the swale at the design depth of flow should not exceed 1.0 foot per second. Maintaining relatively low velocities will assist with the removal of suspended solids through sedimentation.

Manning's n for Vegetative Cover: The Manning's n values recommended for the design of a bioswale are provided in Table 10-6-4.

Table 10-6-4: Manning's Roughness Coefficient for Vegetation

Height of Vegetation	n Value
Dense grass up to 6 inches tall	0.07
Dense grass 6-12 inches tall	0.10
Dense grass >12 inches tall	0.20
Wetland plants	0.07

Aesthetics: A bioswale should be planned and designed to fit into the surrounding vegetation and development. Native vegetative species should be used when such species are available to blend the swale into the natural environment. Regular maintenance must be performed on this BMP to preserve its aesthetics and prevent it from becoming a mosquito breeding ground or other public nuisance.

- E. Planting Soil:** The planting soil of the bioretention area shall be installed at level grade to allow uniform ponding over the entire area. The planting soil media shall be a mixture of 60-75% coarse washed sand (It is very important to ensure that sand meets the specification above; sand particles that are too fine have caused clogging in several bioretention cells), 25% silt or topsoil, and 10% leaf compost (fully composted)

or equivalent. The maximum clay content shall be less than 10%*. Slightly higher clay content may be used upon recommendation from a geotechnical consultant. This mixture should provide sufficient infiltration capacity, as well as provide organic material to enhance plant growth and pollutant removal. The soil mixture shall have a minimum hydraulic conductivity of 0.5 inches/hour and an average porosity of 0.45.

The City encourages engineered soils to be inoculated with mycorrhizal fungi that is comprised of Endomycorrhizae and Ectomycorrhizae fungi types. Bio-Plex 5-in-1 planting granule or similar.

Appendix PL 5.0 includes the Bioretention and Riparian Buffer Plant List.

F. Maintenance Requirements

Maintenance requirements of bioswales are minimal, except for mowing and removal of sediments. Once the vegetation has been established, mowing should be performed on an as needed basis, and the grass clippings should not be allowed to decay in the bioswale. Maintenance schedules should be modified to be site specific. Sediments should be removed whenever the volume of the facility is determined to be inadequate and ponding occurs for an extended period following a rain storm. A swale which exhibits continuous ponding following a rainstorm may require mosquito control.

The bioretention media mix is designed to maintain long-term fertility and pollutant processing capability. Research on metal attenuation indicates that metal accumulation should not present a toxicity concern for at least 20 years in bioretention facilities (USEPA 2000). If the media in a bioretention cell needs to be replaced, DEQ recommends having it tested for toxicity for proper disposal, although usually a standard landfill can accept it.

Proper inspection should be performed during the construction of the bioswale. It should be inspected regularly during the period when vegetation is being established. After the vegetation has been established, an annual inspection is recommended.

BEST MANAGEMENT
PRACTICE EXAMPLE

Bioretention BMPs



Source
Virginia Association
of Soil and Water
Conservation Districts

10.6.10 Bioretention BMPs

A. Description

A bioretention basin generally consists of a shallow, landscaped depressional area that provides temporary storage of stormwater for subsequent infiltration into the soil. The basin typically receives sheet flow runoff from adjacent developed area. A typical bioretention BMP in a residential setting is shown on Figure 10-6-4 .

Bioretention: This BMP is a relatively new technology that diverts stormwater runoff to a landscaped basin where the runoff is allowed to pool during storm events and then draw down by infiltration into the planting media and evapotranspiration. Because infiltration is a key process, these devices are best-suited for applications where the water table is deep, soils are highly permeable, and the contributing area is relatively small (10 acres or less).



Figure 10-6-4. Typical Bioretention Basin.

Source: Virginia Stormwater Management Handbook, 1999.

B. Applicability

Bioretention BMPs are usually designed to capture sheet flow runoff from areas up to 5 acres in size. Application sites typically include parking lots, individual residential home sites, or small commercial facilities. The suitability of bioretention BMPs to a small development project will depend on whether the proposed BMP site passes the feasibility tests listed below.

C. Feasibility Tests

Since bioretention BMPs are only suitable for sites with appropriate soils characteristics and water table conditions, the design engineer must demonstrate that the proposed BMP site satisfies the following feasibility tests before a development plan relying on bioretention BMPs will be approved:

- 1 The soil beneath the bioretention facility shall exhibit minimum infiltration rates that permit adequate percolation of stored runoff. The minimum infiltration rate is the rate at which water percolates through the soil under saturated conditions. Soils with infiltration rates between approximately 0.5 to 2.5 inches per hour are suitable for bioretention practices. This criteria restricts the use of bioretention BMPs to the following soil textures to ensure adequate minimum infiltration rates: loam (0.52 in/hr); sandy loam (1.02 in/hr); and loamy sand (2.4 in/hr). If the underlying soil does not have an adequate infiltration rate, the basin should be underlain with an underdrain to carry percolating water away from the facility.
- 2 The maximum allowable drainage time for the bioretention basin surface shall be no more than 48 hours, assuming average antecedent moisture conditions in the soil.
- 3 The invert of the bioretention facility must be at least two feet above the seasonally high groundwater table or bedrock.
- 4 The site topography should be considered in locating the bioretention facility, including slope, soils, and the proximity of building foundations. To prevent basement flooding, building foundations shall be at least 10 feet up-gradient from the bioretention facility.

D. Planning Considerations

Bioretention facilities are primarily used as water quality controls for small development projects. It may not be cost-effective to use these devices to achieve required flooding/erosion control performance standards because the facility must be sized to capture all design storm runoff up to, and for some period after, the time of peak flow. Whereas detention basins can be designed to limit most of the peak-shaving storage to periods around the time of peak flow, peak-shaving designs of bioretention devices require the provision of a considerable amount of storage to handle the entire rising limb (and portions of the falling limb) of the design storm hydrograph.

E. Design Criteria

The following general criteria apply for bioretention BMPs:

Pre-treatment: Pre-treatment of stormwater runoff is necessary to reduce incoming velocities, evenly distribute the flow over the bioretention area, and remove coarse sediments. Pre-treatment located along the upstream edge of the bioretention area may consist of the following:

- Gravel, landscape stone, or geotextile level spreader
- Gently sloping vegetated filter areas
- Vegetated swale

Storage Capacity: The available storage volume includes the surface ponding volume, plus subsurface storage in the planting soil, assuming average antecedent conditions. The storage capacity must be equal to or greater than the water quality volume.

Planting soil: The planting soil of the bioretention area shall be installed at level grade to allow uniform ponding over the entire area. The planting soil media shall be a mixture of 60-75% sand, 25% silt or topsoil, and 10% leaf compost (fully composted) or equivalent.

The maximum clay content shall be less than 10%*. Slightly higher clay content may be used upon recommendation from a geotechnical consultant. This mixture should provide sufficient infiltration capacity, as well as provide organic material to enhance plant growth and pollutant removal. The soil mixture shall have a minimum hydraulic conductivity of 0.5 inches/hour and an average porosity of 0.45.

Ponding depth: The maximum allowable ponding depth at the bioretention surface is 6 to 12 inches to allow drainage within a reasonable time and prevent extended plant submergence.

Minimum width: The minimum width of bioretention areas is 10 feet in order to properly establish vegetation.

Planting soil depth: The minimum depth of the planting mix shall be 1.5 feet for bioretention areas using grass as the sole vegetative media, 3 feet for areas using shrubs, and 4 feet for areas using trees, or 4 inches deeper than the bottom of the largest root ball, whichever is greater. This depth should provide sufficient soil for establishing plant root systems and preventing plant damage due to severe wind, and sufficient depth for filtering pollutants.

Surface Area: The required surface area (A) of the bioretention basin can be calculated as follows:

$$BSA = \frac{DA \times WQ_v}{D_{avg}}$$

Where:

BSA	=	Bioretention surface area (ft ²)
DA	=	Contributing drainage area of bioretention area (ft ²)
WQ _v	=	Water quality volume expressed as depth over the drainage area (ft)
D _{avg}	=	Average ponding water depth above ground (ft)

Maximum Storage Time: The bioretention facility must be sized to dewater the ponded surface water within 24-48 hours, assuming average antecedent conditions. Given the maximum ponding depth of 6 inches, infiltration rates of 0.13 to 0.25 inches per hour would be sufficient to dewater the pooled area. The recommended soil mix with its relatively high sand content will have infiltration rates that exceed those required.

Overflow System: An overflow system shall be designed to pass runoff volumes greater than the water quality volume away from the bioretention area once the maximum ponding depth has been reached.

Mulch: A mulch layer shall be provided on top of the planting soil in order to reduce erosion of the filter bed, maintain soil moisture, trap fine sediments, and promote decomposition of organic matter. The mulch layer shall be 2 to 3 inches in depth, consisting of a standard landscape fine shredded hardwood mulch or pine needles. Pine bark mulch should be avoided due to its ability to float.

Peak Flow Control: Stormwater management facilities must also be provided to control

the post-development peak runoff from the 2-year, 10-year, and 25-year, 24-hour storm events. The peak runoff performance standard can be met by expanding the bioretention facilities and/or by providing additional detention storage facilities.

Underdrain: Bioretention areas that do not have native soil compositions providing adequate infiltration shall include an underdrain system placed beneath the planting mix to collect excess water and discharge to a storm conveyance system. At a minimum, the underdrain shall consist of a 4-inch diameter perforated PVC pipe (AASHTO M 252) with an 8-inch gravel jacket filter layer and non-woven geotextiles to separate the piping from the native soils and the gravel from the planting mixture. The geotextile should be placed directly over the pipe. Wrapping the pipe will result in a shortened useful life. The underdrain shall be designed to pass the peak drawdown rate. Further guidance for designing an underdrain system is provided in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

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Bioretention Landscaping:

The bioretention basin should be vegetated to include a mixture of trees, shrubs, and herbaceous ground cover. Shrubs and herbaceous vegetation are recommended for wetter zones and trees along the perimeter. A bioretention landscape plan including all vegetation types as well as total number and location of each species shall be prepared by a landscape architect, botanist, or extension agent.

- 1 Plant selection: Table 10-6-5 lists examples of trees and shrubs suitable for bioretention landscaping. Additional suitable plants can be found in the City of Greer's *Stabilization Specification & Bioretention Native Plant Specification* (December 3, 2012). Native species that are tolerant to pollution loadings and wet/dry conditions are most desirable. As space allows, a minimum of three species of trees and three species of shrubs should be selected for diversity.
- 2 Plant placement: Plants should be placed by a landscape professional to simulate natural conditions. Two to three shrubs should be planted for each tree (i.e., ratio of shrubs to trees should be 2:1 to 3:1).
- 3 Plant layout: Trees should be planted primarily on the perimeter of the basin, to maximize the shading and wind protection afforded by the trees. This will limit extremes of summer solar radiation and winter freezes and winds.

F. Maintenance Requirements

Routine maintenance activities include debris removal, erosion inspection (at least quarterly following rainstorms), adding mulch, removal and replacement of dead and dying vegetation, treatment of diseased trees and shrubs, and record-keeping. Maintenance schedules should be modified to be site specific.

Because bioretention facilities are a relatively new BMP technology, it is difficult to evaluate the potential for non-routine maintenance. It is possible that the facility surface may clog due to sediment accumulation. Cultivation, core aeration, replacement of surface mulch, or other procedures may be necessary to maintain surface infiltration capacity. In addition, accumulation of toxics from stormwater may impair plant health and growth, and replacement of the planting soil media may be required.

Bioretention facilities that are used to treat runoff from parking lots or other commercial sites might require more frequent maintenance in the form of trash removal. Because bioretention is sited lower than the surrounding drainage area, facilities in commercial areas are prone to collect refuse such as shopping bags, food wrappers, and cigarette butts that are thrown on the ground. Regular removal of such items is required in these circumstances to keep the facility operating properly and maintain aesthetics.

Source:

Clemson Cooperative
Extension 'Carolina
Yards' Plant Database.

**Table 10-6-5: Recommended Shrubs and Trees for Use
in Bioretention Areas**

Latin Name	Common Name	Type
<i>Acer rubrum</i>	Red Maple	Tree, Deciduous
<i>Aesculus pavia</i>	Red Buckeye	Tree, Deciduous
<i>Amelanchier spp.</i>	Serviceberry	Large Shrub, Deciduous
<i>Asimina triloba</i>	Common Pawpaw	Shrub, Deciduous
<i>Betula nigra</i>	River Birch	Tree, Deciduous
<i>Callicarpa americana</i>	American Beautyberry	Shrub, Deciduous
<i>Calycanthus floridus</i>	Carolina Allspice	Shrub, Deciduous
<i>Carpinus caroliniana</i>	American Hornbeam	Tree, Deciduous
<i>Cephalanthus occidentalis</i>	Buttonbush	Shrub, Deciduous
<i>Cercis canadensis</i>	Eastern Redbud	Tree, Deciduous
<i>Chionanthus virginicus</i>	Fringetree	Tree, Deciduous
<i>Clethra alnifolia</i>	Summersweet	Shrub, Deciduous
<i>Cornus amomum</i>	Silky Dogwood	Tree, Deciduous
<i>Cornus florida</i>	Flowering Dogwood	Tree, Deciduous
<i>Cyrilla recemiflora</i>	Titi / Leatherwood	Shrub, Deciduous
<i>Diospyros virginiana</i>	Persimmon	Tree, Deciduous
<i>Fothergilla gardenii</i>	Dwarf Fothergilla	Shrub, Deciduous
<i>Ilex cassine</i>	Dahoon Holly	Large Shrub, Evergreen
<i>Ilex glabra</i>	Inkberry Holly	Large Shrub, Evergreen
<i>Ilex opaca</i>	American Holly	Large Shrub, Evergreen
<i>Ilex verticillata</i>	Winterberry Holly	Large Shrub, Deciduous
<i>Ilex vomitoria</i>	Yaupon Holly	Large Shrub, Evergreen
<i>Itea virginica</i>	Virginia Sweetspire	Shrub, Deciduous/Perennial
<i>Juniperus virginiana</i>	Eastern Red Cedar	Tree, Evergreen
<i>Magnolia grandiflora</i>	Southern Magnolia	Tree, Deciduous
<i>Magnolia virginiana</i>	Sweetbay Magnolia	Tree, Evergreen
<i>Nyssa sylvatica</i>	Black Gum	Tree, Deciduous
<i>Osmanthus americanus</i>	Wild Olive	Large Shrub, Evergreen
<i>Salvia coccinea</i>	Scarlet Sage	Shrub, Evergreen/Perennial
<i>Salvia farinacea</i>	Mealycup Sage	Shrub, Evergreen/Perennial
<i>Salvia greggii</i>	Autumn Sage	Shrub, Evergreen/Perennial
<i>Salvia 'Indigo Spires'</i>	Indigo Spires Sage	Shrub, Evergreen/Perennial
<i>Salvia madrensis</i>	Forsythia Sage	Shrub, Evergreen/Perennial
<i>Salvia officinalis</i>	Common Sage	Shrub, Evergreen/Perennial
<i>Sambucus canadensis</i>	Elderberry	Shrub, Deciduous/Perennial
<i>Solidago spp.</i>	Sweet Goldenrod	Shrub, Evergreen/Perennial
<i>Tradescantia virginia</i>	Virginia Spiderwort	Shrub, Evergreen/Perennial

BEST MANAGEMENT
PRACTICE EXAMPLE

Natural Infiltration

Source

Mississippi WMO on
Twitter

10.6.11 Natural Infiltration

A. Description

Infiltration is the process by which surface water enters the soil. Through natural infiltration, an undisturbed and naturally vegetated land area can act as a storm water quality control system. Natural vegetation typically accepts runoff and infiltrates the runoff into the suitable soil.

Natural Infiltration: This BMP is highly recommended for undisturbed forested areas. Runoff from new development encounters natural vegetation and infiltrates into the soil. This stormwater control system requires a large amount of undisturbed land and the appropriate soils in order to function properly.

B. Applicability

Natural infiltration should only be used in areas where soil is suitable. Soils must have high permeability, but soils that infiltrate too rapidly may not provide sufficient treatment. The soils should have no greater than 20 percent clay content, and less than 40 percent silt/clay content. The infiltration rate should range from 0.5-3 inches per hour (USEPA, 1983).

C. Planning Considerations

Natural Infiltration areas should have low erosion potential and good drainage. Natural Infiltration cannot be used in a floodplain or wetland. Areas in a forested condition are recommended for natural infiltration. If a forested area is not available, the size of the area needed should be doubled. The slope of the land being considered for natural infiltration should be less than 10%.

D. Design Considerations

When considering natural infiltration as an option for storm water quality control, runoff must enter the infiltration area as a sheet flow at a slow enough velocity to prevent erosion.

The area must be a minimum of 20 feet in length, as well as stabilized and vegetated. In order to calculate the appropriate size for a natural infiltration area, use the equation below, found in the SC ~~DHEC~~ Stormwater BMP Handbook.

$$A = \frac{(KTI)}{(cd) - K}$$

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Where:

- A = Natural infiltration area required (acres)
- K = Runoff volume to infiltrate (inches)
- T = Total site area or total drainage area (acres)
- I = Built upon area ratio (Built upon area/T)
- c = Effective water capacity (in/in), should be determined from site specific soil samples
- d = Depth of soil A horizon (inches), should be determined from site specific soil samples

E. Maintenance Requirements

In order to prevent clogging of a natural infiltration area, it is recommended that the upstream area be heavily vegetated, while the downstream area consists of thick turf. Inspect for eroding areas and restore sediment when needed. Remove litter and debris as needed.

BEST MANAGEMENT
PRACTICE EXAMPLE

Pervious Pavement



Source:

Left: EPA NPDES Stormwater Best Management Practice - Permeable Pavements, 2021. (Credit: Anthony D'Angelo for USEPA, 2015)

Right: EPA NPDES Stormwater Best Management Practice - Permeable Pavements, 2021.

10.6.12 Pervious Pavement

A. Description

Pervious pavement allows infiltration of storm water into the underlying soil. Pervious concrete is composed of reduced sand or fines that allows water to drain through it. When placed over an aggregate storage bed, stormwater runoff volume, rate, and pollutants are all reduced. Porous asphalt is a standard hot-mix asphalt with the same reduced sand or fines as the porous concrete. The two work similarly to meet post-construction stormwater quantity and quality requirements. When properly designed and installed, both pervious concrete and porous asphalt are durable and cost efficient compared to their respective traditional paving materials. Figure 10-6-5 shows properly installed porous asphalt.



Figure 10-6-5. Typical Porous Asphalt.

Source: The National Asphalt Paving Association

Pervious Pavement: This BMP can be applied to most pedestrian walkways, sidewalks, driveways, parking lots, and low volume roadways. The paving materials allows for infiltration of water into a temporary storage area. Pervious pavement can reduce stormwater runoff volume, rate, and pollution.

B. Applicability

These alternative paving surfaces can be used to replace traditional pavements in areas with drainage less than 15 acres. Porous asphalt and pervious concrete can be used in most locations without any complications and can also be used to reduce noise, spray, and skidding on roadways. It is recommended for use on pedestrian walkways, sidewalks,

driveways, parking lots, and low volume roadways, but has successfully handled highway traffic volumes. Pervious concrete will deteriorate under constant heavy traffic, so its uses are limited to low-volume roadways and sidewalks. Both have a slightly rougher surface texture than traditional pavements, which offers more traction to vehicles and pedestrians.

C. Planning Considerations

Pervious asphalt can be mixed using the same equipment as standard asphalt. When laying the asphalt, the same general method should be used. Unlike standard asphalt, minimal pressure and compaction should be used to avoid closing the pore spaces in the pervious asphalt. Vehicle traffic is restricted for 24-48 hours after the asphalt is installed. Porous concrete requires a different approach from standard concrete. Since it has a low water content and will harden rapidly, the porous concrete needs to be poured within one hour of mixing. Floating and troweling should not be used to prevent the closing of pores. Consolidation should occur within 15 minutes of placement. A steel roller is typically recommended. Within 20 minutes of placement, the concrete should be covered with plastic and allowed to cure for a minimum of 7 days (USEPA, 1983). The minimum setback from water supply wells is 100 feet; and building foundations is 100 feet down gradient and 10 feet up gradient.

D. Design Considerations

Infiltration is the key to pervious pavement acting as water quality control systems. The infiltration rate of the native soil should be considered when choosing pervious pavement or porous asphalt for stormwater quality. In order to act as a stormwater quality control system, pervious pavement should be designed with the following criteria (See Figure 10-6-6):

Pervious Pavement Layer:

This layer should include a porous mixture of concrete or asphalt. This layer is typically 4 to 8 inches deep, depending on the predicted traffic loads.

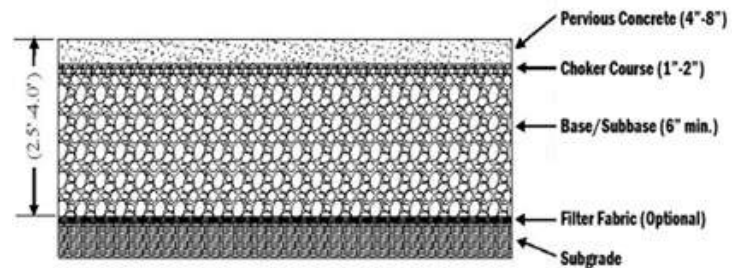


Figure 10-6-6. Pervious Pavement Layers.

Source: US EPA

Choke Course/Settling Layer: A permeable layer approximately 1 to 2 inches thick with small, open-graded aggregate.

Open-graded Base Reservoir: Placed directly below the choke course, this layer is typically 2-4 inches thick with crushed stones ranging from $\frac{3}{4}$ - $\frac{3}{16}$ inch in size. This layer should be designed to drain completely within 48 hours. The base/subbase must be at least nine inches thick.

Open-graded Subbase Reservoir: This layer is composed of larger stones, typically $\frac{3}{4}$ to 2 $\frac{1}{2}$ inches. The thickness of this layer depends on traffic loads and water storage demands. In pedestrian walkways or residential driveways, the subbase layer may not be required.

Underdrain (optional): Install an underdrain when pervious pavement is designed over low infiltration soils. This includes hydrologic soil group D, most group C soils, and soils with high (>30%) clay content. A perforated pipe should be installed and connected to an outlet structure.

Geotextile (optional): In order to prevent the movement of soil between the base and subbase, a geotextile can be installed between the two layers.

Subgrade: Non-compacted soil directly below the subbase. This layer determines how much water can infiltrate into the surrounding soil.

For pervious concrete the surface layer should consist of 5/8 to 3/8 inch aggregate and should be 4 to 8 inches thick, depending upon the expected traffic loads. For porous asphalt the surface layer should consist of an aggregate bonded together by bituminous asphalt and should be 2 to 4 inches thick. There should be a minimum of 15% air voids in the asphalt for adequate permeability (USEPA, 1983).

E. Maintenance

The main concern is the potential for clogging of the pores. If surface infiltration rates decrease due to clogging, the surface of the pavement should be vacuumed with a heavy duty vacuum truck. If vacuuming does not reduce clogging, half inch holes can be drilled through the pavement to allow stormwater to drain to the aggregate base. These holes should not exceed a half inch or be drilled closer than every few feet to avoid weakening the structure. If fine sediments are removed from the surface periodically, the permeability will remain optimal. Both porous asphalt and pervious concrete can support freeze/thaw stress without major impacts. Porous asphalt tends to develop less cracks and pot holes than standard asphalt. Inspection of pervious pavement should occur as described in Table 10-6-7. Maintenance records should be kept and made available to the City at the City's request.

Table 10-6-7: Inspection and Maintenance of Pervious Pavement

	Inspection	Maintenance
Perimeter of the pervious pavement surface	Areas appear to have eroded, bare soil is present	Plant groundcover and stabilize the area, regrade soil if necessary
	Vegetation is overgrown	Keep vegetation between a height of 3 to 6 inches, remove clippings
Surface of the pervious pavement	Weeds present on surface	Do NOT pull weeds. Treat with a pesticide.
	Sediment present on surface	Vacuum sweep the pavement surface
	The surface is damaged/ deteriorating	Contact an appropriate professional
	Water does not drain between storm events	Vacuum sweep the pavement; if the problem persists contact an appropriate professional

BEST MANAGEMENT
PRACTICE EXAMPLE

Mechanical & Manufactured Devices

Source:

Left: Aquashield Aqua-Swirl Concentrator, Murfreesboro, TN, aquashieldinc.com

Right: Filterra Solutions Brochure, Contech Engineered Solutions



10.6.13 Mechanical or Manufactured Devices

A. Description

Mechanical and manufactured BMPs are commercially-constructed BMPs that can be used to treat stormwater from relatively small development sites. Table 10-6-5 lists some of the BMPs that are currently available. Additional mechanical BMPs can be found at the New Jersey Department of Environmental Protection, Stormwater website (<http://www.nj.gov/dep/stormwater/treatment.html>).

Mechanical and Manufactured Devices: Commercially-manufactured stormwater treatment technologies may be applied to treat relatively small development sites. These BMPs use varying methods to remove pollutants. Some use swirl concentrator technology to remove only sediment and particulate pollutants, while others use filter media to remove soluble and particulate pollutants.

The table includes manufacturer information that can be used to obtain further information on particular devices. These BMPs use varying methods to remove pollutants. Some strictly use swirl concentrator technology to remove only sediment and particulate pollutants. Others use filter media, or constructed wetlands to remove soluble as well as particulate pollutants. Additional pre-fabricated devices and removal efficiencies are discussed in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

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Table 10-6-8: Summary of Available Mechanical and Manufactured BMPs

Treatment System	Treatment Processes	Manufacturer/Company
Arkal Filtration System	2-stage filtration system	Zeta Technology Stuart, FL www.zetatechnology.com
Aqua-Filter Stormwater Filtration System	Swirl concentrator followed by media filtration	Aquashield, Inc. Hixton, TN www.aquashieldinc.com
Aqua-Swirl Concentrator	Swirl concentrator	Aquashield, Inc. Hixton, TN www.aquashieldinc.com
Baysaver	Gravity sedimentation and flotation	Baysaver, Inc. Mount Airy, MD www.baysaver.com
CrystalStream	Gravity sedimentation and flotation	CrystalStream Technologies Lawrenceville, GA www.crystalstream.com
Downstream Defender	Swirl concentrator	Hydro International Portland, ME www.hydro-international.biz
Filtrerra	Bioretention/Filtration System	Amercast Ashland, VA www.filtrerra.com
Flexstorm Inlet Filters	Inlet Filter Bag	Inlet & Pipe Protection Naperville, IL www.inletfilters.com
FloGard	Dual vortex hydrodynamic separator or inlet filter bag	Kristar Enterprises, Inc. Santa Rosa, CA www.kristar.com
HydroKleen	Multi-media filtration	Hydro Compliance Management, Inc. Ann Arbor, MI
PolyDak Filter	Inlet filter bag	Stormdrain Solutions Devon, PA www.stormdrains.com
Stormceptor	Swirl concentrator	CSR New England Pipe Westfield, MA www.csrstormceptor.com
Stormfilter	Mechanical filtration, ion exchange, adsorption	Stormwater Management, Inc. Portland, OR www.stormwaterinc.com
StormTreat	Sedimentation followed by filtration, adsorption and biochemical reactions in constructed wetland	StormTreat Systems, Inc. Sandwich, MA www.stormtreat.com
Ultra-Drain Guard	Inlet filter bag	Ultratech International Jacksonville, FL www.spillcontainment.com
UltraUrban Filter	Media filtration	Ultratech International Jacksonville, FL www.spillcontainment.com
Vortechs Stormwater Treatment System	Swirl concentrator	Vortechtechnics, Inc. Scarborough, MA www.vortechtechnics.com

B. Applicability

Mechanical BMPs are appropriate for drainage areas of less than 10 acres. The swirl concentrator BMPs and sedimentation/media filtration devices will typically be effective in removing some sediment and particulate pollutants. The sedimentation/constructed wetland devices are capable of more effective removal of sediment and some soluble pollutants. However, multiple units will generally be required to treat site runoff because of the low treatment rate associated with the sedimentation/constructed wetland device.

In general, the only site constraint for the mechanical BMPs is the head required between inflow and outflow. This is generally in the range of 1 to 3 feet. Because the units are self-contained, high water table or other site factors will not have an adverse effect if proper construction techniques are used.

C. Planning Considerations

Mechanical and manufactured BMPs are exclusively used as water quality controls for small development projects. These BMPs require regular maintenance to function correctly, an owner's ability to maintain the BMP is an important consideration of site applicability.

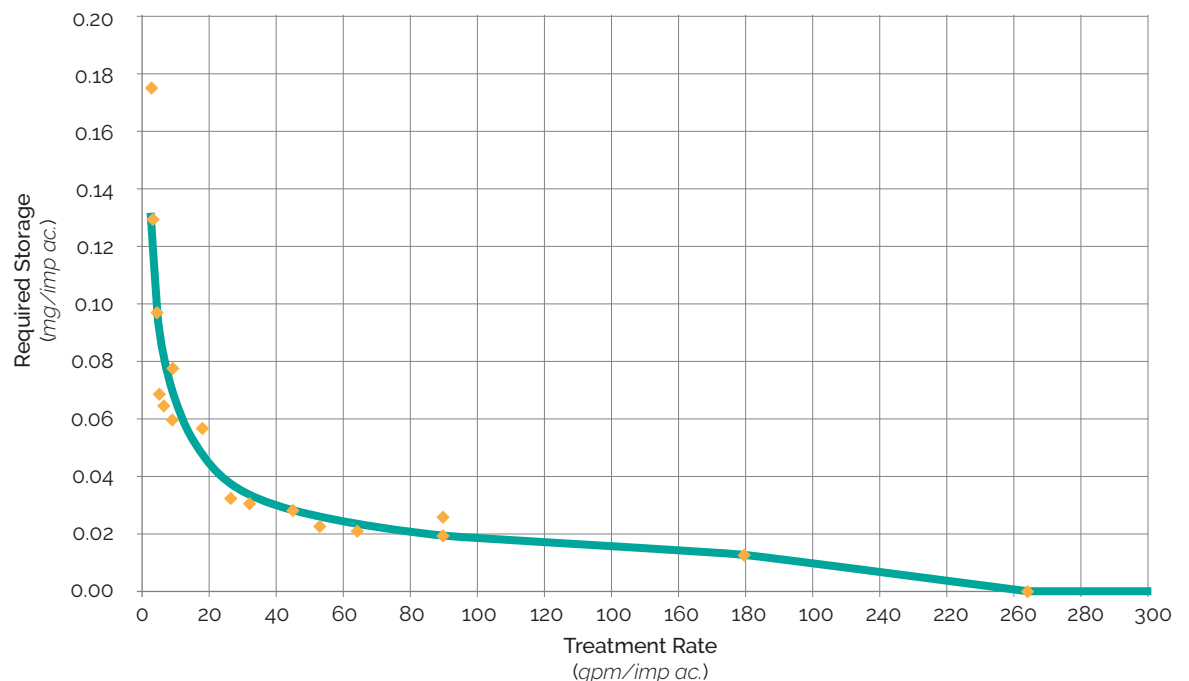
D. Design Criteria

Because mechanical and manufactured BMPs are commercially-constructed units, there are a limited number of design criteria. The key criteria for the units are the treatment rate and the required storage volume.

For the swirl concentrator and sedimentation/filtration units, the units should be selected so that the treatment rate of the units is 260 gallons per minute (gpm) or more per impervious acre of drainage, which is equivalent to 0.6 cfs or more per impervious acre of drainage. No storage volume is required for a treatment rate of 260 gpm per impervious acre or more.

For the sedimentation/constructed wetland unit, the minimum recommended treatment rate is 20 gpm per impervious acre of drainage. Based on the actual treatment rate of the unit(s), the engineer should use Figure 10-6-7 to determine the corresponding storage required for 90% runoff capture.

Figure 10-6-7. Storage and Treatment Rates Required to Capture and Treat 90% of Stormwater Runoff



E. Maintenance Requirements

In order to provide effective stormwater pollution control on a continuing basis, periodic maintenance of the mechanical BMP is necessary. Routine maintenance requirements are typically specified by the manufacturer. Most of the manufacturers suggest annual removal of accumulated sediment and removal/replacement of filtration media as necessary, though actual maintenance frequency can be evaluated based on inspections in the initial year of operation and maintenance schedules should be modified to be site specific.

Non-routine maintenance would generally be limited to replacement of the units or unit components due to structural failure. Based on manufacturer information, the useful life of these units may be 30 to 100 years.

BEST MANAGEMENT
PRACTICE EXAMPLE

Infiltration Trench

Source
Virginia Association
of Soil and Water
Conservation Districts



10.6.14 Infiltration Trench

A. Description

An infiltration trench generally consists of a long, narrow excavation 3-8 feet deep filled with stone, gravel or engineered soils that provides temporary storage of stormwater for subsequent infiltration into the native soil. The trench can receive sheet flow or shallow, concentrated runoff from adjacent developed areas. The trench can be covered with grating, washed stone, sand, or vegetation. A typical infiltration trench BMP in a residential setting is shown on Figure 10-6-8.



Figure 10-6-8. Typical Infiltration Trench.

Source: Virginia Stormwater Management Handbook, 2013.

B. Applicability

Infiltration trench BMPs can be designed to capture sheet flow runoff from areas up to 5 acres in size, however, drainage areas of 2 acres or less for an individual trench are preferred. Application sites typically include parking lots or commercial facilities. Due to their narrow shape, infiltration trenches can be used at many locations and are well suited to retrofits. Infiltration trenches should not be installed in fill areas. Infiltration trenches are not suitable in areas that have sediment loads (i.e. roads) or have an elevated risk of chemical spills (i.e. industrial developments, car repair facilities). The suitability of infiltration trench BMPs to a small development project will depend on whether the proposed BMP location passes the feasibility tests listed below.

C. Feasibility Tests

Since infiltration trench BMPs are only suitable for sites with appropriate soils characteristics and water table conditions, the design engineer must demonstrate that the proposed

BMP location satisfies the following feasibility tests before a development plan relying on infiltration trench BMPs will be approved:

- 1 The soil beneath the infiltration trench facility shall exhibit saturated hydraulic conductivity that permit adequate percolation of stored runoff. The saturated hydraulic conductivity is the rate at which water percolates through the soil under saturated conditions. Soils with hydraulic conductivity rates greater than 0.5 inches per hour (hydrologic soil group A or B) are suitable for infiltration trench practices. Field verify the soil saturated hydraulic conductivity rates, depth to restrictions (e.g. bedrock) and the seasonal high water table must be field verified prior to trench design. If the underlying soil does not have an adequate percolation rate, the basin should be equipped with an overflow pipe or underdrain to carry percolating water away from the facility.
- 2 The maximum allowable drainage time for the infiltration trench basin surface shall be no more than 48 hours, assuming average antecedent moisture conditions in the surrounding soil.
- 3 The invert of the infiltration trench facility must be at least two feet above the seasonally high groundwater table or bedrock.
- 4 The site topography should be considered in locating the infiltration trench facility, including slope, soils, and the proximity of building foundations. To prevent basement flooding, building foundations shall be at least 20 feet up-gradient and 100 feet down-gradient from the infiltration trench. Do not locate infiltration trenches on slopes greater than 20%.

D. Planning Considerations

Infiltration trenches are primarily used as water quality controls for small development projects. It may not be cost-effective to use these devices to achieve required flooding/erosion control performance standards because the facility must be sized to capture all design storm runoff up to, and for some period after, the time of peak flow. Whereas detention basins can be designed to limit most of the peak-shaving storage to periods around the time of peak flow, peak-shaving designs of infiltration trenches require the provision of a considerable amount of storage to handle the entire rising limb (and portions of the falling limb) of the design storm hydrograph.

Infiltration trenches frequently fail without regular maintenance. The BMP owner's ability to maintain the trench should be considered. Infiltration trenches should not be installed until the rest of the site has been stabilized. If the BMP must be installed prior to full stabilization, then divert all stormwater around the BMP to prevent clogging until the site has been fully stabilized.

The infiltration rate of native soils around the trench can change due to sediment loading, a safety factor of 2 shall be used to account for changing infiltration rates over the life of the BMP.

E. Design Criteria

The following general criteria apply for infiltration trench BMPs:

Pre-treatment: Pre-treatment of stormwater runoff is necessary to reduce incoming velocities, evenly distribute the flow over the infiltration trench area, and remove coarse sediments. Any pre-treatment device and design that allows sediment-laden water to enter the infiltration trench upon failure should be avoided. Pre-treatment located along the upstream edge of the infiltration trench area may consist of the following:

- Gravel, landscape stone, or geotextile level spreader
- Sediment forebay
- Gently sloping (5% or less) vegetated filter areas with at least a 20-foot flow length

- Vegetated swale
- Mechanical or manufactured water quality device

Storage Capacity: The available storage volume includes the surface ponding volume, plus subsurface void storage in the trench stone/soil. The storage capacity must be equal to or greater than the water quality volume.

Ponding depth: The maximum allowable ponding depth at the infiltration trench surface is 6 to 12 inches to allow drainage within a reasonable time. Ponding deeper than 12 inches may require safety measures to be included in the design.

Trench Shape: Infiltration trenches typically have rectangular cross sections. The length, width, and depth of the trench will be primarily determined by the characteristics of the site and the path of the influent water. If stormwater enters the trench as sheet flow, the length of the trench perpendicular to the flow direction should be maximized. The maximum width of infiltration trench areas is 25 feet. If the influent stormwater is a concentrated flow, then the trench length parallel to the direction of flow should be maximized. The bottom of the trench should be flat (no more than 1% slope) to encourage uniform infiltration.

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Surface Area: Per the SC ~~DHEC~~ Storm Water Management BMP Handbook, the required surface area (A) of the infiltration trench basin can be calculated as follows:

$$A = \frac{WQ_v}{(nd + (kT)/12)}$$

Where:

A	=	Infiltration trench surface area (ft ²)
WQ _v	=	Water quality volume expressed as depth over the drainage area (ft)
n	=	Porosity of stone/soil in infiltration trench (typically 0.3 to 0.5, use 0.32 if not known)
d	=	depth of trench (ft)
k	=	Saturated hydraulic conductivity (in/hour)
T	=	Fill time (hours) (Fill time of 2 hours is recommended for most designs)

Other sizing calculations may be used at the discretion of the administrator.

Maximum Storage Time: The infiltration trench facility must be sized to dewater within 48 hours, assuming average antecedent conditions. Given the maximum ponding depth of 6 inches, infiltration rates of 0.13 to 0.25 inches per hour would be sufficient to dewater the pooled area. The recommended soil mix with its relatively high sand content will have infiltration rates that exceed those required.

Overflow System: An overflow system shall be designed to pass runoff volumes greater than the design volume away from the infiltration trench area once the maximum ponding depth has been reached.

Peak Flow Control: Stormwater management facilities must also be provided, as

required by the Storm Ordinance, to control the post-development peak runoff from the 2-year, 10-year, and 25-year, 24-hour storm events. The peak runoff performance standard can be met by expanding the infiltration trench facilities and/or by providing additional detention storage facilities.

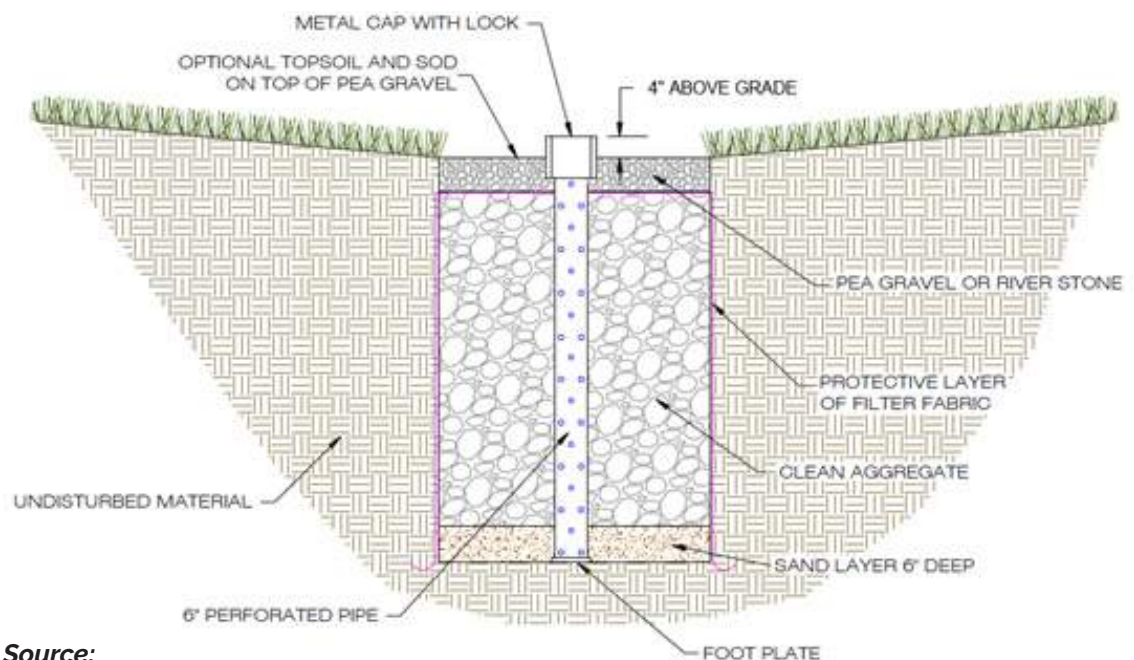
Underdrain: Infiltration trench areas that do not have native soil compositions providing adequate infiltration, as confirmed by a geotechnical engineer or equivalent, shall include an underdrain system placed beneath the stone mix. At a minimum, the underdrain shall consist of a 4-inch diameter perforated PVC pipe (AASHTO M 252) with an 8-inch gravel jacket filter layer and non-woven geotextiles to separate the piping from the native soils and the gravel. The geotextile should be placed directly over the pipe. Wrapping the pipe will result in a shortened useful life. The underdrain shall be designed to allow the trench to dewater within 48 hours after the design storm. Further guidance for designing an underdrain system is provided in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

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Storage Media: The stone fill media should consist of 1.0 to 2.5 D50 crushed stone overlain by 6-inches of pea gravel and underlain by a 6-inch sand filter on the bottom of the trench. The pea gravel and stone must be separated by a non-woven geotextile filter fabric that acts as a sediment barrier to prevent sediment migration deeper into the trench. A separate geotextile filter fabric should line the sides of the trench to prevent piping.

Observation Wells: Install observation wells spaced a maximum of 100-feet in every trench. Construct the wells of 4 to 6 inch PVC pipe that extends to the bottom of the trench. Install the wells in the trench centerline and flush with the ground elevation of the trench. Cap and lock the wells. The observation wells are used to determine the rate of de-watering and if maintenance is required. A minimum of one observation well is required in each infiltration trench even if less than 100 feet in length.

Figure 10-6-8. Typical Infiltration Trench Cross Section



Source:
VA DEQ Stormwater
Design Manual, 2013

F. Maintenance Requirements

Routine maintenance activities include monthly debris and trash removal, erosion inspection (at least quarterly and following rainstorms), semi-annual removal of trees, shrubs or invasive vegetation and record-keeping. Inspect the pretreatment structures for sediment accumulation at least semi-annually. Check the observation wells 72 hours after a rainfall event to confirm proper infiltration trench function. Maintenance schedules should be modified to be site specific.

It is possible that the facility surface may clog due to sediment accumulation. If standing water or clogging is observed at the surface, then the pea gravel and non-woven geotextile fabric should be replaced. If observation wells contain standing water after 72 hours, the underdrain or infiltration surfaces may be clogged. In the event of incomplete draining, the trench may need to be excavated to expose clean walls and base and all sand, gravel, and geotextiles replace.

Infiltration trench facilities that are used to treat runoff from parking lots or other commercial sites might require more frequent maintenance in the form of trash removal. Because an infiltration trench is located lower than the surrounding drainage area, facilities in commercial areas are prone to collect refuse such as shopping bags, food wrappers, and cigarette butts that are thrown on the ground. Regular removal of such items is required in these circumstances to keep the facility operating properly and maintain aesthetics.

10.7

10.7 Stormwater Pollution Prevention Plan

10.7.1 Introduction

This section describes the preparation and implementation of a stormwater pollution prevention plan (SWPPP) for construction activities in the City of Greenville. A SWPPP must be prepared before construction begins, typically during the project planning and design phases.

While under review, this document must be labeled as the Comprehensive SWPPP (C-SWPPP) as defined by Section 3.1.1.G of the CGP (Construction General Permit). After C-SWPPP approval, a condensed version of the C-SWPPP labeled as the On-Site SWPPP (OS-SWPPP) must be kept at the construction site until final stabilization is reached and coverage under the permit has been terminated.

Implementation of the SWPPP begins before the initial clearing, grubbing, and grading operations, since these activities increase erosion potential on the site. The SWPPP is a living document that must be amended by the owner/operator as significant changes occur in construction operations, which could increase the potential for discharge of pollutants.

Compliance with the requirements of a CGP consists of three major components: preparation and implementation of a SWPPP, submission of the Notice of Intent (NOI), and submission of the Notice of Termination (NOT). The SWPPP is prepared in conjunction with the construction documents for the site and before the submission of the NOI to the City. As part of the NOI, the owner/operator must certify that the SWPPP has been prepared for the site and that they will conform to the requirements of the SWPPP.

Chapter 3 of the ~~SCDHEC~~ CGP should be referenced for any items not mentioned in this section.

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10.7.2 Preparation of the SWPP

The C-SWPPP consists of a narrative description of the project and a plan view showing the location of the construction site along with potential pollutant sources and management practices used to minimize erosion and sedimentation during construction. The C-SWPPP describes the planned management measures for controlling pollution of storm runoff by any chemicals and materials used during construction, and shows areas of long-term post-construction control measures. SWPPP submittals should include the rationale used for selecting control measures, including how the control measure protects a waterway or stormwater conveyance system. Good housekeeping best management practices (BMPs) and associated inspection and maintenance measures performed by the owner/operator to enhance the effectiveness of these techniques are also included.

The C-SWPPP is required to be **submitted for review** and approved before construction activities may commence. Once approved, the C-SWPPP will be condensed into the On-Site SWPPP. The On-Site SWPPP must include the same stormwater management and sediment control plan, and the same construction site plans included in the Comprehensive SWPPP approved for the site. The contents of the On-Site SWPPP include all items required for the review and approval of the C-SWPPP **except** for the Engineering Report.

Each On-Site SWPPP will act as the construction site's living documentation that will be followed as the stormwater pollution prevention plan is implemented, updated as modifications are made, and used as a record log as stages of the approved OS-SWPPP are completed until the construction site has reached final stabilization and coverage under this permit has been terminated.

The SWPPP should be directed at personnel on the construction project (e.g., supervisors, foreman, and inspectors). The SWPPP should provide specific guidance on actions to be taken by these personnel, and presented in a format that accommodates day-to-day use (e.g., loose leaf, pullout sections, and check lists). A current version of the OS-SWPPP must be available on-site for inspection and amended by the owner/operator as changes occur in construction operations that could have a significant effect on the potential for discharge of pollutants from the site.

For non-linear construction sites disturbing more than 5 acres, the Comprehensive SWPPP must be submitted with a phased erosion prevention and sediment control plan. For any Comprehensive SWPPPs associated with a Larger Common Plan (LCP), specifically associated with residential development, the C-SWPPP must be designed in a manner that the entire project site, during construction and through final build out, is in compliance with this permit. A Comprehensive SWPPP designed to the above conditions will allow Secondary Permittees to apply for individual lot coverage under this general permit by referencing and implementing the approved OS-SWPPP.

In preparing the On-Site SWPPP, the following information will be required prior to approval:

SC ~~DHEC~~ Construction General Permit: One copy of this permit, excluding the appendices. Provisions may be made for the copy of general permit to be accessed electronically as long as a hard copy can be made available by the end of the working day when required.

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Notice of Intent: A stamped and approved copy of the NOI.

NPDES Coverage Approval Letter: The letter generated once the C-SWPPP is determined to be in compliance with this permit.

Local Approvals: Any additional letters, approvals, or certifications necessary to implement the OS-SWPPP, when necessary.

USACOE Approvals: Certifications necessary to allow impacts to Waters of the State or Jurisdictional wetlands, when necessary.

Contractor Certifications: Certifications necessary to allow contractors to conduct construction activities within the construction site.

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Record Keeping: Any logs necessary to track the progress, compliance, modifications and those associated with the construction site. These logs may include, but are not limited to, a pre-construction conference log, an inspection log, a stabilization log, a rain log, a contractor log and/or any additional record keeping as deemed necessary by the Permittee, Contractor, ~~DHEC~~, MS4 or an entity delegated under Regulation 72-300.

10.7.3 Contents

Refer to the City of Greenville's website for the Stormwater Permit Checklist and SWPPP template. The SWPPP should contain (but not be limited to) the following information.

Each C-SWPPP must include a project narrative that accurately addresses the following requirements for each construction site:

- Scope of project outlined, including a detailed description of pre- and post-development conditions.
- Description of existing and potential flooding problems at the site due to pre-construction drainage conditions, and any potential flooding problems within the surrounding area that may be a direct result of current site conditions or the proposed site development. Identify if the site is located within a floodplain.
- The function of the Project (e.g., low density residential, shopping mall, highway, etc.).
- Estimates of the total area expected to be disturbed by excavation, grading, or other construction activities, including dedicated off-site borrow and fill areas.
- Information regarding the required on-site support activities (e.g. concrete and asphalt batch plants, etc).
- Identification of prior uses of the construction site or potential sources of pollution that may reasonably be expected to cause or contribute to a violation of any applicable water quality standard based upon the existing condition of the construction site.

Stormwater Management and Sediment Control

Each C-SWPPP must include a Stormwater Management and Sediment Control section that accurately addresses the following requirements for each construction site as applicable:

I. Industrial Stormwater Discharges.

Identify and describe the location of any Stormwater discharge associated with industrial activity other than construction activities at the construction site.

II. Water Quality BMPs.

Identify and describe all pollution control measures (i.e., BMPs) that will be implemented as part of the construction activities to control pollutants in Stormwater discharges.

III. Erosion Prevention BMPs.

Identify and describe all temporary and final stabilization practices for the construction site, including a schedule of when the practices will be implemented. Use of impervious surfaces for stabilization should be avoided.

IV. Structural Control Measures.

Identify and describe all structural practices used to divert flows from exposed soils; to retain/detain flows; or to otherwise limit runoff and the discharge of pollutants from exposed areas of the construction site.

V. Post-Construction Water Quality BMPs.

Identify and describe all post-construction Stormwater management measures (LIDs, BMPs, etc.) that will be installed during the construction process to control pollutants in Stormwater discharges after construction operations have been completed.

VI. Construction Debris Management.

Identify and describe all measures to prevent the discharge of building or other similar materials to Surface Waters of the State, except as authorized by a permit issued under section 404 of the CWA.

VII. Construction Entrances and Dust Control.

Identify and describe all measures to minimize off-site vehicle tracking of sediments onto paved surfaces and the generation of dust.

VIII. Stock Pile Management.

Identify and describe potential construction and waste materials expected to be stored on-site. The controls, including storage practices such as roll off containers, spill prevention, and response practices used to minimize exposure of these waste materials to Stormwater discharges must also be identified and described.

IX. Additional Onsite and Offsite Pollution Identification.

Identify and describe potential pollutant sources from areas other than construction. Provide measures that will be implemented at those Sites to minimize pollutant discharges.

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Site Features and Sensitive Areas

The C-SWPPP must identify and delineate all Waters of the State (WoS), including wetlands, located within the disturbed area and/or the total area associated with the construction site. The C-SWPPP must also identify all WoS, including wetlands, which are located immediately adjacent to or within the surrounding area of the construction site. The C-SWPPP must also identify receiving waters, including wetlands and South Carolina Navigable Waters. The following must be addressed when a WoS is required to be identified:

- An additional, separate plan sheet, provided within the construction site plans when necessary that delineates all WoS within the construction site's Limits of Disturbance, and that identifies all WoS within the surrounding or adjacent areas. This plan sheet must identify all impacted areas with a description of the activities, whether permanent or temporary, and any other relevant information.
- If impacts to WoS, outlined areas of impacts and labeled that no work can begin in this area until all necessary USACOE permits and ~~SCDHEC~~ 401 certifications have been obtained.
- If Structural BMPs are proposed to be installed within a WoS, the C-SWPPP must specifically address the requirements listed in Section 3.2.6.A.V of this permit.

Buffer Zone Management

In order to minimize sediment discharges, **during construction**, if surface waters are located on or immediately adjacent to the construction site, the C-SWPPP must address any stormwater discharges from the construction site to such waters so that these discharges are treated by an undisturbed buffer zone that is capable of achieving maximum pollutant removal. See the City's Stormwater Ordinance for temporary and permanent stream buffer requirements.

Construction Site Plans

The C-SWPPP must include a set of Construction Site Plans that are consistent with the requirements listed in State Regulations 72-307.A.3 and include, but are not limited to, the

following requirements:

- The Limits of Disturbed (LOD) area must be outlined on all plan sheets.
- BMPs must be identified on the construction site plans using the symbols identified in the current edition of the SC ~~DHEC~~ Stormwater BMP Handbook or from a unique legend of symbols provided on the construction site plans. Symbols used for BMPs not identified in the Handbook must be included in the legend on each sediment and erosion control plan sheet.
- A construction sequence.
- Detailed Plan sheets, including grading and drainage plans, and BMP Detail sheets.

Phased Plan Requirements

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Over 5 acres

For non-linear construction sites disturbing more than 5 acres, the Construction Site Plans must include a phased stormwater management plan. This phased plan identifies all BMPs and grading work implemented during a specific portion of a site's construction sequence (e.g., initial grading and perimeter controls, interim land disturbances through final grading, post-construction and final stabilization). Each phase must be addressed and identified on at least one separate plan sheet. One sheet showing all BMPs and grading work for the entire course of the construction project will not be considered a complete phased plan.

For site disturbances less than 10 acres, at least two (2) separate plan phases shall be developed. Each plan phase shall be identified and must be addressed separately on at least one single plan sheet, with each sheet reflecting the conditions and the BMPs necessary to manage Stormwater runoff, erosion and sediment during the phases, at a minimum, listed below:

a). Initial Land Disturbance Phase.

This includes but is not limited to the perimeter BMPs, the necessary sediment and erosion control BMPs to be installed prior to initial/mass grading, and any additional BMPs necessary to keep the construction site in compliance with this permit.

b). Stabilization Phase.

This includes but is not limited to all BMPs required to be installed, maintained, and retrofitted during the time required to begin the majority of all construction and grading activities, and the time required to bring the construction site into compliance with permanent water quality requirements and into final stabilization.

The scope of the land-disturbing activities and BMPs to be included in each of the phases identified in this section should be evaluated on a site-to-site basis and selected based on what the SWPPP preparer and reviewer deems to be the most appropriate for each construction site.

Greater or equal to 10 Acres

For site disturbances greater than or equal to 10 acres, at least three (3) separate plan phases shall be developed. Each plan phase shall be identified and must be

addressed separately on at least one single plan sheet, with each sheet reflecting the conditions and the BMPs necessary to manage Stormwater runoff, erosion and sediment during the phases, at a minimum, listed below:

a). Initial Land Disturbance Phase.

This includes but is not limited to the perimeter BMPs, the necessary sediment and erosion control BMPs to be installed prior to initial/mass grading, and any additional BMPs necessary to keep the construction site in compliance with this permit.

b). Construction Phase.

This includes but is not limited to all sediment and erosion control BMPs necessary to be installed, maintained and designed to prevent sediment-laden stormwater from discharging off-site during construction. Examples of such BMP control measures to include in this phase are all temporary BMPs used to convey, manage, and treat stormwater runoff including additional sediment traps and sediments basins, rock check dams, silt fence, sediment tubes, inlet protection, temporary conveyance channels and any other sediment control measure.

c). Stabilization Phase.

This includes but is not limited to all BMP control measures required to be installed, maintained, and retrofitted during the time required to bring a construction site into compliance with permanent water quality requirements and into final stabilization.

The scope of the land-disturbing activities and BMPs to be included in each of the phases identified in this section should be evaluated on a site-to-site basis and chosen based on what the SWPPP preparer and reviewer deems to be the most appropriate for each construction site.

Non-Numeric Effluent Limits

The C-SWPPP must be developed so that the design, installation and maintenance of all sediment control and erosion prevention BMPs are implemented in a manner to minimize the discharge of pollutants. At a minimum, such BMPs must be designed, installed and maintained to:

- Control Stormwater volume and velocity within the site to minimize soil erosion during construction activity.
- Control Stormwater discharges, including both peak flow rates and total Stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion during construction activity.
- Minimize the amount of soil exposed during construction activity.
- Minimize the disturbance of existing steep slopes (i.e., slopes of 30% (~3H:1V) or greater), unless infeasible.
- Minimize sediment discharges from the site during construction activity.
- Provide and maintain natural buffers around surface waters and, after stormwater runoff is treated by the construction site's BMPs, direct the construction site discharges into these vegetated areas to increase sediment removal and maximize Stormwater infiltration, unless infeasible during construction activity; and

- Minimize soil compaction and, unless infeasible, preserve topsoil.

Documentation of Permit Eligibility Related to Total Maximum Daily Loads (TMDLs)

For construction sites with stormwater discharges to a receiving water that is identified as being impaired or has an EPA established or approved TMDL refer to the Chapter 3 of the CGP for required documentation.

Planning Phase

- *Assess Site Conditions*
- *Develop Basemaps*
- *Select Post-Construction BMPs*
- *Establish Long-Term Maintenance Agreements*
- *Prepare SWPPP with Information from Preceding Steps*

Design Phase

- *Prepare Project Site Plan*
- *Define BMP Objectives – include the rationale used for selecting control measures including how the measure protects a waterway or stormwater conveyance.*
- *Design Post-Construction BMPs*
- *Update SWPPP with Information from Preceding Steps*

Construction Phase

- *Bidding and Mobilization*
 - *Select BMPs*
 - *Submit SWPPP to the City*
 - *Submit Notice of Intent (NOI) to the City*
 - *Obtain Letter of Coverage (LOC) from the City*
 - *Train Personnel*
- *Construction Operations*
 - *Inspect and Maintain BMPs for Construction Activities*
 - *Construct Post-Construction BMPs*
 - *Revise the SWPPP as Necessary*
- *Complete Construction*
 - *Permanent Site Stabilization*
 - *Maintenance Agreements for Post-Construction BMPs*
 - *Submit Notice of Termination (NOT) to the City*

10.7.4 Summary

The City of Greenville is a delegated review entity for the State and, therefore, is authorized to review and grant approval for NPDES general permit coverage (also referred to as a CGP) within its jurisdiction. Coverage under the CGP requires the Applicant to have a SWPPP for the control of stormwater discharges from the construction site at the time the NOI (SC ~~DHEC form DHEC~~ 2617, 10/2012) is filed with the City. The CGP authorizes storm water discharges from large and small construction activities where those discharges enter Surface Waters of the State subject to the conditions of the 2012 SC NPDES # SCR100000. If approved, the Applicant is sent a LOC from the City summarizing conditions for coverage. Upon completing construction activities and final stabilization of the site, a NOT (SC ~~DHEC form DHEC~~ 2610, 6/2013) shall be submitted by the Applicant to the City. Electronic copies of the SCR100000 permit along with NOI and NOT forms can be downloaded from the City's website.

The required forms and documentation to obtain stormwater permit coverage for all construction/land-disturbing activity within the incorporated areas of the City of Greenville shall be submitted to the following address:

City of Greenville
Engineering and Public Works Department
P O Box 2207
Greenville, South Carolina 29602

Further guidance on preparing a SWPPP for construction sites is available from the US Environmental Protection Agency's report titled "Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites." http://www.epa.gov/npdes/pubs/sw-swppp_guide.pdf

10.8

10.8 Soil Erosion & Sediment Control

10.8.1 Introduction

The purpose of this section is to establish the minimum design guidelines for the following Soil Erosion and Sediment Control BMPs for use in the City of Greenville:

- Surface Roughening
- Silt Fence
- Storm Drain Inlet Protection
- Sediment Basins
- Sediment Traps
- Seeding
- Stabilized Construction Entrance
- Check Dams
- Turf Reinforcement

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10.8.2 Overview of Soil Erosion and Sediment Control BMPs

Soil erosion controls are designed to prevent or minimize loosening of soil particles (erosion) and are primarily focused on construction sites. Phased construction plans are preferred over mass grading and encouraged beyond the ~~SCDHEC~~ minimum requirements. Sediment controls help remove sediment from runoff, and can limit or prevent sediment from leaving a construction site. The use of one or more specific BMP types depends on specific site conditions and needs such as soil characteristics, topography, and ground cover. In many cases, there are multiple goals or needs for a given project and the best protection will likely include a combination of controls. According to the City's Stormwater Ordinance, soil erosion and sediment control measures shall at a minimum achieve an equivalent removal efficiency of 80% for suspended solids or 0.5 ML/L peak settleable solids concentration, whichever is less. The efficiency shall be calculated for disturbed conditions for the 10-year, 24-hour design event.

In 2004, Clemson University initiated the development and implementation of the Certified Erosion Prevention and Sediment Control Inspector (CEPCSI) Program to educate field personnel on the proper installation, maintenance, and inspection of erosion prevention and sediment control measures at construction sites. ~~Further information on the CEPCSI Program can be accessed at: <http://www.clemson.edu/public/cepSCI/>~~

Surface Roughening: The surface of the soil can be "roughened" by utilizing construction equipment to create grooves or furrows in otherwise smooth exposed soils. The furrows limit erosion by slowing runoff velocities, trapping loose sediment, and increasing infiltration. Surface roughening is often used in conjunction with grading. In addition, soil roughening helps seeds become established.

Silt fences: A silt fence can be used along a site perimeter and at key locations in the interior of a site to prevent migration of sediment off-site.

Storm Drain Inlet Protection: These BMPs provide protection from excess sediment to storm drain inlets by filtering sediment from the runoff. Examples include hay bales, silt fencing, temporary coarse gravel, silt sacks, mat/roll-type barriers, or fabric barriers.

Sediment Basins and Sediment Traps: These BMPs can remove sediment from runoff by providing detention time for stormwater. The basins and traps allow sediment to settle out of runoff.

Seeding: Applying seeds to bare soils will eventually provide vegetative covering, which will promote infiltration and help to stabilize soils and minimize erosion.

Stabilizing the Construction Entrance: This BMP minimizes the amount of sediment leaving a construction site on vehicles. A gravel pad and filter cloth can be installed at the entrance to collect sediment from construction vehicles. A wash station can also be used to rinse vehicles leaving the site, if rinse water is controlled.

Check Dams: These small, temporary dams are constructed across a channel or swale to reduce runoff velocity within the channel. The dams may also serve to settle out sediment, but should not be used primarily for this purpose.

Turf Reinforcement: Turf reinforcement mats can be used to enhance the ability of vegetation to stabilize the soil and minimize erosion.

10.8.3 Pollutants of Concern from Construction Sites

The primary pollutant of concern associated with construction activities is sediment (suspended and dissolved solids) from erosion. Clearing and digging activities during construction remove vegetation and disrupt the stability of the soil surface, leaving the soil susceptible to rainfall erosion, stream and channel erosions, and wind erosion if left untreated. If not managed properly, the material suspended by erosion can settle during sedimentation in downstream reaches.

Other potential pollutants from construction sites include metals, pesticides, oil and grease, fuels, other toxic chemicals, and miscellaneous wastes. These pollutants originate from a variety of activities including paving operations, demolition, materials storage, equipment fueling, and other daily activities necessary for project construction or site (commercial or industrial) management. By taking an activities inventory, the contractor/operator can identify potential pollutant sources and then select appropriate BMPs to address these sources. Appropriate BMPs are usually specific to the construction activity or site (commercial or industrial) management activity as described in a site's Stormwater Pollution Prevention Plan (10.7).

Metals: Many artificial surfaces (e.g., galvanized metal, paint, or preserved wood) contain metals that can enter stormwater as the surfaces corrode, flake, dissolve, decay, or leach. However, significant portions of metals in urban runoff are from cars and trucks. Over half the trace metal load carried in stormwater is associated with sediments to which these eroded metals attach. Heavy metals are of concern because they are toxic to aquatic organisms, can be bioaccumulative, and have the potential to contaminate drinking water supplies.

Pesticides: Herbicides, insecticides, and rodenticides (collectively termed pesticides), are commonly used on construction sites, lawns, parks, golf courses, etc. Unnecessary, excessive, or improper application of these pesticides may result in direct water contamination, indirect water pollution by aerosol drift, or erosion of treated soil and subsequent transport into surface waters.

Oil, Grease, and Fuels: These products are widely used and can be spilled/leaked/dumped on the ground where they can wash into waterways. Sources include leakage during normal vehicle use, hydraulic line failure, spills during fueling, and inappropriate disposal of drained fluids. These products can cause harm to plant and animal life.

Other Toxic Chemicals: Often synthetic organic compounds (adhesives, cleaners, sealants, solvents, etc.) are widely applied and may be improperly stored and disposed. Accidental spills and leakage or deliberate dumping of these chemicals onto the ground or into storm drains causes environmental harm in receiving waters.

Miscellaneous Wastes: Miscellaneous wastes include wash water from concrete mixers, paints and painting equipment cleaning activities, solid organic wastes resulting from trees and shrubs removed during land clearing, wood and paper materials derived from packaging of building products, food containers, such as paper, aluminum, and metal cans, industrial or heavy commercial process wash/cooling water, vehicle washing, other commercial or industrial wastes and sanitary wastes. The discharge of these wastes can lead to unsightly and polluted receiving waters.

10.8.4 Surface Roughening

A. Description

Roughening, terracing, and rounding are techniques used for creating unevenness on bare soil through the construction of furrows running across a slope, creation of intermediate benches in long slopes, or by utilization of construction equipment to track the soil surface. This management practice is likely to create a significant reduction in sediment. The primary function of surface roughening is to reduce erosion potential by reducing sheet flow runoff velocities, trapping sediment, and increasing infiltration of water into the soil. Surface roughening should be used as a permanent measure, to prepare a slope to receive permanent vegetation.

B. Applicability

Surface roughening should be applied to all construction slopes (particularly slopes steeper than 3H:1V) to facilitate stabilization with vegetation. It can provide instant erosion protection on bare soil while vegetative cover is being established. The amount of roughening required depends on the steepness of the slope and the type of soil. Surface roughening can also be utilized in graded areas with smooth, hard surfaces, with potential for erosion of clay, silt, or sand-sized particles. Surface roughening can also be applied to areas where the slope length needs to be shortened by terracing. Terracing is usually permanent and should be designed under the direction of and approved by a licensed professional civil engineer based on site conditions. Terraces must be designed with adequate drainage and stabilized outlets for the design flow.

C. Planning and Design Considerations

Roughening methods include stair-step grading or furrowing, which must be done across the slope and along the contour. Tracking, by contrast, must be done up and down the slope. Factors to be considered in choosing a method are slope steepness, mowing requirements, soil type, and whether the slope is formed by cutting or filling. Regardless of the method used, the final slope face should not be bladed or scraped to give a smooth hard finish.

Stair-Step Grading:

- To slow erosion, perform stair-step grading within seven days after removal of the vegetation from the slope.
- Use stair-step grading or furrows (groove cuts) on cut slopes that are steeper than 3H:1V, but less than 2H:1V.
- Use stair-step grading on erodible material which is soft enough to be ripped by a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the step in toward the slope.
- Do not make individual vertical cuts more than 2 feet high in soft materials or more than 3 feet high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope and on the contour.
- Seed and stabilize areas graded in this manner within 14 days.
- Stair-step grading may not be practical for sandy, steep, or shallow soils.

Cuts, Fills, and Graded Areas:

- Slopes that will be maintained by mowing should be no steeper than 3H:1V.
- To roughen these areas, create shallow grooves (a series of ridges and depressions perpendicular to the slope) by normal tilling, disking, harrowing, or use a cultipacker-seeder. Make the final pass of any such tillage on the contour.
- Make grooves formed by such implements close together, less than 10 inches apart and not less than 1 inch deep.
- Excessive roughness is undesirable where mowing is planned.

Fill Slope Roughening:

- Place fill slopes with a gradient steeper than 3H:1V in lifts not to exceed 8 inches, ensuring that each lift is properly compacted.
- The face of the slope should consist of loose, un-compacted fill 4 to 6 inches deep.
- Use grooving (see above) or tracking to roughen the face of the slopes, if necessary.
- Apply seed, fertilizer, and mulch then track or punch in the mulch.

Tracking:

- To slow erosion, perform tracking as soon as possible after vegetation has been removed from the slope.
- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not backblade during the final grading operation.
- Seed and mulch roughened areas to obtain optimum seed germination and growth.

Additional design requirements for surface roughening may be found in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

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D. Maintenance Requirements

Inspections shall take place every seven calendar days and within 24 hours after each significant storm event (greater than 0.5 inches). If rills or washes appear, fill these areas slightly above the original grade, then re-seed and mulch as soon as possible.

E. Limitations

Roughening may increase grading costs and result in sloughing in certain soil types. Roughening alone as a temporary erosion control or surface preparation measure is of limited effectiveness in intense rainfall events. If roughening effects are washed away in a heavy storm, the surface will have to be re-roughened and new seed and mulch applied.

10.8.5 Silt Fence

A. Description

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to steel posts, entrenched into the ground, and depending upon the strength of the fabric used, supported with wire fence. Silt fences trap sediment in two ways: (1) by intercepting and detaining small amounts of sediment from disturbed areas during construction operations in order to promote sedimentation behind the fence; and (2) by decreasing the velocity of low flows.

B. Applicability

Silt fences are suitable for temporary perimeter control around sites where there will be soil disturbance due to construction. A silt fence is typically located downstream of the disturbed area(s) in order to intercept runoff discharging from a site. It is only feasible for non-concentrated, sheet flow conditions. Silt fences shall be placed below the toe or down slope of exposed and erodible slopes. In addition, a silt fence shall be applied around temporary spoil areas and stockpiles. They should be further located upstream of sediment traps or basins and along streams and channels (not across). Generally, silt fencing should be used in conjunction with erosion source controls up slope to provide effective control.

C. Planning and Design Considerations

A silt fence is recommended for use in areas where the maximum sheet or overland flow path length to the fence is 100 feet and maximum slope gradient (perpendicular to fence line) is 2H:1V. These areas shall not receive concentrated flows greater than 0.5 cfs. A properly installed silt fence is expected to provide up to 80% removal efficiency for total suspended solids.

The installed fence fabric height shall range from 18 inches to 24 inches. Posts shall have a minimum bury depth of 18 inches and shall be spaced 4 to 6 feet apart. Silt fences are typically designed to function under a 10-year storm event and may be operated for as long as 5 to 8 months. Silt fences are designed to pond water behind them, so it is crucial that they are sufficiently anchored and installed following site contours. Silt fences that are not entrenched and do not follow contours can result in worsened erosion.

Additional design requirements for silt fencing along with silt fence design examples may be found in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

D. Maintenance Requirements

Silt fences shall be inspected for sediment buildup every 7 days and within 24 hours after each rainfall event that produces 0.5 inches or more of precipitation. Sediment accumulated along the fence should be removed once it reaches 1/3 the height of the fence. If a fence fabric tears or becomes ineffective in any way, it shall be repaired promptly. Remove silt fence within 30 days after final stabilization is achieved or after temporary BMPs are no longer needed. Permanently stabilize disturbed areas resulting from fence removal.

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10.8.6 Storm Drain Inlet Protection

A. Description

Inlet protection consists of a variety of temporary erosion control methods for intercepting sediment at low point inlets through the use of stone, filter fabric, and other materials. This BMP is normally located at the storm drain inlet, providing either detention or filtration to reduce sediment and floatable materials in storm water.

B. Applicability

Every storm drain inlet at the site receiving sediment-laden runoff should be protected, either by covering the inlet or promoting sedimentation upstream of the inlet. Inlet protection can reduce sediment in storm sewer systems by serving as a back-up system to on-site controls or by reducing sediment loads from controls with limited effectiveness. A storm inlet protection BMP can be used as appropriate in areas where ponding will not encroach into the access road or highway traffic or where disturbed tributary areas have not yet been permanently stabilized. This management practice shall be required on all inlets that have outfalls that bypass sediment traps or basins and directly discharge off-site.

C. Planning and Design Considerations

There are six types of inlet structure filters that are used as follows:

Type A-Low Flow: Type A inlet filters include filter fabric inlet protection (silt fence) and 18-inch diameter sediment tubes. Filter fabric inlet protection consists of geotextile fabric stretched across steel posts with the lower edge of the fence vertically trenched into the ground or covered by compacted backfill. Sediment tubes consist of elongated flexible netting material filled with compacted geotextiles, curled excelsior wood, natural coconut fibers, hardwood mulch, or a mix of these materials. The inlet filters are oriented horizontally around the perimeter of the inlet to filter sediment. These types of inlet filters are appropriate where peak flow rates at the inlets are less than 1cfs. The allowable basin slope shall be less than 5%, while the immediate drainage area (5-foot radius around the inlet) shall have slopes less than 1%. This type of protection is not applicable in areas that receive concentrated flows.

Type B-Medium Flow, Low Velocity: Type B inlet filters include hardware fabric or comparable wire mesh and stone inlet protection. These types of filters are applicable for inlets with peak flow rates less than 3 cfs and where the inlet drain area has slopes less than 5%. This type of protection should not be used where an overflow capacity is required to prevent excessive ponding around the structure.

Type C-Medium Flow, Medium Velocity: Type C inlet filters include block and gravel inlet protection. These types of filters are applicable for inlets with peak flow rates less than 3 cfs and where the inlet drain area has slopes less than 5%. Flow velocities to the inlet should not exceed 5 feet per second. These types of filters can be used where an overflow capacity is required to prevent excessive ponding around the structure; however, they are not applicable in areas exposed to traffic, such as median drains.

Type D-High Flow, High Velocity: Type D rigid inlet filters include pre-fabricated inlet filters composed of a geotextile fabric connected to a rigid structure that covers the entire inlet opening rather than just the perimeter. These filters are applicable for drainage areas up to 2 acres with peak flow rates greater than 3 cfs where the inlet drain area has slopes greater than 5%. Flow velocities to the inlet may exceed 3 feet per second. These inlet filters are used for median and sump applications. These inlets are also applicable where an overflow capacity is required to prevent excessive ponding around a structure.

Type E-Surface Course Curb Inlet: Type E inlet filters are pre-fabricated and composed of a synthetic material that has aggregate compartments for stone, sand, or other weighted mechanisms to hold the unit in place. These inlet filters are applicable for roadway catch basins after the road surface is placed.

Type F-Inlet Tubes: There are two categories of Type F inlet tubes, which consist of weighted and non-weighted tubes. Weighted inlet tubes are applicable for inlets with drainage areas less than one acre and used for placement on gravel, concrete, asphalt or other hard surfaces around drainage inlets where stakes cannot be driven. Weighted inlet tubes can be used where construction traffic may occur around the inlet. Non-weighted inlet tubes are applicable for catch basins with drainage areas less than one acre where stabilization is needed to hold the tube in place.

Additional design requirements for inlet protection filters may be found in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

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D. Maintenance Requirements

All inlet and catch basin protection devices shall be inspected weekly and within 24 hours after each storm that produces 0.5 inches or more of rain. The storm drain inlet or other infrastructure downstream shall be inspected after severe storms to check for bypassed sediment or debris. Clogged filter fabric or stone filters should be replaced immediately and sediment removed when depth exceeds 1/3 the height of the filter.

All inlet protection devices shall be removed within 30 days after the site is stabilized, or when the inlet protection is no longer needed. Clean around and inside the storm drain inlet so that it is free of sediment and debris at the time of final inspection.

E. Limitations

Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. Ponding may occur at the inlet with possible flooding as a result. If high flow conditions are expected, use other on-site sediment trapping techniques in conjunction with inlet protection. Inlet protection is only viable at low point inlets. Inlets which are on a slope cannot be effectively protected because stormwater will bypass the inlet and continue downstream, causing an overload condition at inlets beyond.

10.8.7 Sediment Basins

A. Description

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged. This management practice is likely to create a significant reduction in sediment with a design TSS removal efficiency goal of 80%.

B. Applicability

Sediment basins are suitable for use on large projects with sufficient space for constructing the basin and especially where soil conditions suggest severe erosion potential. Sediment basins can be used when permanent detention basins are planned to be built at the same location. Sediment basins can be used in association with dikes, temporary channels, and pipes that are used to convey runoff from disturbed areas.

C. Planning and Design Considerations

Area: A sediment basin shall be required for disturbed areas draining 5 or more acres. The maximum drainage area contributing to the basin should be 150 acres.

Capacity: Sediment basins should have a both a permanent pool (dead storage) and an additional volume (live storage) with each volume equal to the runoff amount of a two-year, 24-hour event over the on-site hydrologically disturbed tributary drainage area to the sediment basin or 3,600 cubic feet per acre drained. The available sediment volume below normal water level, in addition to the dead storage volume shall be sized to store the estimated sediment load generated from the site over the duration of the construction period.

Drawdown Time: The required draw down time of the basin is the time to detain flows to meet the 80% design removal goal. The minimum draw down time for a sediment basin shall be 24 hours and the maximum draw down time shall be 72 hours.

Basin Shape: The effective flow length shall be at least twice the effective flow width.

Outlet Riser and Barrel Requirements: A sediment basin shall be designed to discharge volumes exceeding the 10-year 24-hour storm event. The minimum outlet pipe diameter shall be 8-inches, and the minimum diameter for the low flow orifice at the bottom of the riser structure shall be 4 inches. The low flow orifice shall be protected by a perforated filtered riser pipe or equivalent control measure. In addition, there should be a minimum one-foot elevation difference from the top of riser to the crest of the emergency spillway. For pre-treatment, an anti-vortex device/trash rack is required.

Embankment Requirements: The maximum upstream and downstream slopes shall be 2H:1V. If the sediment basin is to be converted into a permanent BMP such as a dry detention pond at the end of construction, embankment slopes shall be re-graded to 3H:1V unless permission is granted by the City to maintain steeper slopes. A minimum of one foot of freeboard is required. In addition, anti-seep collars are required on all penetrations through the dam.

Additional design requirements for sediment basins may be found in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

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D. Maintenance Requirements

Sediment basins shall be inspected weekly, before and after all rainfall events. The banks of the basin shall be examined periodically for seepage and structural soundness. The outlet structure and spillway should be checked for any damage or obstructions. Erosion at the outlet area should be monitored and stabilized if necessary. The sediments should be removed when sediment reaches 50% of storage volume or reaches the top of the designed cleanout stake, where applicable. All temporary sediment basins should be removed or converted to permanent detention BMPs within 30 days after final site stabilization is achieved or after it is no longer needed. For construction periods exceeding one year, the one-year sediment load and a sediment removal schedule must be submitted to the City.

E. Limitations

Since sediment basins require the use of large, expensive development area and comprehensive planning prior to implementation, alternative BMPs must be thoroughly investigated for erosion control before selecting sediment basins. Failure of the basin structure may result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. Sediment basins are only practically effective in removing sediment of the medium silt size fraction or larger. Sediment-laden runoff with smaller size fractions (fine silt and clay) will pass through untreated, emphasizing the need to stabilize the soil quickly.

10.8.8 Sediment Traps

A. Description

A sediment trap is a small, excavated or bermed area where runoff from small drainage areas is temporarily detained and sediment can settle. Sediment traps are formed by excavating or constructing an earthen embankment. This management practice is likely to create a significant reduction in sediment with a design TSS removal efficiency goal of 80%.

B. Applicability

Sediment traps can be applied to any disturbed area that is less than five acres. Sediment traps can be used along the perimeter of the site at locations where sediment-laden runoff is discharged off-site. They can also be used around and/or upslope from storm drain inlet protection measures.

C. Planning and Design Considerations

Area: Maximum drainage area contributing to the trap should be up to five acres.

Basin Shape: The effective flow length shall be at least twice the effective flow width.

Embankment Requirements: The maximum dam height shall be 5 feet and the maximum stone height shall be 3.5 feet. The minimum rock bottom width shall be 3 feet. Discharge and treatment capacity shall be sized for the 10-year 24-hour storm event.

Additional design requirements for sediment traps may be found in the South Carolina ~~DHEC Storm Water Management BMP Handbook~~.

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D. Maintenance Requirements

Sediment traps shall be inspected weekly, before and after all rainfall events. Trap banks should be examined periodically for structural soundness. The outlet structure and spillway should be checked for any damage or obstructions. The sediments should be removed when sediment reaches 50 percent of storage volume or reaches the top of the designed cleanout stake where applicable. All temporary sediment traps should be removed within 30 days after final site stabilization is achieved or after it is no longer needed.

E. Limitations

Sediment traps can be used only for drainage areas up to five acres. They require surface areas of 3% to 5% of the drainage area to allow for settling of sediment. Sediment traps can only remove large and medium sized particles and must be implemented in conjunction with upstream erosion control. In addition, the maximum design life of a sediment trap shall not exceed 18 months. Remove sediment traps within 30 days after final stabilization is achieved or after temporary BMPs are no longer needed.

10.8.9 Temporary Seeding

A. Description

Seeding is a temporary stabilization BMP that uses rapidly growing annual plants to prevent erosion and stabilize disturbed areas before final grading or in a season not suitable for permanent seeding. This management practice is likely to create a significant reduction in sediment and a partial reduction in nutrients and toxic materials.

B. Applicability

Seeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity. Seeding can be applied to denuded areas, soil stockpiles, dikes, dams, sides of sediment basins, and temporary diversions.

C. Planning and Design Considerations

Seed Application: Seed selection is based on geographical location, soil type, and the season of the year in which the planting is to be done. Designers should use the seeding schedule and seeding application rate for temporary vegetation. A guidance document is provided by the County of Greenville's Technical Specifications (EC-03, January 2013). Seeds should be applied at the specified rate and schedule and sown uniformly as soon as preparation of the seedbed has been completed. To prevent seed wash-out, the area should be protected with methods such as surface roughening diversions and terraces. A mulch cover should be applied especially to seedlings in the fall for winter cover or slopes that exceed 3H:1V. No seeding shall be done during windy weather or when the ground surface is frozen, wet or otherwise non-tillable. No seeding shall be performed during December and January unless otherwise permitted. Seeded areas shall be watered at controlled rates that are less than the rate at which the soil can absorb water to prevent runoff.

Fertilizer and Lime Requirements: Soils should be analyzed for fertilizer and lime requirements (soil testing is available through Clemson University Cooperative Extension Service). If the soil's pH is below 5.0, lime shall be applied at a minimum rate of 1.5 tons of lime/acre (70 pounds per 1,000 square feet). Fertilizer shall be applied at a minimum of 500 pounds per acre of 10-10-10 fertilizer (11.5 pounds per 1,000 square feet) or equivalent during seeding. Fertilizer and lime should be incorporated into the top 4 to 6 inches of the soil by disking or other means where conditions allow. Additional guidance on commercial fertilizer and lime application is provided by County of Greenville's Technical Specifications (EC-03, January 2013).

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Additional design requirements for seeding may be found in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

D. Maintenance Requirements

New seeding should be inspected frequently within the first six weeks of planting to see if stands are uniform and dense and to make sure that appropriate moisture levels are maintained. Seeded areas shall be checked periodically for damage caused by equipment or heavy rains. Damaged areas if any, should be repaired, fertilized, seeded, and mulched. Mulch should be tacked or tied down if necessary.

E. Limitations

Uneven seed broadcasting or low application may lead to patchy growth and erosion. Misapplication of fertilizer or lime could lead to pollutant runoff.

10.8.10 Stabilized Construction Entrance

A. Description

A stabilized construction entrance is defined as a process of stabilizing any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk or parking area. Stabilizing the construction entrance significantly reduces the amount of sediment (dust, mud) tracked off-site, especially if a washrack is incorporated for removing caked on sediment.

B. Applicability

This BMP can be applied to any point where traffic will be entering or leaving the construction site. A stabilized construction entrance shall be constructed on level ground where possible.

C. Planning and Design Considerations

Minimum entrance dimensions: The entrance shall have a thickness of 6 inches, a width of 24 feet, and length of 100 feet.

Cover: Material shall consist of stone with a D50 diameter ranging from 2 to 3 inches. Non-woven geotextile fabric is required to underlie the stone.

Miscellaneous: Ample turning radii shall be provided at the entrance. Perimeter fencing shall be installed proximate to the construction entrance that will limit egress of sediment to the designated construction exit(s). This BMP should be used in conjunction with street sweeping on adjacent public right-of-way.

D. Maintenance Requirements

Stabilized construction entrances shall be inspected weekly and within 24 hours after each storm that produces 0.5 inches or more of rain, or after heavy use. The integrity of the pad should be checked periodically. More maintenance is required in wet weather conditions. All sediments deposited on paved roadways shall be removed at the end of the work day. Any broken pavement shall be repaired immediately. Stabilized construction entrances shall be removed as soon as they are no longer needed to provide access to the site and the area should be stabilized using appropriate permanent stabilization methods. Remove the construction entrance within 30 days after final stabilization is achieved or after temporary BMPs are no longer needed.

E. Limitations

Stabilized construction entrances can be expensive to construct, especially when a wash rack is included. A sediment trap should also be provided to collect wash water runoff. The cost of a sediment trap for a construction entrance should be incremental or much less expensive than other BMPs to control sediment from a construction entrance.

10.8.11 Check Dams**A. Description**

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing the velocity of flowing water, allowing sediment to settle and reduce erosion.

B. Applicability

Check dams can be used in steeply sloped swales, or in swales where adequate vegetation cannot be established. They can be used in small open channels that drain 10 acres or less. Check dams should not be placed in Waters of the State.

C. Planning and Design Considerations

Area: Maximum drainage area of the check dam should not exceed 10 acres.

Height: Maximum height of the check dam should not exceed 2 feet.

Rock Placement: Rock check dams should be constructed using approximately 1-inch to 3-inch rock, which should be keyed into, or inset into, the swale/channel bottom. Filter fabric should be placed on the upstream face of the check dam.

Check Dam Location: Check dams should be located such that the toe of the upstream check dam is at the same elevation as the top of the downstream check dam. Backwater from a downstream check dam should reach, but not exceed the toe of the upstream check dam.

Sump: A sump may be provided immediately upstream of the check dam to capture sediment.

Additional design requirements for check dams may be found in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

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D. Maintenance Requirements

Check dams should be inspected weekly and within 24-hours after each rainfall event that produces 0.5 inches or more of precipitation. Sediment buildup behind the check dam and signs of erosion around the check dam should be inspected after each rainfall event. The accumulated sediment should be removed whenever it reaches $\frac{1}{3}$ the original check dam height by lifting the filter fabric and hand shoveling or backhoeing the silt. In the case of grass-lined ditches and swales, rock check dams shall be removed when the grass has matured sufficiently to protect the ditch or swale unless the slope of the swale is greater than 4%. Remove check dams within 30 days after final stabilization is achieved or after temporary BMPs are no longer needed.

E. Limitations

Check dams cannot be used for permanent placement unless life-cycle maintenance including sediment removal is guaranteed. The installation of check dams may damage vegetation. Check dams require extensive maintenance especially following high velocity flows. The sediments trapped by check dams can be resuspended during subsequent storms if regular sediment removal is not performed. Accumulated sediment must be removed prior to check dam removal.

10.8.12 Turf Reinforcement**A. Description**

Turf reinforcement mats are products composed primarily of non-degradable products such as jute mesh, excelsior matting, erosion control fabric, or other approved matting that enhances the ability of living plants to stabilize the soil and thus prevent or reduce erosion.

B. Applicability

Turf reinforcement mats shall be used in places where vegetation alone will not hold a slope or stream bank. Turf reinforcement mats enable the use of "green" solutions in areas where only other solutions such as riprap or concrete linings were viable in the past.

C. Planning and Design Considerations

There are four types of turf reinforcement mats as follows:

Type 1: This type of matting should be placed on slopes 2H:1V or flatter or in channels where the calculated design shear stress is 4.0 lb/ft² or less and the design flow velocity is up to 10 ft/s.

Type 2: This type of matting should be placed on slopes 1.5H:1V or flatter or in channels where the calculated design shear stress is 6.0 lb/ft² or less and the design flow velocity is up to 15 ft/s.

Type 3: This type of matting should be placed on slopes 1H:1V or flatter or in channels where the calculated design shear stress is 8.0 lb/ft² or less and the design flow velocity is up to 20 ft/s.

Type 4: This type of matting should be placed on slopes 1H:1V or greater or in channels where the calculated design shear stress is 12.0 lb/ft² or less and the design flow velocity is up to 25 ft/s. This type of matting is 100% synthetic and should be resistant to biological, chemical and ultraviolet degradation.

Large rocks, soil clods, vegetation, and other sharp objects that could keep the turf reinforcement mat from proper contact with the subgrade should be removed prior to installation. The seedbed shall be prepared by loosening 2 to 3 inches of soil above final grade. The proper installation of turf reinforcement mats is different for each product; therefore, the recommended installation procedure from the specific manufacturer should be followed.

Additional design requirements for turf reinforcement mats may be found in the South Carolina ~~DHEC~~ Storm Water Management BMP Handbook.

Replaced with "DES"

Soil Erosion & Sedimentation Control Requirements:

Turf Reinforcement

D. Maintenance Requirements

Turf reinforcement mats should be inspected weekly and within 24 hours after each rainfall event that produces 0.5 inches or more of precipitation. Regular inspections should be conducted until grasses are firmly established. If the turf reinforcement mat is not securely fastened to the soil, extra pins or staples should be installed to inhibit the turf reinforcement mat from becoming dislodged. If washout or breakage occurs, all damaged areas should be repaired immediately by restoring the soil on slopes or channels to its finished grade, re-applying fertilizer and seed, and replacing the appropriate turf reinforcement mat material as needed.

E. Limitations

Inadequate coverage of the turf reinforcement mat or anchoring can result in erosion, washout, and poor plant establishment. Lack of appropriate staple spacing may result in loss of seed, topsoil, and mulch to wind and stormwater runoff.

10.9

10.9 Definitions, Equations, & References

10.9.1 Definitions, Acronyms, & Symbols

The following are definitions, acronyms, and symbols commonly used in hydrologic and hydraulic analysis. Additional definitions pertaining to stormwater management are included in Appendix A of the City's Stormwater Management Ordinance.

A. Definitions:

Administering Authority – The designated unit of government, which has the authority to issue permits.

Administrator – An individual designated by the City who manages and oversees people, practices, and policies related to the City's stormwater management. See the City's Development Code for list of duties.

Annual Exceedance Probability (AEP) – The percent probability that a storm event will occur in any given year. For example, a ten-year storm has a 10% AEP, while a 100-year storm has a 1% AEP.

Applicant – Any person, firm, or governmental agency who owns property or the duly appointed representative that wishes to develop that property and one who executes the necessary forms to procure a permit to carry out such development from the City.

As-built Drawings – See Record Drawings.

Base Flood – A flood having a one percent probability of being equaled or exceeded in any given year. The base flood is also known as the 100-year flood frequency event or one percent AEP.

Base Flood Elevation (BFE) – means the highest predicted flood elevation of a stream during the 100-year flood or the one percent AEP event.

Basement – Any area of a building having its floor subgrade (below grade level) on all sides by at least half.

Basin – An area within the City of Greenville, which all surface water flows toward the lowest point of its elevation.

Best Management Practice (BMP) – Design, construction, and maintenance practices and criteria for stormwater facilities that minimize the impact of stormwater runoff rates and volumes, prevent erosion, and capture pollutants.

BMP Owner – The owner of the property on which the BMP is constructed.

Buffer – An area of predominantly vegetated land to be left open, adjacent to drainage ways, wetlands, lakes, ponds, or other surface waters for the purpose of eliminating or minimizing adverse impacts to such areas.

Bypass – To route tributary drainage area runoff around and not through a stormwater control structure.

Capacity of Storm Drainage Facility – The maximum flow that can be conveyed or stored by a storm drainage facility without overflow or surcharge.

Channel – Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, lake, flowage, slough, ditch, conduit, culvert, gully, ravine, swale, wash, or natural or man-made drainage way, in or into which surface or groundwater flows, either perennially or intermittently.

Compensatory Storage – An excavated, hydraulically equivalent volume of storage used to offset the loss of natural flood storage capacity when artificial fill or structures are placed within a regulatory floodplain.

Contributing Drainage Area – The total drainage area to a given point, including off-site drainage.

Control Structure – A structure designed to control the rate of flow that passes through the structure, given a specific upstream and downstream water surface elevation.

Critical Facility – A facility that is critical to the community's public health and safety, is essential to the orderly functioning of a community, stores or produces highly volatile, toxic, or water-reactive materials, or houses occupants that may be insufficiently mobile to avoid the loss of life or injury. Examples of critical facilities include jails, hospitals, schools, fire stations, nursing homes, wastewater treatment facilities, water plants, and gas/oil/propane storage facilities.

Culvert – A closed conduit used for the passage of surface drainage water under an embankment or roadway.

Curve Number (CN) – An empirical parameter utilized to predict infiltration or runoff from a rainfall event across a site.

Dam – A barrier to obstruct the flow of water, especially one of earth, masonry, etc., built across a body of water. Dams which are either twenty five feet or more in height or impound (hold back) 50 acre feet or more are regulated by the ~~SCDHEC~~ unless exempted by state law.

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Design Detention Storage – The amount of stormwater storage required to detain an increase in stormwater runoff from a given watershed that has been altered from its natural state.

Design Storm – A selected storm event, described in terms of the probability of occurring once within a given number of years, for which stormwater or flood control improvements are designed and built.

Detention Basin – A manmade structure for the temporary storage of stormwater runoff with controlled release during or immediately following a storm.

Detention Storage – The temporary detaining of stormwater in storage basins, on rooftops, in streets, parking lots, open spaces, natural depressions or other areas under predetermined and controlled conditions, with the rate of drawdown regulated by appropriately installed devices.

Detention Storage Zone – The live detention storage (above the lowest opening in an outlet structure) that provides peak flood control, erosion control, and additional treatment benefits.

Detention Volume Safety Factor – A multiplication factor applied to a development's detention volume when the detention basin is constructed on-stream.

Development – Any man-made change to improved or unimproved real estate, including but not limited to, subdivision of land; construction or alteration of structures, roads, utilities, and other facilities; installation of septic systems; mining, dredging, grading, paving, excavation or drilling operations; deposit of refuse, debris, or fill materials; and, clearing of natural vegetative cover

Drainage Area – The land area above a given point that contributes stormwater to that point.

Dry Detention Basin – A stormwater facility designed to drain completely after temporary storage of stormwater flows and to normally be dry over the majority of its bottom area.

Duration – The time period of a rainfall event.

Ectomycorrhizae – Symbiotic relationship that occurs between fungi that grow on or around plant roots. These fungi assist plants by enhancing plant nutrient and water uptake, as well as reducing stress and improving overall growth of plants. The ecto-prefix means the mycorrhizae does not penetrate the plant root cortical cell.

Emergency Overflow – A structure in a stormwater management system designed to protect the system in the event of a malfunction of the primary flow structure or a storm event greater than the system design. The emergency overflow capacity initiates at the facility design high water level or base flood elevation.

Endomycorrhizae – Symbiotic relationship that occurs between fungi that grow on or around plant roots. These fungi assist plants by enhancing plant nutrient and water uptake, as well as reducing stress and improving overall growth of plants. It is the most widespread and common type of mycorrhiza. The endo- prefix means the mycorrhizae penetrates the plant root cortical cell.

Erosion – The process whereby soil is removed by flowing water or wave action.

Existing Depressional Storage – The volume, in inches, that is filled in natural depressions in the land surface prior to the occurrence of overland flow.

Flood – A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waves, or the unusual and rapid accumulation of runoff of surface waters from any source.

Flood Elevation – The elevation delineating the maximum level of high water for a flood of a given return period and rainfall duration.

Flood Frequency – A period of years, based on a statistical analysis, during which a flood of a specific magnitude may occur in any given year.

Flood Hazard Area – Any area which has been or may hereafter be covered by floodwaters.

Flood Protection Elevation (FPE) – The elevation of the base flood plus two feet of freeboard required and four feet of freeboard recommended at the discretion of the administrator or designee.

Footing Drain – A drain pipe installed around the exterior of a basement wall foundation to relieve water pressure caused by high groundwater elevation.

Freeboard – An increment of height added to the base flood elevation to provide a factor of safety for uncertainties in calculations, unknown local conditions, wave actions, and unpredictable effects such as those caused by ice or debris jams.

Grade – The inclination or slope of a channel, canal, conduit, etc., or natural ground surface, usually expressed in terms of the percentage of the change in elevation over the corresponding horizontal distance.

Hydrograph – A graph of the rate of flow versus time.

Hydrologically Disturbed – An area where the land surface has been cleared, grubbed, compacted, or otherwise modified and has resulted in alteration of stormwater runoff, volumes, rates, flow direction, or inundation duration.

Illicit Discharge – An illicit discharge is defined as any discharge to the municipal separate storm sewer system that is not composed entirely of storm water, except for discharges allowed under a NPDES permit or waters used for firefighting operations. These non-stormwater discharges typically occur due to illegal connections to the storm drain system from business or commercial establishments.

Impervious Surface – Any hard-surfaced, manmade area that does not readily absorb

or retain water including, but not limited to, building roofs, parking and driveway areas, graveled areas, sidewalks, and paved recreation areas.

Inlet – An opening into a storm sewer system for the collection of surface stormwater runoff, more completely described as a storm sewer inlet.

Inspect – To visit, to review plans, or to oversee a site visit or plan review per generally accepted engineering practices.

Lag Time – A time adjustment applied to peak flow calculations to account for differences in time of concentration values from multiple basins upstream of the calculation point.

Lake – A natural or artificial body of water encompassing an area of two or more acres which retains water throughout the year.

Land Disturbing Activity – Any man-made changes of the land surface including, but not limited to removing vegetative cover, excavating, filling, transporting and grading of soils, sediment or rock. Agricultural land disturbing activities are excluded from the requirements of this Manual.

Lateral Storm Sewer – A sewer that has inlets connected to it, but has no other upstream storm sewer connected.

Littoral Zone – The topmost area near the shore of a lake or pond that extends by a gradual slope from the shoreline and continues to a depth where sufficient light for plant growth reaches the sediment and lake bottom. Ledges are recommended to be four to six feet in width. The first or upper ledge must be located between one and one and one-half feet above the permanent pool level. The second or lower ledge must be located approximately two and one-half feet below the permanent pool level. Alternative safety designs shall be considered by the City Engineer.

Manhole – Storm sewer structure through which a person may enter to gain access to an underground storm sewer or enclosed structure.

Mitigation – Measures taken to eliminate or minimize damage from development activities, such as construction in wetlands or regulatory floodplain filling, by replacement of the resource.

Multi-Purpose Basin – A stormwater basin that is sized to achieve both water quality and erosion/flood control benefits (e.g., two-stage dry detention basin).

New Impervious Area - Impervious area that was created after February 1, 2008 within the City's jurisdiction.

Non-Gravity Storm Sewer System – Storm sewer system that uses pressure hydraulics instead of gravity to convey stormwater runoff.

Off-Line Structure – A BMP that captures runoff from a site or diverted flow from a conveyance system and provides stormwater treatment or control off of the conveyance system. After the design flow has been treated and/or controlled, it is discharged or returned to the conveyance system downstream.

On-Stream Detention – Any detention basin that has off-site tributary drainage area.

Outfall Structure – The facility used for the transport and discharge of surface runoff or treated effluent to a waterway or swale. The facility includes all appurtenant channels, supply lines, energy dissipation, and erosion control systems.

Overland Flow – Overland flow, or sheet flow, is the shallow runoff from a gently sloping surface with a uniform depth generally less than 0.1 feet, occurring in the upper reaches of a basin over a relatively short distance.

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Peak Discharge – The peak discharge, or peak flow, is the maximum flow rate of water passing a given point during or after a rainfall event.

Pollutant – Any substance harmful to the environment that is not authorized for discharge from a storm sewer by a South Carolina DHEC MS4 or NPDES permit.

Pond – A natural or artificial body of water of less than two acres which retains water year-round.

Post-Developed Discharge – The rate of stormwater runoff from a site that occurs after all, or a portion of, the site is developed.

Pre-Developed Discharge – The rate of stormwater runoff from a site under pre-developed, or natural conditions. Pre-development conditions assume land use conditions prior to the proposed development or re-development. In such cases where development is initiated prior to receiving appropriate local, state, and federal permits, the land use condition will be assumed to be the condition prior to European Settlement. In this situation, the vegetative cover is assumed to be native forest and a curve number of 60 shall be used for runoff calculations in response to a Notice of Violation.

Rainfall Intensity – The cumulative depth of rainfall occurring over a given duration, usually expressed in inches per hour.

Reach – A length of river, channel, or storm sewer.

Record Drawings – Upon completion of the development a registered professional engineer or land surveyor, in accordance with South Carolina law, shall certify construction drawings of what was built and that the development is built in accordance with the submitted plans and previous pre-development certifications.

Redevelopment – Any alteration to an existing site where existing development, including impervious surface, is removed and/or replaced.

Registered Professional Engineer – An engineer licensed in the State of South Carolina, under the South Carolina Code of Regulations Chapter 49.

Regulated Area – All areas under the jurisdiction of the stormwater utility.

Regulatory Floodplain – May be either riverine or non-riverine depressional areas. Floodplain boundaries shall be delineated by projecting the base flood elevation onto the best available topography. A flood-prone area is a regulatory floodplain if it meets any of the descriptions classified under this term found in the City's Stormwater Management. The Federal Emergency Management Agency (FEMA) produces floodplain maps, defining areas within the base flood elevation floodplain, in order to implement the National Flood Insurance Program.

Regulatory Floodway – The channel, including on-stream lakes, and that portion of the regulatory floodplain adjacent to a stream or channel which is needed to store and convey the existing and anticipated future 100-year frequency flood discharge with no more than a 0.5 foot increase in stage due to the loss of flood conveyance or storage, and no more than a ten-percent increase in velocities. Where interpretation is needed to determine the exact location of the regulatory floodway boundary, the City floodplain manager should be contacted for the interpretation.

Release Rate – The amount of stormwater released from a stormwater control facility or site per unit of time.

Riverine – Related to, formed by, or resembling a river, creek, or stream.

Runoff Coefficient – A decimal fraction relating the amount of rain, which results as runoff that reaches the storm drainage system to the total amount of rain falling. A coefficient of 0.5 implies that 50 percent of the rain falling on a given surface is discharged as stormwater runoff.

Sediment – Material of soil and rock origin, transported, carried, or deposited by water.

Sedimentation – The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or watercourses.

Seep – A point or area in which a fluid contained in the ground infiltrates slowly to the surface, often forming a pool.

Spillway – A waterway that constitutes all or a portion of a hydraulic structure for the release of water.

Spring – A natural or artificial source of water flowing from the ground onto the surface.

Stilling Basin – A structure used to slow water down or dissipate its energy such that velocities become non-erosive.

Storage Duration – The length of time that water may be stored in any stormwater control facility, computed from the time water first begins to be stored.

Storage Volume – The volume of water to be stored for a rainfall event of a given return period based on developed conditions.

Storm Frequency – The statistical interval between equal magnitude storm events. This Manual expresses storm frequencies in terms of the statistical likelihood that a given storm event will occur in a given year or AEP. For example, a storm event that is expected to return an average of every 25 years is equivalent to a 4% AEP [calculated by a 1 in 25 chance of occurring or $(1/25) \cdot 100$].

Storm Sewer – A closed conduit for conveying collected stormwater.

Stormwater Runoff – The water derived from rain falling within a tributary basin, flowing over the surface of the ground, or collected in channels or storm sewers.

Stormwater Management – A set of actions taken to control stormwater runoff with the objectives of providing controlled surface drainage, flood control, and pollutant reduction in runoff.

Stormwater Permit – A permit established by Article 19-5 of the Land Management Ordinance and issued through the City prior to the approval of a building permit signifying conformance with provisions of this article.

Subarea – A drainage area that has been delineated or identified from within a larger watershed for the purpose of studying its impacts on the overall watershed.

Substantial Improvement – Per FEMA's National Flood Insurance Program Policy Index, substantial improvement means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures, which have incurred "substantial damage", regardless of the actual repair work performed.

Structure – Anything constructed or erected that requires permanent location on land surface. The term "structure" does not include features such as walkways, driveways, recreational courts, flagpoles, light standards, or mailboxes.

Swale – A vegetated channel, ditch, or low-lying or depressional tract of land that is periodically inundated by conveying stormwater from one point to another.

Time of Concentration – The time required for water to flow from the most hydrologically remote point of the drainage basin to the outlet or collection point being analyzed. The time of concentration is the maximum time for water to travel through the

watershed, which is not always the maximum distance from the outlet to any point in the watershed.

Treatment Train – More than one BMP utilized in series to maximize the water quality treatment of stormwater runoff.

Tributary – A stream that flows to a larger stream or other body of water.

Unit Hydrograph – A unit hydrograph is the hydrograph of direct runoff that results from one inch of excess rainfall generated uniformly in a watershed over a defined time period.

Urbanization – The development, change, or improvement of any parcel of land consisting of one or more lots for residential, commercial, industrial, institutional, recreational, or public utility purposes.

Watercourse – Any river, stream, creek, brook, branch, natural or man-made drainage way in or into which stormwater runoff or floodwaters flow either regularly or intermittently.

Watershed – The land area above a given point on a channel that contributes stormwater to that point.

Water Quality Volume (WQv) – For dry detention, water quality treatment shall be provided for a volume equal to the first inch over the required treatment area as specified above with a release rate over a 24-hour period.

- For alternate water quality methods (i.e. mechanical water quality), water quality treatment shall be provided for a volume equal to the first inch over the required treatment area as specified in the City's Stormwater Ordinance.
- For wet detention, water quality treatment shall be provided for a volume equal to 0.5 inches of runoff over the required treatment area as specified above with a release rate over a 24-hour period. A littoral zone shall be established for water quality treatment to enhance treatment effectiveness.
- For permanent infiltration trenches, water quality treatment shall be provided for a volume equal to the first inch of runoff from all impervious surfaces. Infiltration trenches shall be designed to completely drain of water within 72 hours. Soil must have adequate permeability to allow water to infiltrate; infiltration practices are limited to soils having an infiltration rate of at least 0.30 inches per hour.
- For those sites using alternate water quality methods that treat water quality based on a flow rate, the treated flow rate shall be determined using the Method for Computing Peak Discharge for a Water Quality Storm (adapted from Clayton and Schueler, 1996). This methodology relies on the volume of runoff computed using the Small Storm Hydrology Method (Pitt, 1994) and utilizes the NRCS, TR-55 Graphical Peak Discharge Method (USDA, 1986). A sample methodology is presented in Chapter ___ of the Design Specifications Manual. · Hydrocarbon (e.g., oil and grease) removal technology shall be required for all areas accepting flow from parking/

loading areas, and vehicle drive surfaces (e.g. roadways and driveways). The volume for hydrocarbon removal shall be based on 0.5 inch over the impervious surfaces described above to each treatment device. The Hydrocarbon removal rate shall be a minimum 50 percent. The volume for Hydrocarbon removal shall not be in addition to those volumes calculated in section (b) thru (d) above, provided the method of treatment provides a hydrocarbon removal rate of 50 percent.

- Waters of the state and waters of the U.S. shall not be used for permanent or temporary placement of water quality treatment devices.

Waters of the State - Waters classified under this term can be divided into four categories:

- 1 All waters such as lakes, rivers, streams (including intermittent streams), mudflats, wetlands, sloughs, wet meadows, or natural ponds;
- 2 All impoundments of waters not otherwise defined as Waters of the State under the definition;
- 3 Tributaries of waters identified above; and
- 4 Wetlands adjacent to waters identified above. Guidance on waters excluded from this definition can be found in the City's Development Code.

Waters of the United States – For the purposes of this Manual, the term refers to those water bodies and wetland areas that are under the United States Army Corps of Engineers' jurisdiction.

Wet Detention Facility – A wet detention facility designed to maintain a permanent pool of water of at least three feet in depth after the temporary storage of stormwater runoff.

Wetland – Wetlands are land that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation adapted for life in saturated soil conditions (known as hydrophytic vegetation). A wetland is identified based upon three attributes: 1) hydrology, 2) soils, and 3) vegetation as mandated by the current federal wetland determination methodology as defined by the United States Army Corps of Engineers (USACE).

B. Acronyms/Abbreviations:

AEP – Annual Exceedance Probability

AMC II – Average Antecedent Soil Moisture Condition

BFE – Base Flood Elevation

BMP – Best Management Practice

BOD – Biochemical Oxygen Demand

CEPCSI – Certified Erosion Prevention and Sediment Control Inspector Program

CGP – Construction General Permit

CLOMR – Conditional Letter of Map Revision

COD – Chemical Oxygen Demand

CN – Curve Number

CSO – Combined Sewer Overflow

DHEC – Department of Health and Environmental Control

DSM – Design Specifications Manual

DO – Dissolved Oxygen

DP – Dissolved Phosphorus

FEMA – Federal Emergency Management Agency

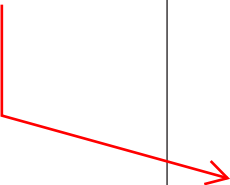
FHWA – Federal Highway Administration

FIRM – Flood Insurance Rate Map

FPE – Flood Protection Elevation

HDPE – High Density Polyethylene

Added "DES-
Department of
Environmental
Services"



HGL – Hydraulic Grade Line

HSG – Hydrologic Soil Group

LCP – Larger Common Plan

LOC – Letter of Coverage

LOMR – Letter of Map Revision

NOAA – National Ocean and Atmospheric Administration

NOI – Notice of Intent

NOT – Notice of Termination

NPDES – National Pollution Discharge Elimination System

NRCS – Natural Resources Conservation Service [previously the Soil Conservation Service (SCS)]

NWS – National Weather Service

OSHA – Occupational Safety and Health Administration

PFDS – Precipitation Frequency Data Server

RCP – Reinforced Concrete Pipe

SCDOT – South Carolina Department of Transportation

SCDHEC – South Carolina Department of Health and Environmental Control

SWPPP – Stormwater Pollution Prevention Plan

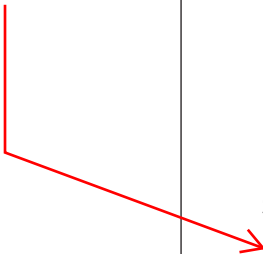
TDS – Total Dissolved Solids

TKN – Total Kjeldahl Nitrogen

TMDL – Total Maximum Daily Load

TP – Total Phosphorus

Added "SCDES -
South Carolina
Department of
Environmental
Services"



TRM – Technical Reference Manual

TSS – Total Suspended Solids

USACE – United States Army Corps of Engineers

USEPA – United States Environmental Protection Agency

WQv – Water Quality Volume

C. Equations and Symbols

Equations and symbols included in each section of this Manual are summarized in Table 10-9.

Table 10-9 Summary of Equations			
Description & Equations	Symbol	Description	Unit
TR-55 Method of Time of Concentration $T_t = \frac{0.007 (nL)^{0.8}}{(P_2)^{0.5} S^{0.4}}$	L	Flow Length	ft
	n	Manning's Roughness Coefficient	-
	P ₂	2-year, 24 hour rainfall	in
	S	Average slope of the flow path	ft/ft
	TT	Travel time of overland or sheet flow segment	hr
Shallow Concentrated Flow Travel Time $T_{si} = \frac{L}{3600 V}$ Unpaved: $V = 16.1345 (s)^{0.5}$ Paved: $V = 20.3282 (s)^{0.5}$	V	Average Velocity for the flow segment	ft/s
	s	Slope	ft/ft
	T _{si}	Travel time of the concentrated flow segment	hr
	L	Flow length	ft
Channel and Pipe Flow Travel Time $T_{si} = \frac{L}{3600 V}$ $V = \frac{1.486 R^{2/3} S_o^{1/2}}{n}$	V	Average Velocity for the flow segment	ft/s
	R	Hydraulic radius	ft
	S _o	Channel or pipe slope	ft/ft
	n	Manning's roughness coefficient	-
	L	Flow Length	ft
	T _{si}	Travel time of the concentrated flow segment	hr
Modified Rational Method $Q = FCIA$	Q	Peak runoff rate	cfs
	F	Large Storm Factor	-
	C	Runoff Coefficient	-
	I	Rainfall Intensity	in/hr
	A	Drainage Area	acres
NRCS Runoff Equation $Q = \frac{(P - I_a)^2}{(P - I_a) + S} \quad I_a = 0.2S$ $Q = \frac{(P - 0.2S)^2}{(P + 0.8S) + S}$ $S = \left(\frac{1000}{CN} \right) - 10$	Q	Volume of direct runoff	in
	P	Precipitation Depth	in
	I _a	Initial Abstraction	in
	S	Potential maximum retention after runoff begins	in

NRCS Graphical Method $q_p = q_u A Q F_p$	q_p	Peak Discharge	cfs
	q_u	Unit Peak Discharge	csm/in
	Q	Runoff	in
	A	Drainage Area	mi ²
	F_p	Pond & Swamp Adjustment Factor	-
Unit Hydrographs $\Delta D = 0.133 t_c$ $t_p = \frac{\Delta D}{2} + 0.66 t_c$ $q_p = \frac{K A Q_d}{t_p}$	ΔD	Incremental duration of rainfall producing runoff	min
	t_c	Time of Concentration	min
	t_p	Time to peak	min
	K	Hydrograph shape factor	-
	A	Drainage area	mi ²
	Q_d	Volume of direct runoff	in
Hydrograph development from unit hydrograph $V = \frac{12 \Delta t \sum q_i}{A(43.560)}$	V	Volume under the hydrograph	in
	Δt	Time increment of the hydrograph runoff ordinates	sec
	$\sum q_i$	Sum of the hydrograph runoff ordinates	sec
	A	Drainage area	acres
Manning's Equation $Q_{max} = \frac{1.486 A R^{2/3} S_o^{1/2}}{n}$	Q_{max}	Maximum flow in conduit	cfs
	A	Cross-sectional area of pipe	ft ²
	R	Hydraulic radius	ft
	S	Slope	ft/ft
	n	Manning's roughness coefficient	-
Hydraulic Grade Line Major Losses $H_{major} = \frac{Q^2 n^2 L}{2.208 A^2 R^{4/3}}$	H_{major}	Major head loss due to friction	ft
	Q	Design Flow	cfs
	n	Manning's roughness coefficient	-
	L	Length of Pipe	ft
	A	Cross-sectional area of pipe	ft ²
	R	Hydraulic Radius	ft
Hydraulic Grade Line Minor Losses $H_{minor} = \sum \frac{K_i V^2}{2g}$	H_{minor}	Minor Head Loss	ft
	K_i	Minor loss coefficient for specific fitting	-
	V	Velocity	ft/sec
	g	Acceleration due to gravity	ft/sec ²

Gutter Flow Calculations $D = TS_x$ $T = \frac{Q^{0.375} n^{0.375}}{0.80 S_x^{0.625} S_L^{0.187}}$	T	Spread, or width of flow	ft
	Q	Design Flow	cfs
	n	Manning's roughness coefficient	-
	S_x	Pavement cross-slope	ft/ft
	S_L	Gutter longitudinal slope	ft/ft
	D	Depth of flow	ft
Inlet Capacity Calculations for Orifice Weir Flow $Q = 2.6PD^{1.5}$	Q	Flow into inlet	cfs
	P	Perimeter of inlet	ft
	D	Depth of water over grate	ft
Inlet Capacity Calculations for Orifice Flow $Q = 4.81AD^{0.5}$	Q	Flow into inlet	cfs
	P	Perimeter of inlet	ft
	D	Depth of water over grate	ft
Broad Crested Weir $Q = CLH^{1.5}$	Q	Flow through weir	cfs
	C	Weir coefficient	-
	L	Length of crest	ft
	H	Height of water above crest	ft
V-Notch Weir $Q = 2.5 \tan(\Phi/2) H^{2.5}$	Q	Flow through weir	cfs
	Φ	Angle of V-notch	degrees
	H	Height of water above crest	ft
Orifice Flow Equation $Q = Ca(2gH)^{0.5}$	Q	Flow through orifice	cfs
	C	Orifice coefficient	-
	a	Area of opening	ft ²
	g	Acceleration due to gravity	ft/sec ²
	H	Height of water above centroid of orifice opening	ft
Size of the Low Flow Outlet for WQ_v $a = \frac{2A(H-H_o)^{0.5}}{3600 CT (2g)^{0.5}}$	a	Area of the orifice	ft ²
	A	Average surface area of the pond	ft ²
	C	Orifice coefficient	-
	T	Drawdown time of pond	hr
	g	Gravity	ft/sec ²
	H	Elevation when the pond is full	ft
	H_o	Final elevation when pond is empty	ft
Forebay Storage Volume $F_v = 0.1 \times AI \times 3.63$	F_v	Forebay Volume	ft ³
	AI	Impervious area of drainage basin	acres

Length of Vegetated Filter Strip $L_f = \frac{(T_f)^{1.25} (P_2)^{0.625} (S)^{0.5}}{3.34n}$	L_f	Length of filter strip parallel to flow path	ft
	T_t	Travel time through filter strip	min
	P_2	2-Year/24-Hour Rainfall	in
	S	Slope of filter strip	ft/ft
	n	Manning's roughness coefficient	-
Hydraulic Residence Time $HRT = \frac{V}{60Q}$	HRT	Hydraulic Residence Time	min
	V	Volume of bioswale at design depth	ft ³
	Q	Flow through bioswale	cfs
Volume of Bioswale (Trapezoidal Dimensions) $V = L(BD + ZD^2)$	L	Length of bioswale	ft
	B	Bottom of bioswale	ft
	D	Design depth of flow	ft
	Z	Side slope	ft/ft
Bioretention Basin Surface Area $BSA = \frac{DA \times WQ_v}{D_{avg}}$	BSA	Bioretention surface area	ft ²
	DA	Contributing Drainage Area	ft ²
	WQ_v	Water quality volume expressed as depth over drainage area	ft
	D_{avg}	Average ponding water depth above ground	ft
Natural Infiltration Area $A = \frac{KTI}{(cd) - K}$	A	Natural Infiltration area	acres
	K	Runoff volume to infiltrate	in
	T	Total site drainage area	acres
	I	Built upon area ratio	-
	c	Effective water capacity	-
	d	Depth of soil A horizon	in

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Table 10-10 Point Precipitation Frequency Estimates (Inches)										
NOAA Atlas 14 Volume 2 Version 3										
Greenville, South Carolina										
PRECIPITATION FREQUENCY ESTIMATES										
By duration for ARI (years):	1	2	5	10	25	50	100	200	500	1000
5-min:	0.399	0.472	0.556	0.62	0.703	0.764	0.826	0.887	0.967	1.03
10-min:	0.637	0.755	0.891	0.992	1.12	1.22	1.31	1.41	1.53	1.62
15-min:	0.796	0.949	1.13	1.26	1.42	1.54	1.66	1.77	1.92	2.04
30-min:	1.09	1.31	1.60	1.82	2.10	2.32	2.54	2.76	3.06	3.30
60-min:	1.36	1.64	2.05	2.37	2.80	3.14	3.50	3.87	4.40	4.82
2-hr:	1.61	1.94	2.42	2.81	3.37	3.85	4.37	4.95	5.82	6.57
3-hr:	1.73	2.08	2.60	3.03	3.68	4.24	4.86	5.57	6.66	7.61
6-hr:	2.20	2.64	3.28	3.82	4.65	5.36	6.18	7.10	8.51	9.78
12-hr:	2.73	3.27	4.07	4.75	5.76	6.66	7.66	8.80	10.6	12.1
24-hr:	3.26	3.91	4.86	5.69	6.98	8.14	9.48	11.1	13.6	15.9
2-day:	3.87	4.63	5.70	6.63	8.06	9.33	10.8	12.5	15.2	17.6
3-day:	4.14	4.94	6.01	6.94	8.34	9.58	11.0	12.7	15.4	17.8
4-day:	4.41	5.25	6.32	7.24	8.62	9.83	11.2	12.8	15.6	18.0
7-day:	6.10	6.10	7.30	8.32	9.85	11.2	12.7	14.4	17.1	19.4
10-day:	5.88	6.94	8.19	9.26	10.9	12.2	13.8	15.5	18.1	20.4
20-day:	7.94	9.29	10.7	11.9	13.6	15.0	16.5	18.1	20.4	22.4
30-day:	9.72	11.3	12.9	14.1	15.9	17.3	18.8	20.3	22.5	24.3
45-day:	12.4	14.3	16.0	17.3	19.1	20.6	22.0	23.5	25.5	27.1
60-day:	14.8	17.1	18.9	20.3	22.1	23.6	25.0	26.4	28.3	29.7

Table 10-11 Point Precipitation Frequency Estimates (Inches/Hour)										
NOAA Atlas 14 Volume 2 Version 3										
Greenville, South Carolina										
PRECIPITATION FREQUENCY ESTIMATES										
By duration for ARI (years):	1	2	5	10	25	50	100	200	500	1000
5-min:	4.79	5.66	6.67	7.44	8.44	9.17	9.91	10.6	11.6	12.4
10-min:	3.82	4.53	5.35	5.95	6.72	7.30	7.87	8.44	9.18	9.74
15-min:	3.18	3.80	4.51	5.02	5.68	6.16	6.64	7.10	7.70	8.15
30-min:	2.18	2.62	3.20	3.64	4.20	4.64	5.08	5.52	6.13	6.60
60-min:	1.36	1.64	2.05	2.37	2.80	3.14	3.50	3.87	4.40	4.82
2-hr:	0.806	0.971	1.21	1.40	1.68	1.92	2.19	2.48	2.91	3.28
3-hr:	0.576	0.694	0.865	1.01	1.22	1.41	1.62	1.86	2.22	2.53
6-hr:	0.368	0.441	0.547	0.638	0.775	0.895	1.03	1.18	1.42	1.63
12-hr:	0.226	0.271	0.337	0.394	0.478	0.552	0.635	0.730	0.877	1.01
24-hr:	0.135	0.162	0.202	0.237	0.290	0.339	0.395	0.460	0.566	0.662
2-day:	0.080	0.096	0.118	0.138	0.167	0.194	0.224	0.260	0.316	0.367
3-day:	0.057	0.068	0.083	0.096	0.115	0.133	0.152	0.175	0.213	0.247
4-day:	0.045	.054	0.065	0.075	0.089	0.102	0.116	0.133	0.162	0.187
7-day:	0.030	0.036	0.043	0.049	0.058	0.066	0.075	0.085	0.101	0.115
10-day:	0.024	0.028	0.034	0.038	0.045	0.051	0.057	0.064	0.075	0.085
20-day:	0.016	0.019	0.022	0.024	0.028	0.031	0.034	0.037	0.042	0.046
30-day:	0.013	0.015	0.017	0.019	0.022	0.023	0.026	0.028	0.031	0.033
45-day:	0.011	0.013	0.014	0.016	0.017	0.019	0.020	0.021	0.023	0.025
60-day:	0.010	0.011	0.013	0.014	0.015	0.016	0.017	0.018	0.019	0.020

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Stormwater Standards

Appendix A

A10.1

A10.1 **General**

The evaluation of stormwater systems sometimes requires analysis of technical material to make determinations on the sizing of pipes, detention basins, outlet structures, etc. This chapter contains information endorsed by the City for use by applicant design professionals in designing projects for City review.

A10.2

A10.2 **Erosion Prevention and Sediment Control Notes**

The following notes shall be incorporated on all standard erosion prevention and sediment control drawings submitted for permitting:

Engineering Division

EROSION PREVENTION AND SEDIMENT CONTROL NOTES

1. The City of Greenville Construction Inspection Bureau shall be notified by the permit holder at (864)467-8890 a minimum of 72 hours prior to beginning construction. A Pre-Construction Conference must be held for each construction site with an approved On-Site SWPPP prior to the implementation of construction activities.
2. Sediment and erosion control devices shall be installed and functioning prior to beginning any project earth disturbing activities.
3. All sediment and erosion controls shall be inspected until construction is complete, the site is permanently stabilized, and the Notice of Termination (NOT) is filed with SCDHEC.
4. All erosion control devices shall be properly maintained during all phases of construction until the completion of all construction activities and all disturbed areas have been permanently stabilized. Additional control devices may be required during construction in order to control erosion and/or offsite sedimentation. All temporary control devices shall be removed once construction is complete and the site is permanently stabilized.
5. All sediment and erosion control devices shall be inspected once every seven (7) calendar days. Damaged, ineffective, or incorrectly installed devices shall be repaired or replaced, as necessary, within 48 hours of identification.
6. All inspection records shall be documented in written form and catalogued in a record keeping binder for the project (SWPPP Book). The City may require electronic submission of weekly inspection records.
7. A rain gauge shall be installed at the project area, and cumulative precipitation depth shall be recorded with weekly inspection documentation. All rainfall events 0.5" and greater, as recorded onsite or by a weather station in reasonable proximity to the project, shall also be documented with the weekly inspection reports.
8. All erosion prevention and sediment control plans and inspection documentation (e.g., SWPPP Book, certification statements, inspection records, maintenance records, and rainfall data) shall be retained at the construction site or, if approved by the City, at a nearby location easily accessible during normal business hours, from the date of commencement of construction activities to the date that final stabilization is reached. All plans and documents shall be updated as required per SC NPDES General Permit SCR100000.
9. If existing BMPs need to be modified or if additional BMPs are necessary to comply with the requirements of this permit and/or SC's Water Quality Standards, implementation must be completed before the next storm event whenever practicable. If implementation before the next storm event is impracticable, the situation must be documented in the SWPPP and alternative BMPs must be implemented as soon as reasonably possible.
10. Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than fourteen (14) days after work has ceased, except as stated below:
 - a. Where stabilization by the 14th day is precluded by snow cover or frozen ground conditions stabilization measures must be initiated as soon as practicable.
 - b. Where construction activity on a portion of the site is temporarily ceased and earth disturbing activities will be resumed within 14 days, temporary stabilization measures do

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not have to be initiated on that portion of the site.

11. The site shall be considered permanently stabilized when all surface disturbing activities are complete and either of the two following criteria is met:
 - a. A uniform (e.g., evenly disturbed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area has been established on all unpaved areas not covered by permanent structures, or
 - b. Equivalent permanent stabilization measures (such as riprap, gabions, or geotextiles) have been employed.
12. A stabilized construction entrance shall be installed and maintained on the project site. Storm water inlet protection shall be provided for all inlets (upstream and downstream) within 50 ft. of the construction entrance or disturbance (on both sides of the public roadway).
13. All existing and new storm water structures, affected by this project, shall be inspected and maintained clean of accumulated demolition debris or sediments.
14. Disposal of all recovered sediments and construction debris shall be in accordance with all applicable City, State and Federal Regulations. No sediment or construction debris shall be flushed down the storm water system.
15. During the course of construction activities, erosion and sediment controls shall be used to prevent tracking of mud and/or sediment accumulation on public roadways (including street gutters), sediment laden runoff from entering into existing storm water system inlets or depositing on adjacent properties, and airborne dust migration off-site. The contractor shall daily remove mud/soil from pavement, by sweeping or vacuuming, as may be required.
16. To secure the project site, locate limits of construction, protect areas that are to remain undisturbed, and prevent migration of construction debris, orange construction fencing shall be installed around areas not requiring silt fencing. Any accumulation of construction debris on public roadways or adjacent properties shall be removed within 24 hours. Care shall be taken when installing construction fencing to not obscure oncoming traffic at intersections, adjacent driveways and the project construction entrance.
17. Provide silt fence and/or other control devices, as may be required, to control soil erosion during utility construction. All disturbed areas shall be cleaned, graded, and stabilized immediately after the utility installation.
18. Silt fence shall be installed along lines of equal elevation. Silt fencing shall be installed no closer than 5 feet downhill from the toe of any slope.
19. All Waters of the State (WoS), including wetlands, are to be flagged or otherwise clearly marked in the field. All WoS shall be clearly delineated on the erosion prevention and sediment control plans.
20. Project setback buffers shall be located a minimum of 30 ft. measured from the top of stream bank or edge of wetland, unless otherwise approved by the City Engineer. All setbacks shall be clearly delineated on the erosion prevention and sediment control plans.
21. A single row of silt fencing shall be installed along all setback buffers that meet the minimum requirements.
22. A double row of silt fencing shall be installed in all areas where a minimum setback buffer cannot be maintained between the disturbed area and the water body or wetland. Double row of silt fencing shall be placed no closer than 5 ft. downhill from the toe of any fill area and a minimum of 5 ft. spacing shall be maintained between silt fence rows. A minimum 5 ft. buffer should be maintained between the last row of silt fence and all water bodies and wetlands.

23. Stockpiles of useable or waste materials shall be surrounded by a row of silt fence at all times. Stockpiles that are undisturbed for more than fourteen (14) days shall have appropriate stabilization measures installed. Stockpiles shall be placed a minimum of 50 feet away from stormwater flows, stormwater inlet structures, drainage courses, adjacent property and public roadways.
24. Litter, construction debris, oils, fuels, building products with significant potential for impact (such as stockpiles of freshly treated lumber), and construction chemicals that could be exposed to storm water must be prevented from becoming a pollutant source in stormwater discharges.
25. Temporary diversion berms, ditches, or slope drains shall be provided for all slopes 3:1 or steeper and as otherwise needed during construction to protect areas from upslope runoff and/or to divert sediment laden water to appropriate traps or stable outlets.
26. Slopes 3:1 or steeper and/or exceeding eight (8) vertical feet shall be stabilized with staked in place sod or synthetic/vegetative mats in addition to hydro seeding as soon as practical but no more than 7 calendar days after land disturbing activities on the slope have permanently or temporarily ceased
27. Cat track or surface roughening is required for all slopes 3:1 or steeper prior to seeding and lying of synthetic or vegetative mats. Cat tracking or surface roughening shall produce a surface with furrows running cross slope, parallel with slope contours, and perpendicular to surface runoff.
28. Portable toilet facilities shall not be located within 20 feet of any storm water structure and/or 50 feet of any water course, wetland area, stream, floodplain, or lake.
29. The following discharges are prohibited:
 - a. Wastewater from washout of concrete, unless managed by an appropriate control
 - b. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials
 - c. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance
 - d. Soaps or solvents used in vehicle and equipment washing during construction.
30. Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent treatment prior to discharge.
31. Minimize the discharge of pollutants from dewatering of trenches and excavated areas. These discharges are to be routed through appropriate BMPs (sediment basin, filter bag, etc.).
32. Residential subdivisions require erosion control features for infrastructure as well as for individual lot construction. Individual property owners shall follow these plans during construction or provide an individual plan in accordance with S.C. Reg. 72-300 et seq. and SCR100000.
33. Properly signed and sealed record drawings of the stormwater plan and a signed and sealed detention basin record drawings shall be submitted to the City within 30 days of permanent stabilization and prior to issuance of project acceptance by the City.

A10.3

A10.3

Definitions and Acronyms

The following are the definitions and acronyms commonly used in hydrologic and hydraulic analysis.

A10.24.1 Definitions

Added "(Section
XX-7. Appendix E)"

Administering Authority – The designated unit of government, which has the authority to issue permits.

Administrator – An individual designated by the City who manages and oversees people, practices, and policies related to the City's stormwater management. See the City's Stormwater Management Ordinance for list of duties.

Annual Exceedance Probability (AEP) – The percent probability that a storm event will occur in any given year. For example, a ten-year storm has a 10% AEP, while a 100-year storm has a 1% AEP.

Applicant – Any person, firm, or governmental agency who owns property or the duly appointed representative that wishes to develop that property and one who executes the necessary forms to procure a permit to carry out such development from the City.

As-built Drawings – See Record Drawings.

Base Flood – A flood having a one percent probability of being equaled or exceeded in any given year. The base flood is also known as the 100-year flood frequency event or one percent AEP.

Base Flood Elevation (BFE) – means the highest predicted flood elevation of a stream during the 100-year flood or the one percent AEP event.

Basement – Any area of a building having its floor below grade level on all sides by at least half.

Basin – An area within the City of Greenville, which all surface water flows toward the lowest point of its elevation.

Best Management Practice (BMP) – Design, construction, and maintenance practices and criteria for stormwater facilities that minimize the impact of stormwater runoff rates and volumes, prevent erosion, and capture pollutants.

BMP Owner – The owner of the property on which the BMP is constructed.

Buffer – An area of predominantly vegetated land to be left open, adjacent to drainage ways, wetlands, lakes, ponds, or other surface waters for the purpose of eliminating or minimizing adverse impacts to such areas.

Bypass – To route tributary drainage area runoff around and not through a stormwater control structure.

Capacity of Storm Drainage Facility – The maximum flow that can be conveyed or stored by a storm drainage facility without overflow or surcharge.

Channel – Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, lake, flowage, slough, ditch, conduit, culvert, gully, ravine, swale, wash, or natural or man-made drainage way, in or into which surface or groundwater flows, either perennially or intermittently.

Compensatory Storage – An excavated, hydraulically equivalent volume of storage used to offset the loss of natural flood storage capacity when artificial fill or structures are placed within a regulatory floodplain.

Contributing Drainage Area – The total drainage area to a given point, including off-site drainage.

Control Structure – A structure designed to control the rate of flow that passes through the structure, given a specific upstream and downstream water surface elevation.

Critical Facility – A facility that is critical to the community's public health and safety, is essential to the orderly functioning of a community, stores or produces highly volatile, toxic, or water-reactive materials, or houses occupants that may be insufficiently mobile to avoid the loss of life or injury. Examples of critical facilities include jails, hospitals, schools, fire stations, nursing homes, wastewater treatment facilities, water plants, and gas/oil/propane storage facilities.

Culvert – A closed conduit used for the passage of surface drainage water under an embankment or roadway.

Curve Number (CN) – An empirical parameter utilized to predict infiltration or runoff from a rainfall event across a site.

Dam – A barrier to obstruct the flow of water, especially one of earth, masonry, etc., built across a body of water. Dams which are either twenty five feet or more in height or impound (hold back) 50 acre feet or more are regulated by the SCDHEC unless exempted by state law.

Design Detention Storage – The amount of stormwater storage required to detain an increase in stormwater runoff from a given watershed that has been altered from its natural state.

Design Storm – A selected storm event, described in terms of the probability of occurring once within a given number of years, for which stormwater or flood control improvements are designed and built.

Detention Basin – A manmade structure for the temporary storage of stormwater runoff with controlled release during or immediately following a storm.

Detention Storage – The temporary detaining of stormwater in storage basins, on rooftops, in streets, parking lots, open spaces, natural depressions or other areas under predetermined and controlled conditions, with the rate of drawdown regulated by appropriately installed devices.

Detention Storage Zone – The live detention storage (above the lowest opening in an outlet structure) that provides peak flood control, erosion control, and additional treatment benefits.

Detention Volume Safety Factor – A multiplication factor applied to a development's detention volume when the detention basin is constructed on-stream.

Development – Any man-made change to improved or unimproved real estate, including but not limited to, subdivision of land; construction or alteration of structures, roads, utilities, and other facilities; installation of septic systems; mining, dredging, grading, paving, excavation or drilling operations; deposit of refuse, debris, or fill materials; and, clearing of natural vegetative cover

Drainage Area – The land area above a given point that contributes stormwater to that point.

Dry Detention Basin – A stormwater facility designed to drain completely after temporary storage of stormwater flows and to normally be dry over the majority of its bottom area.

Duration – The time period of a rainfall event.

Emergency Overflow – A structure in a stormwater management system designed to protect the system in the event of a malfunction of the primary flow structure or a storm event greater than the system design. The emergency overflow capacity initiates at the facility design high water level or base flood elevation.

Erosion – The process whereby soil is removed by flowing water or wave action.

Existing Depressional Storage – The volume, in inches, that is filled in natural depressions in the land surface prior to the occurrence of overland flow.

Flood – A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waves, or the unusual and rapid accumulation of runoff of surface waters from any source.

Flood Elevation – The elevation delineating the maximum level of high water for a flood of a given return period and rainfall duration.

Flood Frequency – A period of years, based on a statistical analysis, during which a flood of a specific magnitude may occur in any given year.

Flood Hazard Area – Any area which has been or may hereafter be covered by floodwaters.

Flood Protection Elevation (FPE) – The elevation of the base flood plus two feet of freeboard required and four feet of freeboard recommended at the discretion of the administrator or designee.

Footing Drain – A drain pipe installed around the exterior of a basement wall foundation to relieve water pressure caused by high groundwater elevation.

Freeboard – An increment of height added to the base flood elevation to provide a factor of safety for uncertainties in calculations, unknown local conditions, wave actions, and unpredictable effects such as those caused by ice or debris jams.

Grade – The inclination or slope of a channel, canal, conduit, etc., or natural ground surface, usually expressed in terms of the percentage of the change in elevation over the corresponding horizontal distance.

Hydrograph – A graph of the rate of flow versus time.

Hydrologically Disturbed – An area where the land surface has been cleared, grubbed, compacted, or otherwise modified and has resulted in alteration of stormwater runoff, volumes, rates, flow direction, or inundation duration.

Illicit Discharge – An illicit discharge is defined as any discharge to the municipal separate storm sewer system that is not composed entirely of storm water, except for discharges allowed under a NPDES permit or waters used for firefighting operations. These non-stormwater discharges typically occur due to illegal connections to the storm drain system from business or commercial establishments.

Impervious Surface – Any hard-surfaced, manmade area that does not readily absorb or retain water, including, but not limited to, building roofs, parking and driveway areas, graveled areas, sidewalks, paved recreation areas, asphalt, concrete, brick, pavers, stone and/or highly compacted soils.

Inlet – An opening into a storm sewer system for the collection of surface stormwater runoff, more completely described as a storm sewer inlet.

Inspect – To visit, to review plans, or to oversee a site visit or plan review per generally accepted engineering practices.

Lag Time – A time adjustment applied to peak flow calculations to account for differences in time of concentration values from multiple basins upstream of the calculation point.

Lake – A natural or artificial body of water encompassing an area of two or more acres which retains water throughout the year.

Land Disturbing Activity – Any man-made changes of the land surface including, but not limited to removing vegetative cover, excavating, filling, transporting and grading of soils, sediment or rock. Agricultural land disturbing activities are excluded from the requirements of this Manual.

Lateral Storm Sewer – A sewer that has inlets connected to it, but has no other upstream storm sewer connected.

Littoral Zone – The topmost area near the shore of a lake or pond that extends by a gradual slope from the shoreline and continues to a depth where sufficient light for plant growth reaches the sediment and lake bottom. Ledges are recommended to be four to six feet in width. The first or upper ledge must be located between one and one-half feet above the permanent pool level. The second or lower ledge must be located approximately two and one-half feet below the permanent pool level. Alternative safety designs shall be considered by the City Engineer.

Manhole – Storm sewer structure through which a person may enter to gain access to an underground storm sewer or enclosed structure.

Mitigation – Measures taken to eliminate or minimize damage from development activities, such as construction in wetlands or regulatory floodplain filling, by replacement of the resource.

Multi-Purpose Basin – A stormwater basin that is sized to achieve both water quality and erosion/flood control benefits (e.g., two-stage dry detention basin).

New Impervious Area – Impervious area that was created after February 1, 2008 within the City's jurisdiction.

Non-Gravity Storm Sewer System – Storm sewer system that uses pressure hydraulics instead of gravity to convey stormwater runoff.

Off-Line Structure – A BMP that captures runoff from a site or diverted flow from a conveyance system and provides stormwater treatment or control off of the conveyance system. After the design flow has been treated and/or controlled, it is discharged or returned to the conveyance system downstream.

On-Stream Detention – Any detention basin that has off-site tributary drainage area.

Outfall Structure – The facility used for the transport and discharge of surface runoff or treated effluent to a waterway or swale. The facility includes all appurtenant channels, supply lines, energy dissipation, and erosion control systems.

Overland Flow – Overland flow, or sheet flow, is the shallow runoff from a gently sloping surface with a uniform depth generally less than 0.1 feet, occurring in the upper reaches of a basin over a relatively short distance.

Peak Discharge – The peak discharge, or peak flow, is the maximum flow rate of water passing a given point during or after a rainfall event.

Pervious Surface – Any surface material that allows stormwater to infiltrate into the ground. Examples include lawn, landscape, pasture, native vegetation areas, forested areas, etc.

Pollutant – Any substance harmful to the environment that is not authorized for discharge from a storm sewer by a South Carolina DHEC MS4 or NPDES permit.

Pond – A natural or artificial body of water of less than two acres which retains water year-round.

Post-Developed Discharge – The rate of stormwater runoff from a site that occurs after all, or a portion of, the site is developed.

Pre-Developed Discharge – The rate of stormwater runoff from a site under pre-developed, or natural conditions. Pre-development conditions assume land use conditions prior to the proposed development or re-development. In such cases where development is initiated prior to receiving appropriate local, state, and federal permits, the land use condition will be assumed to be the condition prior to European Settlement. In this situation, the vegetative cover is assumed to be native forest and a curve number of 60 shall be used for runoff calculations.

Rainfall Intensity – The cumulative depth of rainfall occurring over a given duration, usually expressed in inches per hour.

Reach – A length of river, channel, or storm sewer.

Record Drawings – Upon completion of the development a registered professional engineer or land surveyor, in accordance with South Carolina law, shall certify construction drawings of what was built and that the development is built in accordance with the submitted plans and previous pre-development certifications.

Redevelopment – Any alteration to an existing site where existing development, including impervious surface, is removed and/or replaced.

Registered Professional Engineer – An engineer licensed in the State of South Carolina, under the South Carolina Code of Regulations Chapter 49.

Regulated Area – All areas under the jurisdiction of the stormwater utility.

Regulatory Floodplain – May be either riverine or non-riverine depressional areas. Floodplain boundaries shall be delineated by projecting the base flood elevation onto the best available topography. The Federal Emergency Management Agency (FEMA) produces and periodically updates floodplain maps, defining areas within the base flood elevation floodplain, in order to implement the National Flood Insurance Program.

Regulatory Floodway – The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. Where interpretation is needed to determine the exact location of the regulatory floodway boundary, the City floodplain manager should be contacted for the interpretation.

Release Rate – The amount of stormwater released from a stormwater control facility or site per unit of time.

Riverine – Related to, formed by, or resembling a river, creek, or stream.

Runoff Coefficient – A decimal fraction relating the amount of rain, which results as runoff that reaches the storm drainage system to the total amount of rain falling. A coefficient of 0.5 implies that 50 percent of the rain falling on a given surface is discharged as stormwater runoff.

Sediment – Material of soil and rock origin, transported, carried, or deposited by water.

Sedimentation – The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or watercourses.

Seep – A point or area in which a fluid contained in the ground infiltrates slowly to the surface, often forming a pool.

Spillway – A waterway that constitutes all or a portion of a hydraulic structure for the release of water.

Spring – A natural or artificial source of water flowing from the ground onto the surface.

Stilling Basin – A structure used to slow water down or dissipate its energy such that velocities become non-erosive.

Storage Duration – The length of time that water may be stored in any stormwater control facility, computed from the time water first begins to be stored.

Storage Volume – The volume of water to be stored for a rainfall event of a given return period based on developed conditions.

Storm Frequency – The statistical interval between equal magnitude storm events. This Manual expresses storm frequencies in terms of the statistical likelihood that a given storm event will occur in a given year. For example, a storm event that is expected to return an average of every 25 years is equivalent to a 4% Annual Exceedance Probability (AEP) [calculated by a 1 in 25 chance of occurring or $(1/25) \cdot 100$].

Storm Sewer – A closed conduit for conveying collected stormwater.

Stormwater Runoff – The water derived from rain falling within a tributary basin, flowing over the surface of the ground, or collected in channels or storm sewers.

Stormwater Management – A set of actions taken to control stormwater runoff with the objectives of providing controlled surface drainage, flood control, and pollutant reduction in runoff.

Stormwater Permit – A permit established by ~~Section XX-7 of~~ the Land Management Ordinance and issued through the City prior to the approval of a building permit signifying conformance with provisions of this article.

Subarea – A drainage area that has been delineated or identified from within a larger watershed for the purpose of studying its impacts on the overall watershed.

Substantial Improvement – any repair, reconstruction, addition, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement or repair. Improvements on a property shall be cumulative for a period of ten years. If the improvement project is conducted in phases, the total of all costs associated with each phase, beginning with the issuance of the first permit, shall be utilized to determine whether substantial improvement will occur. The term includes all structures that have incurred repetitive loss or substantial damage, regardless of the actual repair work performed. The term does not, however, include either:

- A. Any project of improvement to a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to ensure safe living conditions; or
- B. Any alteration of a historic structure, provided that the alteration will not preclude the structure's continued designation as a historic structure.

Structure – Anything walled and roofed that is constructed or erected that requires permanent location on land surface. The term "structure" does not include features such as walkways, driveways, recreational courts, flagpoles, light standards, or mailboxes.

Swale – A vegetated channel, ditch, or low-lying or depressional tract of land that is periodically inundated by conveying stormwater from one point to another.

Time of Concentration – The time required for water to flow from the most hydrologically remote point of the drainage basin to the outlet or collection point being analyzed. The time of concentration is the maximum time for water to travel through the watershed, which is not always the maximum distance from the outlet to any point in the watershed.

Treatment Train – More than one BMP utilized in series to maximize the water quality treatment of stormwater runoff.

Tributary – A stream that flows to a larger stream or other body of water.

Unit Hydrograph – A unit hydrograph is the hydrograph of direct runoff that results from one inch of excess rainfall generated uniformly in a watershed over a defined time period.

Urbanization – The development, change, or improvement of any parcel of land consisting of one or more lots for residential, commercial, industrial, institutional, recreational, or public utility purposes.

Watercourse – Any river, stream, creek, brook, branch, natural or man-made drainage way in or into which stormwater runoff or floodwaters flow either regularly or intermittently.

Watershed – The land area above a given point on a channel that contributes stormwater to that point.

Water Quality Volume (WQv) – is used to describe the required storage capacity for a specific BMP.

Waters of the State - Waters classified under this term can be divided into four categories:

- 1) All waters such as lakes, rivers, streams (including intermittent streams), mudflats, wetlands, sloughs, wet meadows, or natural ponds;
- 2) All impoundments of waters not otherwise defined as Waters of the State under the definition;
- 3) Tributaries of waters identified above; and
- 4) Wetlands adjacent to waters identified above. Guidance on waters excluded from this definition can be found in the ~~City's Stormwater Management Ordinance (Section XX-7, Appendix A).~~

Waters of the United States – For the purposes of this Manual, the term refers to those water bodies and wetland areas that are under the United States Army Corps of Engineers' jurisdiction.

Wet Detention Facility – A wet detention facility designed to maintain a permanent pool of water of at least three feet in depth after the temporary storage of stormwater runoff.

Wetland – Wetlands are land that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation adapted for life in saturated soil conditions (known as hydrophytic vegetation). A wetland is identified based upon three attributes: 1) hydrology, 2) soils, and 3) vegetation as mandated by the current federal wetland determination methodology as defined by the United States Army Corps of Engineers (USACE).

A10.24.2 Acronyms

AEP – Annual Exceedance Probability

AMC II – Average Antecedent Soil Moisture Condition

BFE – Base Flood Elevation

BMP – Best Management Practice

BOD – Biochemical Oxygen Demand

CEPCSI – Certified Erosion Prevention and Sediment Control Inspector Program

CGP – Construction General Permit

CLOMR – Conditional Letter of Map Revision

COD – Chemical Oxygen Demand

CN – Curve Number

CSO – Combined Sewer Overflow

DHEC – Department of Health and Environmental Control

DO – Dissolved Oxygen

DP – Dissolved Phosphorus

FEMA – Federal Emergency Management Agency

FHWA – Federal Highway Administration

FIRM – Flood Insurance Rate Map

FPE – Flood Protection Elevation

HDPE – High Density Polyethylene

HGL – Hydraulic Grade Line

HSG – Hydrologic Soil Group

LCP – Larger Common Plan

LOC – Letter of Coverage

LOMR – Letter of Map Revision

NOAA – National Ocean and Atmospheric Administration

NOI – Notice of Intent

NOT – Notice of Termination

NPDES – National Pollution Discharge Elimination System

NRCS – Natural Resources Conservation Service [previously the Soil Conservation Service (SCS)]

NWS – National Weather Service

OSHA – Occupational Safety and Health Administration

PFDS – Precipitation Frequency Data Server

RCP – Reinforced Concrete Pipe

SCDOT – South Carolina Department of Transportation

SCDHEC – South Carolina Department of Health and Environmental Control

SWPPP – Stormwater Pollution Prevention Plan

TDS – Total Dissolved Solids

TKN – Total Kjeldahl Nitrogen

TMDL – Total Maximum Daily Load

TP – Total Phosphorus

TSS – Total Suspended Solids

USACE – United States Army Corps of Engineers

USEPA – United States Environmental Protection Agency

WQv – Water Quality Volume

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Stormwater Standards Appendix B

Let all references to Chapter 10 be changed to Chapter 8 and page numbers updated accordingly.

2021



Guidelines for Green Infrastructure & Low Impact Development

INTRODUCTION

Background and Purpose

Land development permanently alters the way in which stormwater flows across a site due to grading, compaction, and the installation of impervious cover. Water quantity control is intended to reduce the impacts of development on surrounding properties by storing runoff on site, encouraging infiltration, and preventing erosive concentrated flows. At a state level, water quantity control is mandated by South Carolina Regulation 72-300, which includes provisions for local governments to provide modified or alternative design criteria in response to specific watershed needs.

The purpose of the City of Greenville Guidelines for Green Infrastructure and Low Impact Development is to provide guidance for selecting and installing the appropriate stormwater management measures primarily on smaller sites under 1 acre in size. These guidelines employ simplified design standards that are more applicable to the small site development experience, thus avoiding the need for complex engineering calculations and analysis. These guidelines are meant to complement the use of the City of Greenville Design and Specifications Manual.

Submittal Information

All projects that are not single-family building projects require a site plan application process prior to building permit submittal. For single-family building projects, a site plan will be reviewed alongside the building permit application. The plans for LID projects will be reviewed during either the respective site plan application or building permit application submittal.

The LID practices within these Guidelines should be designed and installed based on the recommendations provided in the section for each practice, or as approved by the City Engineering Department. The City Engineering Department reserves the right to modify these practices or approve other practices at their discretion.

Pictures should be taken of each individual LID practice during installation, before underground features (e.g., perforated underdrain, Dry Well tank, level spreader trench, required excavation depth for stone subbase, amended soil, or filter media) are covered up. Additional pictures should be taken after installation is complete. All pictures should include site-specific landmarks such as unique signs, buildings, or backgrounds, and be provided to the City for verification of installation.

Typically, a Maintenance Agreement is recorded to document the LID installation and maintenance responsibilities and is required as a part of the site plan permitting process.

Frequently Asked Questions

The following section provides, in a question and answer format, information to aid in understanding of these Guidelines and when and how they apply.

What types of projects may utilize the City of Greenville Guidelines for Green Infrastructure and Low Impact Development?

In general, the intent is for the Guidelines for Green Infrastructure and Low Impact Development to be used for projects under 1 acre in size that need to provide water quantity control. This may include:

- Individual residential lots not part of a larger common plan
- Commercial lots that are adjacent to an existing single-family detached use
- Other scenarios at the discretion of the City of Greenville

For ease of discussion, projects utilizing these guidelines for Low Impact Development (LID) practices will be referred to as LID projects below.

What portions of LID projects require Stormwater Management?

These requirements are intended to capture the **major** portions of impervious areas, described below.

Impervious cover is defined as *a surface composed of any material that significantly impedes or prevents the natural percolation of water into soil, which includes, but is not limited to, rooftops, buildings, streets and roads, and any gravel, concrete or asphalt surface.*

The area draining to each practice is called the “contributing drainage area” and normally consists of 100% impervious area for these LID practices, though incidental small pervious areas can be included if unavoidable, and the areas are stabilized to eliminate soil erosion.

What are the principles for managing stormwater on LID projects?

LID projects are not required to provide the same types of stormwater management as major subdivisions or commercial projects; however, certain requirements must be met to ensure that stormwater runoff does not overwhelm stormwater infrastructure or impact adjacent property. The key principles for managing stormwater from LID projects are:

- Green Infrastructure (GI) (see section below);
- Reliance on infiltration only where the water table or bedrock layer is at least two feet below the bottom of the practice in use; and
- Proper installation and maintenance of downspouts, channels, or any other drainage features for concentrated flow.

Note: Many of the native soils in the City of Greenville do not allow for adequate infiltration, therefore a perforated underdrain is required for practices that rely on infiltration. The perforated underdrain must flow to a stable outlet that daylights (emerges from the ground and is open to the air) or tie into a stormwater conveyance system. Specific underdrain requirements for each SFR practice will be discussed in the appropriate sub-section.

What is Green Infrastructure?

The terms Green Infrastructure (GI) and Low Impact Development (LID) refer to practices that reduce runoff by utilizing stormwater practices that encourage the interception, evapotranspiration, infiltration and/or capture of stormwater runoff. Examples of applicable Green Infrastructure techniques include any appropriate combination of the following techniques:

- Installing a rain garden or bioretention area;
- Replacing traditionally impervious surfaces (driveways, patios, etc.) with pervious paving;
- Routing downspouts to underground dry wells;
- Routing downspouts to modified French drains; or
- Directing sheet flow to undisturbed natural water quality buffers or densely vegetated areas.

The goal of these techniques for use in the City is to reduce the volume of runoff and minimize the impact of a site's stormwater runoff on adjacent sites for small, frequent, storm events. GI and LID practices typically do not provide large amounts of runoff storage to address large storm events.

How are Green Infrastructure techniques sized on LID projects?

In order to minimize the effort required for LID projects, sizing tables and/or guidance are provided for each LID practice based on its drainage area. As an alternative to the LID practices in these guidelines, other GI or LID practices that employ runoff reduction techniques to provide storage for 1-inch of runoff may be used in lieu of these techniques with the assistance of a design professional and proper documentation of design criteria and details.

What is in the rest of this document?

The remainder of the document contains:

- A set of six information/specification sheets, one for each of the LID practices recommended for use. For each measure, the last two pages are a set of specifications that can be filled in and submitted with the permit application.
- Appendix A describing infiltration requirements and testing methods for these LID practices.
- Appendix B describing the filter media mix for use in Rain Gardens (LID-05).

Acknowledgements

The City of Greenville Stormwater Division would like to acknowledge and thank the Greenville County Land Development Division and the City of Atlanta, Georgia Department of Watershed Management for making their Green Infrastructure guidelines available for use and modification in the creation of the City of Greenville Guidelines for Green Infrastructure and Low Impact Development.

Technical Specification for: LID-01 DRY WELL

1.0 Dry Well

1.1 Description

Dry wells are excavated stone-filled systems designed to intercept and temporarily store stormwater runoff until it infiltrates into the soil or leaves the system through a perforated underdrain that drains to a stable outlet. The stone filled excavation may contain either a seepage tank or a perforated pipe and standpipe in order to facilitate movement of runoff through the stone. The use of the seepage tank option is recommended, as it provides more storage volume and reduces the amount of area and excavation required compared to the perforated standpipe option.

Dry wells utilizing a seepage tank are particularly well suited to receive rooftop runoff entering the tank via an inlet grate or direct downspout connection. When properly sized, installed, and maintained, dry wells may provide reductions in stormwater runoff and pollutant loads.

Dry wells are an infiltration-based LID practice which must reliably drain to function as designed. Many of the native soils in the City of Greenville do not allow for adequate infiltration, therefore a perforated underdrain is required. The perforated underdrain must flow to a stable outlet that daylights (emerges from the ground and is open to the air) or tie into a stormwater conveyance system. The City acknowledges that on flat sites, this may be difficult or infeasible due to the depth of Dry Wells. **If installation of an underdrain that daylights is infeasible, infiltration testing must be performed (see Appendix A) to demonstrate an infiltration rate of 0.5 in/hr in order to use a dry well.** If the infiltration rate is inadequate and an underdrain that daylights is infeasible, use other LID practices.

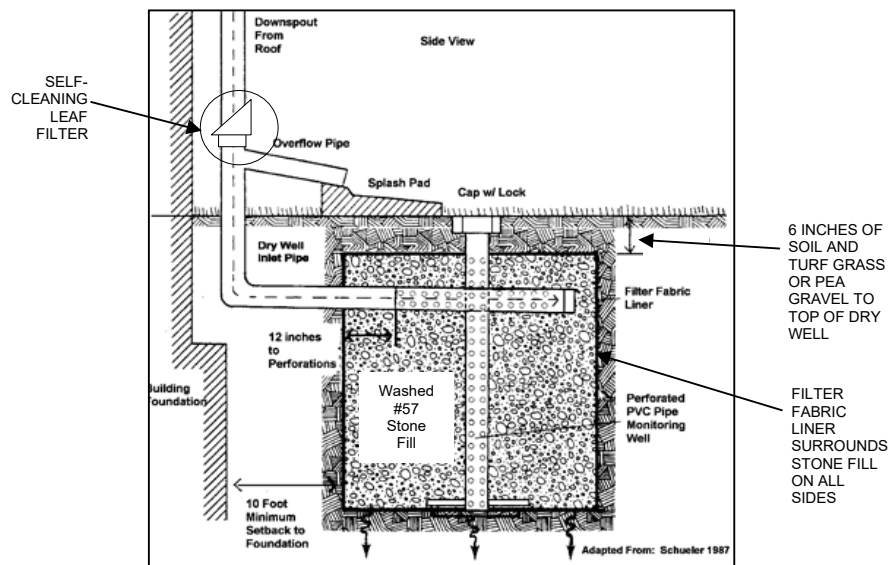
1.2 Using Dry Wells

- Dry wells must be located at least 10 feet from building foundations.
- To reduce the chance of clogging, dry wells should drain only impervious areas and runoff should be pretreated to remove leaves, debris, and other larger particles.
- Ensure the dry well drains through the underdrain and/or infiltration within a drain time of 72 hours or less.
- Dry wells should be located in a lawn or other pervious (unpaved) area and should be designed so that the top of the dry well is located as close to the surface as possible.
- Dry wells should not be located: (1) beneath an impervious (paved) surface; (2) above an area with a water table or bedrock less than two feet below the trench bottom; (3) over other utility lines; or, (4) uphill from or within 20 feet of a septic drain field. Always call 811 to locate utility lines before you dig.



1.3 Construction

- Consider the drainage area size and the soil infiltration rate when determining the size of the dry well. See comments on infiltration rate and underdrains in Section 1.1 above and design guidance on specifications sheet.
- The sides of the excavation should be trimmed of all large roots that will hamper the installation of the permeable drainage fabric used to line the sides and top of the dry well.
- For seepage tank dry wells, the dry well hole should be excavated a minimum of 1 foot deeper and two feet larger in diameter than the seepage tank to allow for a minimum 12-inch stone fill jacket.
- The native soils along the bottom of the dry well should be scarified or tilled to a depth of 3 to 4 inches.
- Install geotextile filter fabric between native soils and the washed #57 stone and dry well tank.
- Fill below and around dry well with a minimum of 12 inches of clean, washed #57 stone. #57 stone diameter averages ½ inch to 1½ inches.
- Fill the final 6 inches of the excavation with native soil. Optionally, pea gravel or #8 stone can be carried to the surface. This top layer should also be separated from the washed stone by geotextile filter fabric.
- For rooftop runoff, install a leaf screen in the gutter or down spout prior to entering the dry well to prevent leaves and other large debris from clogging the dry well. For non-rooftop runoff, precede dry well with an in-ground sump grate inlet leaf trap.
- A stabilized overflow area, such as a vegetated filter strip or grass channel, should be designed to convey the stormwater runoff generated by larger storm events safely bypassing the dry well.
- See specifications sheet for typical seepage tank dry well components and installation.
- See figure below for perforated standpipe dry well constructed of a stone pit and perforated vertical standpipe connected to the inlet pipe. This option also requires a perforated underdrain at the elevation of the bottom of the stone pit (required but not shown below) or infiltration testing if an underdrain is infeasible (see Appendix A).



- If you elect to measure infiltration rate (see Appendix A) and find it is greater than or equal to 1.0 in/hr, the dry well size can be reduced. For every 0.5 in/hr increase in measured infiltration rate above the required 0.5 in/hr, subtract ten percent of the required dry well size, as measured in

contributing area captured (square feet) which determines the volume and dimensions of the dry well.

1.3.1 Vegetation

- The landscaped area above the surface of a dry well should be covered with pea gravel when water enters a dry well through surface features rather than the pipe. This pea gravel layer provides sediment removal and additional pretreatment upstream of the dry well and can be easily removed and replaced when it becomes clogged.
- Alternatively, a dry well may be covered with an engineered soil mix and planted with managed turf or other herbaceous vegetation.

1.4 Maintenance

Annual maintenance is important for dry wells, particularly in terms of ensuring that they continue to provide stormwater management benefits over time.

- Inspect gutters and downspouts, removing accumulated leaves and debris.
- Inspect dry well following rainfall events.
- If applicable, inspect pretreatment devices for sediment accumulation. Remove accumulated trash and debris.
- Inspect top layer of filter fabric for sediment accumulation. Remove and replace if clogged.



1.5 Design Example

The fundamental principle of Dry Well design is to provide the required volume based on the drainage area. This requires calculations that will vary based on the size and shape of dry well tanks and the excavation of the stone pit around the tanks. The sub-sections below provide example calculations for a simplified design scenario. Note that Dry Well design is not limited to the tanks and excavation geometries used in this example, as these will vary based on available materials and site-specific constraints.

1.5.1 Calculating Required Volume

A home has a drainage area of 2400 sf that is to be treated for water quality using dry wells following SFR-01 Dry Well guidance. Calculate the required volume for **all dry wells** using the equation from the specification, shown below.

$$\text{Volume required [cf]} = 0.0833 * \text{Drainage Area [sf]}$$

$$\text{Volume required [cf]} = 0.0833 * 2400 \text{ sf}$$

$$\text{Volume required [cf]} = \mathbf{200 \text{ cf (all dry wells)}}$$

The house is rectangular in footprint and the drainage area flows to each corner equally, with 600 sf draining to each corner. A dry well will be installed at each corner, for a total for four dry well installations around the home. Calculate the required volume for **each dry well** using the equation from the specification, shown below.

$$\text{Volume required [cf]} = 0.0833 * \text{Drainage Area [sf]}$$

$$\text{Volume required [cf]} = 0.0833 * 600 \text{ sf}$$

$$\text{Volume required [cf]} = \mathbf{50 \text{ cf (each of the 4 dry wells)}}$$

The volume required for each dry well is 50 cf and the total volume required on the site is 200 cf. Calculations in the sub-sections below are for **one of the four dry wells**, assuming all four will be installed for full site compliance. Note that sites with uneven drainage area distributions may have different required volumes at different treatment locations.

1.5.2 Calculating Provided Volume

The dimensions of the dry well tanks and rock aggregate pit will be assessed by calculating the volume provided by the design and comparing it to the volume required (50 cf per dry well in this example). The volume provided by the design is calculated by adding the storage volume in the tank and the volume capacity of the surrounding rock aggregate, using the equation from the specification, shown below.

$$\text{Volume provided [cf]} = TV [cf] + (RV)(P)[cf]$$

TV = Tank volume

RV = Rock aggregate volume

P = Rock aggregate porosity

Tank volume (TV) is calculated from the dimensions of the tank. Rock volume (RV) is calculated from the dimensions of the rock aggregate, adjusted by the rock aggregate porosity (P) since only the volume of the pore space around the rock is available volume to be counted as volume provided.

The following sub-sections elaborate on calculations for TV and RV in two different scenarios, one with a cylindrical rock aggregate pit and another with a rectangular rock aggregate pit.

1.5.2.1 Scenario 1: Cylindrical Tank and Cylindrical Pit Excavation

In this example, the design will use stackable, round dry well tanks with a 2 ft diameter (D) and a height (H) of 2 ft.

Two dry well tanks (each 2' D x 2' H) will be stacked on top of each other to create a 2' D x 4' H dry well tank.

The tank volume is calculated using the formula for the volume of a cylinder, as follows:

$$TV = 3.14 * \left(\frac{D}{2}\right)^2 * H$$

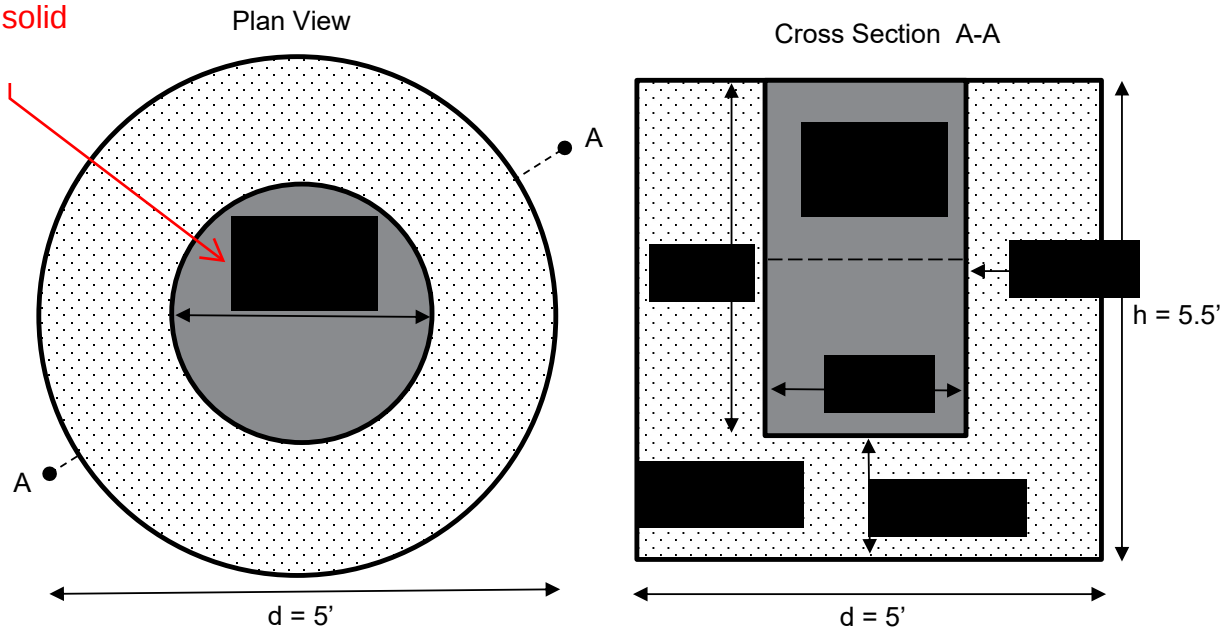
$$TV = 3.14 * \left(\frac{2\text{ ft}}{2}\right)^2 * 4\text{ ft} = 12.5\text{ cf}$$

D = diameter of tank = 2ft

H = tank height = 4ft

The tank described above is installed in a cylindrical pit. The minimum rock thickness around the tank for a dry well installation is 1 ft for both sides and bottom of the tank. In this example, the rock thickness is 1.5 ft for sides and bottom of the tank, to provide adequate volume. The pit has overall dimensions of 5' diameter (d) x 5.5' height (h) from the bottom, as shown in the schematic below.

Corrected solid
hatches



On the following page, the rock aggregate volume (RV) provided by the design will be calculated to determine if provided volume meets the required minimum volume required to treat the drainage area.

Rock aggregate volume is calculated as the volume of the pit excavated for the dry well minus the volume of the tank, since no rock will be present where the tank is located. The total rock aggregate volume is calculated below.

$$RV = V_{pit} - TV$$

$$RV = \pi * \left(\frac{d}{2}\right)^2 * h - TV$$

d = pit diameter = 5 ft

h = pit height = 5.5 ft

TV = tank volume = 12.5 ft³

$$RV = \pi * \left(\frac{5ft}{2}\right)^2 * 5.5ft - 12.5ft^3$$

$$RV = 95 \text{ cf}$$

The total volume provided by the design can be determined from the previously calculated tank volume and rock aggregate volume. The porosity is determined by the type of rock aggregate used in the design. In this example, 0.4 is used as a typical value of rock aggregate porosity.

$$\text{Volume provided [cf]} = TV \text{ [cf]} + (RV)(P)[cf]$$

$$\text{Volume provided [cf]} = 12.5 \text{ [cf]} + (95)(0.4)[cf]$$

$$\text{Volume provided [cf]} = 50.5 \text{ [cf]}$$

The volume provided by the dry well installation described above is 50.5 cf, which is greater than the required volume of 50 cf per dry well. The site design of four dry well installations (one dry well installed at each corner of the house receiving equal amounts of stormwater) will provide a total volume of 202 cf, which is greater than required 200 cf volume, so the design meets the drainage area requirements.

The final design is four dry wells, one at each corner of the house, each consisting of a 2' D x 4' H dry well tank placed in a cylindrical rock aggregate pit that is 5' d x 5.5' h. Volume provided is greater than volume required so the design is acceptable.

1.5.2.2 Scenario 2: Cylindrical Tank and Rectangular Pit Excavation

In this example, the design will use stackable, round dry well tanks with a 2 ft diameter (D) and a height (H) of 2 ft. Two dry well tanks (each 2' D x 2' H) will be stacked on top of each other to create a 2' D x 4' H dry well tank. This is the same tank used previously in Scenario 1. The tank volume is calculated using the formula for the volume of a cylinder, as follows:

$$TV = 3.14 * \left(\frac{D}{2}\right)^2 * H$$

$$TV = 3.14 * \left(\frac{2\text{ ft}}{2}\right)^2 * 4\text{ ft} = 12.5\text{ cf}$$

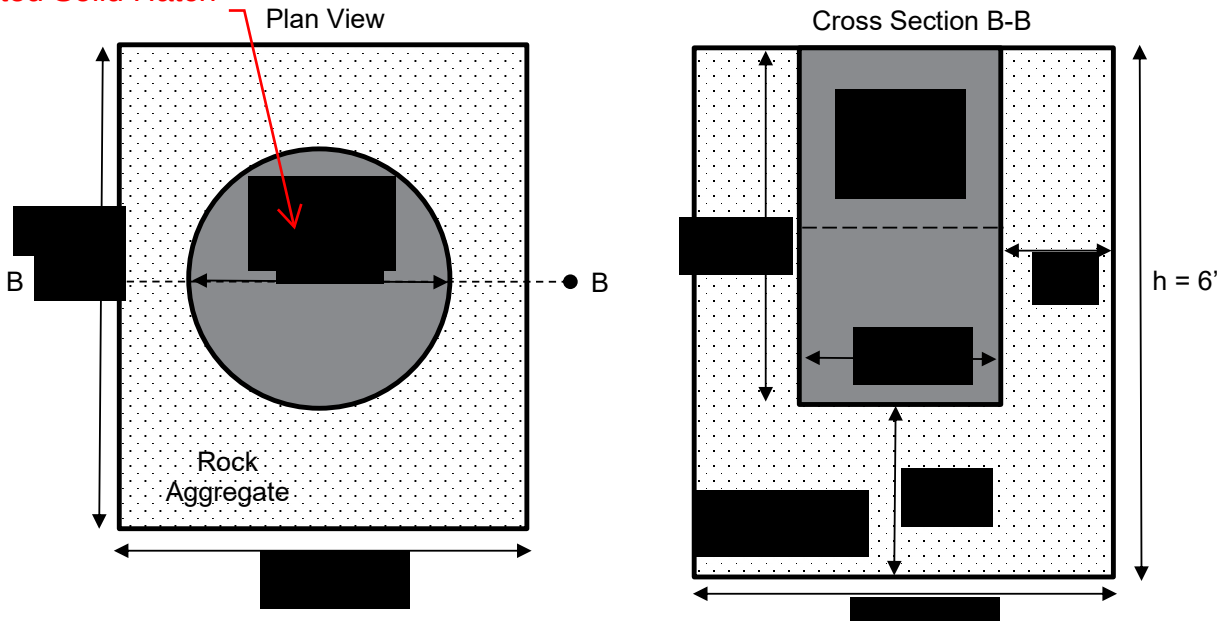
D = diameter of tank = 2ft

H = tank height = 4ft

The tank described above is installed in a cylindrical pit. The minimum rock thickness around the tank for a dry well installation is 1 ft for both sides and bottom of the tank. In this example, the rock thickness is 1.5 ft for sides and bottom of the tank, to provide adequate volume. The pit has overall dimensions of 5' diameter (d) x 5.5' height (h) from the bottom, as shown in the schematic below.

The tank described above is installed in a rectangular pit. The minimum rock thickness around the tank is 1 ft for both sides and bottom of the tank. In this example, the rock thickness varies between 1 ft and 1.5 ft on sides and is 2 ft on the bottom of the tank, to provide adequate volume. The pit has dimensions of 4' width (w) x 5' length (L) x 6' height (h) from the bottom, as shown in the schematic below.

Corrected Solid Hatch



On the following page, the rock aggregate volume (RV) provided by the design will be calculated to determine if provided volume meets the required minimum volume required to treat the drainage area.

Rock aggregate volume is calculated as the volume of the pit excavated for the dry well minus the volume of the tank, since no rock will be present where the tank is located. The total rock aggregate volume is calculated below.

$$RV = V_{pit} - TV$$

$$RV = w * L * h - TV$$

$$RV = 4ft * 5ft * 6ft - 12.5ft^3$$

$$RV = 107 cf$$

w = pit width = 4ft

L = pit length = 5ft

h = pit height from bottom = 6ft

TV = tank volume = 12.5 ft³

The total volume provided by the design can be determined from the previously calculated tank volume and rock aggregate volume. The porosity is determined by the type of rock aggregate used in the design. In this example, 0.4 is used as a typical value of rock aggregate porosity.

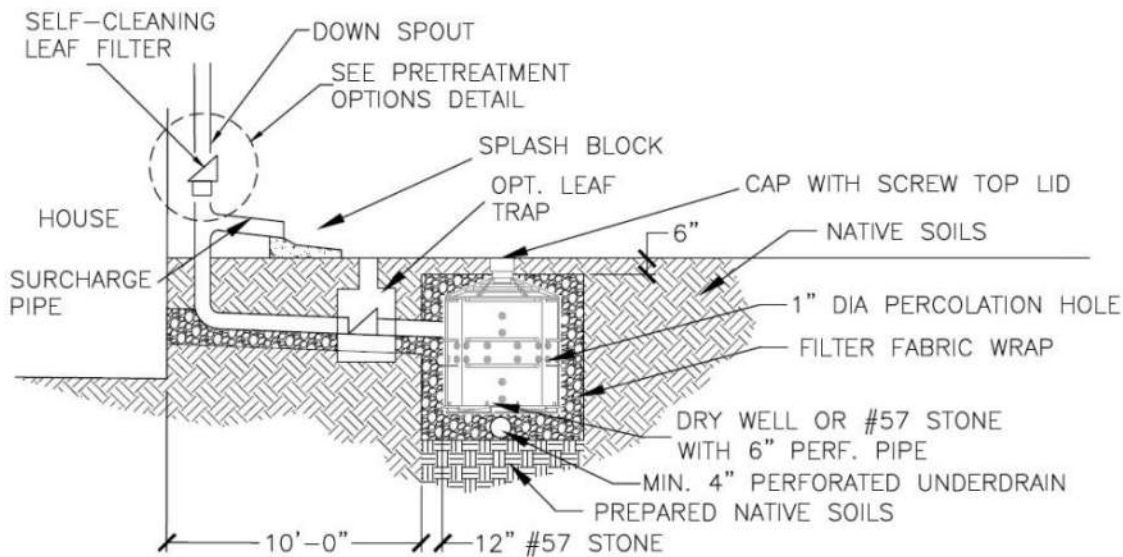
$$Volume\ provided\ [cf] = TV\ [cf] + (RV)(P)[cf]$$

$$Volume\ provided\ [cf] = 12.5\ [cf] + (107)(0.4)[cf]$$

$$Volume\ provided\ [cf] = 55\ cf$$

The volume provided by the dry well installation described above is 55 cf, which is greater than the required volume of 50 cf per dry well. The site design of four dry well installations (one dry well installed at each corner of the house receiving equal amounts of stormwater) will provide a total volume of 220 cf, which is greater than required 200 cf volume, so the design meets the drainage area requirements.

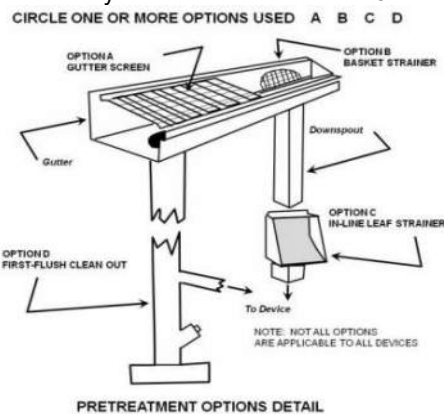
The final design is four dry wells, one at each corner of the house, each consisting of a 2' D x 4' H dry well tank placed in a rectangular rock aggregate pit that is 4' w x 5' L x 6' h. Volume provided is greater than volume required so the design is acceptable.



**TYPICAL COMPONENTS OF SEEPAGE TANK DRY WELL
(ATTACH MANUFACTURER'S SPECIFICATIONS)**

CONSTRUCTION STEPS:

1. Review potential dry well areas and layout. Dry wells should not be located: (1) beneath an impervious (paved) surface; (2) above an area with a water table or bedrock less than two feet below the trench bottom; (3) over other utility lines; (4) uphill from or within 20 feet of a septic drain field; or, (5) within 10 feet of building foundations.
2. Measure the area draining to the dry well and determine required volume on chart on the next page.
3. Design dry well tank and rock volume and demonstrate required volume is provided (attach if necessary).
4. Infiltration rate testing is not necessary when using the required perforated underdrain. If an underdrain is infeasible, see Appendix A for soil infiltration rate testing and requirements.
5. If the infiltration rate is greater than or equal to 1.0 in/hr, the contributing drainage area (square feet) may be decreased 10% for every 0.5 in/hr infiltration rate in excess of the required 0.5 in/hr. See Appendix A for soil infiltration testing and requirements.
6. Measure elevations and dig the hole to the required dimensions. Scarify the bottom soil surface 3" minimum.
7. Place and secure geotextile filter fabric on bottom and down sides of the excavation leaving enough to fold over the top below the soil and turf.
8. Place a minimum of 12" of #57 washed stone in bottom. Pea gravel can be substituted for leveling purposes in the upper three inch layer below the tank.
9. Place tank and install piping. Bond top of tank in place.
10. Cut and route downspouts or other rainwater delivery components including leaf screen option(s) chosen (**circle selected options in Pretreatment Options Detail figure**). Strap and support as needed.
11. Create a safe overflow at least 10 feet from any building foundations and ensure it is protected from erosion.
12. Test connections with water flow.
13. Fill with gravel jacket around tank and ensure filter fabric is installed between gravel and soil.
14. Backfill with soil/sod or pea gravel.
15. Consider aesthetics as appropriate and erosion control for overflow.



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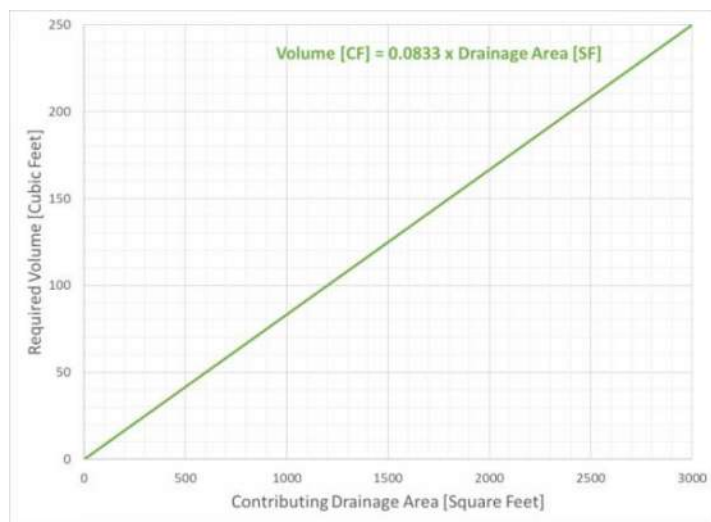
DRY WELL SPECIFICATIONS
PAGE 1 OF 2

SKETCH LAYOUT

PROVIDE PLAN AND ELEVATION VIEWS OF DRY WELL AND HOUSE SHOWING ROOF AREA DIRECTED TO DRY WELL AND KEY DIMENSIONS, CONNECTIONS AND OVERFLOW RELATIVE TO PROPERTY LINE. ATTACH ADDITIONAL PAGES IF NECESSARY.

VOLUME REQUIRED:

CONTRIBUTING DRAINAGE AREA= _____ SQ FT



VOLUME REQUIRED = _____ CU FT (FROM CHART)

VOLUME PROVIDED:

CALCULATE VOLUME PROVIDED, MUST BE GREATER THAN OR EQUAL TO REQUIRED VOLUME FROM CHART/EQUATION ON LEFT.

DRY WELL TANK VOLUME= (TV)* CU FT
 ROCK AGGREGATE VOLUME= (RV) CU FT
 ROCK AGGREGATE POROSITY= (P)**
 *IF USING STANDPIPE-STONE PIT DRY WELL, TV = 0 (NO TANK PRESENT)
 **USE P = 0.4 OR PROVIDE JUSTIFICATION

VOLUME PROVIDED = (TV) + (RV)(P)

= _____ + (____)(____) CU FT

VOLUME PROVIDED = _____ CU FT

IS VOLUME PROVIDED ≥ VOLUME REQUIRED? _____ (YES/NO)

MAINTENANCE:

1. INSPECT GUTTERS AND DOWNSPOUTS REMOVING ACCUMULATED LEAVES AND DEBRIS, CLEANING LEAF REMOVAL SYSTEM(S).
2. IF APPLICABLE, INSPECT PRETREATMENT DEVICES FOR SEDIMENT ACCUMULATION. REMOVE ACCUMULATED TRASH AND DEBRIS.
3. INSPECT DRY WELL FOLLOWING A LARGE RAINFALL EVENT TO ENSURE OVERFLOW IS OPERATING AND FLOW IS NOT CAUSING EROSION OR OTHER PROBLEMS.

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ATTACH THIS TWO-PAGE
SPECIFICATION TO HOUSE
PLAN SUBMITTAL

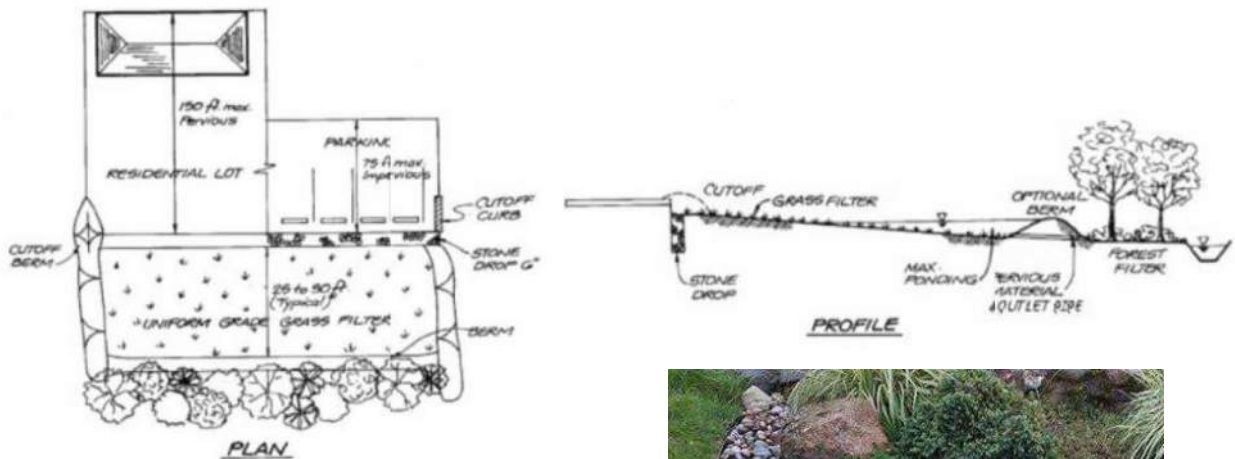
DRY WELL SPECIFICATIONS
PAGE 2 OF 2

Greenville Technical Specification for: LID-02 VEGETATED FILTER STRIP

1.0 Vegetated Filter Strip

1.1 Description

A vegetated filter strip can be an attractive and functional addition to your landscape. Vegetated filter strips (also known as grass filters) are uniformly graded, vegetated areas of land designed to receive rainwater as sheet flow and slow and filter stormwater runoff from roof downspouts or parking areas. When properly sized, installed, and maintained, vegetated filter strips may provide reductions in stormwater runoff and pollutant loads. Typical plan and profile schematics are shown below.



1.2 Using Vegetated Filter Strips

- Take note of the drainage patterns to determine the best location for a vegetated filter strip. Assess the drainage area flow paths on your property and the slope of the drainage area. Ideal locations are places where there is a gentle slope away from the structure or paved area, the area is relatively flat, and where the flow can be evenly disbursed along the top of the filter area.
- The ideal slope of the vegetated filter strip is between 1% and 5%. Greater slopes would encourage the formation of concentrated flow within the filter strip, while lesser slopes would encourage unplanned ponding.
- Placing a filter strip over utilities is acceptable except where the amended soil option is used. In that case, ensure utility locations are noted and



care is taken in soil amendment actions. Amended or bermed filter strips should not be placed uphill from or within 20 feet of a septic field.

- The length of the vegetated filter strip should be no less than 25 feet. If there is a permeable berm at the lower end, the length of the vegetated filter strip should be no less than 15 feet. Natural forested areas on site can be counted in the filter strip length total.
- The surface impervious area to any one discharge location cannot exceed 5,000 square feet.

1.3 Construction

- Measure the rooftop and any other area that is going to be directed to the filter strip. See sizing table on the specifications sheet. From the site layout drainage area, select the size and type of filter strip from the table.
- There are three types of filter strips: conventional, amended soil, and berm. The use of amended soil or a berm reduces the required size of the filter strip, as shown in the sizing table.
- For example, a 1,000 square foot rooftop with a conventional filter strip would require at least 2,000 square feet of area with a minimum flow length of 25 feet. The use of amended soil reduces the required area to 670 square feet, still with a minimum flow length of 25 feet. If built with a berm, it can have a surface area of 500 square feet and have a minimum flow length of 15 feet.



1.3.1 Amended Soil Design Option

- Required filter area can be reduced by amending the soil within the filter strip by tilling the existing soil 12" deep and mixing 4" of compost. This increases infiltration within the filter strip.

1.3.2 Berm Design Option

- Filter area can be further reduced through the use of a permeable berm at the bottom end of the filter strip. The permeable berm is used to temporarily store stormwater runoff within the filter strip, which increases the infiltration and reduces the required width of the filter strip.
- Permeable berms should be constructed of well drained soils (sand, gravels, and sandy loams) that support plant growth and should be no more than 12" high.
- Appropriately sized outlets should be provided within permeable berms to ensure that vegetated filter strips will drain within 24 hours following the end of a rainfall event.
- A stone-protected overflow area through the berm may be used to manage the stormwater runoff generated by large storm events. The overflow point must be at least 20 feet from the property line if flow is onto adjoining property. Erosion protection is critical.

1.3.3 Level Spreader

- All vegetated filter strips require a level spreader to be used at the upstream end of the filter strip to evenly distribute stormwater runoff into the filter strip. The level spreader must be located at least 10 feet from building foundations.
- The standard level spreader for this application is a small stone trench filled with river rock, pea gravel, or #8 stone installed along a level contour. This stone trench should be 6" to 12" wide and 6" to 12" deep. Larger diameter stone may be required to stabilize entry points for larger contributing impervious areas.
- When applicable, the level spreader may be connected to the downspout through a T-connection to perforated pipes embedded in the stone trench.
- Alternatively, a level spreader may be constructed using manufactured landscape or playground borders/barriers (plastic or recycled material only; no lumber ties or railroad ties). This installation requires a 2" drop on the downstream side to ensure positive flow (see detail on specifications sheet).
- Ensure level spreader overflow points are protected from erosion and not blocked by vegetation.
- If the impervious drainage area to any one entry point (e.g. a downspout) is less than or equal to 300 square feet, requirement for a level spreader **may** be waived if flow will flow as a sheet through the vegetated filter strip area. In this case splash blocks or downspout protection pads can be used to introduce flow into vegetated filter strip areas instead of a level spreader. Drainage areas greater than 300 square feet require construction of the level spreader. Vegetation requirements (below) for the vegetated filter strip are the same regardless of use of level spreader or other energy dissipation.



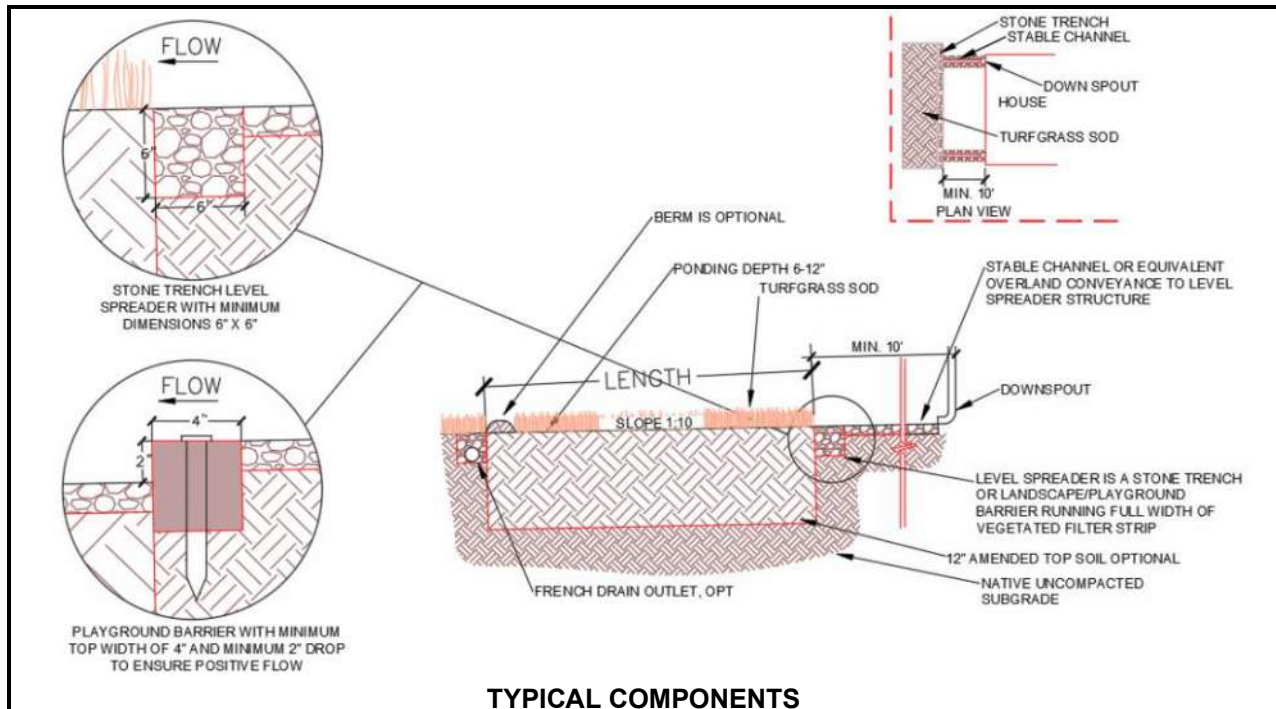
1.3.4 Vegetation

- Vegetation commonly planted on vegetated filter strips includes turf and other herbaceous vegetation.
- Choose grasses and other vegetation that will be able to tolerate the stormwater runoff rates and volumes that will pass through the vegetated filter strip.
- Vegetation used in filter strips should be able to tolerate both wet and dry conditions.
- Vegetated filter strip areas must be sodded as a part of the project if they drain to an LID practice.
- Do not use Bermuda grass. Use Zoysia or Fescue.

1.4 Maintenance

Maintain the vegetated filter strip so that it will continue to provide measurable stormwater management benefits over time.

- Water as needed to promote plant growth and survival, especially in the first two seasons.
- Provide normal turf or garden maintenance - mow, prune, and trim as needed.
- Inspect the vegetated filter strip following rainfall events. Fix erosion issues immediately.
- Remove accumulated trash, sediment, and debris.



CONSTRUCTION STEPS:

1. Review potential filter strip areas and layout. Filter strips should slope between 1% and 5% away from the home or other structures.
2. Amended or bermed filter strips should not be located uphill from or within 20 feet of a septic field. If there is a concentrated overflow, ensure it is at least 10 feet from building foundations and 20 feet from adjacent property lines.
3. Placing a filter strip over utilities is acceptable except where the amended soil option is used. In that case ensure utility locations are noted and care is taken in soil amendment actions.
4. Measure the area draining to the filter strip and determine required surface area and minimum length from the table on the next page. Determine the desired filter strip and level spreader options. **All runoff entering the filter strip must be sheet flow.**
5. Lay out and mark filter strip area as well as level spreader location.
6. Construct level spreader by filling trench with appropriate stone and noting overflow points.
7. Construct filter strip option. Install berm or prepare amended soil if applicable.
8. Construct erosion control at the flow entrance and exit points as applicable.
9. Plant dense vegetation according to plan, or sod/seed. Ensure an irrigation plan is in place.
10. Ensure temporary erosion control is in place as needed until vegetation establishment.

CITY OF GREENVILLE STORMWATER DIVISION	NAME/ADDRESS:	VEGETATED FILTER STRIP SPECIFICATIONS PAGE 1 OF 2
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SKETCH LAYOUT

PROVIDE PLAN AND ELEVATION VIEWS OF VEGETATED FILTER STRIP AND HOUSE SHOWING ROOF AREA DIRECTED TO FILTER STRIP AND KEY DIMENSIONS, CONNECTIONS AND OVERFLOW RELATIVE TO PROPERTY LINE. ATTACH ADDITIONAL PAGES IF NECESSARY.

SIZING CALCULATION:

Contributing Drainage Area (square feet)	Filter Strip Type		
	Conventional	Amended Soil	Berm
	Filter Strip Area (sq ft)		
100	200	70	50
500	1000	350	250
1000	2000	670	500
2000	4000	1400	1000
3000	6000	2700	1500
4000	8000	5400	2000
5000	10000	6700	2500

MEASURE CONTRIBUTING DRAINAGE AREA AND READ FILTER STRIP AREA FOR GIVEN FILTER STRIP TYPE. FOR SPECIFIC DRAINAGE AREAS NOT LISTED ON TABLE, INTERPOLATE BETWEEN THE CLOSEST VALUES LISTED.

CONTRIBUTING DRAINAGE AREA= _____ SQ FT
 FILTER STRIP AREA= _____ SQ FT
 CONVENTIONAL – 25' MINIMUM LENGTH
 BERM OPTION – 15' MINIMUM LENGTH

MAINTENANCE:

1. INSPECT GUTTERS AND DOWNSPOUTS REMOVING ACCUMULATED LEAVES AND DEBRIS, CLEANING LEAF REMOVAL SYSTEM(S).
2. IF APPLICABLE, INSPECT PRETREATMENT DEVICES FOR SEDIMENT ACCUMULATION. REMOVE ACCUMULATED TRASH AND DEBRIS.
3. WATER AS NEEDED TO PROMOTE PLANT GROWTH AND SURVIVAL ESPECIALLY IN THE FIRST TWO SEASONS.
4. PROVIDE NORMAL TURF OR GARDEN MAINTENANCE - MOW, PRUNE, AND TRIM AS NEEDED.
5. INSPECT THE VEGETATED FILTER STRIP FOLLOWING RAINFALL EVENTS. FIX EROSION ISSUES IMMEDIATELY.

CITY OF GREENVILLE
STORMWATER
DIVISION

ATTACH THIS TWO-PAGE
SPECIFICATION TO HOUSE PLAN
SUBMITTAL

VEGETATED FILTER STRIP
SPECIFICATIONS
PAGE 2 OF 2

Technical Specification for:
LID-03 MODIFIED FRENCH DRAIN

1.0 Modified French Drain
1.1 Description

Modified French Drains (MFD) are shallow trench excavations filled with stone that are designed to intercept and temporarily store stormwater runoff until it infiltrates into the soil. When properly sized, installed, and maintained, MFDs may provide reductions in stormwater runoff and pollutant loads. They are particularly well suited to receive rooftop runoff but can also be used to receive stormwater runoff from other small impervious areas. The use of MFDs for compliance with City stormwater ordinance requirements are only allowed to address ordinance requirements for single-family residential projects. The perforated pipe is daylighted at its end allowing for overflow of larger storms and a failsafe mechanism should infiltration not be as anticipated.

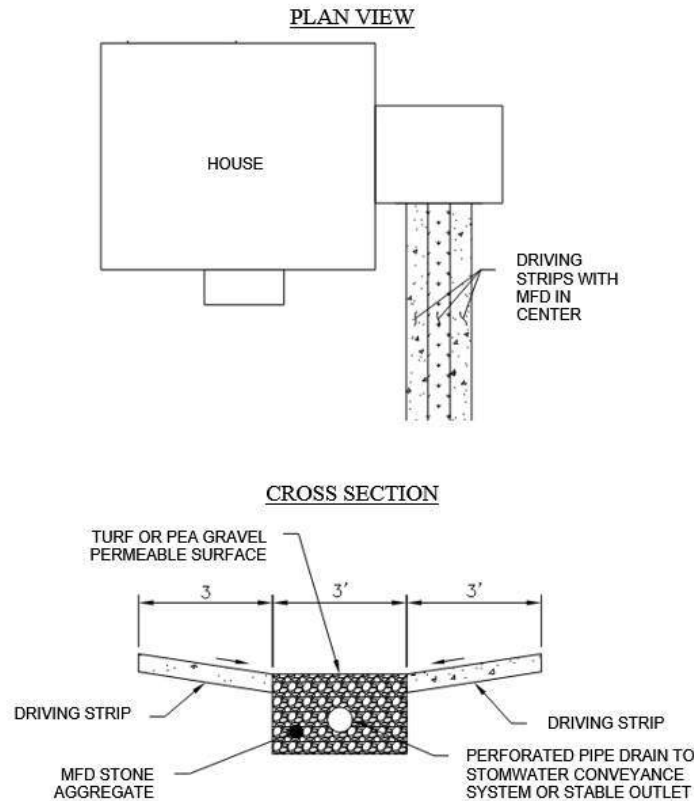
MFDs are an infiltration-based LID practice which must reliably drain to function as designed. Many of the native soils in the City of Greenville do not allow for adequate infiltration, therefore the perforated pipe drain of the MFD is required and critical to ensure the function of the MFD. The perforated pipe drain must flow to a stable outlet that daylights (emerges from the ground and is open to the air) or tie into a stormwater conveyance system. **If daylighting the perforated pipe drain is infeasible, infiltration testing must be performed (see Appendix A) to demonstrate an infiltration rate of 0.5 in/hr in order to use a MFD.** If the infiltration rate is inadequate and daylighting the perforated pipe drain is infeasible, use other LID practices. If it is infeasible to slope the MFD away from structures on site, use other LID practices.

1.2 Using Modified French Drains

- MFD trenches should be located at least 10 feet from building foundations and 20 feet from property lines. Downspout connections within 10 feet of the building that direct flow to the MFD should be constructed of non-perforated pipe to direct flow away from the structure.
- MFDs must slope away from the structures. The slope of the MFD pipe should be between 0.5% and 6%. It can be serpentine or multi-pronged in construction if sufficient slope is available.
- To reduce the chance of clogging, MFDs should drain only impervious areas, and runoff should be pretreated to remove leaves, debris, and other larger particles.
- MFD gravel trench depth and width should each be at least 18 inches and no more than 36 inches.
- MFDs should be located in a lawn or other pervious (unpaved) area and should be designed so that the top of the MFD is located as close to the surface as possible to reduce excavation.
- MFDs should not be located: (1) beneath an impervious (paved) surface; (2) above an area with a water table or bedrock less than two feet below the trench bottom; (3) over other utility lines; or, (4) uphill from or within 20 feet of a septic field. Always call 811 to locate utility lines before you dig.



- The downstream end of the pipe must daylight for overflows more than ten feet from the property line.
- If you elect to measure infiltration rate (see Appendix A) and find it is greater than or equal to 1.0 in/hr, the MFD size can be reduced. For every 0.5 in/hr increase in measured infiltration rate above the required 0.5 in/hr, subtract ten percent of the required MFD size, as measured in contributing area captured (square feet) which determines the dimensions of the MFD.
- MFDs may be used in a variety of locations based on site constraints. One application is to install the MFD adjacent to a driveway or in the center of a split track driveway, such that the driveway is sloped to drain into the MFD. The split track driveway application is shown below:



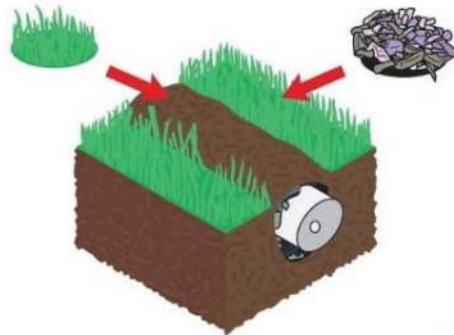
1.3 Construction

- As a rule-of-thumb there should be 21 cubic feet of stone for every 100 square feet of rooftop (0.21 cubic feet per square foot of rooftop). See specifications sheet for MFD design guidance.
- Actual installed width and depth of MFD may vary between 18 and 36 inches and should match cross section shown on specification sheet.
- The sides of the excavation should be trimmed of all large roots that will hamper the installation of the permeable drainage fabric used part way down the sides and above the gravel layer on top of the MFD.
- The native soils along the bottom of the MFD should be scarified or tilled to a depth of 3 to 4 inches.
- Install geotextile filter fabric between native soils and the washed #57 stone and perforated pipe.
- Fill the MFD with clean, washed #57 stone embedding a 6-inch diameter perforated pipe in the top of the stone such that the stone covers the top of the pipe. #57 stone averages ½ inch to 1-½ inches.
- The pipe should have 3/8-inch perforations, spaced 6 inches on center, and have a minimum slope of 0.5% and a maximum slope of 6%.

- The perforated pipe must daylight at the downstream end of the trench or adequate infiltration must be demonstrated through testing (see Section 1.1).
- A pop-up emitter at the end of the perforated pipe is a recommended addition to disperse flow.
- An overflow, such as a vegetated filter strip or grass channel, should be designed to convey the stormwater runoff generated by larger storm events safely out of the downstream end of the MFD.
- Place permeable geotextile filter fabric over gravel to keep soil or pea gravel from migrating into the gravel and filling the pore spaces and leave four to six inches above the pipe to the ground surface.
- Cover with topsoil and sod or with pea gravel.
- For rooftop runoff, install one or more leaf screen options prior to entering the MFD to prevent leaves and other large debris from clogging the MFD. For driveway or parking runoff a screened inlet grate over a sump or pea gravel pit can be used to settle out material prior to entering the pipe.

1.3.1 Vegetation

- MFDs are normally covered with topsoil and managed turf or other herbaceous vegetation.
- As an alternative, the area above the surface of the MFD may be covered with pea gravel (or larger depending on the inflow rates) to allow for incidental lateral inflow along the edge of ground level impervious surfaces.
- The downstream end of the pipe must be stabilized and can be landscaped for aesthetics.



1.4 Maintenance

Annual maintenance is important for MFDs.

- Inspect gutters/downspouts removing accumulated leaves and debris, cleaning leaf removal system(s).
- Inspect any pretreatment devices for sediment accumulation. Remove accumulated trash and debris.
- Inspect MFD following a large rainfall event to ensure overflow is operating and flow is not causing problems.

TYPICAL COMPONENTS (ATTACH MANUFACTURER'S SPECIFICATIONS)		
CONSTRUCTION STEPS: 1. Review potential MFD areas and layout. MFDs should slope between 0.5% and 6% away from the structure and should <u>not</u> be located: (1) beneath an impervious (paved) surface; (2) above an area with a water table or bedrock less than two feet below the trench bottom; (3) over other utility lines; or, (4) uphill from or within 20 feet of a septic drain field. Ensure outlet daylights at least 20 feet from property line. 2. Measure the area draining to the MFD and calculate the required volume of stone on the next page. 3. Determine the required length, width, and gravel depth to provide the required volume of stone aggregate. Consider routing of flows, excavation depth, and space constraints on the site. 4. Infiltration rate testing is not necessary when using the required perforated pipe drain with a stable outlet that daylights. See specification Section 1.1 for detailed underdrain and infiltration requirements. 5. A pop-up emitter at the end of the perforated pipe is a recommended addition to disperse flow. 6. If a perforated pipe drain with positive slope/flow is infeasible, MFDs cannot be used. 7. If the infiltration rate is greater than or equal to 1.0 in/hr, the contributing drainage area (square feet) may be decreased 10% for every 0.5 in/hr infiltration rate in excess of the required 0.5 in/hr. See Appendix A for soil infiltration testing and requirements. 8. Measure elevations and lay out the MFD to the required dimensions, marking the route and required excavation depths. Often a level line (torpedo level) is used. 9. Remove sod using a sod cutter if appropriate. Excavate ditch to the depth of the gravel plus six inches for topsoil/pea gravel. Be careful not to compact soils in the bottom. Level the bottom laterally as much as possible to maximize infiltration area. Roughen bottom to a depth of at least three inches and trim roots. 10. Place and secure geotextile filter fabric on bottom and down sides of the excavation leaving enough to fold over the top below the soil and turf. 11. Place gravel in ditch to planned depth placing the pipe three inches deep in the upper portion of the gravel. 12. Then place gravel until it covers the pipe. 12. Fold drainage fabric over top of pipe and stone. 13. Place topsoil and sod or pea gravel. 14. Cut and route downspouts or other rainwater delivery components, leaf screen option(s) chosen (circle selected options in Pretreatment Options Detail figure). Strap and support as needed. 15. Create a safe overflow and ensure it is protected from erosion.		
CIRCLE ONE OR MORE OPTIONS USED A B C D PRETREATMENT OPTIONS DETAIL		
CITY OF GREENVILLE STORMWATER DIVISION	NAME/ADDRESS:	MFD SPECIFICATIONS PAGE 1 OF 2

SKETCH LAYOUT

PROVIDE PLAN AND ELEVATION VIEWS OF MFD AND HOUSE SHOWING ROOF AREA DIRECTED TO MFD AND KEY DIMENSIONS, CONNECTIONS AND OVERFLOW RELATIVE TO PROPERTY LINE. ATTACH ADDITIONAL PAGES IF NECESSARY.

VOLUME REQUIRED:

0.21 CU FT OF STONE AGGREGATE TRENCH
PER SQ FT OF CONTRIBUTING ROOF
DRAINAGE AREA (21 CU FT PER 100 SF OF
ROOF AREA)

_____ SQ FT ROOF AREA X 0.21 = _____ FT³

DIMENSIONS OF MFD:

DEPTH OF STONE MEDIA= _____ FT
(1.5 TO 3.0 FT)

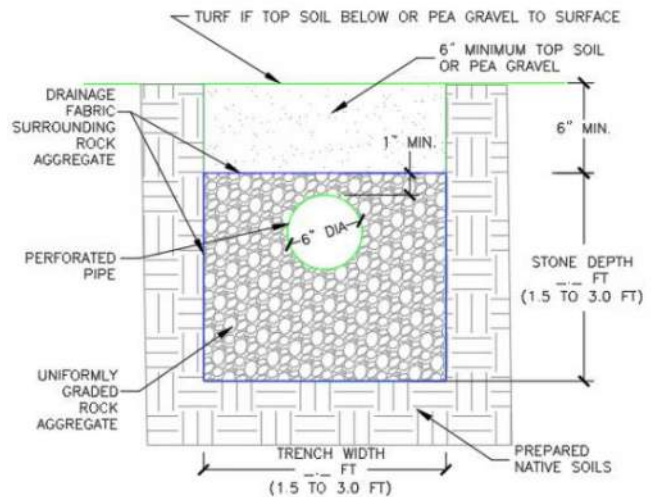
WIDTH OF MFD TRENCH= _____ FT
(1.5 TO 3.0 FT)

TOTAL LENGTH OF MFD= _____ FT
(SITE SPECIFIC)

VOLUME PROVIDED:

_____ FT X _____ FT X _____ FT = _____ FT³

IS VOLUME PROVIDED ≥ VOLUME REQUIRED?
_____ (YES/NO)

**MFD CROSS SECTION: LABEL TRENCH WIDTH AND
STONE DEPTH DIMENSIONS BELOW.****MAINTENANCE:**

1. INSPECT GUTTERS AND DOWNSPOUTS REMOVING ACCUMULATED LEAVES AND DEBRIS, CLEANING LEAF REMOVAL SYSTEM(S).
2. IF APPLICABLE, INSPECT PRETREATMENT DEVICES FOR SEDIMENT ACCUMULATION. REMOVE ACCUMULATED TRASH AND DEBRIS.
3. INSPECT MFD FOLLOWING A LARGE RAINFALL EVENT TO ENSURE OVERFLOW IS OPERATING AND FLOW IS NOT CAUSING EROSION OR FLOODING PROBLEMS.

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MFD SPECIFICATIONS
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Technical Specification for: LID-04 PERMEABLE PAVERS

1.0 Permeable Pavers

1.1 Description

Permeable pavers are an alternative to traditional paving surfaces that can decrease stormwater runoff. They are well suited for use when constructing sidewalks, parking areas, patios, and driveways. Permeable pavers

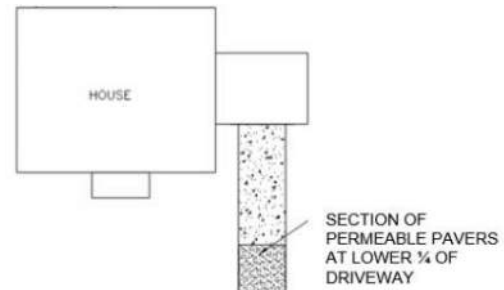


consist of permeable interlocking or grid concrete pavers underlain by a drainage layer. A permeable paver system allows stormwater runoff to pass in between the paver surface and into an underlying stone reservoir, where it is temporarily stored and allowed to infiltrate into the underlying soils. When properly sized, installed, and maintained, permeable pavers may provide reductions in stormwater runoff and pollutant loads.

Permeable pavers are an infiltration-based LID practice which must reliably drain to function as designed. Many of the native soils in the City of Greenville do not allow for adequate infiltration, therefore a perforated underdrain is required. The perforated underdrain must flow to a stable outlet that daylights (emerges from the ground and is open to the air) or tie into a stormwater conveyance system. **If installation of an underdrain that daylights is infeasible, infiltration testing must be performed (see Appendix A) to demonstrate an infiltration rate of 0.5 in/hr in order to use permeable pavers.** If the infiltration rate is inadequate and an underdrain that daylights is infeasible, use other LID practices.

1.2 Using Permeable Pavers

- Permeable pavers should not be located: (1) above an area with a water table or bedrock less than two feet below the gravel bottom; (2) over other utility lines; or, (3) uphill from or within 20 feet of a septic field. Always call 811 to locate utility lines before you dig.
- Permeable pavers should drain only impervious areas. Drainage from other areas onto the pavers will eventually clog them.
- Permeable paver systems should be installed on slopes less than 6% to help ensure even distribution of runoff over the infiltration surface and should slope away from structures.
- Permeable pavement may be used for a portion of a driveway or parking area, ensuring it is downgradient from impervious areas that are to be treated. For example, the lower $\frac{1}{4}$ of a driveway could be permeable pavement that treats the upper $\frac{3}{4}$ of the driveway. See example at right.
- Long driveways may be treated with multiple strips or sections of permeable pavers, located downgradient from impervious areas that are to be treated.



1.3 Construction

- Permeable pavers are sized based on the volume of stone needed in the stone aggregate base course

square feet of drainage area (0.21 cubic feet per square foot of drainage area). See specifications sheet for design calculation guidance.

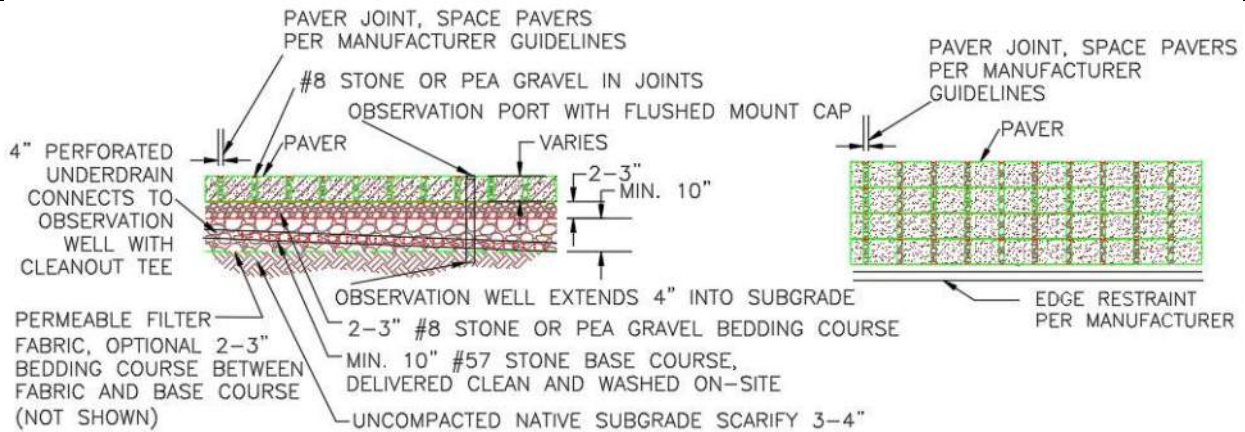
- Actual installed dimensions of the permeable pavement system and stone aggregate base course layer may vary and should be as described on the specification sheet and shown on the site layout sketch.
- The drainage area to the permeable pavement practice must be stabilized prior to installation.
- Permeable paver systems require multiple layers. Typical layers of an installed system are listed below, from top to bottom of the system. When available, manufacturer's instructions should be followed in lieu of these typical guidelines.
 - The top course consists of the pavers and a crushed aggregate material swept between the paver joints, such as #8 stone or 1/8" to 3/8" pea gravel. The thickness of this layer varies depending upon the depth of the paver.
 - The bedding course consists of 2 to 3 inches of #8 stone or 1/8" to 3/8" pea gravel. The bedding course provides a level bed for setting the pavers evenly.
 - The stone aggregate base course consists of washed #57 stone installed with a minimum depth of 10 inches. The aggregate base course acts as a reservoir to provide stormwater storage capacity.
 - An optional bedding course of 2 to 3 inches of #8 stone or 1/8" to 3/8" pea gravel may be installed between the base course and filter fabric.
 - A permeable drainage filter fabric should be used to separate the stone layers and the subgrade, following any applicable manufacturer's specifications.
 - The subgrade layer is the layer of native soils below the stone layers and the permeable drainage filter fabric. The subgrade soil layer should be prepared by scarifying or tilling to a depth of 3 to 4 inches. The subgrade should be level to encourage infiltration across the entire paver area.
- Installation of the system should include a horizontal 4" perforated underdrain and a vertical observation well that extends 4" into subgrade, connects to the underdrain with cleanout tee, and ends at paver surface with a flushed mount cap to allow access.
- In all cases the above should be the minimum specifications for the pervious paver system. Manufacturer's specifications may require larger depths or alternate materials. These systems are permitted as long as an infiltration rate of 6 in/hr is maintained and the system can drain in 72 hours.
- If you elect to measure infiltration rate (see Appendix A) and find it is greater than or equal to 1.0 in/hr, the required stone aggregate base course volume of the permeable paver system can be reduced. For every 0.5 in/hr increase in measured infiltration rate above the required 0.5 in/hr, subtract ten percent of the required stone aggregate base course volume.

1.4 Maintenance

Maintenance is very important for permeable pavers systems, particularly in terms of ensuring that they continue to provide measurable stormwater management benefits over time.

- Remove accumulated sediment and debris from joint space monthly.
- Observe the permeable paver system for excessive ponding during storm events and repair as needed.
- Vacuum, sweep, or blow permeable paver surface quarterly to keep the surface free of sediment. New #8 stone may need to be swept into the space between stones as needed.
- Inspect permeable paver surface for deterioration annually. Repair or replace any damaged areas as needed.

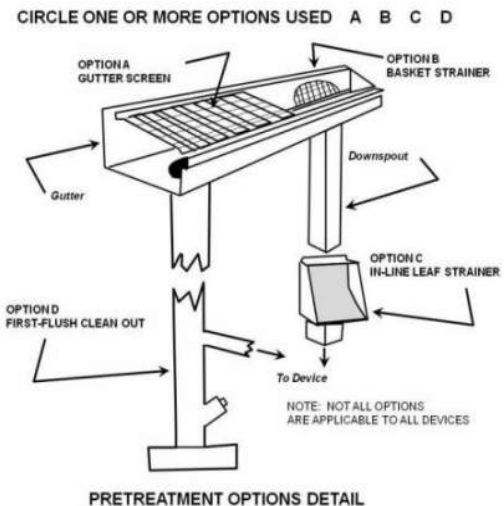




TYPICAL COMPONENTS (ATTACH MANUFACTURER'S SPECIFICATIONS)

CONSTRUCTION STEPS:

1. Review potential paver areas and layout. Pavers should slope less than 6% away from the structure and should not be located: (1) above an area with a water table or bedrock less than two feet below the trench bottom; (2) over utility lines; or, (3) uphill from or within 20 feet of a septic field.
2. Measure the area draining to the pavers and determine required paver dimensions from the calculation on the next page based on the depth of the base course stone aggregate storage layer.
3. Infiltration rate testing is not necessary when using the required perforated underdrain. If an underdrain is infeasible, see Appendix A for soil infiltration rate testing and requirements.
4. If the infiltration rate is greater than or equal to 1.0 in/hr, the required stone aggregate base course volume (cubic feet) may be decreased 10% for every 0.5 in/hr infiltration rate in excess of the required 0.5 in/hr. See Appendix A for soil infiltration testing and requirements.
5. Excavate area to appropriate depth with level subgrade (not to exceed 2% in any direction) and scarify soil to 3-4".
6. Place and secure geotextile filter fabric (Mirafi #140 N or equivalent) on bottom and down sides of the excavation.
7. Install 4" perforated underdrain and observation well. Observation well extends 4" into subgrade, connects to underdrain with cleanout tee, and ends at paver surface with flushed mount cap to allow access.
8. If desired, optional 2-3" bedding course layer of #8 stone or pea gravel may be installed under base course.
9. Place and level washed #57 stone aggregate for base course storage layer to planned depth. (10" min.)
10. Place and level 2-3" #8 stone or pea gravel bedding layer for level paver surface installation.
11. Lay paving stone one at a time or using mechanical placement as applicable. Cut stone at edges to fit.
12. Install edge restraints per manufacturer's specifications.
13. Sweep more #8 stone or pea gravel into stone joints until filled and even.
14. If applicable, cut and route downspouts or other rainwater delivery components, and indicate leaf screen option(s) chosen (**circle selected options in Pretreatment Options Detail**). Strap and support as needed.
15. In all cases the above should be the minimum specifications for the pervious paver system. Manufacturer's specifications may require larger depths or alternate materials. These systems are permitted as long as an infiltration rate of 6 in/hr is maintained and the system can drain in 72 hours.



CITY OF GREENVILLE STORMWATER DIVISION	NAME/ADDRESS:	PERMEABLE PAVER SPECIFICATIONS PAGE 1 OF 2
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SKETCH LAYOUT PROVIDE PLAN AND ELEVATION VIEWS OF PERVIOUS PAVER AND HOUSE SHOWING ROOF AREA DIRECTED TO PAVERS AND KEY DIMENSIONS, CONNECTIONS AND ANY APPLICABLE OVERFLOW RELATIVE TO PROPERTY LINE. ATTACH ADDITIONAL PAGES IF NECESSARY.		
PROVIDE ADEQUATE VOLUME OF WASHED STONE AGGREGATE IN THE BASE COURSE LAYER (MIN. DEPTH 10") VOLUME REQUIRED: 0.21 CU FT OF STONE AGGREGATE BASE COURSE PER SQ FT OF CONTRIBUTING DRAINAGE AREA (21 CU FT PER 100 SF) _____ SQ FT DRAINAGE AREA X 0.21 = _____ FT³ REQUIRED DIMENSIONS OF BASE COURSE LAYER: DEPTH OF STONE= _____ FT (MIN. DEPTH = 10" = 0.83') WIDTH OF PAVER AREA= _____ FT LENGTH OF PAVER AREA= _____ FT VOLUME PROVIDED: _____ FT X _____ FT X _____ FT = _____ FT³ PROVIDED IS VOLUME PROVIDED ≥ VOLUME REQUIRED? _____ (YES/NO)	MAINTENANCE: 1. REMOVE ACCUMULATED SEDIMENT AND DEBRIS FROM JOINT SPACE MONTHLY. REMOVE WEEDS BY SPRAYING OR PULLING BY HAND. 2. INSPECT PERMEABLE PAVER SURFACE FOR DETERIORATION ANNUALLY. REPAIR OR REPLACE ANY DAMAGED AREAS AS NEEDED. 3. OBSERVE THE PERMEABLE PAVER SYSTEM FOR EXCESSIVE PONDING DURING STORM EVENTS AND REPAIR AS NEEDED. 4. VACUUM, SWEEP, OR BLOW PERMEABLE PAVER SURFACE QUARTERLY TO KEEP THE SURFACE FREE OF SEDIMENT. DO NOT PRESSURE WASH. 5. NEW STONE MAY NEED TO BE SWEEPED INTO THE JOINTS AS NEEDED. 6. DO NOT APPLY SAND DURING WINTER. 7. DO NOT WASH VEHICLES OR STOCKPILE MATERIALS/CHEMICALS ON PAVER SURFACE. 8. BAG GRASS CLIPPINGS OR DIRECT THEM AWAY FROM PAVERS TO PREVENT CLOGGING.	
CITY OF GREENVILLE STORMWATER DIVISION	ATTACH THIS TWO-PAGE SPECIFICATION TO HOUSE PLAN SUBMITTAL	PERMEABLE PAVER SPECIFICATIONS PAGE 2 OF 2

Technical Specification for: LID-05 RAIN GARDENS

1.0 Rain Gardens

1.1 Description

Rain gardens are small, landscaped depressions that are filled with a mix of native soil and compost and are planted with trees, shrubs and other garden-like vegetation. They are designed to temporarily store stormwater runoff from rooftops, driveways, patios and other areas around your home while reducing runoff rates and pollutant loads in your local watershed. A rain garden can be a beautiful and functional addition to a landscape plan. When properly sized, installed, and maintained, rain gardens may provide reductions in stormwater runoff and pollutant loads.



Rain gardens are an infiltration-based LID practice which must reliably drain to function as designed. Many of the native soils in City of Greenville do not allow for adequate infiltration, therefore a perforated underdrain is required. The perforated underdrain must flow to a stable outlet that daylights (emerges from the ground and is open to the air) or tie into a stormwater conveyance system. **If installation of an underdrain that daylights is infeasible, infiltration testing must be performed (see Appendix A) to demonstrate an infiltration rate of 0.5 in/hr in order to use a rain garden.** If the infiltration rate is inadequate and an underdrain that daylights is infeasible, use other LID practices.

1.2 Using Rain Gardens

- Rain gardens should be located to receive the maximum amount of stormwater runoff from impervious surfaces, and where downspouts or driveway runoff can enter garden flowing away from the home.
- Swales, berms, or downspout extensions may be helpful to route runoff to the rain garden.
- Locate at least 10 feet from building foundations, not within the public right of way, away from utility lines, not uphill from or within 20 feet of septic fields, and not near a steep bluff edge. Call 811 before you dig to locate the utility lines on your property.
- Rain gardens on steep slopes (>10%) may require an alternative design with terracing.

1.3 Construction

- The size of the rain garden will vary depending on the impervious surface draining to it and the depth of the filter media. See sizing table on specification sheet.
- A maximum ponding depth of 6 inches is allowed within rain gardens. On average, rain gardens drain within a day which will not create a mosquito problem.
- Design rain garden entrance to immediately intercept inflow and reduce its velocity with stones, dense hardy vegetation or by other means.
- If sides are to be mowed rain gardens should be designed with side slopes of 3:1 (H:V) or flatter.

- For best results, it is suggested to test your soil characteristics as you would for a garden, or contact the Clemson Home & Garden Information Center for help <https://hgic.clemson.edu/factsheet/soil-testing/>.
- See Appendix B for filter media recommendations and local suppliers.
- A mulch layer consisting of 2-3 inches of non-floatable organic mulch (fine shredded hardwood mulch, pine straw, or leaf compost) should be included on the surface of the rain garden. Pine bark and wood chips should not be used.
- Often rain gardens have a better appearance and can be more easily maintained if they have defined edges, similar to a normal garden.
- The overflow from the rain garden should be non-eroding and can consist of a small berm or even an inlet grate set at the proper elevation in the garden. The grate should be set at a slant or be domed to allow clogging debris to fall off.
- If you elect to measure infiltration rate (see Appendix A) and find it is greater than or equal to 1.0 in/hr, the rain garden size can be reduced. For every 0.5 in/hr increase in measured infiltration rate above the required 0.5 in/hr, subtract ten percent of the required rain garden area (square feet).

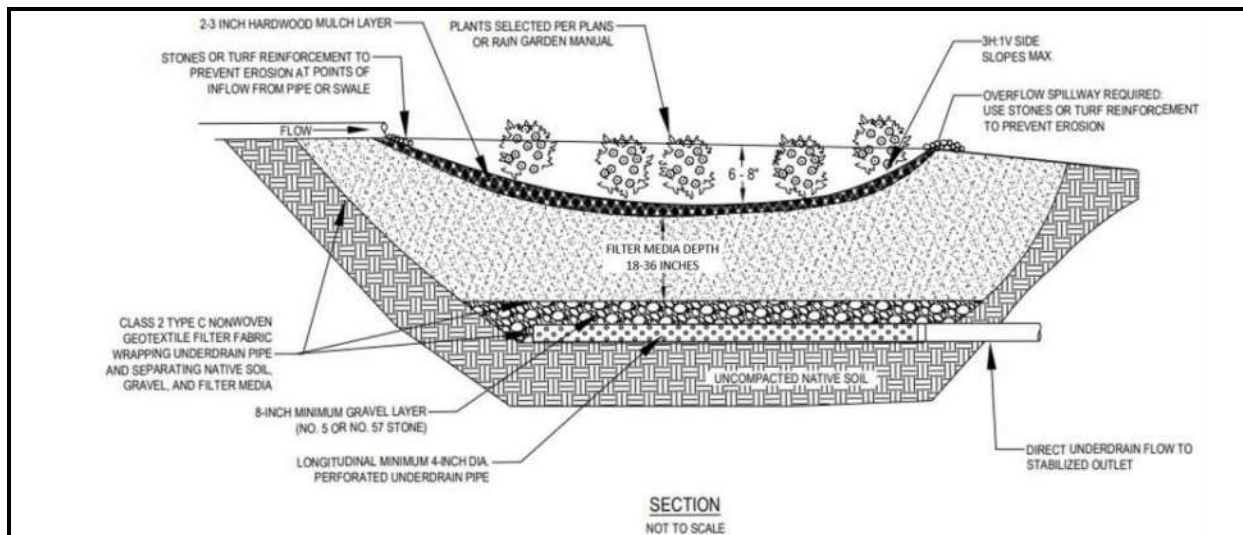
1.3.1 Vegetation

- Vegetation commonly planted in rain gardens includes native trees, shrubs and other herbaceous vegetation. When developing a landscaping plan, you should choose vegetation that will be able to stabilize soils and tolerate the stormwater runoff rates and volumes that will pass through the rain garden.
- Vegetation used in rain gardens should also be able to tolerate both wet and dry conditions. See The Carolina Yards Plant Database (<https://www.clemson.edu/extension/carolinayards/plant-database/index.html>) and The South Carolina Waterways Fact Sheet Series (<https://hgic.clemson.edu/category/water/>) for more information on grasses and other plants that are appropriate for use in rain gardens. Links are provided to assist with finding information but may change. If the specific link does not work, search Clemson University extension online publications for rain garden planting information.
- As with any garden in the first season the vegetation may require irrigation to become well established. It may be appropriate to plant more densely than a normal garden to obtain the benefit of plant soil stabilization and evapotranspiration as soon as possible.



1.4 Maintenance

Routine garden maintenance should include weeding, deadheading, replacing dead plants, and replenishing mulch when depleted. Catching areas of erosion is also important as is correcting standing water problems. If standing water persists it may be necessary to place a perforated underdrain in the garden daylighting downstream.



TYPICAL COMPONENTS

CONSTRUCTION STEPS:

1. Locate rain garden(s) where downspouts or driveway runoff can enter garden flowing away from the home. Locate at least 10 feet from building foundations, away from utility lines, not uphill from or within 20 feet of septic fields, and not near a steep bluff edge.
2. Measure the area draining to the planned garden and determine required rain garden surface area from the table on the next page and your planned excavation depth.
3. Infiltration rate testing is not necessary when using the required perforated underdrain. If an underdrain is infeasible, see Appendix A for soil infiltration rate testing and requirements.
4. If the infiltration rate is greater than or equal to 1.0 in/hr, the area of rain garden (square feet) may be decreased 10% for every 0.5 in/hr infiltration rate in excess of the required 0.5 in/hr. See Appendix A for soil infiltration testing and requirements.
5. Measure elevations and stake out the garden to the required dimensions ensuring positive flow into garden, the overflow elevation allows for six inches of ponding, and the perimeter of the garden is higher than the overflow point. If the garden is on a gentle slope a berm at least two feet wide can be constructed on the downhill side and/or the garden can be dug into the hillside taking greater care for erosion control at the garden inlet(s).
6. Remove turf or other vegetation in the area of the rain garden. Excavate garden being careful not to compact soils in the bottom of the garden. Level bottom of garden to maximize infiltration area.
7. See Appendix B for description of the recommended filter media and local suppliers.
8. Fill rain garden with the required filter media, leaving the surface eight inches below your highest surrounding surface. Eight inches allows for 6 inches ponding and 2" of mulch. The surface of the rain garden should be as close to level as possible.
9. Build a berm at the downhill edge and sides of the rain garden with the remaining subsoil. The top of the berm needs to be level and set at the maximum ponding elevation.
10. Plant the rain garden using a selection of plants described previously in specification section 1.3.1.
11. Mulch the surface of the rain garden with two to three inches of non-floating organic mulch. The best choice is finely shredded hardwood mulch.
12. Water all plants thoroughly. As in any new garden or flower bed, regular watering will likely be needed to establish plants during the first growing season.
13. During construction build the inlet feature as a pipe directly connected to a downspout or use a rock lined swale with a gentle slope. Use of an impermeable liner under the rocks at the end of the swale near the house is recommended to keep water from soaking in at that point. Test the drainage of water from the source to the garden prior to finishing.
14. Create an overflow at least 10 feet from building foundations and ensure it is protected from erosion.

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NAME/ADDRESS:

RAIN GARDEN
SPECIFICATIONS
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SKETCH LAYOUT

PROVIDE PLAN VIEWS OF RAIN GARDEN AND HOUSE SHOWING DRAINAGE AREA DIRECTED TO RAIN GARDEN AND KEY DIMENSIONS AND OVERFLOW AREA RELATIVE TO PROPERTY LINE. ATTACH ADDITIONAL PAGES IF NECESSARY.

SIZING CALCULATION:

Contributing Drainage Area (square feet)	Depth of Filter Media (inches)			
	18	24	30	36
	Area of Rain Garden (square feet)			
100	6.6	5.7	5.1	4.6
500	35	30	25	23
1000	65	60	50	45
2000	135	115	100	90
3000	200	170	150	140
4000	260	230	200	185
5000	330	290	255	230

MEASURE CONTRIBUTING DRAINAGE AREA AND READ RAIN GARDEN AREA FOR GIVEN MEDIA DEPTH. FOR SPECIFIC DRAINAGE AREAS NOT LISTED ON TABLE, INTERPOLATE BETWEEN THE CLOSEST VALUES LISTED.

CONTRIBUTING DRAINAGE AREA= _____ SQ FT

DEPTH OF FILTER MEDIA= _____ INCHES

AREA OF RAIN GARDEN= _____ SQ FT

MAINTENANCE:

1. IRRIGATE VEGETATION AS NEEDED IN FIRST SEASON
2. REMOVE WEEDS
3. REPLACE UNSUCCESSFUL PLANTINGS
4. REPLENISH MULCH
5. REPAIR ERODED AREAS
6. RAKE CLOGGED SURFACE TO RESTORE INFILTRATION
7. MONITOR RAIN GARDEN FOR APPROPRIATE DRAINAGE TIMES; IF GARDEN DOES NOT DRAIN, UNDERDRAIN MAINTENANCE OR MODIFICATIONS MAY BE NECESSARY

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ATTACH THIS TWO-PAGE SPECIFICATION
TO HOUSE PLAN SUBMITTAL

RAIN GARDEN
SPECIFICATIONS
PAGE 2 OF 2

Technical Specification for:
LID-06 VEGETATED BUFFER

1.0 Vegetated Buffer
1.1 Description

A vegetated buffer is an undisturbed natural area along the lot perimeter which filters runoff, encourages infiltration, and functions as a LID practice. Vegetated buffers may also provide protection of waterbodies when they are located along a lake, wetland, creek or stream. Development is restricted or prohibited in the vegetated buffer to prevent impacts to the waterbody or adjacent properties. In addition, the vegetated buffer provides the following:



- Protection to the overall stream or waterbody quality by providing shade for the stream or waterbody (if present),
- Natural habitat for wildlife, and
- A setback from the stream or waterbody, when applicable, to prevent damage to structures or improved property due to flooding or changes in the stream or waterbody.

Ideally, vegetated buffers are natural and undisturbed. When a buffer must be disturbed (or has previously been disturbed), promptly replant a dense cover of strong rooted grasses, native plants, and native trees.

1.2 Using Vegetated Buffers

- The most effective natural undisturbed vegetated buffers are those that consist of undisturbed natural vegetation, including maintaining the original tree line along the stream or channel banks, when applicable.
- The buffer should remain undisturbed to the maximum extent practical. Any area that is temporarily disturbed should be immediately replanted with a dense cover of strong rooted natural grasses, native plants, and native trees.
- Buffers may also be created or enhanced by planting new vegetation of native varieties.
- The ideal slope of the buffer is less than 8% to prevent flows that may cause erosion of the buffer and/or stream bank.
- The length of the buffer should be no less than 25 feet. If there is a permeable berm at the lower end, the length of the buffer should be no less than 15 feet. Note that bermed vegetated buffers should not be located uphill from or within 20 feet of a septic field.

1.3 Construction

- Measure the rooftop and any other area that is going to be directed to the vegetated buffer. See sizing table on specifications sheet. From the site layout drainage area, select the size and type of buffer from the table.
- There are three types of buffers: disturbed, undisturbed, and berm. Undisturbed conditions or a berm reduces the required size of the stream buffer, as shown in the sizing table.
- Undisturbed buffers are likely to be less compacted and more likely to contain dense, well-established, vegetation. For these reasons, undisturbed buffers typically provide better stream protection (when applicable), infiltration, and pollutant removal.
- For example, a 1,000 square foot rooftop with a disturbed buffer would require at least 2,000 square feet of area with a minimum flow length of 25 feet. The use of an undisturbed buffer reduces the required area to 670 square feet, still with a minimum flow length of 25 feet. If a berm is added to undisturbed conditions, it can have a surface area of 500 square feet and have a minimum flow length of 15 feet.



1.3.1 Berm Design Option

- Buffer area can be further reduced through the use of a permeable berm at the bottom end of the buffer. The permeable berm is used to temporarily store stormwater runoff within the buffer, which increases the infiltration and reduces the required width of the buffer.
- Permeable berms should be constructed of well drained soils (sand, gravels, and sandy loams) that support plant growth and should be no more than 12" high.
- Appropriately sized outlets should be provided within permeable berms to ensure that the buffer will drain within 24 hours following the end of a rainfall event.
- A stone-protected overflow area through the berm may be used to manage the stormwater runoff generated by large storm events. The overflow point must be at least 10 feet from building foundations and 20 feet from the property line if flow is onto adjoining property. Erosion protection is critical.
- Bermed vegetated buffers should not be located uphill from or within 20 feet of a septic field.

1.3.2 Level Spreader

- All vegetated buffers require a level spreader to be used at the upstream end of the buffer to evenly distribute stormwater runoff into the vegetated buffer. The level spreader must be located at least 10 feet from building foundations.
- The standard level spreader for this application is a small stone trench filled with river rock, pea gravel, or #8 stone installed along a level contour. This stone trench should be 6" to 12" wide and 6" to 12" deep. Larger diameter stone may be required to stabilize entry points for larger contributing impervious areas.
- When applicable, the level spreader may be connected to a downspout through a T-connection to perforated pipes embedded in the stone trench.

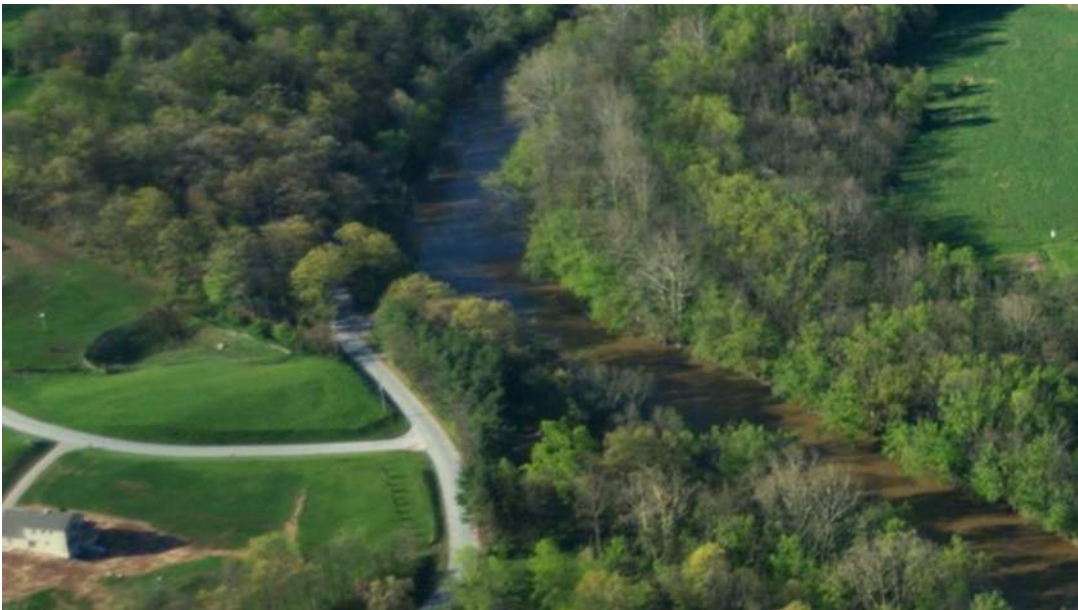
- Alternatively, a level spreader may be constructed using manufactured landscape or playground borders/barriers (plastic or recycled material only; no lumber ties or railroad ties). This installation requires a 2" drop on the downstream side to ensure positive flow (see detail on specifications sheet).
- Ensure level spreader overflow points are protected from erosion and not blocked by vegetation.
- If the impervious drainage area to any one entry point (e.g. a downspout) is less than or equal to 300 square feet, requirement for a level spreader **may** be waived if flow will flow as a sheet through the vegetated buffer area. In this case splash blocks or downspout protection pads can be used to introduce flow into vegetated buffer areas instead of a level spreader. Drainage areas greater than 300 square feet require construction of the level spreader. Vegetation requirements (below) for the vegetated buffer are the same regardless of use of level spreader or other energy dissipation.

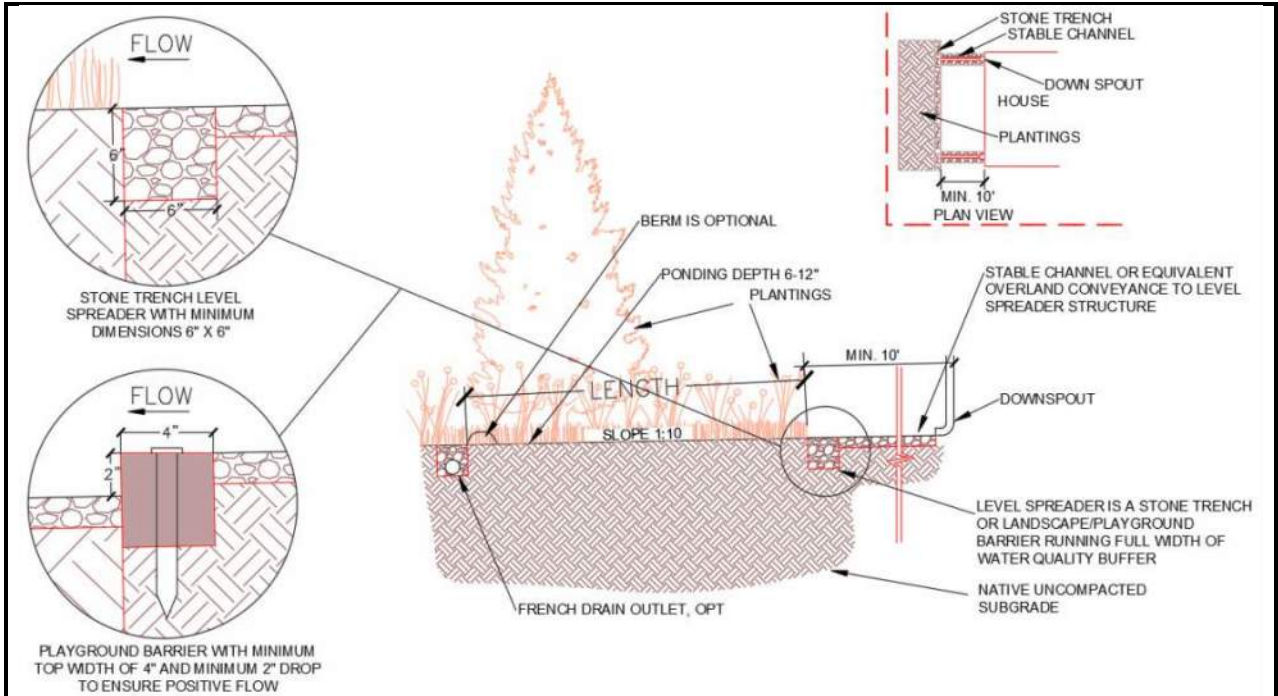
1.3.3 Vegetation

- Vegetation commonly present in vegetated buffers includes turf, trees, shrubs, and other herbaceous vegetation.
- When planting is necessary, choose grasses and other vegetation that will be able to tolerate the stormwater runoff rates and volumes that will pass through the buffer.
- Vegetation used in vegetated buffers should be able to tolerate both wet and dry conditions.

1.4 Maintenance

Clearly mark the buffer extents before construction begins to prevent unnecessary disturbance. After construction, maintain the level spreader and buffer vegetation as needed. Removal of invasive species or diseased plants and planting of new native species is permitted, so long as disturbance from these activities is minimized and the area is replanted.





TYPICAL COMPONENTS

CONSTRUCTION STEPS:

1. Review potential vegetated buffer areas and layout. Vegetated buffer areas should not exceed 8% slope and should direct water away from the home or other structures,
2. Bermed vegetated buffers should not be located uphill from or within 20 feet of a septic field. If there is a concentrated overflow, ensure it is at least 10 feet from building foundations and 20 feet from adjacent property lines.
3. Measure the area draining to the vegetated buffer and determine required surface area and minimum length from the table on the next page. Determine the desired buffer and level spreader options. **All runoff entering the buffer must be sheet flow.**
4. Vegetated buffer should be undisturbed when possible but may be replanted if disturbance is unavoidable.
5. Lay out and mark buffer area to remain undisturbed as well as level spreader location.
6. Construct level spreader by filling trench with appropriate stone and noting overflow points.
7. Construct vegetated buffer option. Install berm if applicable.
8. Construct erosion control at the flow entrance and exit points as applicable.
9. If natural vegetation is sparse in some areas, plant dense vegetation according to plan, or sod/seed. Ensure an irrigation plan is in place if needed.
10. Ensure temporary erosion control is in place as needed until vegetation establishment.

CITY OF GREENVILLE STORMWATER DIVISION	NAME/ADDRESS:	VEGETATED BUFFER SPECIFICATIONS PAGE 1 OF 2
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SKETCH LAYOUT

PROVIDE PLAN AND ELEVATION VIEWS OF VEGETATED BUFFER AND HOUSE SHOWING ROOF AREA DIRECTED TO VEGETATED BUFFER AND KEY DIMENSIONS, CONNECTIONS AND OVERFLOW RELATIVE TO PROPERTY LINE. ATTACH ADDITIONAL PAGES IF NECESSARY.

SIZING CALCULATION:

Contributing Drainage Area (square feet)	WQ Buffer Type		
	Disturbed	Undisturbed	Berm
	WQ Buffer Area (sq ft)		
100	200	70	50
500	1000	350	250
1000	2000	670	500
2000	4000	1400	1000
3000	6000	2700	1500
4000	8000	5400	2000
5000	10000	6700	2500

MEASURE CONTRIBUTING DRAINAGE AREA AND READ BUFFER AREA FOR GIVEN BUFFER TYPE. FOR SPECIFIC DRAINAGE AREAS NOT LISTED ON TABLE, INTERPOLATE BETWEEN THE CLOSEST VALUES LISTED.

CONTRIBUTING DRAINAGE AREA= _____ SQ FT
 FILTER STRIP AREA= _____ SQ FT
 CONVENTIONAL – 25' MINIMUM LENGTH
 BERM OPTION – 15' MINIMUM LENGTH

MAINTENANCE:

6. INSPECT GUTTERS AND DOWNSPOUTS REMOVING ACCUMULATED LEAVES AND DEBRIS, CLEANING LEAF REMOVAL SYSTEM(S).
7. IF APPLICABLE, INSPECT PRETREATMENT DEVICES FOR SEDIMENT ACCUMULATION. REMOVE ACCUMULATED TRASH AND DEBRIS.
8. WATER AS NEEDED TO PROMOTE PLANT GROWTH AND SURVIVAL ESPECIALLY IN THE FIRST TWO SEASONS.
9. LEAVE UNDISTURBED AS MUCH AS POSSIBLE BUT PROVIDE VEGETATION MAINTENANCE - MOW, PRUNE, AND TRIM AS NEEDED.
10. INSPECT THE WQ BUFFER FOLLOWING RAINFALL EVENTS. FIX EROSION ISSUES IMMEDIATELY.

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ATTACH THIS TWO-PAGE
SPECIFICATION TO HOUSE PLAN
SUBMITTAL

VEGETATED BUFFER
SPECIFICATIONS
PAGE 2 OF 2

APPENDIX A: INFILTRATION TESTING

When Do I Need to Do Infiltration Testing?

The following LID practices are infiltration-based features which must reliably drain (into the soil or through an underdrain that daylights to a stable outlet) to function as designed:

- LID-01 Dry Well
- LID-03 Modified French Drain
- LID-04 Permeable Pavers
- LID-05 Rain Gardens

The sizing criteria in the individual specifications are based on a required infiltration rate of 0.5 inches per hour. **Many of the native soils in the City of Greenville do not allow for adequate infiltration, therefore a perforated underdrain is required for these infiltration-based LID practices. No infiltration testing is required when using the required perforated underdrain.**

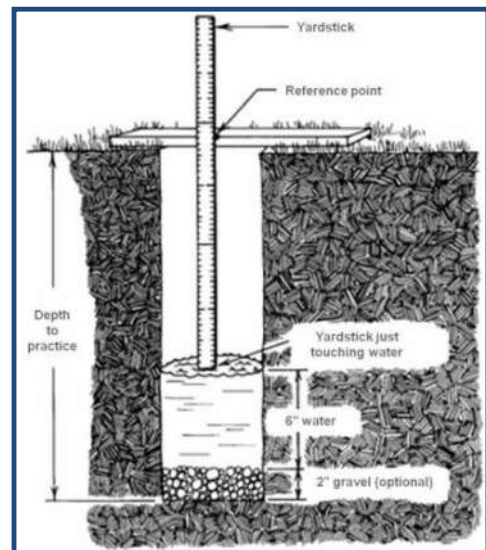
Infiltration testing may be done in either of the following two scenarios:

1. **Perforated Underdrain Infeasible:** If a functioning perforated underdrain is infeasible due to flat slopes (cannot install an underdrain with positive flow to a stable outlet that daylights) at the location of the infiltration-based LID practice and there are no other possible locations on site, then the following infiltration test may be performed to determine whether an infiltration-based LID practice (listed above) may be installed without a perforated underdrain. The test must return a minimum infiltration rate of 0.5 inches per hour to allow installation without a perforated underdrain. If the test indicates the infiltration rate is less than 0.5 inches per hour and an underdrain is infeasible, then infiltration-based features are not applicable and other LID practices should be used.
2. **Verify High Infiltration Rate to Reduce BMP Size:** If the site soils have an infiltration rate greater than or equal to 1.0 inch per hour, the size of infiltration-based LID practices (listed above) may be reduced. At the discretion of the property owner, the following infiltration test may be conducted to assess infiltration rate. For every 0.5 inches per hour in excess of the required 0.5 inches per hour, the LID practice size may be reduced by 10% (e.g. an infiltration rate of 1 inch per hour allows a decrease in size by 10%, an infiltration rate of 1.5 inches per hour allows a decrease in size by 20%, etc.) See each individual LID practice specification and detail for the practice-specific size adjustment procedure.

Testing Infiltration: A Simple Approach

When applicable, the following simplified test may be used to determine the infiltration rate of your site's soils.

1. Locate the approximate center of the area where you expect to build your feature.
2. Dig an access pit down to the bottom of the amended soils or gravel layer in the feature.
3. At that elevation dig a narrow test hole at least eight inches deep. You can optionally place 2" of coarse gravel in the bottom. The test hole can be excavated with small excavation equipment or by hand using a spade shovel or post-hole digger.
4. If you run into a hard layer that cannot be penetrated with a shovel or, you come across water in the hole, stop. Infiltration features should not be sited over impenetrable rock surfaces or over high water tables, so your site is inappropriate.
5. Place a flat board across the hole to serve as a measuring point (see figure).



Source: modified from www.ag.ndsu

6. Fill the hole with water to a depth of six inches. Measure from the flat board to the water surface. Record the exact time you stop filling the hole and the height of the water every 10 minutes for fast draining soils for a minimum of one hour or every 30 minutes for slow draining soils for a minimum of two hours.
7. Refill the hole again and repeat step 6 twice more. The third test will give you the best measure of how quickly your soil absorbs water when it is fully saturated.
8. If on the third test the water is dropping at least $\frac{1}{2}$ " per hour, the soil will work for infiltration-based LID practices. If the water is dropping at least 1" per hour, you may be able to reduce the size of the infiltration-based LID practice at that location.



Source: <https://newsstand.clemson.edu>



Source: www.learntogrow.com

APPENDIX B: FILTER MEDIA MIX

Greenville County has developed a filter media mix specification that is utilized for LID-05 Rain Gardens as well as other stormwater practices within the County. For consistency within the Greenville area, the City of Greenville recommends utilizing the Greenville County filter media mix, described below, or latest revision.

What is the recommended filter media mix?

The filter media shall be a uniform mix of sand and organic material meeting the following criteria.

- 80% medium to coarse washed sand
 - Use Masonry Sand
 - River Sand is NOT acceptable
- 20% stable composted material
 - Composted leaf/yard waste and organic/food waste are acceptable
 - Manure-based compost is NOT acceptable
- pH between 5.2 and 8.0 with an optimal range of 6.0 to 7.5
- Minimum infiltration rate of 1 inch per hour with an optimal range of 1 to 6 inches per hour

Receipt from the landscape supplier must be provided before construction of the LID practice to verify compliance with these requirements.

Why was the mix developed?

The filter media mix was developed for the following reasons:

1. Water Quality: To ensure that filter media and LID practices are effective at pollutant removal to improve water quality of stormwater runoff and Greenville County waterbodies.
2. Ease of Implementation: To specify filter media that is composed of locally available materials and can be provided pre-mixed by landscape suppliers without extensive testing.
3. Encourage LID: To streamline the process of acquiring, filter media and encourage the use of for LID practices.

Where is the mix available?

There are landscape suppliers in Greenville County which have confirmed they can pre-mix and provide this filter media to order. A list of potential suppliers is provided below. Contact the landscape suppliers in advance to arrange for timely filter media preparation.

Landscape Supplier	Website	Phone Number
Upstate Materials	http://upstatematerialsandmulch.com/	864-220-5154
Hensons' Inc. Mulch and More	http://hensonsinc.net/	864-963-9330

Appendix - Plant Lists

PL 1.0

GRASS PLANT LIST	
<u>Botanical Name</u>	<u>Common Name</u>
Acorus americanus	Sweet Flag
Andropogon glomeratus	Bushy Bluestem
Carex amphibola	Creek Sedge
Carex cherokeensis	Cherokee Sedge
Carex comosa	Longhair Sedge
Carex crinita	Fringed Sedge
Carex grayi	Gray's Sedge
Carex lurida	Lurid Sedge
Carex muskingumensis	Palm Sedge
Carex radiata	Eastern Star Sedge
Carex rosea	Rosy Sedge
Carex squarrosa	Narrow-Leaved Cattail Sedge
Carex stricta	Tussock Sedge
Carex vulpinoidea	Fox Sedge
Chasmanthium latifolium	River Oats
Chasmanthium laxum	Slender Woodoats
Elymus hystrix	Bottlebrush Grass
Eragrostis spectabilis	Purple Lovegrass
Juncus effusus	Common Rush, Soft Rush
Juncus tenuis	Path Rush
Muhlenbergia capillaris	Muhly Grass
Panicum virgatum	Switchgrass
Schizachyrium scoparium	Little Bluestem
Scirpus cyperinus	Wool Grass
Sorghastrum nutans	Indian Grass

PL 2.0

UPPER LEDGE AND BIOSWALE PLANT LIST	
Botanical Name	Common Name
Andropogon glomeratus	Bushy Beardgrass
Amsonia tabernaemontana	Eastern blue star
Asclepias incarnata	Swamp Milkweed
Carex cherokeensis	Cherokee sedge
Carex crinita	Fringed Sedge
Carex gravi	Gray's sedge
Carex lupulina	Hop sedge
Carex lurida	Lurid Sedge
Carex stricta	Tussock Sedge
Carex vulpinoidea	Fox Sedge
Chasmanthium latifolium	River Oats
Chasmanthium laxum	Slender wood oats
Chelone glabra	White Turtlehead
Conoclinium coelestinum	Blue Mistflower
Coreopsis lanceolata	Tickseed
Coreopsis tinctoria	Tickseed
Echinacea purpurea	Purple cone flower
Eupatorium fistulosum	Joe Pye Weed
Eupatorium perfoliatum	Boneset
Gallardia pulchella	Blanket flower
Helenium autumnale	Sneezeweed
Helianthus angustifolius	Swamp Sunflower
Heliopsis helianthoides	False sunflower
Hibiscus coccineus	Scarlet Rosemallow
Hibiscus moscheutos	Marsh Hibiscus
Juncus effusus	Common Rush
Juncus tenuis	Path Rush
Liatris spicata	Blazing star/Dense blazing star
Lobelia cardinalis	Cardinal Flower
Lobelia elongata	Blue lobelia
Monarda didyma	Bee balm
Muhlenbergia capillaris	Muhly Grass
Panicum virgatum	Switchgrass
Ratibida pinnata	Gray-headed coneflower
Saururus cernuus	Lizard's tail
Scirpus atrovirens	Green Bulrush
Scirpus cyperinus	Wool grass
Solidago rugosa	Goldenrod
Solidago sempervirens	Goldenrod

PL 3.0

LOWER LEDGE AND MARSH PLANT LIST	
<u>Botanical Name</u>	<u>Common Name</u>
Acorus americanus	Sweetflag
Canna flaccida	Yellow canna
Dichromena colorata	Star Grass
Iris virginica	Virginia iris
Juncus effusus	Common rush
Lilaeopsis carolinensis	Carolina grasswort
Nelumbo lutea	American lotus
Nuphar lutea ssp. advena	Yellow pond-lily
Peltandra virginica	Arrow arum
Pontederia cordata	Pickrelweed
Sagittaria latifolia	Broadleaf arrowhead
Saururus cernuus	Lizard's tail
Scirpus expansus	Sedge/Woodland bulrush
Sagittaria lancifolia	Lance-leaf Arrowhead
Sagittaria latifolia	Duck Potato
Saururus cernuus	Lizard's Tail
Scirpus americanus	Three-square
Scirpus californicus	Giant Bulrush
Scirpus validus	Softstem Bulrush
Sparganium americanum	American bur-reed
Thalia geniculata	Alligator Flag

PL 4.0

AQUATIC PLANT LIST	
Botanical Name	Common Name
<i>Acorus americanus</i>	Sweetflag
<i>Crinum americanum</i>	Swamp Lily
<i>Dichromena colorata</i>	Star Grass
<i>Eleocharis palustris</i>	Common Spikerush
<i>Hibiscus coccineus</i>	Scarlet Rosemallow
<i>Hibiscus moscheutos</i>	Marsh Hibiscus
<i>Hymenocallis liriosme</i>	Spider Lily
<i>Iris fulva</i>	Copper Iris
<i>Juncus effusus</i>	Common rush
<i>Nuphar luteum</i>	Spatterdock
<i>Nuphar lutea ssp. advena</i>	Yellow pond-lily
<i>Nymphaea mexicana</i>	Yellow Water Lily
<i>Nymphaea odorata</i>	Fragrant Water Lily
<i>Peltandra virginica</i>	Arrow arum
<i>Pontederia cordata</i>	Pickernelweed
<i>Sagittaria lancifolia</i>	Lance-leaf Arrowhead
<i>Sagittaria latifolia</i>	Duck Potato
<i>Saururus cernuus</i>	Lizard's Tail
<i>Scirpus americanus</i>	Three-square
<i>Scirpus californicus</i>	Giant Bulrush
<i>Scirpus validus</i>	Softstem Bulrush
<i>Sisyrinchium angustifolium</i>	Blue Eyed Grass
<i>Thalia geniculata</i>	Alligator Flag

PL 5.0

BIORETENTION AND RIPARIAN BUFFER PLANT LIST	
TREES	
Botanical Name	Common Name
<i>Acer rubrum</i>	Red Maple
<i>Aesculus pavia</i>	Red buckeye
<i>Amelanchier</i> spp.	Serviceberry
<i>Asimina triloba</i>	Pawpaw
<i>Betula nigra</i>	River Birch
<i>Carpinus caroliniana</i>	Ironwood
<i>Cercis canadensis</i>	Eastern redbud
<i>Chionanthus virginicus</i>	Fringe tree
<i>Ilex opaca</i>	American holly
<i>Liriodendron tulipifera</i>	Tulip poplar
<i>Magnolia grandiflora</i>	Southern Magnolia
<i>Magnolia virginiana</i>	Sweetbay magnolia
<i>Nyssa sylvatica</i>	Blackgum
<i>Oxydendrum arboreum</i>	Sourwood
<i>Platanus occidentalis</i>	American sycamore
<i>Quercus bicolor</i>	Swamp white oak
<i>Quercus lyrata</i>	Overcup
<i>Quercus phellos</i>	Willow oak
<i>Quercus shumardii</i>	Shumard oak
<i>Taxodium distichum</i>	Bald cypress
SHRUBS	
Botanical Name	Common Name
<i>Aronia arbutifolia</i>	Red chokeberry
<i>Aronia melanocarpa</i>	Black chokeberry
<i>Callicarpa americana</i>	American beautyberry
<i>Calycanthus floridus</i>	Sweetshrub
<i>Cephalanthus occidentalis</i>	Button bush
<i>Clethra alnifolia</i>	Summersweet
<i>Cornus amomum</i>	Silky dogwood
<i>Hypericum densiflorum</i>	Dense Hypericum
<i>Hypericum prolificum</i>	Shrubby St. Johnswort
<i>Ilex glabra</i>	Inkberry
<i>Ilex verticillata</i>	Winterberry
<i>Ilex vomitoria</i>	Yaupon Holly
<i>Itea virginica</i>	Virginia Sweetspire
<i>Lindera benzoin</i>	Northern Spicebush
<i>Leucothoe fontanesiana</i>	Highland doghobble
<i>Leucothoe axillaris</i>	Coastal doghobble

Physocarpus opulifolius	Ninebark
Sambucus canadensis	Elderberry
Vaccinium corymbosum	Highbush blueberry
Viburnum dentatum	Arrowwood Viburnum
Viburnum prunifolium	Blackhaw Viburnum
Viburnum nudum	Possumhaw Viburnum
Xanthorhiza simplicissima	Yellowroot
PERENNIALS AND GRASSES	
<u>Botanical Name</u>	<u>Common Name</u>
Acorus americanus	Sweet Flag
Amsonia tabernaemontana	Eastern Blue Star
Asclepias incarnata	Swamp Milkweed
Andropogon glomeratus	Bushy Bluestem
Carex amphibola	Creek Sedge
Carex cherokeensis	Cherokee Sedge
Carex lurida	Lurid Sedge
Carex stricta	Tussock Sedge
Chasmanthium latifolium	River Oats
Chasmanthium laxum	Slender Woodoats
Chelone glabra	White Turtlehead
Eragrostis spectabilis	Purple Lovegrass
Eupatorium fistulosum	Joe Pye Weed
Eupatorium perfoliatum	Boneset
Helianthus angustifolius	Swamp Sunflower
Heliopsis helianthoides	False sunflower
Hibiscus coccineus	Scarlet Rosemallow
Hibiscus moscheutos	Marsh Hibiscus
Juncus effusus	Soft Rush
Juncus tenuis	Path Rush
Liatris spicata	Blazing Star
Lobelia cardinalis	Cardinal Flower
Lobelia elongata	Blue lobelia
Monarda didyma	Bee balm
Muhlenbergia capillaris	Muhly Grass
Osmunda cinnamomea	Cinnamon Fern
Osmunda regalis	Royal Fern
Panicum virgatum	Switchgrass
Rudbeckia spp.	Blackeyed Susan
Schizachyrium scoparium	Little Bluestem
Solidago spp.	Goldenrod
Tradescantia virginia	Spiderwort
Verbena hastata	Blue Vervain
Vernonia lettermannii	Dwarf Ironweed
Vernonia noveboracensis	Ironweed

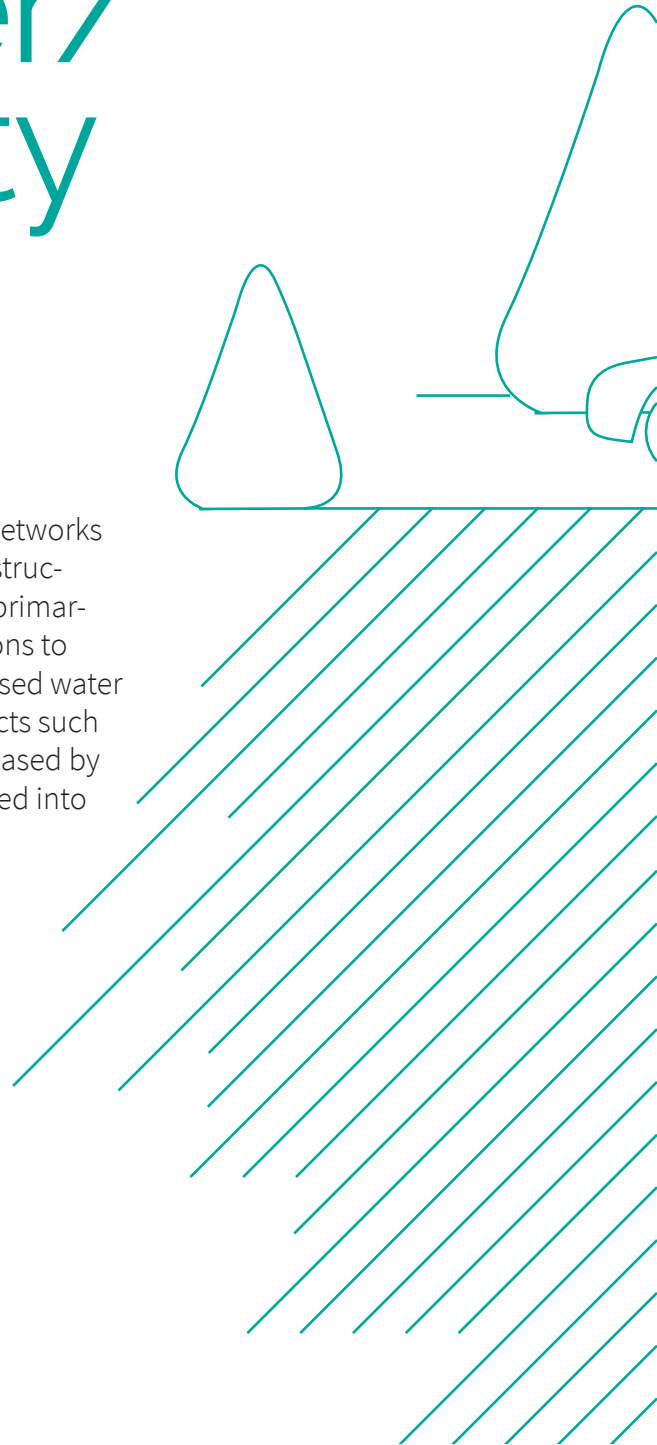
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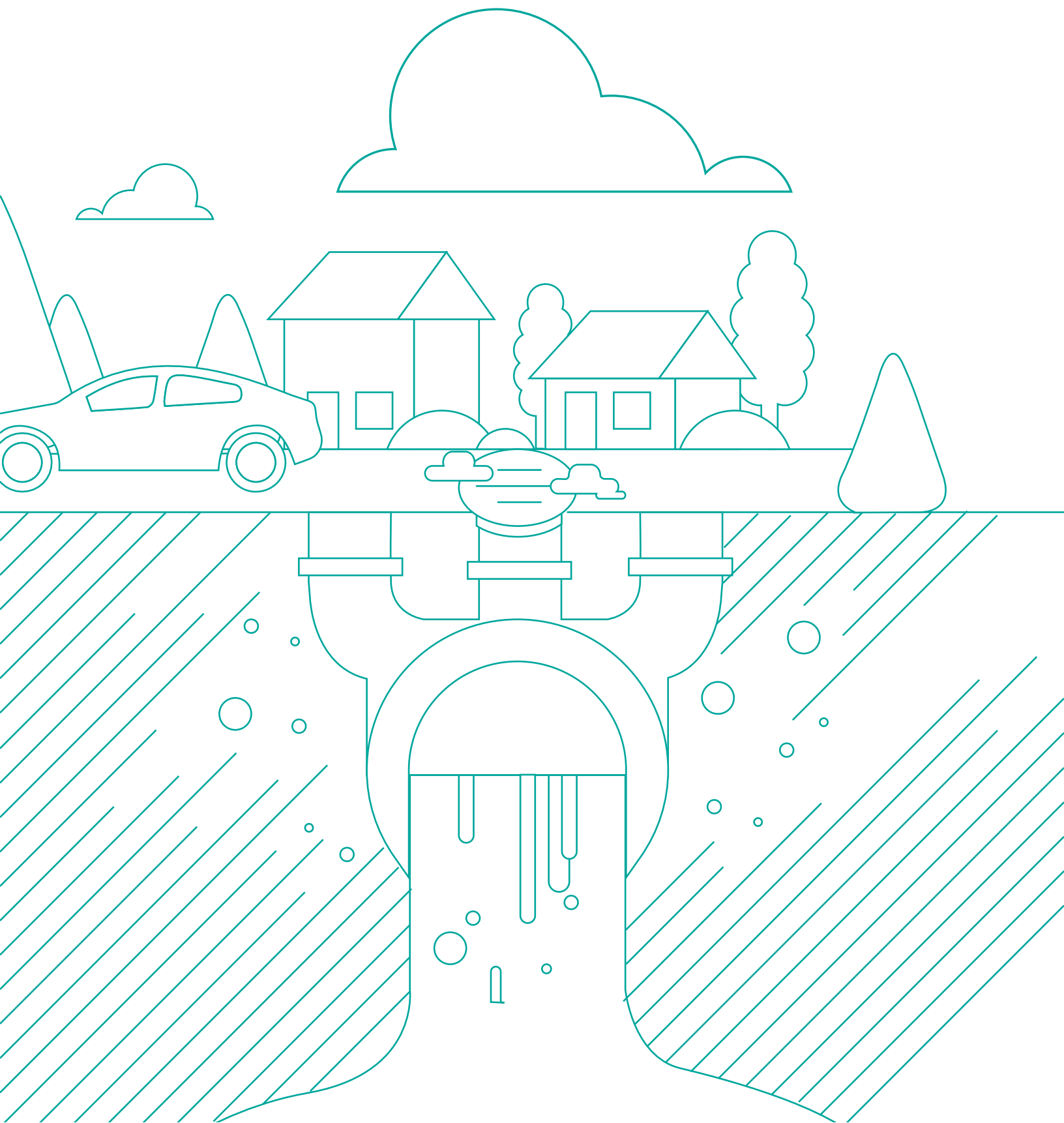
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Chapter 11

Wastewater/ Sewer Utility Standards

Unlike stormwater standards which utilize both controlled networks (e.g., pipes, etc.) and open channels, basins and green infrastructure, wastewater requirements within the City of Greenville primarily address pipe standards – materials, size, slope, connections to manholes, storage capacity, etc. Wastewater is essentially used water which includes not only human waste but also waste products such as food scraps, soaps, oils, and other chemicals that are released by homes and business and must be cleaned before it is released into the environment.







Wastewater/Sewer Utility Standards

11.1

Added "The demolition of all structures requires that the existing service lateral be removed from the wastewater main. If wastewater lateral is to be reused, it shall conform to the pipe materials specification 9.2.7. Reuse of a vitrified clay lateral is prohibited when structure is being demolished. This applies to commercial and residential construction."

11.1

General Requirements

Replaced with
"SCDES"

The following Wastewater Utility regulations shall be followed for the design and construction of all sanitary sewer facilities installed in the City of Greenville. The requirements specified hereinafter are considered to be minimum requirements. Additional requirements set forth in the Development Code apply, including but not limited to Plumbing Code, Site Development and Related Infrastructure, and Stormwater Management.

Design of all wastewater facilities that are to be dedicated to the City shall be performed by a Professional Engineer registered in the State of South Carolina. All designs shall be in accordance with, in order of precedence, the City of Greenville Land Management Ordinance (LMO) and the Design and Specifications Manual, South Carolina Department of Health and Environmental Control (SCDHEC) Regulation 61-67, and the Ten State Recommended Standards for Wastewater Facilities (latest edition). Where this article and other ordinance, deed, or plat restrictions conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

Horizontal survey datum control shall be based upon, and referenced to, South Carolina State Plane, NAD83 HARN, International Feet coordinates. Vertical survey datum control shall be based upon, and referenced to, the North American Vertical Datum of 1988 (NAVD 88). Electronic drawings submitted to the City shall be in the correct projection, coordinate system, datum, and units.

Sanitary sewers are designed for the collection and transmission of wastewater. Downspouts; foundation drains; yard drains; area drains; basement drains; residential, industrial and commercial cooling water; hazardous waste materials; and sump discharges for other than sanitary wastes shall not be connected to the facilities of the City nor into any sewer leading into any facilities of the City. Other connections may be approved on a case-by-case basis.

The safety and protection of public and private water supplies is paramount. There shall be no connection between any public or private potable water supply system and any sewer or appurtenance thereto which would permit the passage of any sewage or polluted water into the potable water supply.

11.2

11.2

Gravity Sewers

Replaced with "SCDES"

11.2.1 System Sizing

No new wastewater mains shall be less than eight inches in diameter.

Average daily flows shall be calculated using SCDHEC's Unit Contributory Loadings and/or known discharges established through flow monitoring. Peak flows shall be calculated by multiplying the average daily flow by a peaking factor based on the following formula. In no case shall the peaking factor be less than 2.5.

$$\text{Peak Factor} = \frac{18 + \sqrt{P}}{4 + \sqrt{P}} \quad \text{where } P = \text{population in thousands}$$

Refer to "Recommended Standards for Wastewater Facilities," latest edition

Design peak flows in sewers less than 10 inches in diameter shall be limited to approximately $d/D = 0.5$, 10-inch sewers shall be limited to approximately $d/D = 0.6$, and sewers 12 inches and larger shall be limited to approximately $d/D = 0.7$, where d is the flow depth, and D is the pipe diameter.

11.2.2 Utility Enlargement and Extension Sewer Mains

These mains shall be designed to serve the entire drainage basin. Flow calculations shall include projections of future flows for upstream areas that drain into the site based on zoning and current development trends. Larger size utility facilities than are required to accommodate the needs of the proposed development may be required by the City in accordance with the requirements of Development Code or as amended.

Similarly, provisions shall be made for logical future extensions at proposed or existing street connections and at other locations as determined by the City Engineer in accordance with the requirements of the Development Code or as amended. In the case where no upstream extensions are reasonable or likely, wastewater systems may be terminated at a point acceptable to the City Engineer. Future extensions may be accomplished via an additional manhole and/or section of pipe as directed by the City Engineer. The pipe shall be properly sealed to prevent infiltration into the sewer system. Additionally, the manhole and pipe shall be pressure tested in accordance with City specifications along with the remainder of the sewer system.

11.2.3 Minimum Velocity and Slope

Computations of full-flow velocity shall be based on Manning's formula using an "n" value of 0.13. In cul-de-sacs or other low flow situations where it has been determined by the City that future extension is not likely or feasible, the slope from the starter manhole shall be a minimum of 1 foot per 100 feet. For all other cases, the minimum slope of a wastewater main shall be 0.5 feet per 100 feet or as otherwise directed by the City Engineer during preliminary design.

Decreased slopes will be considered only when there are significant adverse conditions as determined by the City Engineer. In such cases, installations with slopes less than 0.5 feet per 100 feet shall have a design average flow depth of at least 0.3 of the diameter or greater ($d/D \geq 0.3$) and maintain a minimum velocity of 2.0 feet per second. In no case shall the slope of a pipe fall below the minimum values listed in Table 11.1 below. Pipe sizes shall not be increased arbitrarily to take advantage of a flatter grade.

TABLE 11.1 – Minimum Slopes for Gravity Sewers

Sewer Diameter (inches)	Minimum Slope (feet per 100 feet)
8	0.40
10	0.28
12	0.22
14	0.17
15	0.15

11.2.4 Maximum Velocity Allowed

Average flow velocities greater than fifteen feet per second will not be permitted without special exception. Drop manholes shall be provided where required to reduce steep slopes and high velocities. Where permitted velocities are anticipated to exceed fifteen feet per second, restrained joint pipe and fittings may be required and the pipe material and/or special linings shall provide protection against internal erosion in conformance with ASTM and/or American Water Works Association (AWWA) specifications. Sewers on twenty percent slopes (20 feet per 100 feet) or greater shall be anchored securely with concrete anchors or approved equal. Anchors shall be spaced as listed in Table 11.2.

TABLE 11.2 – Anchoring Intervals for Steep Sewers

Slope (percent)	Maximum Anchor Spacing (feet)
20 to 34.9	36
35 to 49.9	24
50 and over	16

11.2.5 Alignment

Gravity sewers shall be laid with straight alignment between manholes. Where applicable, lines shall be laid beneath the travel way, with manholes centered within a lane. Installations under curb lines shall be limited to the greatest extent possible. Sewer lines shall be constructed such that the internal angle of deflection is equal to or greater than ninety (90) degrees.

11.2.6 Depth

For most common applications, the minimum bury depth from the top of the pipe to the surface shall be 4.0 feet and the maximum bury depth shall be 20.0 feet. The presence of rock or unsuitable soil conditions is not necessarily justification for reduced cover. Reduced cover and installations deeper than 20 feet may be approved on a case-by-case basis by the City Engineer. Burial depths less than 3.0 feet will not be permitted.

11.2.7 Pipe Material

Pipe material shall be the same between manholes. Material transitions necessary as part of a point repair, connection to an existing system, or other special conditions require prior approval by the City Engineer. The transition must be a rigid type coupling designed specifically for transitioning between the two types of materials in conformance with ASTM C1173, D5926, and ASTM A240/A240M such as 5000 Series Strong Back RC Couplings by Fernco®, or approved equal. Flexible couplings and adapters are not permitted.

For most common applications, sewer pipe shall be SDR 26 or SDR 35 Poly Vinyl Chloride (PVC) pipe meeting ASTM D3034 for 4" to 15" diameter pipe or ASTM F679 for 18" to 36" diameter pipe. Pipe shall be made from PVC compounds having a cell classification of 12454B as defined in ASTM D1784. Pipe shall incorporate an integral bell joint with a single rubber gasket conforming to ASTM F477. Joints shall be in accordance with ASTM D3212, and be furnished complete with all necessary accessories. All fittings and accessories shall be furnished with either Push-on or Mechanical Type Joints and shall

be compatible with the pipe to which they are attached. All fittings and accessories shall meet the specifications defined in ASTM D3034 and ASTM F1336. Pipe shall be legibly and permanently marked with the following minimum information:

- Manufacturer's name or trademark and production code
- Nominal size
- PVC cell classification
- "SDR-26 PVC Sewer Pipe" or "SDR-35 PVC Sewer Pipe" as appropriate
- "ASTM D 3034"

Alternatively, asphalt coated cement mortar lined Class 50 Ductile Iron Pipe (DIP) may be placed. DIP shall be pressure class 150. DIP shall be designed and manufactured in accordance with ANSI/AWWA C150/A21.50 and C151/A21.51. Pipe shall have a standard 1-mil asphaltic coating applied on the exterior of the pipe in accordance with ANSI/AWWA C151/A21.51.

Pipe shall also have a cement-mortar lining on the interior in accordance with ANSI/AWWA C104/A21.4. All pipe shall be furnished with Push-on Type Joints, such as Tyton® or Fastite®. Joints shall be in accordance with ANSI/AWWA C111/A21.11, and be furnished complete with all necessary accessories. Fittings shall be ductile iron conforming to the latest revision of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Fittings and accessories shall be furnished with either Push-on or Mechanical Type Joints in accordance with ANSI/AWWA C111/A21.11. Pipe shall be legibly and permanently marked with the following minimum information:

- Class or nominal thickness
- Net weight without lining
- Casting period
- Manufacturer's name or trademark
- Country where cast
- Production year
- "DI" or "Ductile"

When burial depths are less than 4.0 feet or greater than 20.0 feet, DIP shall be used.

When soil tests in accordance with Appendix A of ANSI/AWWA C105/A21.5 and/or performance history indicate that conditions are corrosive to DIP, positive corrosion protection is required. In most cases, polyethylene encasement, in accordance with the AWWA C105 standard, shall be applied for corrosion protection. It shall be the burden of the owner/developer to satisfy the City as to the extent and aggressiveness of corrosive soils.

When DIP is used to transport septic sewage, where hydrogen sulfides create a corrosion related problem, specially lined pipe is required. The lining shall cover, at a minimum, the inner surfaces of the pipe and the fitting from the plain end or beveled spigot end to the rear of the gasket socket. If flanged fittings and pipe are included in the project, the lining must not be used on the face of the flange; however, full face gaskets must be used to protect the ends of the pipe.

The interior of the pipe shall have a protective lining with an average dry film thickness of 40 mils and a minimum thickness of 35 mils. Protective lining shall be installed per the manufacturer's specification. Due to the tolerances involved, the gasket area and spigot end up to 4 inches back from the end of the spigot end must be coated with a nominal

10 mil, 6 mil minimum, thickness. The quality of the lining and adherence to installation specifications must be certified prior to acceptance. Tnemec Perma-Shield PL Series 431 or equivalent are approved coatings for DIP. The specially lined pipe shall be placed from the source of the septic sewage downstream to a point acceptable to the City Engineer.

11.2.8 Installation

PVC pipe shall be installed in conformance with the latest City standard details and specifications and in accordance with ASTM D2321. Ductile iron pipe shall be installed in conformance with the latest City standard details and specifications and in accordance with sections 4.3.1 through 4.3.5 (except 4.3.3.5, 4.3.4.4, and 4.3.5.1.1), 5.1.1, and 6.1 of ANSI/AWWA C600 as well as the applicable portions ASTM D2321 for non-rigid pipe installation. Each section of sewer pipe shall be laid to the appropriate line and grade, as designed and permitted, working in the upstream direction with the bell end laid upgrade.

11.2.9 Horizontal and Vertical Separation

All separation requirements are measured from the nearest outside edge of the sewer pipe to the nearest outside edge of that which is being avoided. A minimum of 18 inches clearance, both horizontally and vertically, shall be maintained between wastewater systems and all other underground systems. No utility shall be installed within 4 feet of a wastewater manhole.

Additionally, sewers shall be laid at least ten feet horizontally from potable water mains, unless otherwise permitted by the City Engineer. Should local conditions prevent a horizontal separation of ten feet, the sewer main must be laid in a separate trench where the elevation of the top of the sewer is at least 18 inches below the bottom of the water main. Where it is impossible to obtain proper horizontal and vertical separation as described, the sewer main shall be constructed of slip type or mechanical joint pipe complying with ANSI/AWWA C900 or ANSI/AWWA C600, public water supply standards, and be pressure tested in place to 110 psi to assure water tightness prior to backfilling. This section of the sewer line shall also be pressure tested in accordance with City specifications along with the remainder of the sewer system.

Prior approval from the City Engineer must be obtained before a wastewater main is permitted to cross a water main. When local conditions necessitate that a sewer main and potable watermain cross, all reasonable effort must be made for the sewer line to cross under the watermain. Sewers crossing water mains shall be laid to provide a minimum vertical separation of 18 inches. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.

When unique and exceptional conditions exist such that a minimum 18 inch vertical clearance cannot be maintained between a wastewater main and any other underground utility crossing, the following conditions must be met:

1. The crossing shall have adequate structural support to prevent damage to the main.
2. The sewer main shall be constructed of slip type or mechanical joint pipe complying with ANSI/AWWA C900 or ANSI/AWWA C600, public water supply standards, and be pressure tested in place to 110 psi to assure water tightness prior to backfilling. This section of the sewer line shall also be pressure tested in accordance with City specifications along with the remainder of the sewer system.

When a new utility installation crosses an existing sewer line not meeting the minimum clearances specified above, a section of the existing sewer line must be replaced with pipe meeting conditions 1 and 2 above for a distance of at least 10 feet on each side of the crossing utility, or as directed by the City Engineer. In addition to the requirements

specified above, a water main shall not be allowed to pass through or come into contact with a sewer manhole.

Relationship to Water Bodies

Sanitary sewer lines shall not be located under ponds, lakes, storm water detention ponds, or within dams or any other structures that hold water on a permanent or temporary basis. Sewer crossings must meet all associated state and federal permitting requirements. Aerial and underground stream crossings will be approved by the City Engineer on a case-by-case basis. Sewer systems shall be designed to minimize the number of stream crossings. Sewers crossing streams must be designed to have a minimum impact on the stream cross section and ecosystem and must cross the stream as nearly perpendicular to the stream flow as possible. Crossings of navigable streams may require the installation of advance warning signage at the direction of the City Engineer.

If an aerial crossing is necessary, support shall be provided for all pipe joints. The supports shall be designed to prevent frost heave, overturning, and settlement. Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above ground and below ground sewers. Where buried sewers change to aerial sewers, special construction techniques shall be used to minimize frost heaving. The bottom of the pipe shall be placed no lower than the elevation of the 50 year flood. The impact of flood waters and debris shall be considered. Ductile iron pipe with mechanical joints is required and must extend between the closest upstream and downstream manhole. Piers and all appurtenances thereto require structural analysis of horizontal and vertical stability by a South Carolina Professional Engineer. All reasonable effort shall be made to the satisfaction of the City Engineer to minimize the number of piers located within the floodway.

Alternative measures, such as a steel casing and carrier pipe system, may be used to clear longer spans and reduce the number of piers necessary to support the pipe.

If an underground stream crossing is necessary, it shall be installed via the jack and bore method, and the encasement and carrier pipe shall be installed in conformance with the latest City standard details and specifications. The encasement pipe shall extend a minimum of 20 feet on both sides of the stream channel measured from the top of bank, or as directed by the City Engineer. The top of all encasement pipes shall be at a sufficient depth below the natural bottom of the stream bed to protect the sewer line crossing. In general, the following cover requirements must be met:

- One foot of cover where the sewer is located in rock.
- Three feet of cover in other material. In major streams, more than three feet of cover may be required.
- In paved stream channels, the top of the sewer line shall be placed one foot below the bottom of the channel pavement.

Steel Pipe Casing

When dry boring and jacking is required for the construction of wastewater lines or a steel casing and carrier pipe system is used for longer aerial spans, installation shall be in conformance with the latest City standard details and specifications. Steel casing pipe shall be manufactured in accordance with ANSI A53. The steel pipe shall be Type S, Grade B, plain and beveled. Steel pipe shall have a minimum yield strength of 35,000 psi. All steel casing pipe shall be furnished in 20-foot lengths and all joints welded in accordance with AWWA C206. Steel casing pipe shall be laid to the appropriate line and grade, as designed and permitted, working in the upstream direction. Steel casing for long span aerial pipe crossings shall have the minimum wall thickness for the anticipated

clear span as shown in latest City standard detail. For underground installation by dry boring and jacking, the minimum wall thickness shall be as shown in Table 11.3 below.

TABLE 11.3 – Minimum Wall Thickness for Buried Casing Pipe

Nominal Diameter (inches)	Minimum Nominal Wall Thickness (inches)
Under 14	0.188
14, 16	0.219
18	0.250
20	0.281
22	0.312
24	0.344
26	0.375
28, 30	0.406
32	0.469
38, 40, 42	0.500

When the casing pipe is installed without the benefit of protective coating or said casing is not cathodically protected, the wall thickness shall normally be increased to the next higher standard thickness as approved by the City Engineer.

11.3

11.3 Manholes

11.3.1 General

New manholes shall be precast 4000 psi reinforced concrete, in conformance with the latest City standard details and specifications and in accordance with ASTM C478. Cones shall be of the eccentric type. When watertightness is not a primary concern, joints in riser sections shall be set with a butyl joint material complying with ASTM C990 and grouted inside and out with non-shrinking grout in conformance with ASTM C1107, C827, and CRD C621 such as 1107 Advantage Grout™ by Dayton Superior, or approved equal. No more than two lift holes may be cast or cored in each section. Lift holes shall be plugged with a rubber plug and grouted inside and out with non-shrinking grout in conformance with the standards above. Steps, in conformance with the latest City standard details and specifications, shall be provided for all manholes greater than four feet of depth measured from the top of the cover to the lowest invert of the flow channel. No more than three tributary inlets are permitted to connect to any one manhole without prior approval of the City Engineer. Installations of doghouse type manholes are not permitted without prior approval of the City Engineer. Where a new sewer line ties to an existing brick manhole, the manhole must be completely replaced with a precast reinforced concrete manhole that meets City specifications.

11.3.2 Location

Manholes must be installed at the end of each gravity sewer main line; at all changes in line size, slope, or alignment; and at all intersections. Additionally, manholes must be installed at intervals not greater than 300 feet for all sewers 24 inches and smaller. Where applicable, manholes shall be placed within the center of the travel lane.

11.3.3 Diameter

For most common applications, the minimum interior diameter of gravity sewer manholes shall be 48 inches for manholes that are 12.0 feet deep or less and 60 inches for manholes deeper than 12.0 feet, measured from the lowest invert of the manhole to the top of the cover. For large pipe installations, larger diameter manholes may be required. In such case, the minimum interior diameter of the manhole shall be no less than the interior diameter of the

largest sewer entering the manhole, plus 18 inches. Manholes shall be structurally designed by a South Carolina Professional Engineer when interior diameters exceed 60 inches or depths exceed 20 feet; additional special provisions may be required as determined by the City Engineer.

11.3.4 Flow Channel

The flow channel straight through a manhole shall conform as closely as possible in shape to that of the connecting sewers and be a smooth connection between the inlet tributary and the outlet pipe. Flow channels between an inlet tributary pipe and the outlet pipe may be field constructed or precast. The invert of the pipe shall be equal to the invert of the flow channel at the connection. The channel walls shall be formed or shaped to the full height of the crown of the outlet sewer in such a manner to not obstruct maintenance,

inspection or flow in the sewers and to prevent solids deposition. When curved flow channels are specified in manholes, increased channel slope may be necessary to maintain acceptable velocities. The maximum difference in elevation between the invert of the tributary inlet and the manhole invert shall be 18 inches. Elevation differences greater than 18 inches require a drop manhole.

11.3.5 Drop Manholes

The use of drop manholes shall be minimized. The City Engineer shall approve the use of drop manholes only when it cannot be avoided. The minimum drop, measured from the invert of the incoming pipe to the manhole invert, shall be no less than 3 feet. No connection to the manhole shall be made between 18 inches and 3 feet above the manhole invert.

Drop manholes must be constructed with an interior drop connection in conformance with the latest City standard details and specifications. Outside drop manholes are not permitted without special exception by the City Engineer.

11.3.6 Bench

A bench shall be provided on each side of any manhole channel when the pipe diameter(s) are less than the manhole diameter. The bench must be sloped no less than $\frac{1}{2}$ inch per foot. No tributary inlet, including service connections, nor drop manhole pipes shall discharge onto the surface of the bench.

11.3.7 Head Loss in Manholes

Through design and installation, careful consideration must be taken to compensate for the head losses occurring through the flow channel between all manhole inlets and outlets. Manholes shall have a minimum 0.1 foot drop in elevation from the lowest tributary inlet invert to the invert of the outlet. Where a new sewer connects to an existing main and a new manhole is required, there shall be a minimum 0.3 foot drop in elevation from the invert of the new inlet tributary to the outlet pipe invert. All changes of direction, size or shape of sewers shall be made by gradual transitions so as to minimize head loss in manholes.

Where a smaller sewer transitions to a larger one through a manhole, the same energy gradient must be maintained. An approximate method for securing these results is to match the 80 percent depth point of both sewers. The City may require calculations supporting the design of the transition through the manhole.

11.3.8 Boot Connections

All pipe connections into existing precast manholes shall be installed by coring and utilize a flexible boot such as Kor-N-Seal® or approved equal. The flexible boot shall be in conformance with the latest City standard details and specifications and in accordance with ASTM C923, ASTM A666, and ASTM A240. The installed pipe shall have a smooth, formed invert; boring or chipping of the existing table to the flow channel is required. Corings for boot connectors shall not be made within six inches of a manhole barrel section joint. Other than precast concrete manholes and without the written approval of the City Engineer, existing manholes may not be cored. The existing manhole must be replaced and new connections installed. Re-coring or over coring an existing connection may not be accepted by the City and should be avoided.

11.3.9 Frames and Covers

Frames and covers conforming to the latest version of the published City standard details shall be used on all publicly owned wastewater mains. All frames and covers shall be certified for H-20 loading. Manhole frames and covers shall be set at elevations to exclude surface water. Within the travel lane, manhole frames and covers shall be set at grade to match the final paved surface. Without special exception by the City Engineer, the rim elevation shall be set 18 inches above the existing ground elevation and shall have a 5H:1V approach grade around the manhole when located outside of the public right-of-way. Adjustment rings may be used to adjust manhole rim elevations up to 12 inches above the top of the eccentric cone section. Adjustments greater than twelve inches require additional barrel riser sections installed below the cone section.

Locked manhole covers may be required in isolated easement locations or where vandalism may be a problem.

11.3.10 Watertightness

Infiltration to and exfiltration from the sanitary sewer system must be minimized to the greatest extent possible. Watertight manhole covers are to be used wherever the manhole tops may be flooded by street runoff or high water. All manholes and other above ground access points located below the Flood Protection Elevation (FPE) shall be watertight. Watertight manholes shall conform to the latest version of the published City standard details. Where a series of watertight manhole covers are used on a wastewater main for a distance of 1,000 feet or more, vent pipes conforming to the latest version of the published City standard details are required. Elevated manholes shall be a Revolution

Access Assembly by East Jordan Iron Works, or approved equal.

Within the floodplain, in areas with a high-water table, or in other areas as directed by the City Engineer, manhole joints shall be sealed with O-ring gaskets in conformance with ASTM C443 and non-shrinking grout in conformance with ASTM C1107, C827, and CRD C621 such as 1107 Advantage Grout™ by Dayton Superior, or approved equal. Additionally, the manhole shall receive water proofing by one of the following methods:

1. The exterior of the manhole shall receive a 40-mil coating of bituminous coal tar epoxy coating meeting the requirements of AWWA C210. Prior to application, all surfaces must be clean and structurally sound, free of dirt, grease, oil, paint, etc. Remove contamination with abrasive blasting, water blasting or wire brush. Make sure all dust is removed after abrasives. Concrete shall be blasted or acid etched before coating. Remove all acid with water before coating. Coating shall be applied in accordance with the manufacturer's specifications.
2. Manholes shall be sealed using waterproofing admixture IPANEX® by IPA Systems in accordance with the manufacturer's dosage and mixing instructions. The admixture shall be dosed at a rate of 13.8 fluid ounces per 100 weight of cementitious per cubic yard of concrete, and all IPANEX® modified concrete shall be batched, delivered, and discharged in accordance with ASTM C94. Certification of the precast units shall be provided prior to acceptance.

11.3.11 Corrosion Protection for Manholes

Where corrosive conditions due to septicity or other causes are anticipated, like at a force main discharge, corrosion protection on the interior of the manholes shall be provided. In such case, the interior of the manhole shall receive a 10 mil minimum thickness acid resistant coating material such as Novocoat SP2000® or approved equal. The interior of manholes for a distance not less than 1,000 linear feet downstream of the corrosive source must also be coated with the acid resistant material.

11.4

11.4

Pump Stations and Force Mains

Replaced with
"Environmental
Services"

The owner/developer and engineer must coordinate a pre-design conference for all projects requiring the use of pump stations and force mains. All pump stations and force mains are subject to review and inspection by the City Engineer. Pump stations may be subject to special provisions based on local conditions as directed by the City Engineer. Pump stations shall only be permitted when the City determines that one is necessary for the orderly development of the City in a manner consistent with the protection of the public's interest. Pump stations should typically be regional in nature. Pump stations and force mains shall be designed and installed in accordance with sound engineering practice and must adhere to South Carolina Department of Health and Environmental Control Regulation 61-67, Ten State Recommended Standards for Wastewater Facilities (latest edition), and Renewable Water Resources (ReWa) regulations. Third party peer review and inspection may be required, and the standard review fee may be modified to include the incurred costs of said review. Force mains shall be tested to satisfy a leakage test in accordance with AWWA Standard C600.

11.5

11.5 Easements

The City of Greenville implemented a Rights-of-Way and Easements Policy as part of a 2003 Environmental Protection Agency (EPA) Consent Agreement and Consent Order. The policy's focus is maintaining accessibility to City of Greenville wastewater infrastructure for inspection, maintenance and repair. Accessibility is achieved through the establishment of restricted utility easements that maintain a Clear Zone above and around City of Greenville wastewater infrastructure. The information below presents the intent of the policy relative to wastewater infrastructure installations. The full policy is located in Appendix E.

A permanent easement with an established Clear Zone, centered over the installed underground system, shall be conveyed to the City. Generally, the easement width must be 25-feet for sewer mains 36" in diameter and smaller. Larger easements may be required by the City Engineer at his discretion. Generally, justification for a larger easement includes, but is not limited to, remote locations, adverse slopes, and/or poor site conditions. When unique and exceptional conditions prohibit the conveyance of a full easement width, the City Engineer may reduce the required width subject to the minimum widths given in Table 11.4 below.

TABLE 11.4 Minimum Easement Widths

Nominal Pipe Size (inches)	Trench Depth			
	4' and less	4' to 7'	7' to 10'	10' and greater
8 to 12	15'	15'	20'	25'
15 to 24	15'	20'	20'	25'
27 to 36	20'	20'	20'	25'

The Clear Zone width shall be the entire width of the easement. The City Engineer may increase or reduce the width of the required Clear Zone. However, the minimum Clear Zone should never be less than fifteen feet (15') in width, centered over the underground system. The entire width of the easement Clear Zone shall remain clear and fully accessible, and access to manholes shall be preserved at all times. No obstacles that inhibit the City's ability to access and maintain its infrastructure shall be placed within an easement Clear Zone including, but not limited to, temporary or permanent structures, walls, fences, trees, ponds, lakes, storm water detention ponds, dams, or any other structures that hold water on a permanent or temporary basis. The City of Greenville has the right to cause any obstruction to be removed without notice to the property owner and all related costs shall be the property owner's responsibility. The City will not bear the responsibility for property loss or damage for unpermitted items

placed within the easement Clear Zone. Asphalt paths, concrete sidewalks, roads, parking lots, grass, shrubs and other planting whose natural height does not exceed three feet are permitted in the easement Clear Zone. Maintenance for these items is the responsibility of the property owner or homeowner's association; however, like all other items not defined for use in the easement, they are at risk and subject to removal at any time.

In order to meet the Clear Zone requirements, the following hierarchy is established:

1. Wastewater infrastructure installations shall be located within public rights-of-way or within permanent easements adjacent to public rights-of-way. Where wastewater infrastructure is placed within an existing easement or right-of-way, but there is less than half of the full width of the required easement or right-of-way on each side of the underground system, additional easement or right-of-way may be required by the City to provide the full easement width.
2. Wastewater infrastructure installations shall be located within a permanent easement through areas with unrestricted paved access, e.g. parking lots or paved accessways.
3. When unique and exceptional conditions exist that prohibit installation in conformance with the above requirements, the City Engineer may permit the installation of wastewater infrastructure within a permanent easement through private property that meets the established Clear Zone requirements to the greatest extent possible. These easements must be clearly marked and identifiable and generally run along common property lines. Moreover, temporary construction easements, of varying widths, shall be acquired when necessary to facilitate wastewater system construction.

11.6

11.6

Service Connections

~~General~~ Each individually owned parcel and each building having plumbing fixtures installed, whichever is applicable, shall have at least one direct and individual connection to a City wastewater main, otherwise known as a main sewer line. Service connections, otherwise known as building sewer, are that portion of the wastewater system that extends from the end of the building drain to the connection to the main sewer line. Building sewers shall be constructed in accordance with the standards outlined in the International Plumbing Code (IPC) or the International Residential Code (IRC), as currently adopted. The connection assemblies of the building sewer to the main sewer line shall be installed in conformance with the latest City standard details and specifications. Building sewers must be installed so that the connection does not cross or significantly front another parcel, unless otherwise approved by the City Engineer. Building sewers and their appurtenances are privately owned and maintained from the building drain up to and including the connection to the City main sewer line. The City may require service connections be tested to ensure positive connectivity to the main sewer line prior to placing the building sewer into operation.

11.6.1 Connection to Existing Main Sewer Line

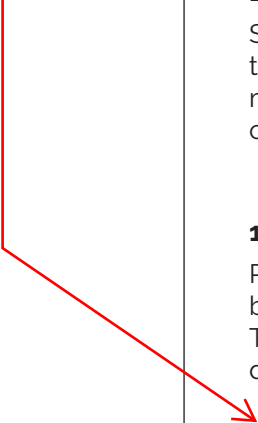
All building sewers and their appurtenances must be permitted through and inspected by the City of Greenville Building Codes Division. Prior to connection, the City may require the main sewer line condition be verified for adequacy prior to making a new connection. Additionally, the City may require that adequate capacity of the downstream system to the ReWa trunk line be verified prior to connection.

11.6.2 Connection to New Main Sewer Line

In such case as the connection to the main sewer line is part of a new main sewer line installation, the building sewer and associated appurtenances shall be installed and inspected by the City Engineer as part of the main sewer line construction permit with the following conditions:

- The building sewer shall be stubbed out only to the edge of the right-of-way and

Added "All existing vitrified clay laterals shall either be replaced with new materials per 9.2.7 or lined and tested to prevent infiltration and exfiltration. A new cleanout shall be installed at the property line."



capped in accordance with the latest City standard details and specifications.

- Without prior knowledge of the variables required to size the lateral per the IPC or IRC, the minimum diameter of the building sewer stub out shall be four (4) inches for single family residential subdivisions and six (6) inches for commercial and multifamily development.
- The building sewer stub out shall be of the same material as the main sewer line.
- When the building sewer is extended from the stub out to the building drain, the building sewer and its appurtenances must be permitted through and inspected by the City of Greenville Building Codes Division.

11.6.3 Connection to a Manhole

Service connections may be precast into a new manhole, and shall be made under the direction of the City Engineer. Service connections shall not be made at an existing manhole without written approval and under the direction of the City Engineer. The invert of a service connection at a manhole shall be made at the crown of the main sewer line.

11.6.4 Use of an Existing Service Connections

Prior to utilizing an existing service connection, the existing service connection must be tested to ensure that it conforms to City of Greenville performance requirements. The owner/developer may be required to provide the City Engineer video evidence documenting the condition of the existing service connection prior to permitting its reuse.

11.6.5 Condominium Structures

In a vertically arranged condominium structure, one private lateral, owned and maintained by a facility owner, homeowners association, business association, or other entity, may convey wastewater from all condominium units within a single structure to the public wastewater main. The recommended approach for a proposed mixed-use development is to provide a combined sewer service as described above for the residential component and separate individual connections for each privately owned commercial unit within the structure.

Replaced with "SCDES"



11.6.6 Service Connection Exclusions

Service connections are limited to the same exclusions as defined by ~~SCDHEC~~ Regulation 61-67 (see also Section 8.9 Definitions). Typically long service connections greater than 6 inches in diameter will be considered main sewer line extensions and are subject to the relative requirements herein.

11.6.7 Grease Traps

Grease traps shall be designed and installed as required by the IPC, IRC, and ReWa (Renewable Water Resources).

11.7

11.7**Permitting Process**Replaced by
"SCDES"

Delegated Review Program State law and regulation require submission of plans and specifications and a written permit (Permit to Construct, PTC) before a wastewater system may be constructed or modified. Wastewater systems regulated by the South Carolina Department of Health and Environmental Control (~~SCDHEC~~) include main sewer lines, wastewater pretreatment facilities, wastewater treatment facilities, and sludge handling and treatment facilities.

The Environmental Quality Control Regional Offices of ~~SCDHEC~~ and the City of Greenville Construction Inspection Bureau are responsible for the field work associated with the wastewater construction permit program. This includes construction inspections and final inspections to ensure all work is performed according to approved plans and specifications. Before wastewater facilities can be placed into operation, a written authorization to begin operations (Permit to Operate, PTO) must be granted by the Regional Office. Enforcement actions are used by the Bureau when necessary to ensure proper construction permits are obtained and to ensure compliance with these permits.

~~SCDHEC~~'s domestic wastewater permitting program has been streamlined by offering local public sewer entities, when approved, the option of reviewing the construction permit application package and performing the technical plan review. The Delegated Review Program (DRP) minimizes duplication of technical review and allows for a faster permitting process. The City of Greenville is an approved participant of the DRP for wastewater construction permits.

To obtain a wastewater construction permit, for the purpose of constructing a new segment of wastewater main or relocating or modifying an existing wastewater main, the applicant must submit a complete permit application directly to the Engineering Division of the City of Greenville. The current permit application checklist is located in the Appendix.

11.7.1 Construction Document Requirements

Plans and supporting documents must be prepared, signed, and sealed by a licensed South Carolina Professional Engineer. System sizing calculations must include all of the items listed in the current application checklist found in the Appendix. Construction drawings shall, at a minimum, include the proposed wastewater main and manhole locations, rim elevations, invert elevations, drop elevations, pipe slope, pipe material, and proposed service connection locations. The plans must show the proposed wastewater main in both plan and profile views, and both views must show all existing and proposed utility crossings that can be anticipated. Plans must include a vicinity map, graphic scale bar, north arrow, and a note designating the basis of vertical datum. Plans must contain all pertinent notes, details, and standard drawings. Current City of Greenville notes, details, and standard drawings are located in Appendix A of this manual.

11.7.2 Review Process

The applicant must submit a complete permit application directly to the Engineering Division of the City of Greenville. Incomplete application packages will be returned to the applicant without review. After a permit application package is reviewed, comments will be returned to the permitting engineer if necessary. The engineer must submit revisions directly to the Engineering Division. Once the City approves the permit application package, the engineer must submit a total of six sets of drawings. The drawing set that is part of the approved application package may be used towards the total number of required sets; the City will notify the engineer of the number of sets of drawings that are outstanding.

Replaced with "DES"

Added "The ReWa new account permit must be obtained prior to scheduling a pre-construction meeting"

The engineer will receive instructions to submit the approved submittal to ~~DHEC~~ via ~~DHEC's~~ portal. Once the PTC letter is received, the engineer will email a copy to the City.

11.7.3 Permit to Construct Requirements

Construction is not authorized until the PTC is issued by the City. In accepting the PTC, the owner/developer agrees to the admission of properly authorized persons at all reasonable hours for the purpose of sampling and inspection. A copy of the PTC and one set of approved stamped construction drawings must be kept on site at all times during construction.

The City of Greenville Construction Inspection Bureau must be contacted at least 72 hours in advance of a desired start date to schedule a mandatory preconstruction meeting with the City Inspector, contractor and any related sub-contractors, owner/developer, and engineer. The pre-construction meeting must occur prior to beginning any work. Failure to comply will result in a stop work order and may result in State and Municipal penalties. All construction shall be in accordance with the standards and specifications of the City of Greenville. Any modifications to the approved stamped construction drawings must be submitted to the City by the permitting engineer for review and approval prior to installation of the modification as well as any other affected portion of the system. The PTC does not constitute approval, temporary or otherwise, to place the system into operation.

11.7.4 Permit to Operate Requirements

Upon completion of construction and all required testing, the permitting engineer must submit one set of signed and sealed record drawings, two letters (both with original signature) certifying the construction is in accordance with the PTC, one utility easement survey plat for any lines without a full 25-foot wide easement wholly contained within the public right-of-way or an existing public utility easement, photographic documentation of the manholes, sewer maintenance and warranty agreement, and bond. The easement plat must meet the minimum standards for a Class A survey in the State of South Carolina and must be signed and sealed by a licensed South Carolina Professional Land Surveyor.

When unique and exceptional conditions exist such that a partial Permit to Operate (PTO) is warranted, the City Engineer, at his discretion, may issue said permit. The partial PTO may be subject to special provisions as directed by the City Engineer. A partial PTO will expire on the date set by the City Engineer at the time the partial PTO is issued but no later than the expiration of the PTC. In most cases, the required warranty period for the system will not commence until the full PTO is issued. In the event that a partial PTO has been issued by the City Engineer, the system must be retested before the full PTO is released.

The record drawings shall, at a minimum, include the wastewater main and manhole locations, rim elevations, ground elevation, invert elevations, drop elevations, pipe slope, pipe material for the main and service lateral stub outs, and the distance from the downstream manhole to connection of each service lateral to the main sewer. If any sewer mains are abandoned or removed as part of the project, the record drawings shall indicate such. The plans must show the new wastewater main in both plan and profile views, and both views must show all utility crossings. Plans must display a vicinity map, graphic scale bar, north arrow, and a note designating the basis of vertical datum. AutoCAD 2014 or newer submission of record drawings shall be required using South Carolina State Plane Coordinate System. Datum: NAD 83/2000 (HARN) units and international feet (EPSG WKID 3361).

After record drawings are reviewed, comments will be returned to the engineer if necessary. The engineer must submit revisions directly to the Engineering Division. Once the City approves the submitted record drawings, the engineer must then submit three additional sets of signed and sealed drawings (four sets in total). The utility easement

survey plat shall meet the minimum standards for a Class A survey in the State of South Carolina and must be signed and sealed by a licensed South Carolina Professional Land Surveyor.

At a minimum the easement plat shall include the wastewater main and manhole locations, including bearing and distance for each line segment, and the extent of the easement, typically 12.5 feet on each side of the centerline of the pipe, and 12.5 feet past the starter manhole. The wastewater line shall be tied to a property corner or other permanent control point. The survey must display the tax map number, graphic scale bar, and north arrow.

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After the utility easement plat is reviewed, comments will be returned to the engineer if necessary. The engineer must submit revisions directly to the Engineering Division. Once the City approves the easement plat, the engineer must submit one additional signed and sealed plat (two sets in total). Upon receipt of both survey plats by the Engineering Division, the legal easement document will be prepared and mailed to the engineer for completion by the signatory authority, typically the property owner. Upon receipt of the executed document of both executed documents, the City will record the easement with Greenville County RMC office and file the Maintenance/Warranty Agreement with the project. Both executed documents must be returned before the Engineering Division will process the PTO for the wastewater system through ~~SCDHEC~~.

Photographic records for each manhole shall include a view of the manhole from the top looking into the manhole. Photographic data should be provided in JPEG or similar format and should utilize a naming convention consistent with the structures as labeled on the plans. A complete PTO package includes four signed and sealed record drawings, two signed and sealed utility easement plats, an executed Maintenance/Warranty Agreement, two signed engineer's certification letters, wastewater system test results, and a fully executed easement document. Once the Engineering Division has received the complete PTO package, the package will be sent to the Environmental Quality Control Regional Office of ~~SCDHEC~~ for review. Upon approval, ~~SCDHEC~~ will issue the Permit to Operate. Please note that wastewater service connections shall not be connected to a newly constructed wastewater main until a Permit to Operate has been officially issued by ~~SCDHEC~~ and a copy has been received by the City of Greenville Engineering Division.

11.7.5 Warranty

Once ~~SCDHEC~~ issues a Permit to Operate for the new wastewater system and the City records all required easements, the Engineering Division will announce the beginning of the mandatory warranty period via a letter to the owner/developer and engineer. A minimum one-year warranty period commencing from the date the easement plat is recorded or the PTO is received, whichever is later, is required for all new wastewater systems. A longer warranty period may be required under special circumstances as determined by the City Engineer. The owner/developer must warrant the newly installed system:

- To be free from defects and flaws in design, workmanship, and materials.
- Strictly conforms to the requirements of the City of Greenville.
- To be fit, sufficient and suitable for the purposes expressed in, or reasonably inferred to, by the record drawings.

As part of the warranty agreement, the owner/developer shall, promptly and without charge to the City, repair, replace, or otherwise remedy such defects that may be discovered or develop at any time within the warranty period to the full and complete satisfaction of the City. The warranty shall be extended automatically to cover all repaired

and replacement parts and labor provided or performed under the warranty for a period of one year from the date of such repair or replacement. Additionally, the obligation to maintain the system by the owner/developer shall be extended for a period of one year from the date of such repair or replacement. At the conclusion of the declared warranty period, the City will inspect the new wastewater system. If the system is performing appropriately, the City will take over full responsibility for operation and maintenance of the system, and a final acceptance letter will be issued to the owner/developer and engineer.

As security to the City for the performance by the owner/developer of the aforesaid warranty obligations, the owner/developer shall post a bond, or acceptable equivalent, in an amount equal to 50 percent of the installed construction price. This amount may be adjusted up or down dependent on the associated elements of risk which include, but are not limited to, an engineering assessment of the soil conditions, installation practice, depth of cover, linear footage of line, number of manholes, and anticipated subsequent construction activity immediately adjacent to the installed mains. A typical Maintenance and Warranty Period Bond is included in Appendix D.

Added "The Construction and Engineering & Inspection Division shall be contacted to schedule all inspection and testing verifications at (864) 467-4400."

11.8

11.8

Inspection and Testing Requirements

11.8.1 General

All new construction of and modifications to wastewater mains, whether public or private, shall be inspected by the City of Greenville Construction Inspection Bureau. Service lateral connections must meet the permitting and inspections requirements described in Section 15.6. Construction must be in accordance with the approved plans, City standard details and specifications. A copy of the PTC and one set of approved stamped construction drawings must be kept on site at all times during construction and accessible to the Inspector. Any modifications to the approved stamped construction drawings must be submitted to the City by the permitting engineer for review and approval prior to installation of the modification as well as any other affected portion of the approved system. A mandatory pre-construction meeting with the City Inspector, contractor and any related sub-contractors, owner/developer, and engineer must be completed as described in the PTC requirements above.

The City Inspector and the permitting engineer, or his designee, must be present for all final performance tests. The contractor must schedule all required inspections at least 72 hours in advance with the Construction Inspection Bureau. The contractor must also notify the permitting engineer in advance of the performance of the tests. Final performance tests may be performed only after all adjacent underground utilities have been installed and all manholes have been backfilled and finished to final grade or 30 days after installation and backfill, whichever is later. The contractor is encouraged to perform a pretest of the system. Pretests may be performed with the City Inspector but will not constitute a final performance test.

11.8.2 Pipe Inspection

The City Inspector will observe the laying techniques to determine if they are appropriate for the soil conditions and the type of pipe. The Inspector will verify that all materials used comply with City of Greenville standards. The contractor may be required to produce supporting documentation that City of Greenville standards are being met. Work stoppages may result if the inspector cannot satisfactorily verify that the work is in compliance with the established standards.

After the lines are laid, but prior to building the flow channel between the inverts (in manholes without precast flow channels), the sewer line system, including the service connection stub outs, shall be air pressure tested in accordance with City of Greenville specifications and ASTM F1417, or other tests acceptable to the City Engineer. If vertical and horizontal separation from other utilities and water is not provided as specified in section 8.2 above then testing shall meet the standards set forth in that section. If any section of pipe fails, it shall be fully replaced from the nearest upstream manhole to the nearest downstream manhole. New sewer lines shall not be repaired or patched in any way in order that the failed section subsequently passes the air pressure test.

Main lines constructed of PVC material will be subject to the GO/NO-GO five percent deflection mandrel test. This test may be performed during the same inspection period as the air pressure test. Mandrel testing should be performed prior to building the flow channel between the inverts (in manholes without precast flow channels) to facilitate easy insertion and removal of the mandrel at manholes.

The City Inspector will perform a visual inspection of all lines, regardless of pipe material, using lamps, video camera or other technology. If there is any settlement or slope loss of the sewer main as it enters and or leaves a manhole, the line shall be uncovered and raised to proper alignment. If in the assessment of the Inspector there is excessive misalignment of the pipe between manholes, the entire line shall be exhumed and re-laid.

11.8.3 Manhole Inspection

The City Inspector will observe the installation techniques to determine if they are appropriate for the in-situ conditions. The Inspector will verify that all materials used comply with City of Greenville standards. The contractor may be required to produce supporting documentation that City of Greenville standards are being met. Work stoppages may result if the inspector cannot satisfactorily verify that the work is in compliance with the established standards. The Inspector will check all the flow channels between inverts and all benches for proper construction. Pipes shall be smoothly cut flush with the inside wall of the manhole. The Inspector shall also inspect all manholes to ensure that lift holes, joints and rings are mortared smooth in accordance with City standards details and specifications. In order to be accepted, there shall be no signs of infiltration into the manhole. The Inspector will verify proper alignment of the ring and cover and all sections of the manhole. The Inspector will also verify that the ring and cover are at appropriate grade.

Additionally, the City Inspector will observe a vacuum test of the manholes in accordance with City of Greenville specifications and ASTM C1244. All connections, benches, and flow channels shall be installed prior to testing. If a coating or lining is to be applied to the interior of the manhole, the vacuum test must not be performed until the coating or lining has been cured according to the manufacturer's recommendations. Failing manholes shall be sealed with non-shrink grout or other sealants approved by the City Engineer and retested. Repeat failures will require new installation.

11.9

11.9 Definitions

Appurtenance	Any accessory object or component connected to a public sewer.
As-Built Drawing	As-built drawings are prepared by the contractor. They show on-site changes to the original construction documents.
Average Daily Flow	The average dry weather flow rate during a typical 24-hour period of normal usage measured over a 30-day period.
City Inspector or Inspector	Designee of the City Engineer for the purposes of observation, inspection and testing of public improvements.
Domestic Waste	The waste produced from non-commercial or non-industrial activities, and which result from normal human living processes, which are of substantially similar origin and strength to those typically produced in households, including waste from sanitary conveniences.
Easement	A permanent non-possessory interest to use real property for the purposes to construct, operate, control, maintain, reconstruct, or remove a public utility and appurtenances along, under, and across said easement.
Flood Protection Elevation	As defined in the City of Greenville Stormwater Ordinance, "the elevation of the base flood elevation plus two feet of freeboard required and four feet of freeboard recommended at the discretion of the Administrator or designee."
Force Main	A sewer line that carries sewage under positive pressure.
Gravity sewer	A collection system where gravity is used to transport wastewater from the customer's premises to a centralized collection or pumping facility.
Grease Trap	Device which collects organic substances including fats, vegetable and mineral oils, waxes, fatty acids from soaps, and other hydrocarbons before they enter the sewer system thus reducing the risk of adhesion problems in sewers.
Grinder Pump	A compact lift or pump station with pump(s), storage capacity and appurtenant piping, valves and other mechanical and electrical equipment which grinds or reduces the particle size of wastewater solids to yield a sewage slurry and which conveys the waste from its source to a gravity sanitary sewage collection system or a sewage force main.
Hydraulic Grade Line	Measure of pressure head available at specific points within a sewer system. The hydraulic grade line is a line connecting the points to which the liquid would rise at various places along any pipe if piezometer tubes were inserted in the liquid within the pipe.
Industrial Waste	liquid and liquid carried waste resulting from industrial, manufacturing, trade or business processes, including industrial cooling water and unpolluted trade or process waste, as distinguished from domestic waste.

Infiltration	Groundwater that enters the sewer system via such means as pipe cracks, joints, connections, or defects in manhole structures.
Inflow	Surface water which enters the sanitary sewer system via an illegal drain connection (foundation drain, roof drain, yard drain, inlet structure, storm sewer cross connection, or sump pump) or from sources such as leaks around manhole covers.
Peak Daily Flow	The maximum flow rate determined by use of the appropriate peaking factor times the average daily flow or as measured directly over a 30 day period for existing developed areas.
Public Sewer	Sewer to the use of which all owners of abutting property have equal rights to and is controlled and maintained by the City of Greenville or other public authority.
Pump Station	Any arrangement of pumps, piping, valves, and controls which convey wastewater to or over a higher elevation.
Record Drawings	Record drawings must be prepared, signed and sealed by a Professional Land Surveyor licensed in the State of South Carolina. Horizontal survey datum control shall be based upon, and referenced to, South Carolina State Plane, NAD83 HARN, International Feet coordinates. Vertical Survey Datum control shall be based upon, and referenced to, the North American Vertical Datum of 1988 (NAVD 88).
Service Area	A geographical area served by a public utility or wastewater collection system.
Service Connection	An individual gravity sewer line, or an individual pump station and force main, serving only one (1) building or one (1) residential lot with domestic or industrial wastewater connecting to a gravity sewer system. Oil/water separators, pH adjustment systems, and other similar simple industrial wastewater treatment systems (as determined by DHEC) will be considered a component of the service connection when a local pretreatment permit is not required. A service connection does not include the following: a. Individual connections, where at the time of connection, design flow contributions are greater than five (5) percent of the existing wastewater treatment facility's design capacity, or generates flows greater than fifty thousand (50,000) gallons per day. b. Individual connections to force main sewers and vacuum sewer connections beginning with the valve pit. c. A gravity sewer line or pump station and force main serving more than one (1) building or more than one (1) residential lot. d. Sewer lines that have the reasonable ability to serve any additional projects and/or buildings in the future.
Springline	In a transverse cross section of pipe, the line of maximum horizontal dimension.
Structure	Anything constructed or erected that requires permanent location on the surface of the land. The term "structure" does not include features such as walkways, driveways, recreational courts, flagpoles, light standards, or mailboxes.

Replaced with "DES"

Stub	Short length of sewer segment tapped into existing system allowing for future connection.
Temporary Easement	The temporary use of land for the purposes of constructing and placing in operation a sewer and its appurtenances. The temporary sewer easement shall expire a minimum of one year from the date of adoption by the City, or on the date specified in the easement instrument.
Ten State Standards	"Recommended Standards for Wastewater Facilities of the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers." Latest Edition.
Travel Way	The portion of a street or other traversable way over which a vehicle customarily passes. The travel way is typically identified as the full width of a street measured from face of curb to the opposite face of curb.
Travel Lane	The portion of a street or other traversable way over which a vehicle customarily passes in one direction. The travel lane is typically identified as the width measured from the face of curb to the centerline of the street.
Wastewater	The water supply of a City after it has been fouled by a variety of uses. From the standpoint of sources of generation, wastewater may be defined as a combination of the liquid- or water-carried wastes removed from residences, institutions, and commercial and industrial establishments.

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COMMONLY USED MATERIAL

SECTION A	
City of Greenville Construction Details	331
SECTION B	
Engineering Division Forms	412
SECTION C	
Selected City Ordinances and Policies	421

CITY OF GREENVILLE CONSTRUCTION DETAILS

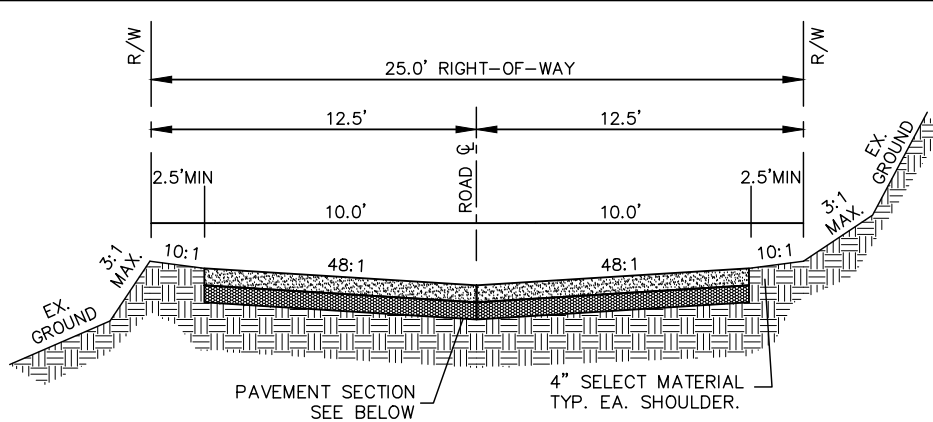
1000 Division: General Civil		
Streets		
	10:00	Alley Mixed-Use +Commercial
	10:01	Alley Residential (One-Way)
	10:02	Alley Residential (Two-Way)
	10:03	Neighborhood One-Way
	10:04	Neighborhood Low-Density
	10:05	Neighborhood Medium-Density
	10:06	Neighborhood High-Density
	10:07	District Mixed-Use (One-Way)
	10:08	District Mixed-Use (Two-Lane)
	10:09	District Mixed-Use (Three Lane)
	10:10	District Mixed-Use (Main St)
	10:11	City Thoroughfare Avenue
	10:12	City Thoroughfare Boulevard
	10:13	Private Street Low-Density
	10:14	Private Street High-Density
	10:15	Private Access
	10:16	Cul-du-sac Turnaround
	10:17	Hammerhead Turnaround
	10:18	Neighborhood Minimum Widths
Curb, Gutter, and Sidewalk		
	11:00	Concrete Curb & Gutter
	11:01	Curb End Taper
	11:02	Concrete Sidewalk
	11:03	Expansion Joints and Scoring Lines
	11:04	Sidewalk with Curb Lawn
	11:05	Curb Edge Patch
	11:06	Tooled Edge Joints for Concrete Sidewalk
Misc. Street Elements		
	12:00	Street Name Sign
	12:01	Concrete Median
	12:02	Speed Hump
	12:03	Nuisance Trough
	12:04	Greenlink Bus Stop Without Sidewalk
	12:05	Greenlink Bus Stop Along Sidewalk
Driveways		
	13:00	Commercial Driveway I Curb Lawn Less than 7'-4"
	13:01	Commercial Driveway II Curb Lawn 7'-4" or Greater
	13:02	Residential Driveway
Handicap Accessibility		
	14:00	Handicap Ramp I Curb Lawn Less than 6'-0"
	14:01	Handicap Ramp II Curb Lawn 6'-0" to 7'-4"
	14:02	Handicap Ramp III Curb Lawn 7'-4" & Greater
	14:03	Handicap Ramp IV Return Curb
	14:04	Handicap Ramp Construction Notes
	14:05	Detectable Warning Surface
	14:06	Handicap Accessibility
	14:07	Handicap Accessibility Symbol
	14:08	Handicap Accessibility Sign
Parking Facility Standards		
	15:00	Parking Standards
	15:01	On-Street Parallel Parking
Non-Street Pavement Sections		
	16:00	Asphalt Pavement Sections
	16:01	Concrete Pavement Section
	16:02	Pervious Concrete Pavement Section

2000 Division: Wastewater Utility		
Ring & Cover		
	20:00	Heavy Duty Ring & Cover Wastewater Utility
	20:01	Watertight Ring & Cover Wastewater Utility
Manhole & Appurtenances		
	21:00	Precast Concrete Manhole
	21:01	Precast Concrete Shallow Manhole
	21:02	Drop Manhole
	21:03	Manhole Invert Shaping
	21:04	Manhole Step
	21:05	Flexible Boot Connection
	21:06	Manhole Vent Pipe
	21:07	Inside Drop Connection
Pipe Material & Spacing Requirements		
	22:00	Allowable Pipe Material and Depths
	22:01	Sewer & Water Main Separation
	22:02	Sewer & Water Crossing Separation
	22:03	Sewer & Other Utility Crossing Separation
Pipe Bedding and Utility Cut Standards		
	23:00	Pipe Bedding
	23:01	Pavement Repair For Utility Cuts
	23:02	Unpaved Surface Repair For Utility Cuts
Misc. Pipe Details		
	24:00	Concrete Anchor
	24:01	Steel Encasement and Carrier Pipe
	24:02	Aerial Pipe Crossing with Steel Casing
Service Connection & Related Elements		
	25:00	Saddle Connection for Live Wastewater Mains
	25:01	Service Connection
	25:02	Cleanout Frame and Cover
	25:03	Precast Service Connection Pier
	25:04	Pipe Strap
Abandonment		
	26:00	Manhole & Wastewater Main Abandonment
Wastewater General Notes		
	29:00	Wastewater General Notes

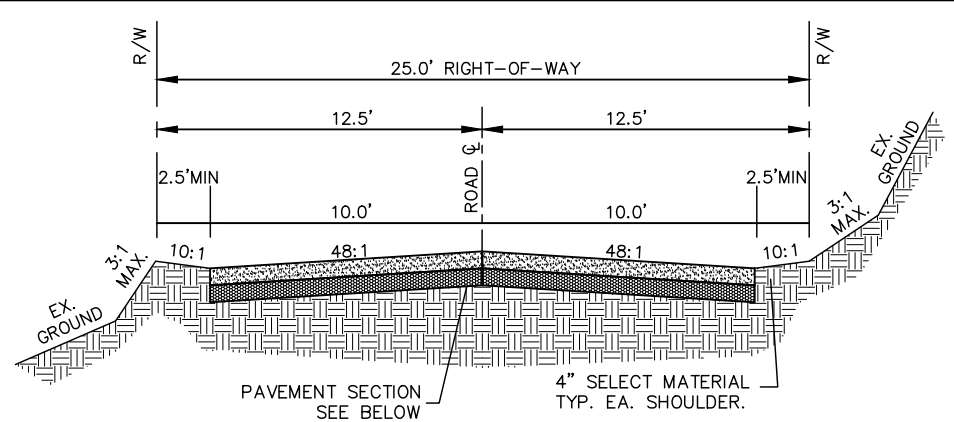
3000 Division: Stormwater Utility		
Ring & Cover		
	30:00	Light Duty Manhole Stormwater Utility
	30:01	Heavy Duty Manhole Stormwater Utility
Inlets		
	31:00	Light Duty Manhole Stormwater Utility

Extended table

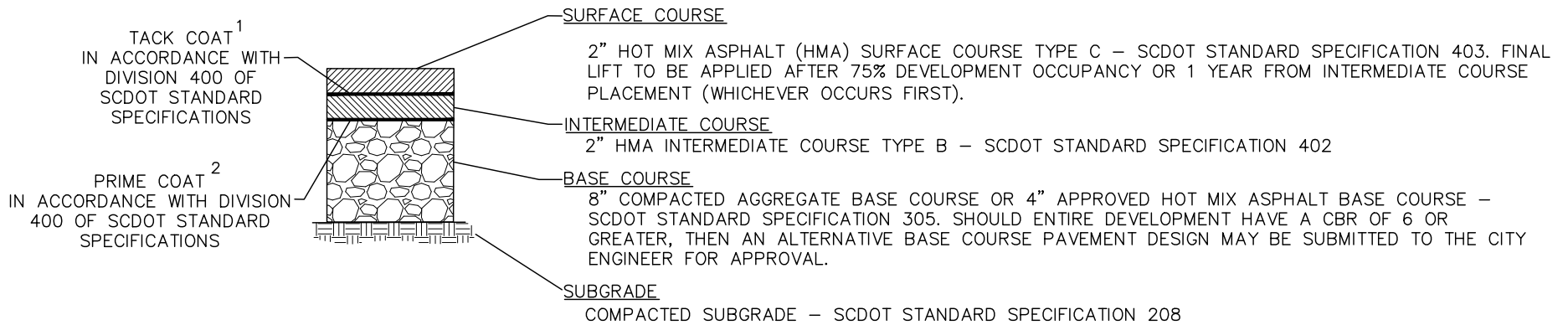
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Pavement Section"



INVERTED CROWN OPTION



NORMAL CROWN OPTION



TYPICAL PAVEMENT SECTION

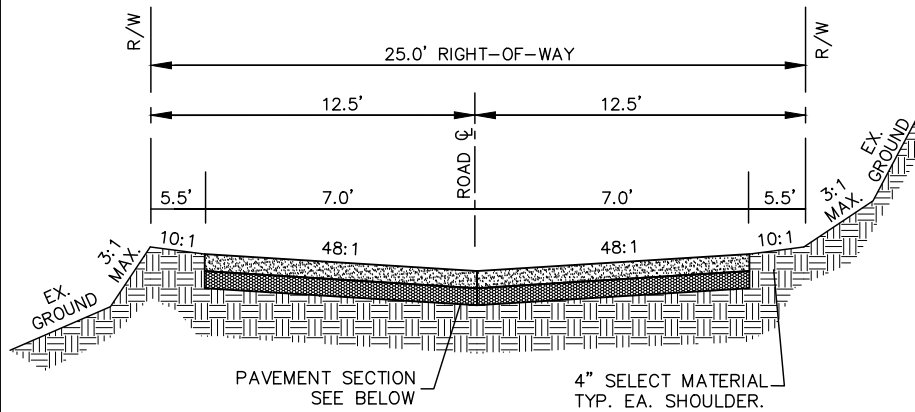
1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 – 0.15 GAL PER SQUARE YARD

2. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 – 0.30 GAL PER SQUARE YARD

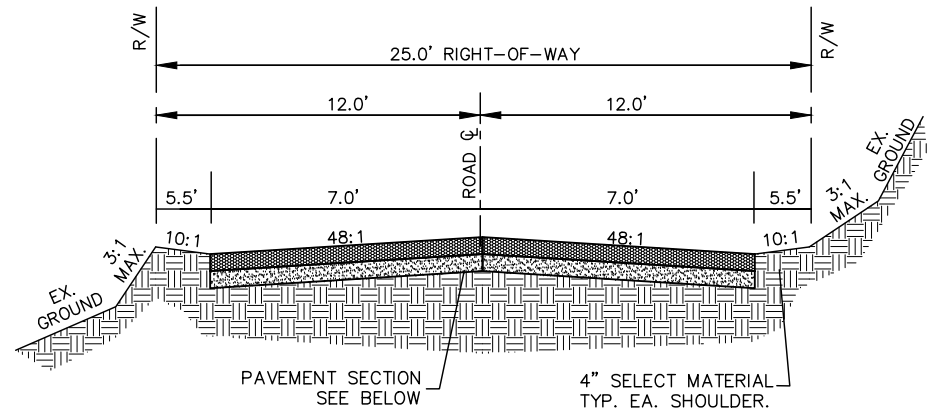
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 city of greenville ENGINEERING DIVISION	ALLEY COMMERCIAL/MIXED USE		SCALE: NO SCALE
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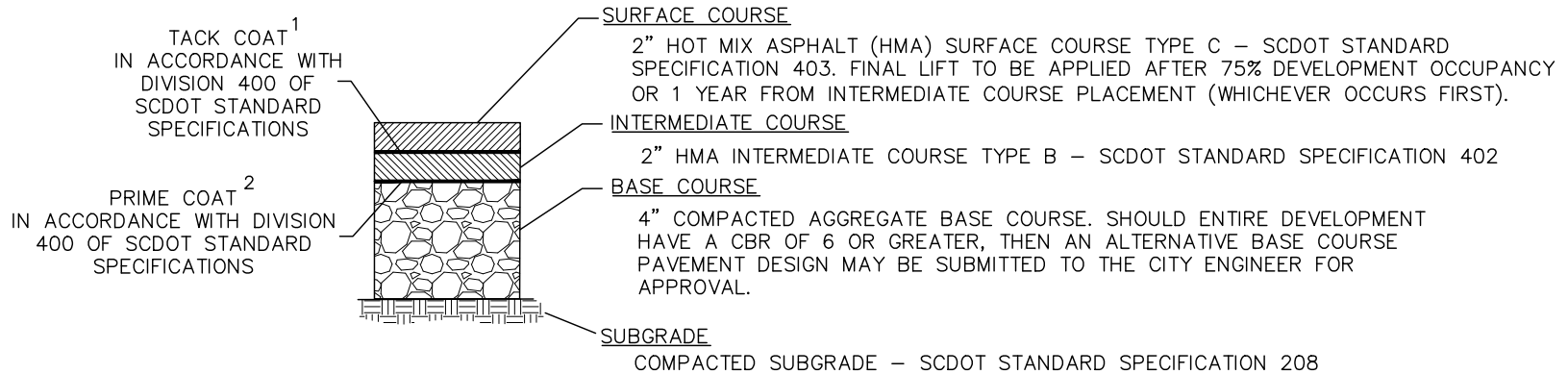
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INVERTED CROWN OPTION



NORMAL CROWN OPTION

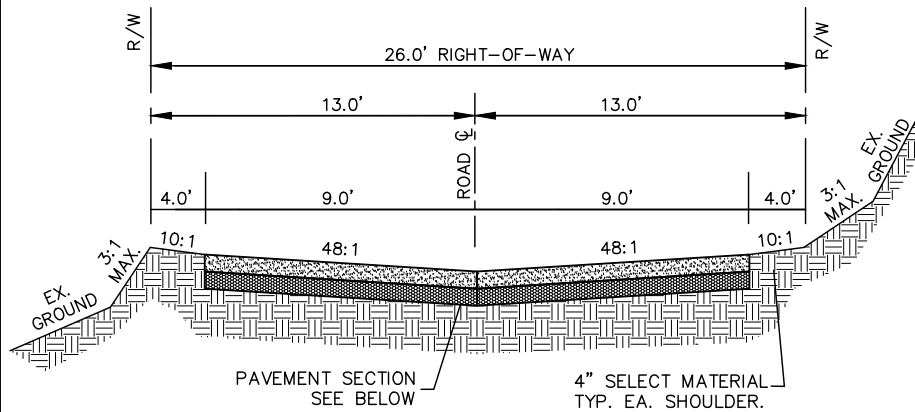


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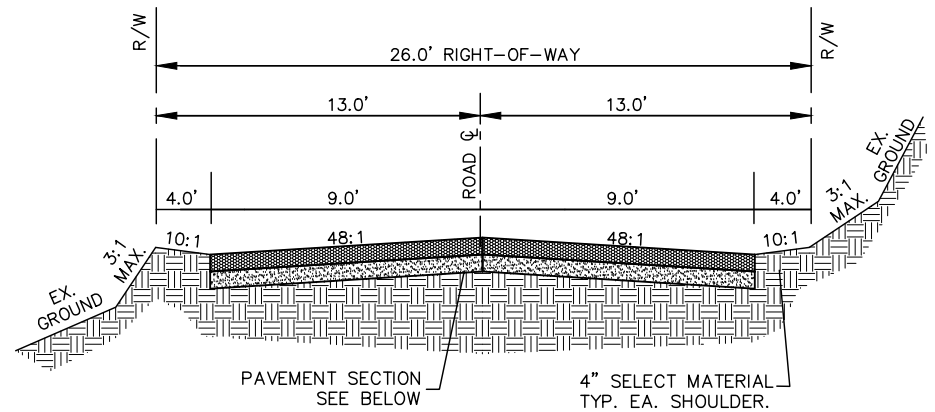
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2. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 – 0.30 GAL PER SQUARE YARD
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 city of greenville ENGINEERING DIVISION	ALLEY RESIDENTIAL-ONE WAY		SCALE: NO SCALE
	DATE APPROVED: OCT. 2023	OFFICE OF THE CITY ENGINEER:	DETAIL : 10:01

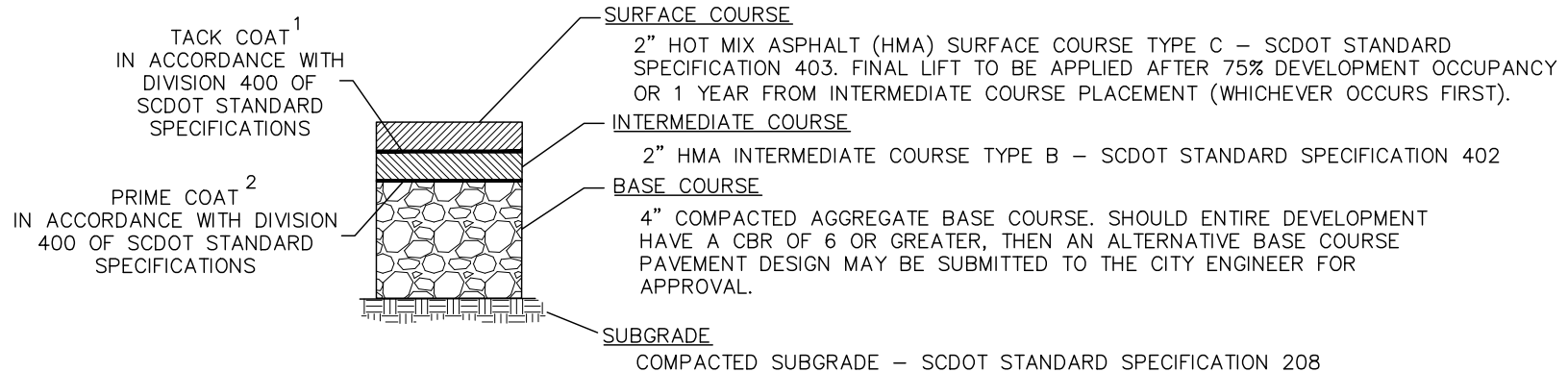
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INVERTED CROWN OPTION



NORMAL CROWN OPTION



TYPICAL PAVEMENT SECTION

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ALLEY RESIDENTIAL-TWO WAY

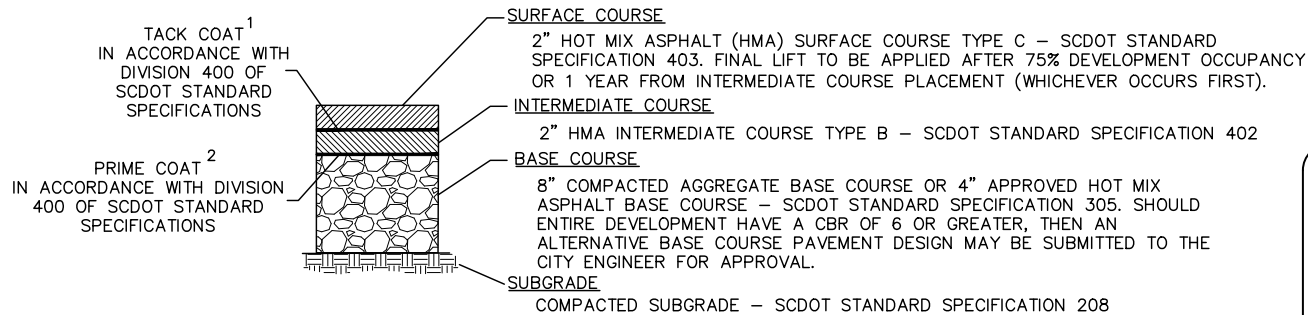
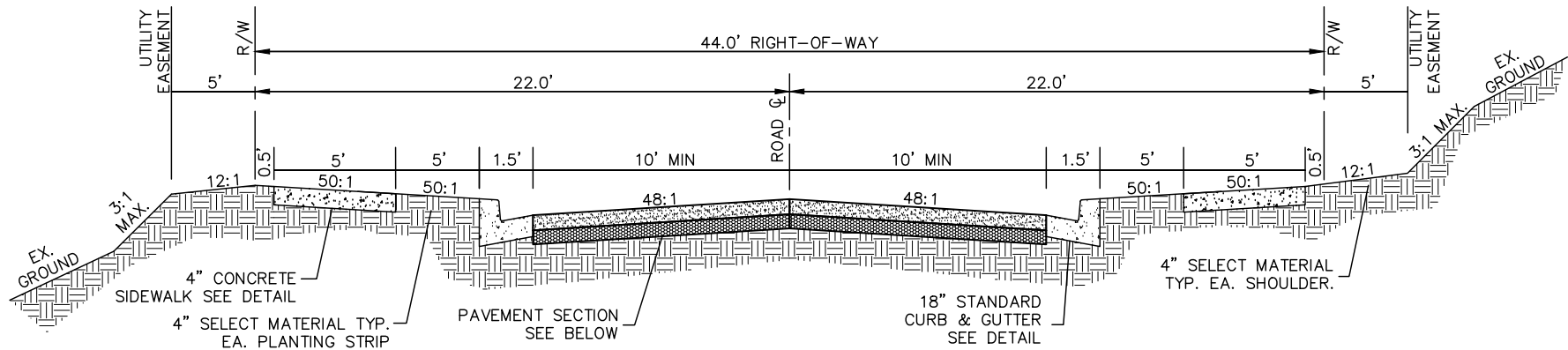
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APPROVED: **OCT. 2023**

OFFICE OF THE
CITY ENGINEER:

SCALE:
NO SCALE

DETAIL :

10:02

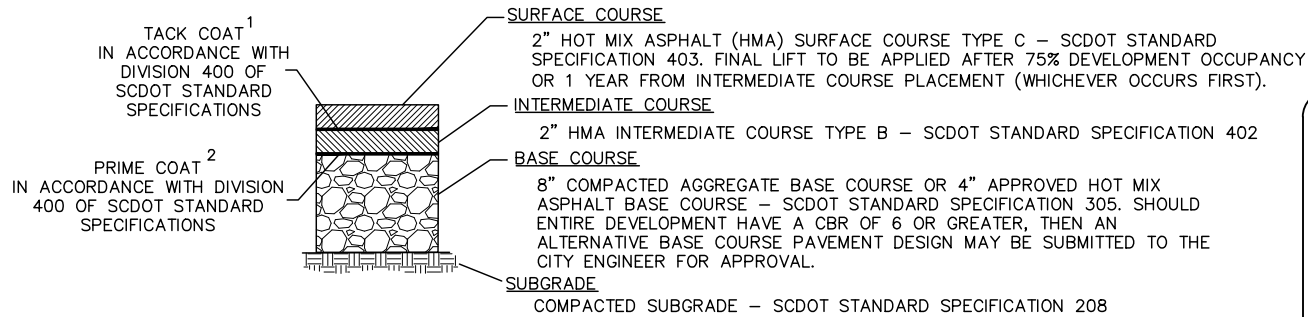
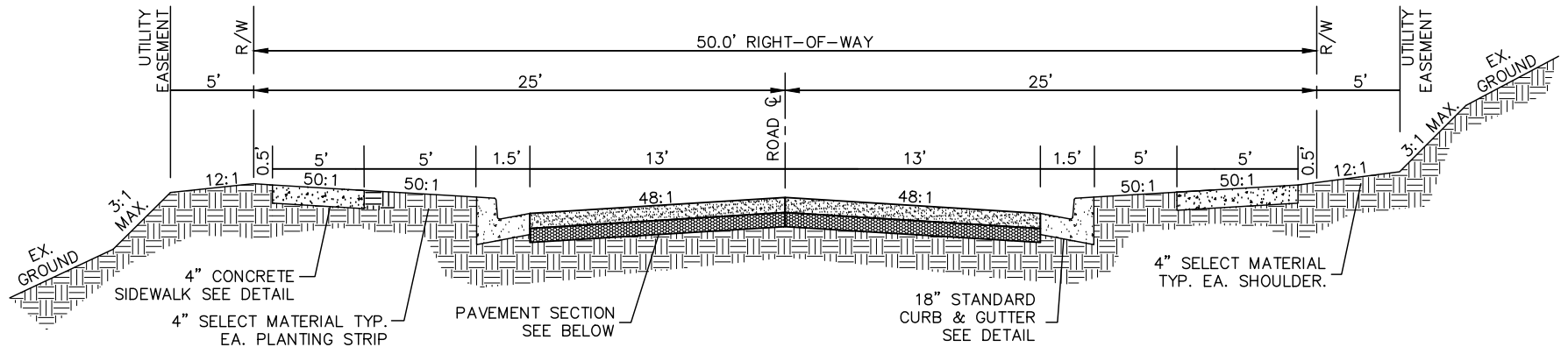


NOTE
THE PREDICTED VOLUME FOR THIS TYPICAL SECTION IS LESS THAN OR EQUAL TO 3000 VEHICLES PER DAY. THIS TYPICAL SECTION SHALL BE USED WHEN:
1. DENSITIES ARE LOW AND A TWO-WAY STREET IS NOT FEASIBLE.

1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 – 0.15 GAL PER SQUARE YARD
2. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 – 0.30 GAL PER SQUARE YARD

 city of greenville ENGINEERING DIVISION	NEIGHBORHOOD ONE-WAY	SCALE: NO SCALE
	DATE APPROVED: OCT. 2023	OFFICE OF THE CITY ENGINEER: 10:03

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TYPICAL PAVEMENT SECTION

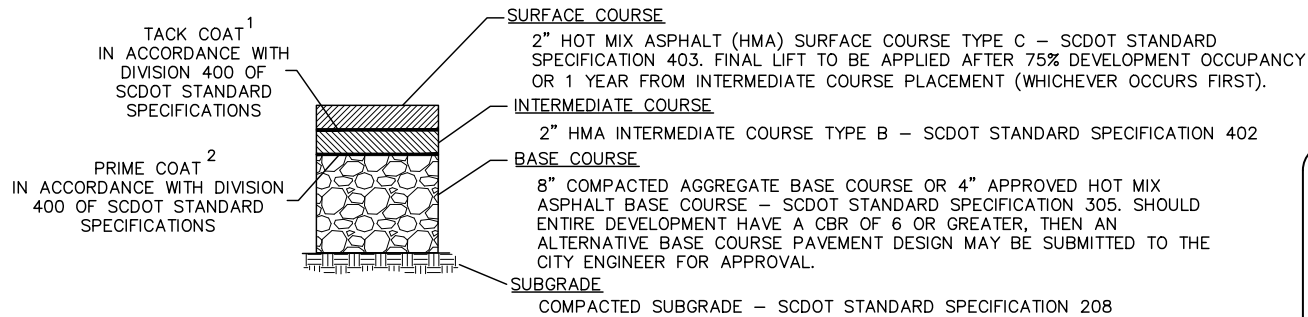
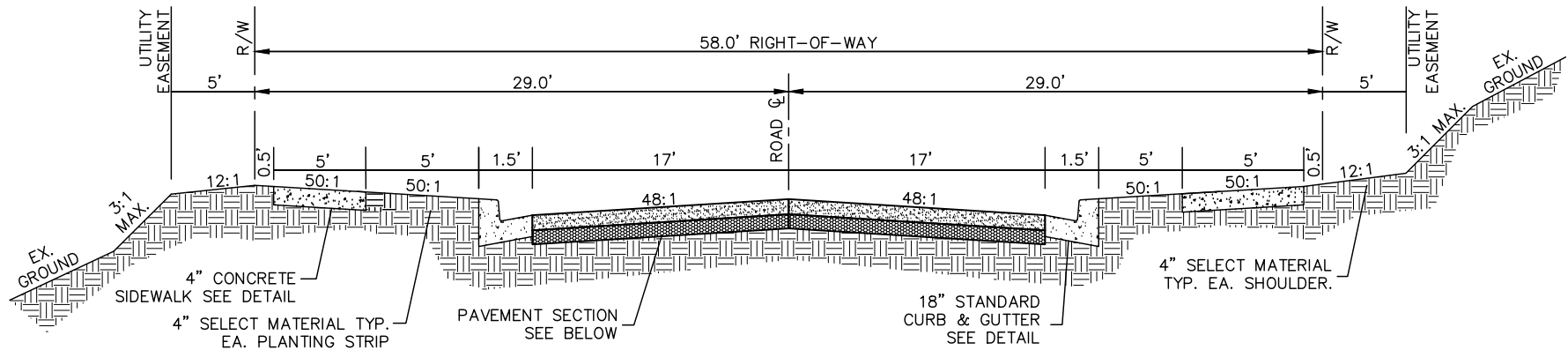
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NOTE

1. THE PREDICTED VOLUME FOR THIS TYPICAL SECTION IS LESS THAN OR EQUAL TO 3000 VEHICLES PER DAY.
2. THE STREET SERVES RESIDENTIAL AREAS ZONED RH-A & RH-B OR AS OTHERWISE DETERMINED BY THE ADMINISTRATOR.
3. DEMARCATION OF ON-STREET PARKING TO BE IMPLEMENTED BY STRIPING, SIGNAGE, OR VARYING CURB WIDTHS. SEE DETAIL FOR RESIDENTIAL MINIMUM WIDTHS.

 city of greenville ENGINEERING DIVISION	NEIGHBORHOOD LOW-DENSITY		SCALE: NO SCALE
	DATE APPROVED: JAN. 2024	OFFICE OF THE CITY ENGINEER:	DETAIL : 10:04

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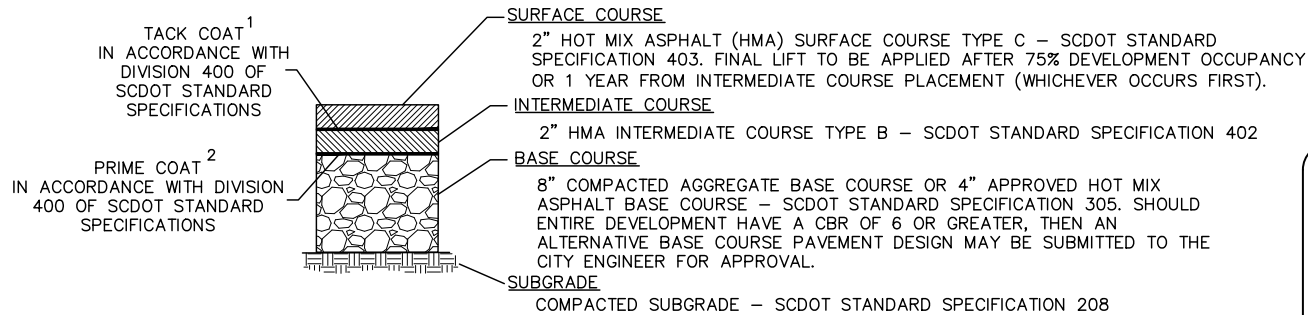
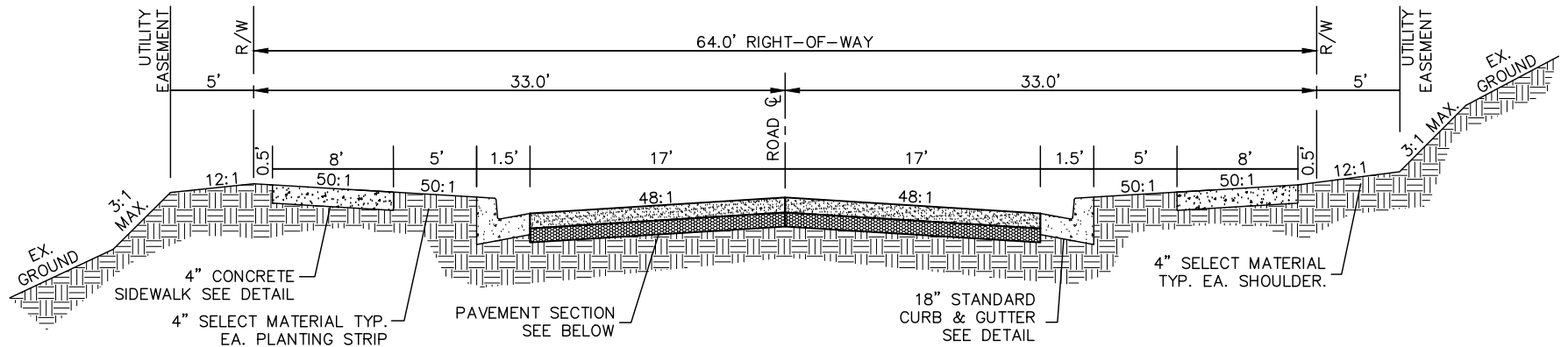
NOTE
THE PREDICTED VOLUME FOR THIS TYPICAL SECTION IS LESS THAN OR EQUAL TO 3000 VEHICLES PER DAY. THIS TYPICAL SECTION SHALL BE USED WHEN:

1. THE STREET SERVES RESIDENTIAL AREAS ZONED RH-C OR RH-D OR AS OTHERWISE DETERMINED BY THE ADMINISTRATOR.
2. SEE WIDE PLAN VIEW DETAIL FOR ROAD WIDTH DESIGN OPTIONS.

1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 – 0.15 GAL PER SQUARE YARD
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 city of greenville ENGINEERING DIVISION	NEIGHBORHOOD MEDIUM-DENSITY		SCALE: NO SCALE
	DATE APPROVED: OCT. 2023	OFFICE OF THE CITY ENGINEER:	DETAIL : 10:05

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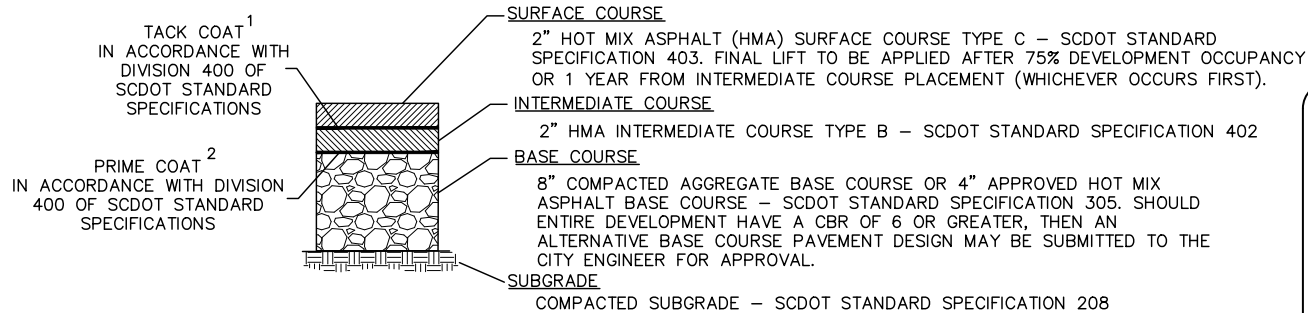
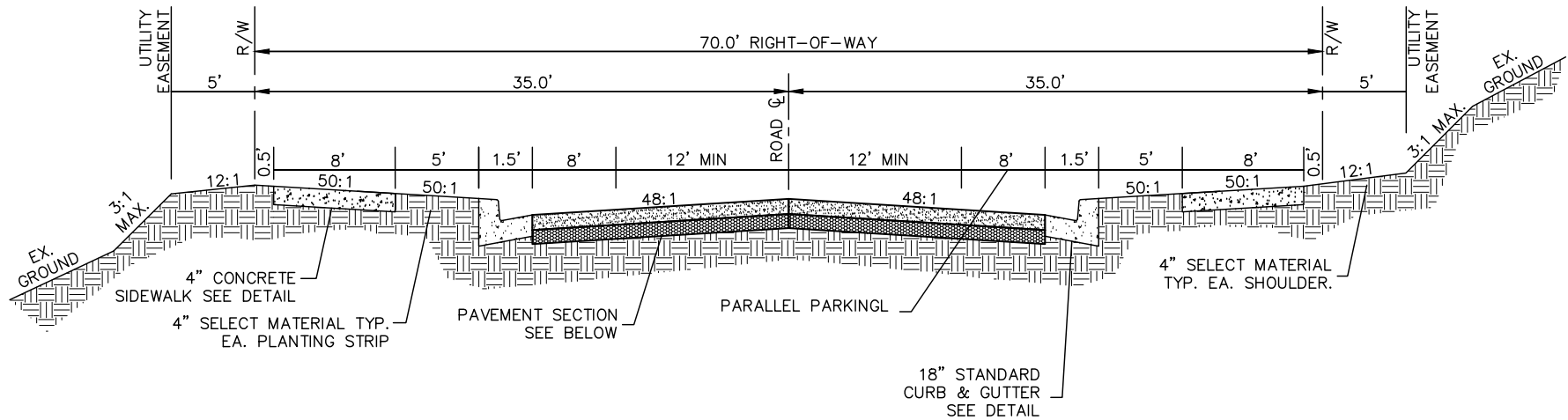
NOTE
THE PREDICTED VOLUME FOR THIS TYPICAL SECTION IS LESS THAN OR EQUAL TO 3000 VEHICLES PER DAY. THIS TYPICAL SECTION SHALL BE USED WHEN:

1. THE STREET SERVES RESIDENTIAL AREAS ZONED RN OR AS OTHERWISE DETERMINED BY THE ADMINISTRATOR.
2. SEE WIDE PLAN VIEW DETAIL FOR ROAD WIDTH DESIGN OPTIONS.

1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 – 0.15 GAL PER SQUARE YARD
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 city of greenville ENGINEERING DIVISION	NEIGHBORHOOD HIGH-DENSITY		SCALE: NO SCALE
	DATE APPROVED: OCT. 2023	OFFICE OF THE CITY ENGINEER:	DETAIL : 10:06

THIS DOCUMENT AND ANY ILLUSTRATIONS HEREON ARE PROVIDED AS STANDARD CONSTRUCTION DETAILS WITHIN THE CITY OF GREENVILLE, SC. DEVIATION FROM, OR MODIFICATION OF, THIS DOCUMENT REQUIRES APPROVAL OF THE CITY OF GREENVILLE. THE CITY OF GREENVILLE SHALL NOT BE HELD LIABLE FOR DAMAGES AS A RESULT OF MISUSE OR CHANGES TO THIS DOCUMENT. THE APPROVAL SIGNATURE AND LOGO SHALL BE REMOVED IF ANY PORTION OF THIS DOCUMENT IS MODIFIED.



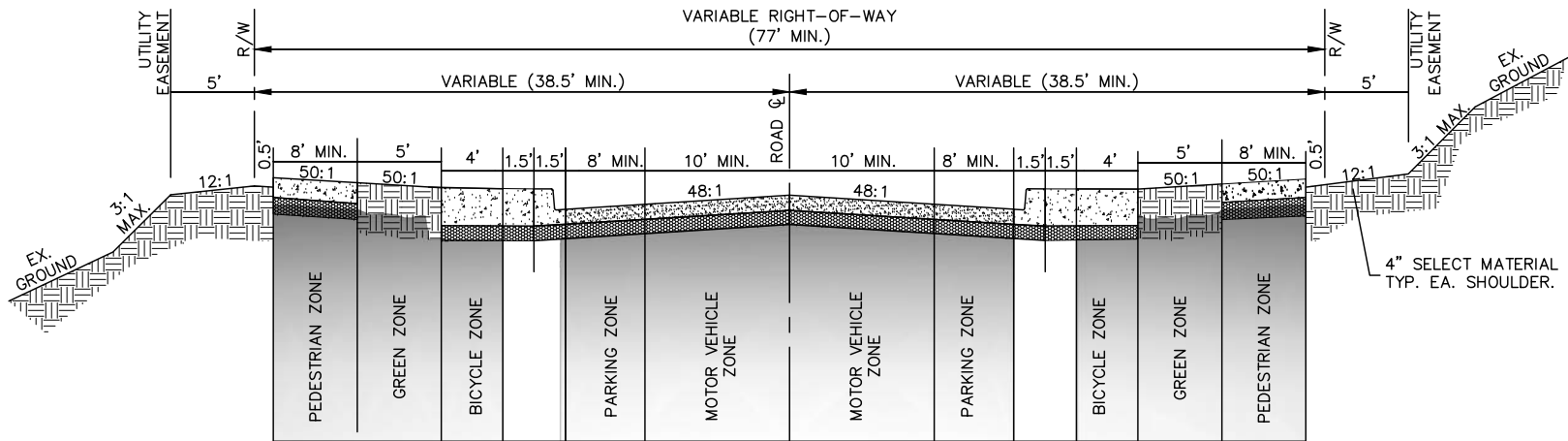
NOTE
THE PREDICTED VOLUME FOR THIS TYPICAL SECTION IS LESS THAN OR EQUAL TO 3000 VEHICLES PER DAY. THIS TYPICAL SECTION SHALL BE USED WHEN:

1. DENSITIES ARE LOW AND A TWO-WAY STREET IS NOT FEASIBLE.
2. DIMENSIONS OF APPENDIX D OF THE FIRE CODE MUST BE PROVIDED IF USED AS FIRE APPARATUS ACCESS.
3. DIMENSIONS MAY BE ADJUSTED TO ACCOMMODATE ANGLED PARKING.

1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 – 0.15 GAL PER SQUARE YARD
2. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 – 0.30 GAL PER SQUARE YARD

 city of greenville ENGINEERING DIVISION	DISTRICT ONE-WAY		SCALE: NO SCALE
	DATE APPROVED: OCT. 2023	OFFICE OF THE CITY ENGINEER:	DETAIL : 10:07

THIS DOCUMENT AND ANY ILLUSTRATIONS HEREON ARE PROVIDED AS STANDARD CONSTRUCTION DETAILS WITHIN THE CITY OF GREENVILLE, SC. DEVIATION FROM, OR MODIFICATION OF, THIS DOCUMENT REQUIRES APPROVAL OF THE CITY OF GREENVILLE. THE CITY OF GREENVILLE SHALL NOT BE HELD LIABLE FOR DAMAGES AS A RESULT OF MISUSE OR CHANGES TO THIS DOCUMENT. THE APPROVAL SIGNATURE AND LOGO SHALL BE REMOVED IF ANY PORTION OF THIS DOCUMENT IS MODIFIED.



1. THE DESIGN GUIDELINES FOR DISTRICT STREETS ARE NOT ENTIRELY PRESCRIPTIVE BUT SHOULD INCLUDE AN ARRANGEMENT OF THE ZONES DESCRIBED HEREIN. THE DESIGN ENGINEER SHALL COORDINATE A PROPOSED TYPICAL SECTION WITH THE CITY ENGINEER IN A PRE-DESIGN CONFERENCE.

2. THE TOTAL RIGHT-OF-WAY WIDTH MAY VARY FROM THE TYPICAL DIMENSION LISTED ABOVE DEPENDING ON THE ARRANGEMENT AND DIMENSIONS OF EACH ZONE AS APPROVED IN THE PRE-DESIGN CONFERENCE.

MOTOR VEHICLE ZONE

3. TYPICALLY DISTRICT MIXED-USE (TWO-LANE) STREETS HAVE ONE TRAVEL LANE IN EACH DIRECTION, HOWEVER IN CERTAIN SITUATIONS THEY MAY HAVE 3, 4, OR 5 TOTAL LANES DEPENDING ON PREDICTED TRAFFIC VOLUMES. IN ALL CASES, TRAVEL LANE WIDTHS SHALL BE A MINIMUM 10' WIDE.

BICYCLE ZONE

4. DEDICATED BICYCLE LANES SHOULD BE PROVIDED ON ALL DISTRICT MIXED-USE STREETS. BICYCLE LANES SHALL BE A MINIMUM 4' WIDE. BICYCLE LANES SHOULD HAVE A MINIMUM OF 3' DOOR BUFFER SPACE BETWEEN THE BICYCLE LANE AND PARALLEL PARKING. THE DESIGN ENGINEER IS ENCOURAGED TO REVIEW NACTO'S *URBAN BIKEWAY DESIGN GUIDE* FOR FURTHER DESIGN CONSIDERATIONS.

PARKING ZONE

5. ON-STREET PARKING SHOULD BE PROVIDED ON ALL DISTRICT MIXED-USE STREETS. ON-STREET PARKING SHOULD BE MARKED AND HAVE A MINIMUM WIDTH OF 8'. PLEASE REFERENCE THE TYPICAL PARALLEL PARKING AND PARKING STANDARDS DETAILS FOR THE CITY OF GREENVILLE STRIPING STANDARD AND DIMENSIONS OF SPACES.

GREEN ZONE

6. PLANTING STRIPS SHALL BE PROVIDED ALONG BOTH SIDES ACCORDING TO STREET TREE CRITERIA IN THE DEVELOPMENT CODE.

PEDESTRIAN ZONE

7. A MINIMUM 8' WIDE UNOBSTRUCTED SIDEWALK SHALL BE PROVIDED ON BOTH SIDES OF A DISTRICT MIXED-USE STREET.

OTHER CONSIDERATIONS

8. THE DESIGN ENGINEER SHALL PROVIDE A PROPOSED STRUCTURAL PAVEMENT SECTION BASED ON GEOTECHNICAL ANALYSIS OF THE EXISTING CONDITIONS AS WELL AS EXPECTED TRAVEL VOLUMES & TYPES. IN NO CASE SHALL THE PAVEMENT SECTION BE LESS THAN THE TYPICAL PAVING SECTION DETAIL FOR COLLECTORS AND ARTERIALS.

9. STANDARD 18" CURB & GUTTER AND SIDEWALK PER CITY OF GREENVILLE STANDARD DETAILS.

10. STREET LIGHTS SHALL CONFORM TO THE CITY OF GREENVILLE LIGHT POLLUTION ORDINANCE (CHAPTER 19, ARTICLE 10). REFER TO 19-487 FOR PERMIT APPLICATION REQUIREMENTS. LOCATION AND TYPE OF PROPOSED STREET LIGHTS, HEIGHT OF POLE, AND PHOTOMETRIC SURVEY SHALL BE PROVIDED.

11. DISTRICT STREETS SHALL HAVE A FUNCTIONAL CLASSIFICATION OF COLLECTOR.



DISTRICT MIXED-USE (TWO LANE)

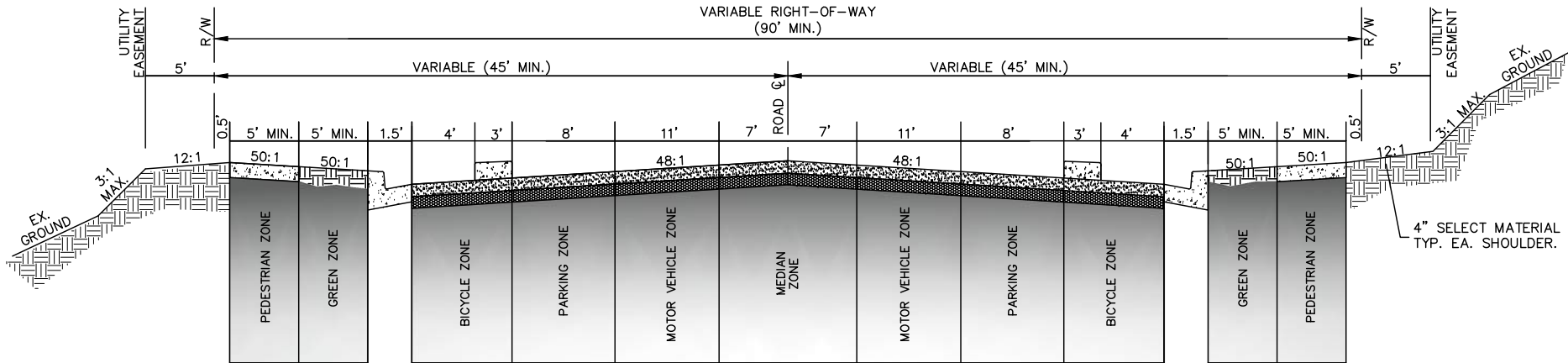
DATE APPROVED: OCT. 2023

OFFICE OF THE CITY ENGINEER:

SCALE:
NO SCALE

DETAIL :

10:08



1. THE DESIGN GUIDELINES FOR DISTRICT STREETS ARE NOT ENTIRELY PRESCRIPTIVE BUT SHOULD INCLUDE AN ARRANGEMENT OF THE ZONES DESCRIBED HEREIN. THE DESIGN ENGINEER SHALL COORDINATE A PROPOSED TYPICAL SECTION WITH THE CITY ENGINEER IN A PRE-DESIGN CONFERENCE.

2. THE TOTAL RIGHT-OF-WAY WIDTH MAY VARY FROM THE TYPICAL DIMENSION LISTED ABOVE DEPENDING ON THE ARRANGEMENT AND DIMENSIONS OF EACH ZONE AS APPROVED IN THE PRE-DESIGN CONFERENCE.

MOTOR VEHICLE ZONE
3. TYPICALLY DISTRICT MIXED-USE (THREE-LANE) STREETS HAVE ONE TRAVEL LANE IN EACH DIRECTION, HOWEVER IN CERTAIN SITUATIONS THEY MAY HAVE 3, 4, OR 5 TOTAL LANES DEPENDING ON PREDICTED TRAFFIC VOLUMES. IN ALL CASES, TRAVEL LANE WIDTHS SHALL BE A MINIMUM 11' WIDE.

BICYCLE ZONE
4. DEDICATED BICYCLE LANES SHOULD BE PROVIDED ON ALL DISTRICT MIXED-USE STREETS. BICYCLE LANES SHALL BE A MINIMUM 4' WIDE. BICYCLE LANES SHOULD HAVE A MINIMUM OF 3' DOOR BUFFER SPACE BETWEEN THE BICYCLE LANE AND PARALLEL PARKING. THE DESIGN ENGINEER IS ENCOURAGED TO REVIEW NACTO'S *URBAN BIKEWAY DESIGN GUIDE* FOR FURTHER DESIGN CONSIDERATIONS.

PARKING ZONE
5. ON-STREET PARKING SHOULD BE PROVIDED ON ALL DISTRICT MIXED-USE STREETS. ON-STREET PARKING SHOULD BE MARKED AND HAVE A MINIMUM WIDTH OF 8'. PLEASE REFERENCE THE TYPICAL PARALLEL PARKING AND PARKING STANDARDS DETAILS FOR THE CITY OF GREENVILLE STRIPING STANDARD AND DIMENSIONS OF SPACES.

GREEN ZONE
6. PLANTING STRIPS SHALL BE PROVIDED ALONG BOTH SIDES OF A COLLECTOR. THE MINIMUM PLANTING STRIP WIDTH SHALL BE 5' (MEASURED FROM BACK-OF-CURB TO EDGE OF SIDEWALK), UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER. THE TOP 4" OF THE PLANTING STRIP SHALL BE SELECT MATERIAL SUFFICIENTLY CAPABLE OF GROWING AND SUSTAINING VEGETATION. FOR TREE SPACING AND PLANTING REQUIREMENTS REFER TO DIV. 19-4.4

PEDESTRIAN ZONE
7. A MINIMUM 5' WIDE UNOBSTRUCTED SIDEWALK SHALL BE PROVIDED ON BOTH SIDES OF A DISTRICT MIXED-USE STREET.

OTHER CONSIDERATIONS
8. THE DESIGN ENGINEER SHALL PROVIDE A PROPOSED STRUCTURAL PAVEMENT SECTION BASED ON GEOTECHNICAL ANALYSIS OF THE EXISTING CONDITIONS AS WELL AS EXPECTED TRAVEL VOLUMES & TYPES. IN NO CASE SHALL THE PAVEMENT SECTION BE LESS THAN THE TYPICAL PAVING SECTION DETAIL FOR COLLECTORS AND ARTERIALS.

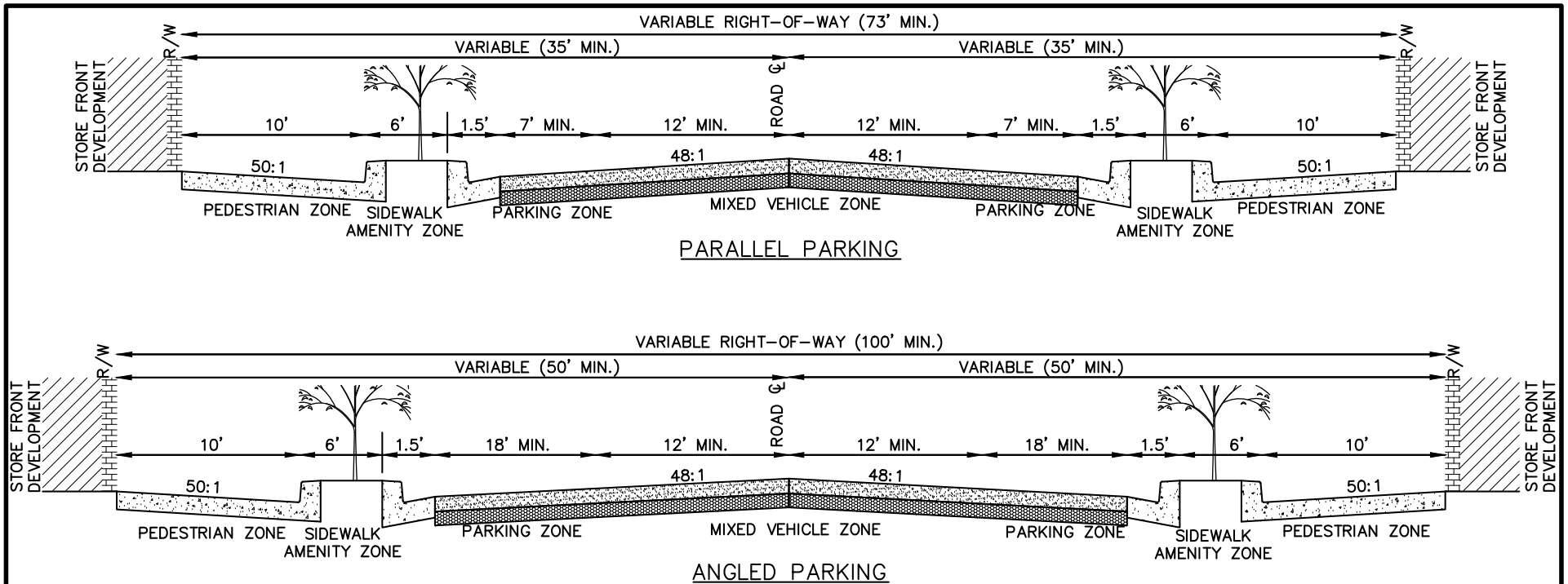
9. STANDARD 18" CURB & GUTTER AND SIDEWALK PER CITY OF GREENVILLE STANDARD DETAILS.

10. STREET LIGHTS SHALL CONFORM TO THE CITY OF GREENVILLE LIGHT POLLUTION ORDINANCE (CHAPTER 19, ARTICLE 10). REFER TO 19-487 FOR PERMIT APPLICATION REQUIREMENTS. LOCATION AND TYPE OF PROPOSED STREET LIGHTS, HEIGHT OF POLE, AND PHOTOMETRIC SURVEY SHALL BE PROVIDED.

11. DISTRICT STREETS SHALL HAVE A FUNCTIONAL CLASSIFICATION OF COLLECTOR.

	DISTRICT MIXED-USE (THREE LANE)		SCALE: NO SCALE
	DATE APPROVED: OCT. 2023	OFFICE OF THE CITY ENGINEER:	DETAIL : 10:09

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1. THE DESIGN GUIDELINES FOR NON-LOCAL THOROUGHFARES ARE NOT ENTIRELY PRESCRIPTIVE BUT SHOULD INCLUDE AN ARRANGEMENT OF THE ZONES DESCRIBED HEREIN. THE DESIGN ENGINEER SHALL COORDINATE A PROPOSED TYPICAL SECTION WITH THE CITY ENGINEER IN A PRE-DESIGN CONFERENCE.
2. THE TOTAL RIGHT-OF-WAY WIDTH WILL VARY DEPENDING ON THE ARRANGEMENT AND DIMENSIONS OF EACH ZONE AS APPROVED IN THE PRE-DESIGN CONFERENCE.
- MIXED VEHICLE ZONE**
3. TYPICALLY HIGHLY URBANIZED MAIN STREETS HAVE ONE TRAVEL LANE IN EACH DIRECTION. HOWEVER IN CERTAIN SITUATIONS THEY MAY HAVE 3 TOTAL LANES DEPENDING ON PREDICTED TRAFFIC VOLUMES. IN ALL CASES, TRAVEL LANE WIDTHS SHALL BE A MINIMUM 12' WIDE. WIDER TRAVEL LANES WILL BE NECESSARY WHERE ON-STREET PARKING IS PROVIDED.
- PARKING ZONE**
4. ON-STREET PARKING IS DESIRABLE IN AREAS WITH FRONT FACING COMMERCIAL DEVELOPMENT AND IN HIGH DENSITY RESIDENTIAL AREAS WHERE ON-STREET PARKING IS EXPECTED. ON-STREET PARKING SHOULD BE CLEARLY MARKED. PARALLEL LANES MUST BE A MINIMUM OF 7' WIDE AND MARKED PER THE APPLICABLE DETAIL. ANGLED PARKING SHALL FOLLOW CITY DESIGN GUIDELINES AND DIMENSIONAL STANDARDS.
- SIDEWALK AMENITY ZONE**
5. THIS ZONE ENHANCES THE PEDESTRIAN ENVIRONMENT ALONG A MAIN STREET AND SHOULD INCLUDE STREET TREES, LIGHTS, FURNITURE (LIKE OUTDOOR DINING), AND OTHER AMMENITIES. THE MINIMUM WIDTH PROVIDED SHALL BE 7.5', UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER AND THE CITY URBAN DESIGNER.
- PEDESTRIAN ZONE**
6. AN 8' WIDE UNOBSTRUCTED SIDEWALK SHOULD BE PROVIDED ON BOTH SIDES OF A MAIN STREET SECTION UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER AND THE CITY URBAN DESIGNER. IN NO CASE SHALL THE UNOBSTRUCTED SIDEWALK WIDTH BE LESS THAN 6'.
- OTHER CONSIDERATIONS**
7. THE DESIGN ENGINEER SHALL PROVIDE A PROPOSED STRUCTURAL PAVEMENT SECTION BASED ON GEOTECHNICAL ANALYSIS OF THE EXISTING CONDITIONS AS WELL AS EXPECTED TRAVEL VOLUMES & TYPES. IN NO CASE SHALL THE PAVEMENT SECTION BE LESS THAN THE TYPICAL PAVING SECTION DETAIL FOR COLLECTORS AND ARTERIALS.
8. STANDARD 18" CURB & GUTTER AND SIDEWALK PER CITY OF GREENVILLE STANDARD DETAILS.
9. STREET LIGHTS SHALL CONFORM TO THE CITY OF GREENVILLE LIGHT POLLUTION ORDINANCE (CHAPTER 19, ARTICLE 10). REFER TO 19-487 FOR PERMIT APPLICATION REQUIREMENTS. LOCATION AND TYPE OF PROPOSED STREET LIGHTS, HEIGHT OF POLE, AND PHOTOMETRIC SURVEY SHALL BE PROVIDED.



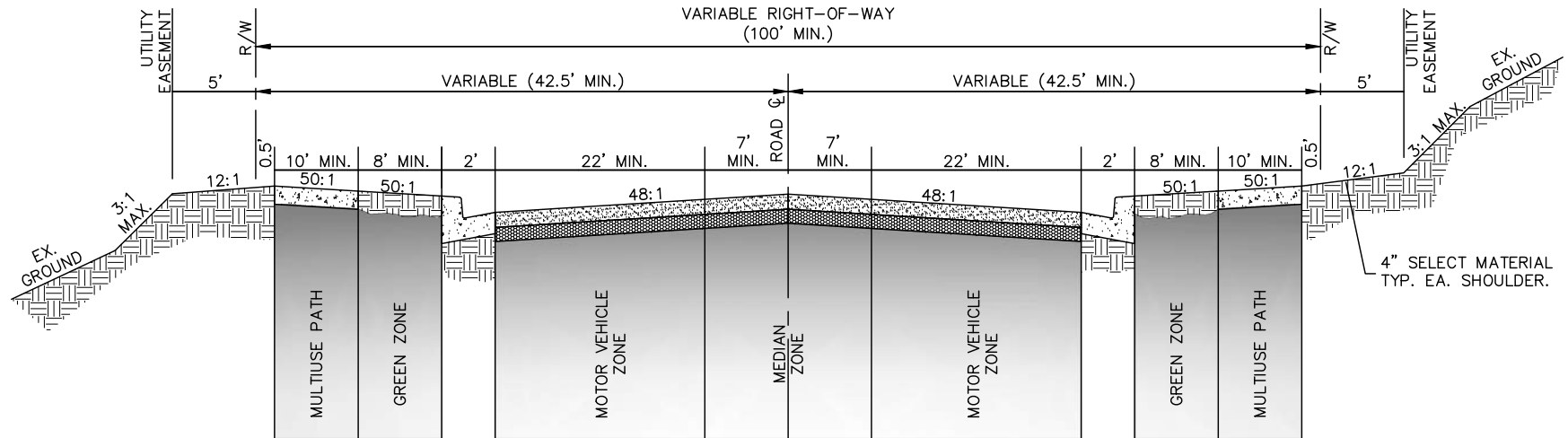
DISTRICT - MAIN STREET

DATE
APPROVED: **OCT. 2023**

OFFICE OF THE
CITY ENGINEER:

SCALE:
NO SCALE
DETAIL :

10:10



1. THE DESIGN GUIDELINES FOR NON-LOCAL THOROUGHFARES ARE NOT ENTIRELY PRESCRIPTIVE BUT SHOULD INCLUDE AN ARRANGEMENT OF THE ZONES DESCRIBED HEREIN. THE DESIGN ENGINEER SHALL COORDINATE A PROPOSED TYPICAL SECTION WITH THE CITY ENGINEER IN A PRE-DESIGN CONFERENCE.

2. THE TOTAL RIGHT-OF-WAY WIDTH MAY VARY FROM THE TYPICAL DIMENSION LISTED ABOVE DEPENDING ON THE ARRANGEMENT AND DIMENSIONS OF EACH ZONE AS APPROVED IN THE PRE-DESIGN CONFERENCE.

MEDIAN ZONE

3. TYPICALLY A PLANTED MEDIAN WITH INTERMITTENT TWO-WAY-LEFT-TURN-LANES (TWLTL) SHOULD BE PROVIDED. MEDIAN SHALL BE A MINIMUM 11' WIDE.

MOTOR VEHICLE ZONE

4. TYPICALLY CITY THOROUGHFARE AVENUES HAVE TWO TRAVEL LANES IN EACH DIRECTION. TRAVEL LANE WIDTHS SHALL BE A MINIMUM 11' WIDE.

BICYCLE ACCOMODATIONS

5. BICYCLE MOBILITY ACCOMMODATED BY MULTIUSE PATHS ON EITHER SIDE.

GREEN ZONE

6. PLANTING STRIPS SHALL BE PROVIDED ALONG BOTH SIDES OF A CITY THOROUGHFARE AVENUE. THE MINIMUM PLANTING STRIP WIDTH SHALL BE 5' (MEASURED FROM BACK-OF-CURB TO EDGE OF SIDEWALK), UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER. THE TOP 4" OF THE PLANTING STRIP SHALL BE SELECT MATERIAL SUFFICIENTLY CAPABLE OF GROWING AND SUSTAINING VEGETATION. FOR TREE SPACING AND PLANTING TYPE REQUIREMENTS REFER TO DIV. 19-4.4

PEDESTRIAN ZONE

7. PEDESTRIAN ZONE ACCOMMODATED BY MULTIUSE PATHS ON EITHER SIDE..

OTHER CONSIDERATIONS

8. THE DESIGN ENGINEER SHALL PROVIDE A PROPOSED STRUCTURAL PAVEMENT SECTION BASED ON GEOTECHNICAL ANALYSIS OF THE EXISTING CONDITIONS AS WELL AS EXPECTED TRAVEL VOLUMES & TYPES. IN NO CASE SHALL THE PAVEMENT SECTION BE LESS THAN THE TYPICAL PAVING SECTION DETAIL FOR COLLECTORS AND ARTERIALS.

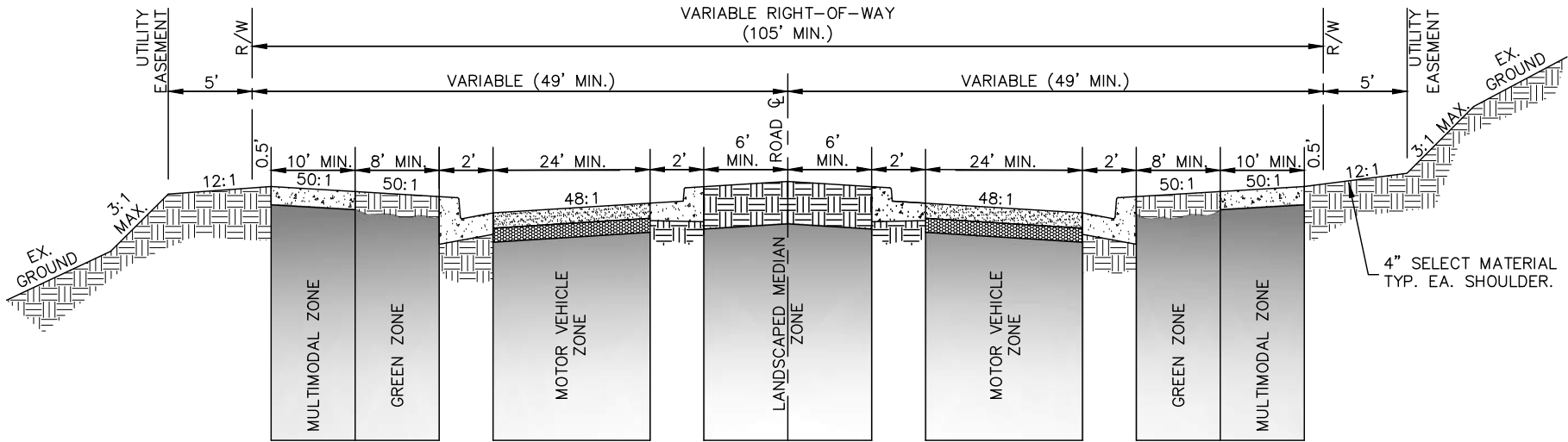
9. STANDARD 18" CURB & GUTTER AND SIDEWALK PER CITY OF GREENVILLE STANDARD DETAILS.

10. STREET LIGHTS SHALL CONFORM TO THE CITY OF GREENVILLE LIGHT POLLUTION ORDINANCE (CHAPTER 19, ARTICLE 10). REFER TO 19-487 FOR PERMIT APPLICATION REQUIREMENTS. LOCATION AND TYPE OF PROPOSED STREET LIGHTS, HEIGHT OF POLE, AND PHOTOMETRIC SURVEY SHALL BE PROVIDED.

11. CITY THOROUGHFARE AVENUES SHALL HAVE A FUNCTIONAL CLASSIFICATION OF ARTERIAL.

 city of greenville ENGINEERING DIVISION	CITY THOROUGHFARE AVENUE	SCALE: NO SCALE
	DATE APPROVED: OCT. 2023	OFFICE OF THE CITY ENGINEER: 10:11

THIS DOCUMENT AND ANY ILLUSTRATIONS HEREON ARE PROVIDED AS STANDARD CONSTRUCTION DETAILS WITHIN THE CITY OF GREENVILLE, SC. DEVIATION FROM, OR MODIFICATION OF, THIS DOCUMENT REQUIRES APPROVAL OF THE CITY OF GREENVILLE. THE CITY OF GREENVILLE SHALL NOT BE HELD LIABLE FOR DAMAGES AS A RESULT OF MISUSE OR CHANGES TO THIS DOCUMENT. THE APPROVAL SIGNATURE AND LOGO SHALL BE REMOVED IF ANY PORTION OF THIS DOCUMENT IS MODIFIED.



1. THE DESIGN GUIDELINES FOR CITY THOROUGHFARE BOULEVARDS ARE NOT ENTIRELY PRESCRIPTIVE BUT SHOULD INCLUDE AN ARRANGEMENT OF THE ZONES DESCRIBED HEREIN. THE DESIGN ENGINEER SHALL COORDINATE A PROPOSED TYPICAL SECTION WITH THE CITY ENGINEER IN A PRE-DESIGN CONFERENCE.
2. THE TOTAL RIGHT-OF-WAY WIDTH MAY VARY FROM THE TYPICAL DIMENSION LISTED ABOVE DEPENDING ON THE ARRANGEMENT AND DIMENSIONS OF EACH ZONE AS APPROVED IN THE PRE-DESIGN CONFERENCE.

LANDSCAPED MEDIAN ZONE

3. TYPICALLY A PLANTED CONTINUOUS LANDSCAPE MEDIAN SHOULD BE PROVIDED FOR ALL CITY THOROUGHFARE BOULEVARDS. THE MEDIAN SHOULD TYPICALLY BE 11'-12' IN WIDTH. FOR TREE SPACING AND PLANTING TYPE REQUIREMENTS REFER TO DIV. 19-4.4.

MOTOR VEHICLE ZONE

4. TYPICALLY CITY THOROUGHFARE BOULEVARDS HAVE TWO TRAVEL LANES IN EACH DIRECTION. TRAVEL LANE WIDTHS SHALL BE 12' (OR 11' WHERE PERMITTED).

GREEN ZONE

5. PLANTING STRIPS SHALL BE PROVIDED ALONG BOTH SIDES OF AN ARTERIAL. THE MINIMUM PLANTING STRIP WIDTH SHALL BE 8' (MEASURED FROM BACK-OF-CURB TO EDGE OF SIDEWALK), UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER. THE TOP 4" OF THE PLANTING STRIP SHALL BE SELECT MATERIAL SUFFICIENTLY CAPABLE OF GROWING AND SUSTAINING VEGETATION. FOR TREE SPACING AND PLANTING TYPE REQUIREMENTS REFER TO DIV.19-4.4.

MULTIMODAL ZONE

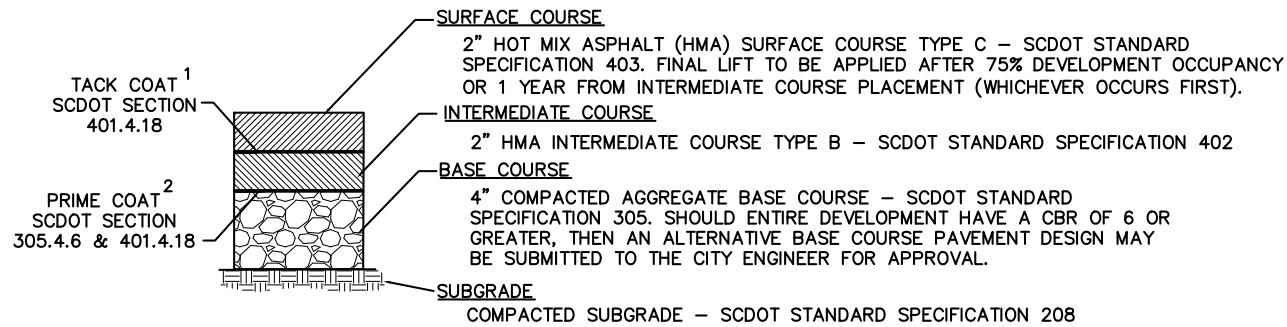
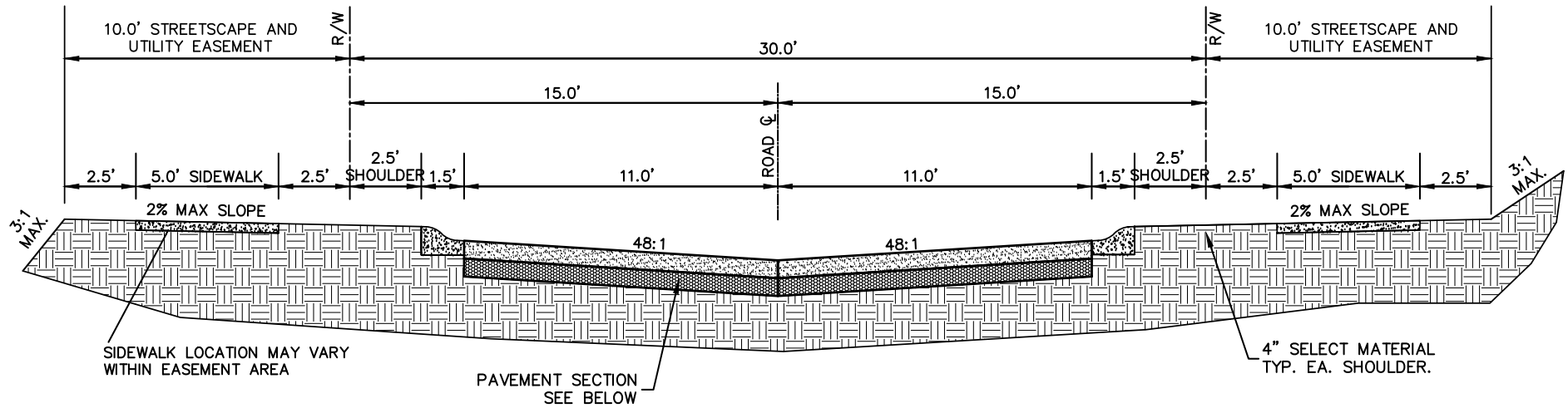
6. A MINIMUM 10' WIDE UNOBSTRUCTED SIDEWALK SHALL BE PROVIDED ON BOTH SIDES OF A CITY THOROUGHFARE BOULEVARD.

OTHER CONSIDERATIONS

7. THE DESIGN ENGINEER SHALL PROVIDE A PROPOSED STRUCTURAL PAVEMENT SECTION BASED ON GEOTECHNICAL ANALYSIS OF THE EXISTING CONDITIONS AS WELL AS EXPECTED TRAVEL VOLUMES & TYPES. IN NO CASE SHALL THE PAVEMENT SECTION BE LESS THAN THE TYPICAL PAVING SECTION DETAIL FOR COLLECTORS AND ARTERIALS.
8. STANDARD 24" CURB & GUTTER AND SIDEWALK PER CITY OF GREENVILLE STANDARD DETAILS.
9. STREET LIGHTS SHALL CONFORM TO THE CITY OF GREENVILLE LIGHT POLLUTION ORDINANCE (CHAPTER 19, ARTICLE 10). REFER TO 19-487 FOR PERMIT APPLICATION REQUIREMENTS. LOCATION AND TYPE OF PROPOSED STREET LIGHTS, HEIGHT OF POLE, AND PHOTOMETRIC SURVEY SHALL BE PROVIDED.
10. CITY THOROUGHFARE BOULEVARDS SHALL HAVE A FUNCTIONAL CLASSIFICATION OF ARTERIAL.

 city of greenville ENGINEERING DIVISION	CITY THOROUGHFARE BOULEVARD		SCALE: NO SCALE
	DATE APPROVED: OCT. 2023	OFFICE OF THE CITY ENGINEER:	DETAIL : 10:12

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TYPICAL PAVEMENT SECTION

1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 – 0.15 GAL PER SQUARE YARD
2. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 – 0.30 GAL PER SQUARE YARD



ENGINEERING DIVISION

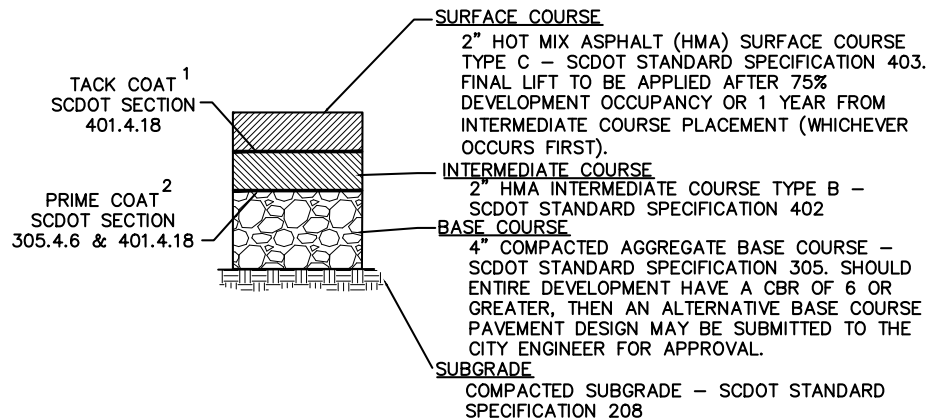
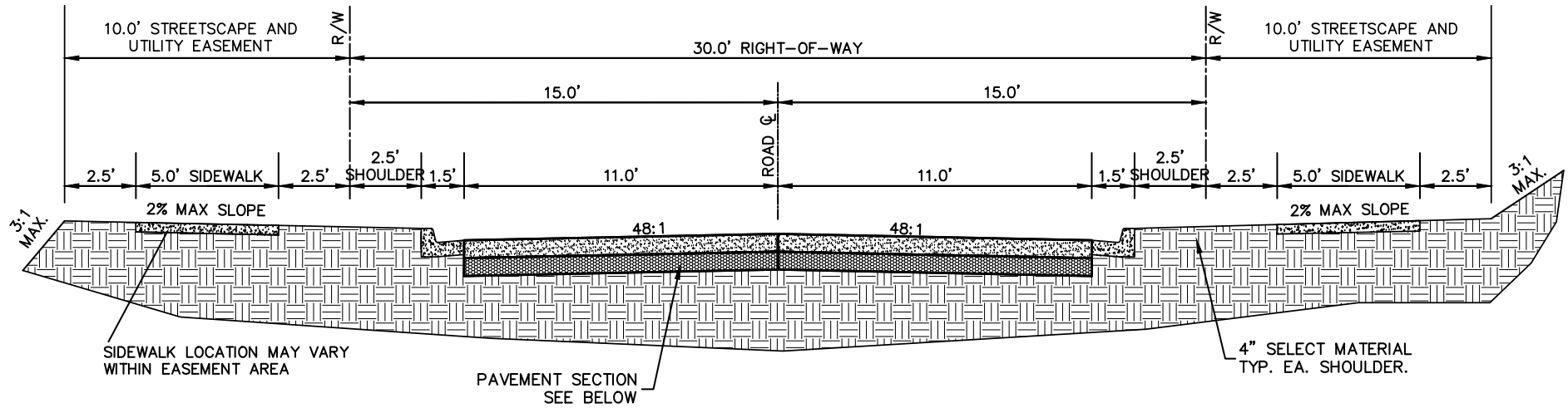
PRIVATE STREET LOW DENSITY

DATE APPROVED: **AUG. 2013**

OFFICE OF THE
CITY ENGINEER:

SCALE:
NO SCALE
DETAIL:

10:13



1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 - 0.15 GAL PER SQUARE YARD
2. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 - 0.30 GAL PER SQUARE YARD
3. ROAD WIDTH REQUIREMENTS OF APPENDIX D OF THE FIRE CODE MUST BE PROVIDED IF INTENDED TO SERVE AS FIRE ACCESS
4. ROLLED OR VERTICAL CURB AND GUTTER ALLOWED
5. ON-STREET PARKING PROHIBITED
6. PARKING ON LOTS SERVED CANNOT BLOCK THE SIDEWALK
7. APPLICABLE FOR 500 VEHICLES PER DAY OR LESS

TYPICAL PAVEMENT SECTION

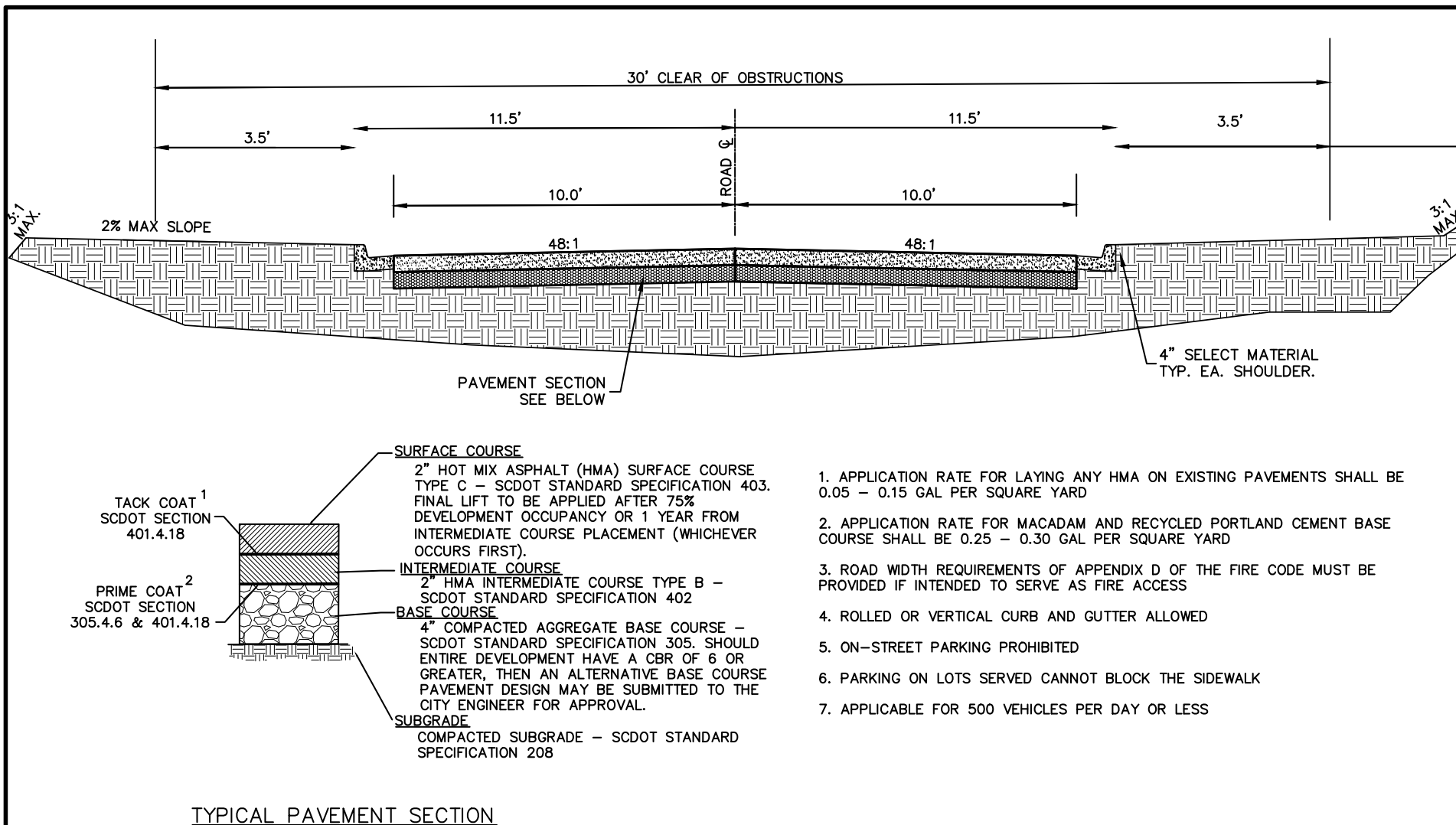


PRIVATE STREET HIGH DENSITY

DATE APPROVED: AUG. 2013

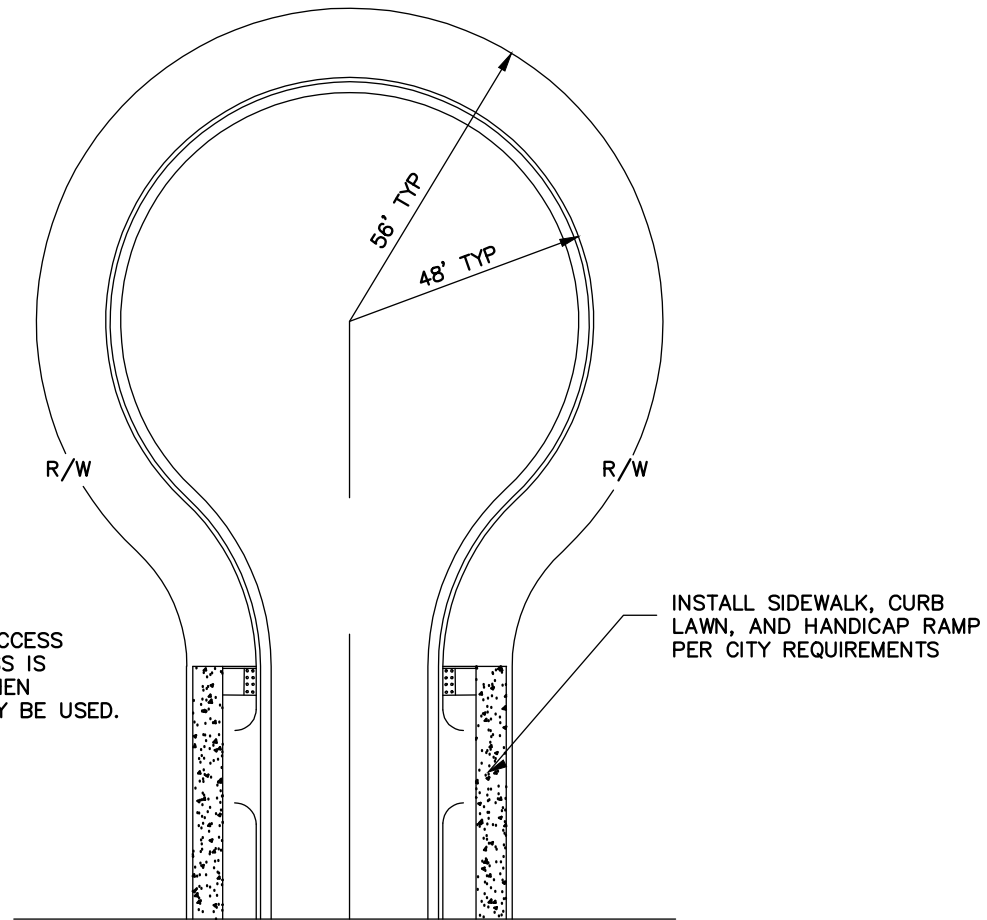
OFFICE OF THE
CITY ENGINEER:SCALE:
NO SCALE
DETAIL:

10:14



NOTES:

1. RH ZONES TO USE CUL-DE-SACS AS APPROVED TURNAROUNDS.
2. DIMENSIONS SHOWN INDICATE FIRE APPARATUS ACCESS ROAD REQUIREMENTS. IF COMPLIANT FIRE ACCESS IS PROVIDED TO SERVE ADDRESSES SEPARATELY, THEN MINIMUM RADIUS DIMENSIONS IN SEC. 19-4.3 MAY BE USED.

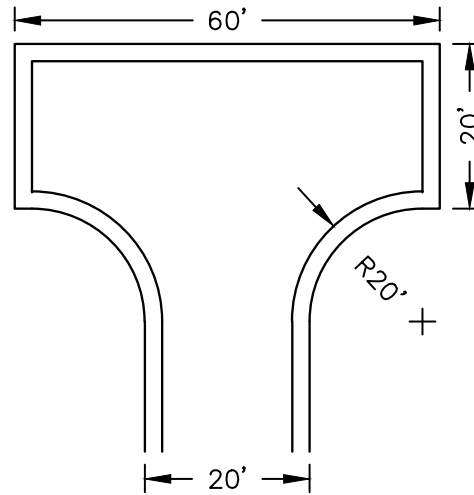


CUL-DE-SAC TURNAROUND

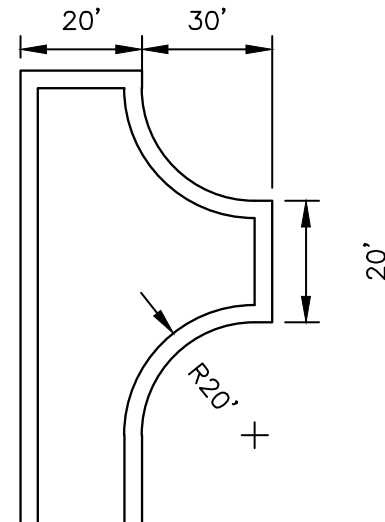
DATE APPROVED: OCT. 2023

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CITY ENGINEER:SCALE:
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DETAIL :

10:16



STANDARD HAMMERHEAD



ROTATED HAMMERHEAD

NOTES:

1. HAMMERHEAD TURNAROUNDS ARE NOT ALLOWED IN RH-A, RH-B, RH-C ZONING UNLESS DETERMINED BY THE ADMINISTRATOR TO BE NECESSARY DUE TO TOPOGRAPHY, ENVIRONMENTAL CONSTRAINTS; PROPERTY CONFIGURATION/SHAPE; PROPERTY ACCESSIBILITY; AND COMPATIBILITY WITH ADJACENT LAND USES .
1. DIMENSIONS SHOWN DO NOT ACCOMMODATE COMMERCIAL VEHICLES OR FIRE APPARATUS ACCESS ROAD REQUIREMENTS.
2. ROAD DIMENSIONS OF APPENDIX D OF THE FIRE CODE MUST BE PROVIDED IF INTENDED TO SERVE AS FIRE ACCESS.



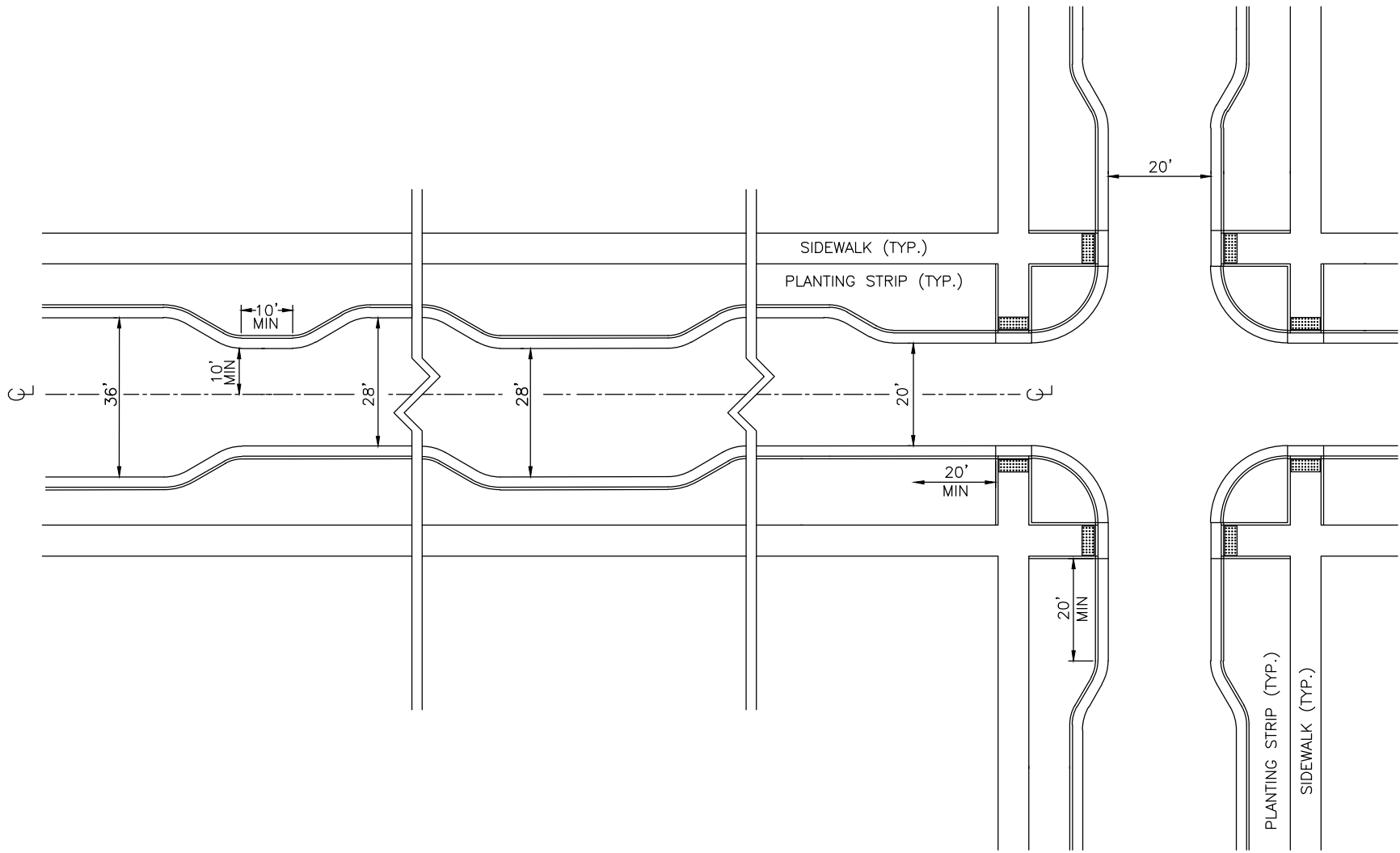
HAMMERHEAD TURNAROUND

DATE APPROVED: **JAN. 2024**

OFFICE OF THE
CITY ENGINEER:

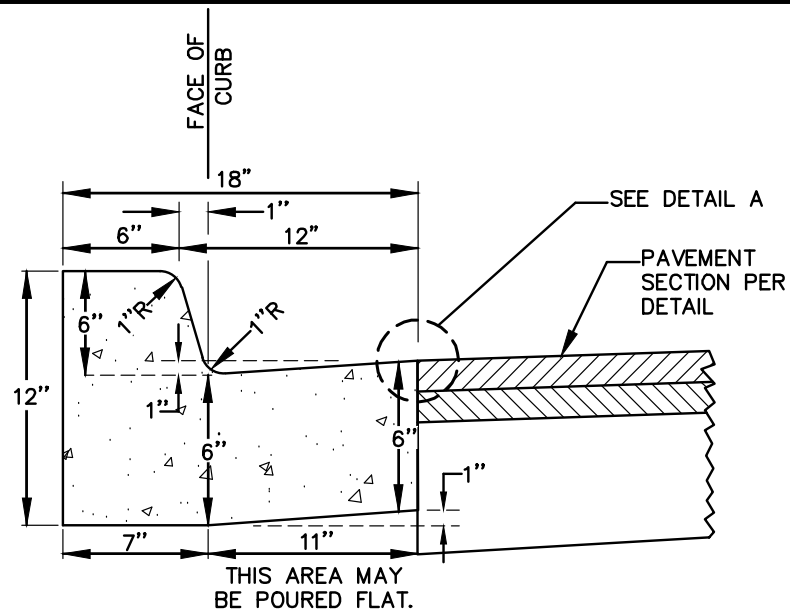
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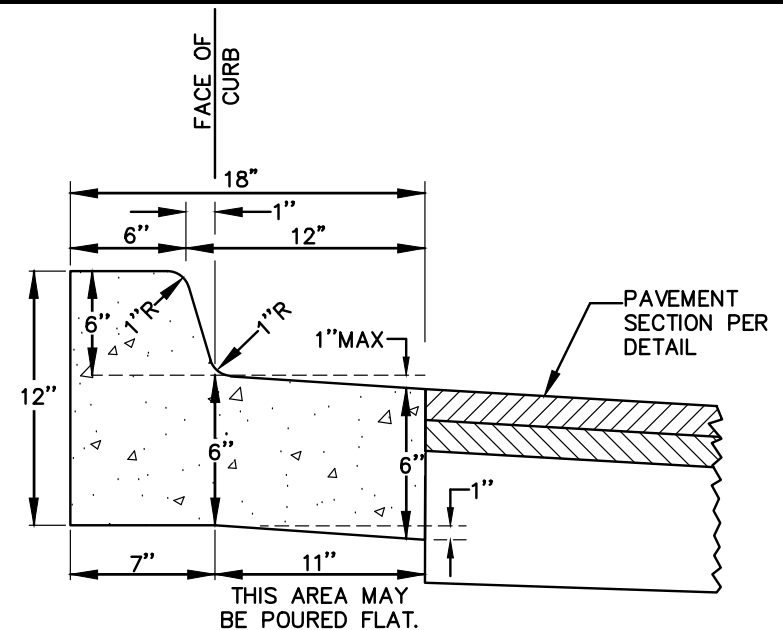


 city of greenville ENGINEERING DIVISION	NEIGHBORHOOD MINIMUM WIDTHS		SCALE: NO SCALE
	DATE APPROVED: JAN. 2024	OFFICE OF THE CITY ENGINEER:	DETAIL : 10:18

THIS DOCUMENT AND ANY ILLUSTRATIONS HEREON ARE PROVIDED AS STANDARD CONSTRUCTION DETAILS WITHIN THE CITY OF GREENVILLE, SC. DEVIATION FROM, OR MODIFICATION OF, THIS DOCUMENT REQUIRES APPROVAL OF THE CITY OF GREENVILLE. THE CITY OF GREENVILLE SHALL NOT BE HELD LIABLE FOR DAMAGES AS A RESULT OF MISUSE OR CHANGES TO THIS DOCUMENT. THE APPROVAL SIGNATURE AND LOGO SHALL BE REMOVED IF ANY PORTION OF THIS DOCUMENT IS MODIFIED.

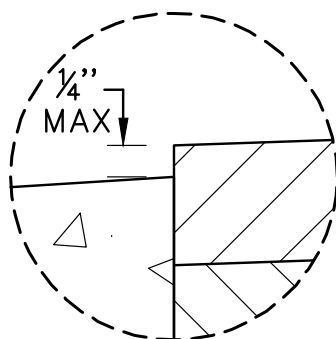


STANDARD CURB

PITCHED CURB

NOTE

1. CONCRETE SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.
2. CURB AND GUTTER TO HAVE CONSTRUCTION JOINTS AND EXPANSION JOINTS PER THE CITY OF GREENVILLE STANDARD DETAIL.
3. CURB AND GUTTER SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 720.4 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.
4. THE SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95 PERCENT OF THE STANDARD PROCTOR DENSITY AND FINISHED TO A SMOOTH, FIRM SURFACE AND SHALL BE MOIST AT THE TIME THE CONCRETE IS PLACED.
5. THERE SHALL BE NO GREATER THAN A $\frac{1}{4}$ " SEPARATION BETWEEN THE TOP OF THE FINAL TRAVEL SURFACE AND THE TOP OF GUTTER.



DETAIL A



ENGINEERING DIVISION

CONCRETE CURB & GUTTER

DATE APPROVED: JAN. 2023

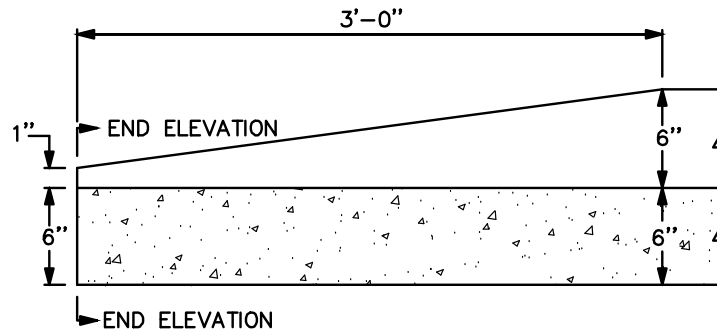
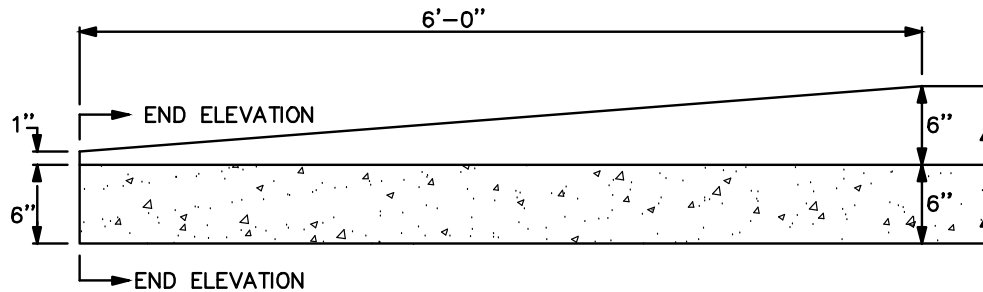
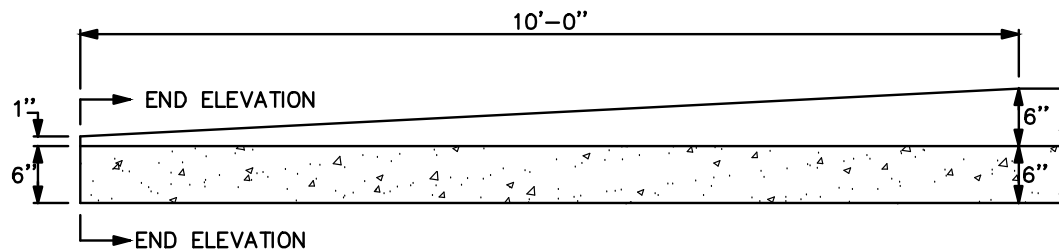
OFFICE OF THE
CITY ENGINEER:

APPROVED

SCALE:
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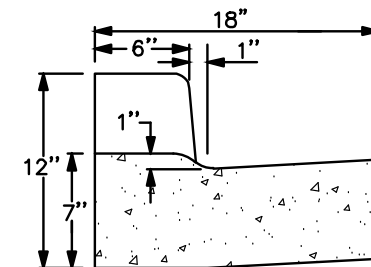
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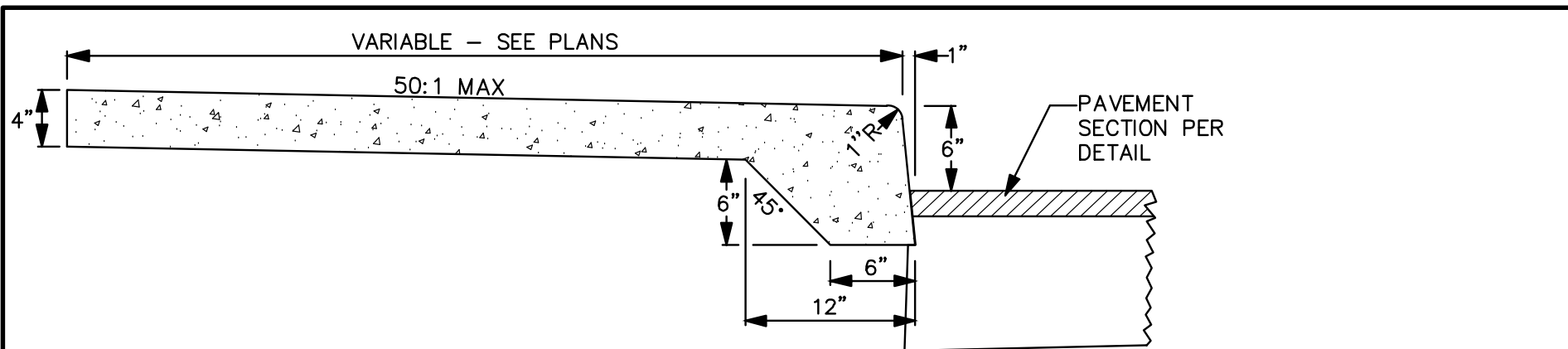
11:00

ELEVATIONELEVATIONELEVATIONNOTE

1. USE 3.0' CURB END TAPER AT END OF RADII ON INTERSECTING STREETS AND WHERE CURB IS 6 FEET OR GREATER FROM MAINLINE TRAVEL LANE.

2. USE 10.0' CURB END TAPER AT END OF CURB WHERE CURB IS LESS THAN 6 FEET FROM MAINLINE TRAVEL LANE.

END ELEVATION**CURB END TAPER**DATE APPROVED: **JAN. 2023**OFFICE OF THE
CITY ENGINEER:**APPROVED**SCALE:
NO SCALE
DETAIL :**11:01**



INTEGRAL CURB & SIDEWALK

NOTE

1. CONCRETE SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.

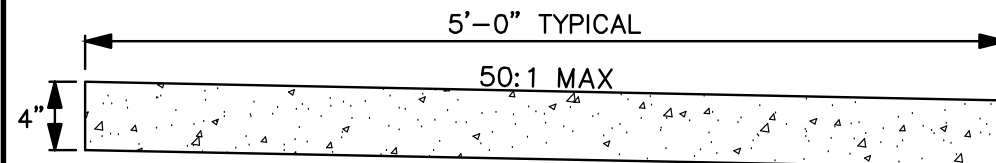
2. SIDEWALK TO HAVE SCORING LINES (CONTRACTION JOINTS) AND EXPANSION JOINTS PER THE CITY OF GREENVILLE STANDARD DETAIL.

3. SIDEWALK SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 720.4 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.

4. THE SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95 PERCENT OF THE STANDARD PROCTOR DENSITY AND FINISHED TO A SMOOTH, FIRM SURFACE AND SHALL BE MOIST AT THE TIME THE CONCRETE IS PLACED.

5. SIDEWALKS SHALL NOT CROSS DRIVEWAYS WITHOUT EXPRESS WRITTEN CONSENT OF THE CITY ENGINEER. TYPICALLY, THE CONTRACTOR SHALL INSTALL THE DRIVEWAY BEFORE THE SIDEWALK. IF INSTALLING THE DRIVEWAY AFTER THE SIDEWALK IS IN PLACE, THE CONTRACTOR SHALL SAW CUT AND REMOVE THE SIDEWALK FOR THE FULL WIDTH OF THE DRIVEWAY SECTION. SEE CITY OF GREENVILLE STANDARD DETAIL FOR DRIVEWAY CONSTRUCTION.

6. INTEGRAL CURB AND SIDEWALK IS NOT PERMISSIBLE FOR PUBLIC INFRASTRUCTURE.



STANDARD SIDEWALK



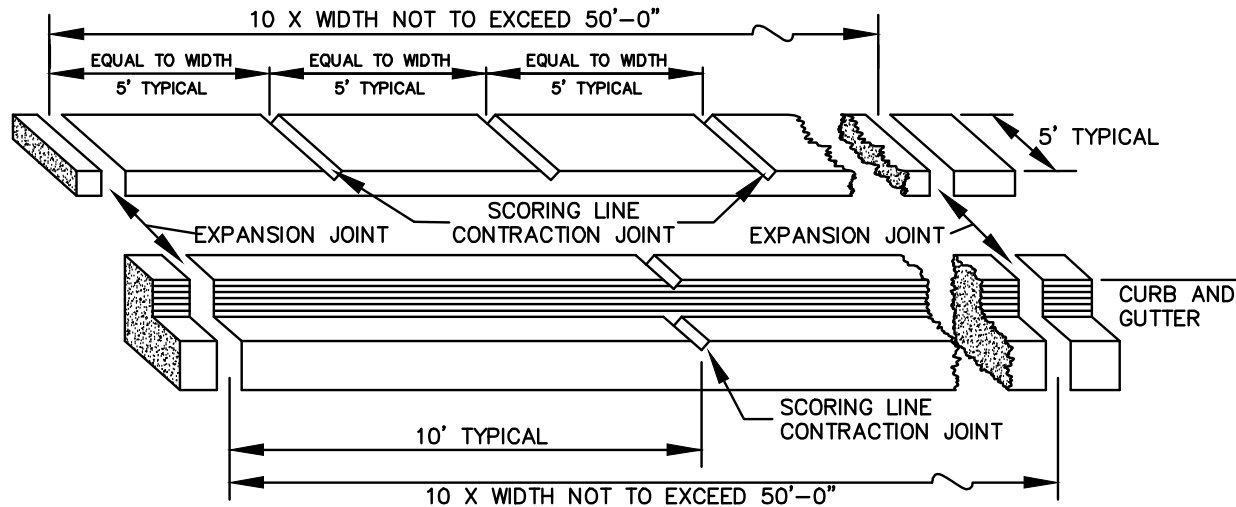
CONCRETE SIDEWALK

SCALE:
NO SCALE
DETAIL :

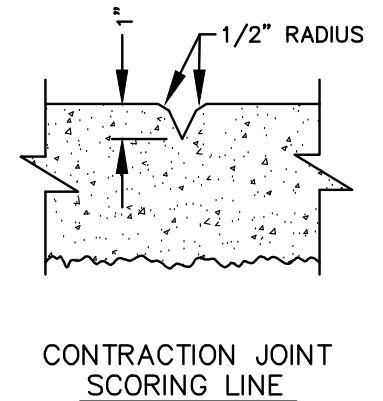
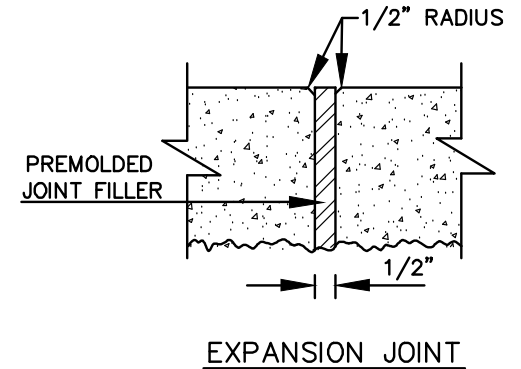
DATE
APPROVED: JAN. 2023

OFFICE OF THE
CITY ENGINEER: APPROVED

11:02



ISOMETRIC



NOTE

1. ALL WORK TO BE COMPLETED IN ACCORDANCE WITH CITY OF GREENVILLE DETAILS AND SPECIFICATIONS. SIDEWALK AND CURBING PER CITY OF GREENVILLE DETAIL.
2. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION INSPECTION BUREAU AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE. THE CITY WILL INSPECT SUBGRADE, FORMS, GRADE AND ALIGNMENT.
3. EXPANSION JOINTS, 1/2 INCH THICK, SHALL BE PLACED IN THE SIDEWALK AND CURBING AT THE POINT OF CURVATURE (PC) AND POINT OF TANGENCY (PT) OF ALL CURVES, AT THE OUTER EDGES OF DRIVEWAYS, AND AT UNIFORM INTERVALS AS SHOWN. EXPANSION JOINTS SHALL MEET SCDOT SPECIFICATION SECTION 702.2.2.1.
4. TRANSVERSE SCORING LINES (CONTRACTION JOINTS) IN THE SIDEWALK SHALL BE PLACED BETWEEN EXPANSION JOINTS AT UNIFORM INTERVALS EQUAL TO THE WIDTH OF THE WALK AS SHOWN.
5. LONGITUDINAL SCORING LINES WILL BE REQUIRED IN WALKS WIDER THAN 5 FEET OR AS DIRECTED BY THE CITY ENGINEER.
6. TRANSVERSE CONTRACTION JOINTS IN THE CURBING SHALL BE PLACED BETWEEN EXPANSION JOINTS AT UNIFORM 10' INTERVALS.
7. TRANSVERSE AND LONGITUDINAL SCORING LINES SHALL BE A DEPTH OF 1" AND NOT LESS THAN 1/4 INCH OR MORE THAN 1/2 INCH IN WIDTH. THE CORNERS OF THE SCORING LINES SHALL HAVE A 1/2 INCH MINIMUM RADII.
8. JOINTS IN THE CURB AND GUTTER SHALL ALIGN WITH CORRESPONDING JOINTS IN THE SIDEWALK.



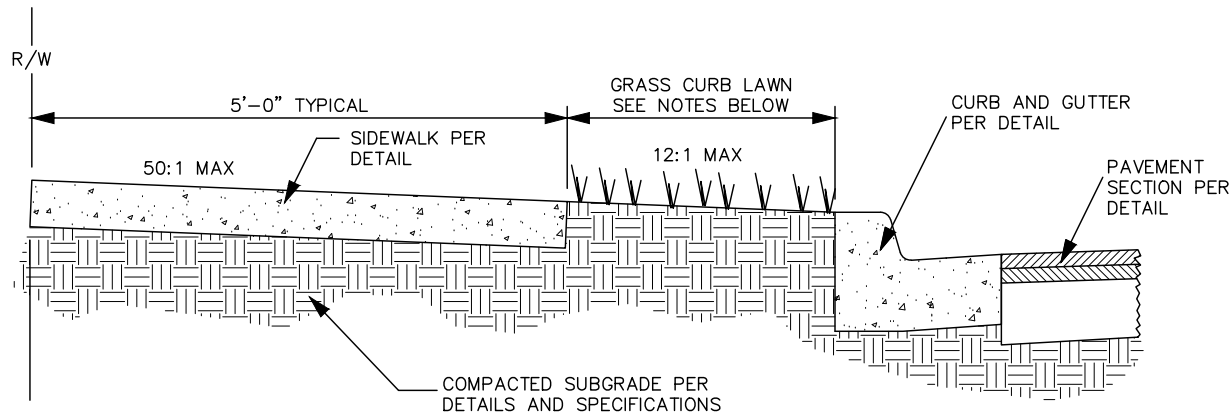
EXPANSION JOINTS AND SCORING LINES

DATE
APPROVED: JAN. 2023

OFFICE OF THE
CITY ENGINEER: APPROVED

SCALE:
NO SCALE
DETAIL :

11:03



- NOTE**
1. ALL SIDEWALK, CURB & GUTTER, GRASS CURB LAWN AND PAVEMENT SECTIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF GREENVILLE DETAILS AND SPECIFICATIONS.
 2. ALL NEW SIDEWALK SHALL BE CONSTRUCTED WITH A CURB LAWN. ALL EXISTING SIDEWALK SHALL BE BROUGHT INTO CONFORMANCE WITH THIS DETAIL.
 3. ON NEW STREETS, THE MINIMUM CURB LAWN WIDTH SHALL BE IN ACCORDANCE WITH THE APPLICABLE STREET SECTION.
 4. ALONG THE FRONTAGE OF EXISTING STREETS, THE MINIMUM CURB LAWN WIDTH SHALL BE IN ACCORDANCE WITH THE PREVAILING LAWN WIDTH OR THE WIDTH ASSOCIATED WITH THE STREET CLASSIFICATION, AT THE DISCRETION OF THE CITY ENGINEER. IN RESTRICTED CONDITIONS, THE MINIMUM CURB LAWN WIDTH SHALL BE 3'-0".
 5. CONCRETE SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.
 6. SIDEWALK TO HAVE SCORING LINES (CONTRACTION JOINTS) AND EXPANSION JOINTS PER THE CITY OF GREENVILLE STANDARD DETAIL.
 7. SIDEWALK SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.
 8. THE SUB-GRADE SHALL BE THOROUGHLY COMPACTED TO 95 PERCENT OF THE STANDARD PROCTOR DENSITY AND FINISHED TO A SMOOTH, FIRM SURFACE AND SHALL BE MOIST AT THE TIME THE CONCRETE IS PLACED.
 9. SIDEWALKS SHALL NOT CROSS DRIVEWAYS WITHOUT EXPRESS WRITTEN CONSENT OF THE CITY ENGINEER. TYPICALLY, THE CONTRACTOR SHALL INSTALL THE DRIVEWAY BEFORE THE SIDEWALK. IF INSTALLING THE DRIVEWAY AFTER THE SIDEWALK IS IN PLACE, THE CONTRACTOR SHALL SAW CUT AND REMOVE THE SIDEWALK FOR THE FULL WIDTH OF THE DRIVEWAY SECTION. SEE CITY OF GREENVILLE STANDARD DETAIL FOR DRIVEWAY CONSTRUCTION.
 10. INTEGRAL CURB AND SIDEWALK IS NOT PERMISSIBLE FOR PUBLIC INFRASTRUCTURE.



SIDEWALK WITH CURB LAWN

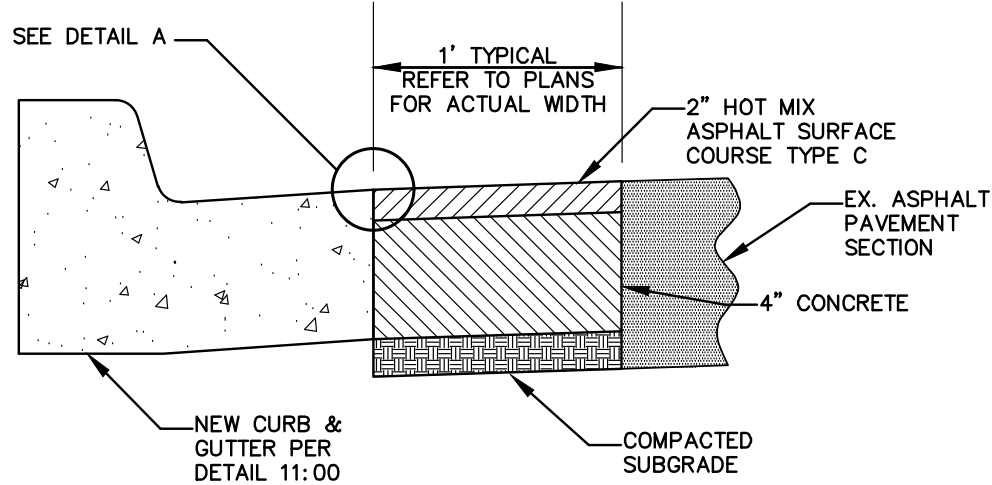
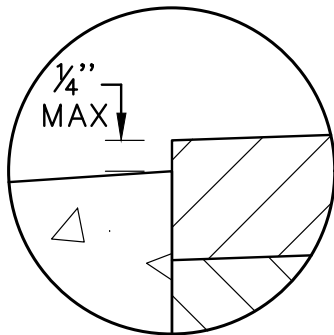
DATE
APPROVED: OCT. 2023

OFFICE OF THE
CITY ENGINEER:

SCALE:
NO SCALE
DETAIL :

11:04

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SECTION VIEWDETAIL ANOTE

1. EXISTING ASPHALT SHALL BE SAWCUT TO CREATE A NEAT, STRAIGHT DEMOLITION LINE.
2. TYPICAL EDGE PATCH WIDTH SHALL BE 1 FOOT. REFER TO PLANS FOR SPECIFIC WIDTHS.
3. THE SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95 PERCENT OF THE STANDARD PROCTOR DENSITY AND FINISHED TO A SMOOTH, FIRM SURFACE AND SHALL BE MOIST AT THE TIME THE CONCRETE IS PLACED.
4. CONCRETE SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.
5. A TACK COAT SHALL BE APPLIED BETWEEN THE CONCRETE AND THE HMA SURFACE COURSE. APPLICATION RATE SHALL BE 0.05 – 0.15 GAL/SY. REFER TO SCDOT STANDARD SPECIFICATION 401.4.18.
6. ASPHALT PATCH SHALL BE FLAT AND EVEN WITH THE EXISTING SURFACE TO WITHIN 1/4" TOLERANCE.
7. CURB AND GUTTER SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE CITY OF GREENVILLE STANDARD DETAIL 11:00.

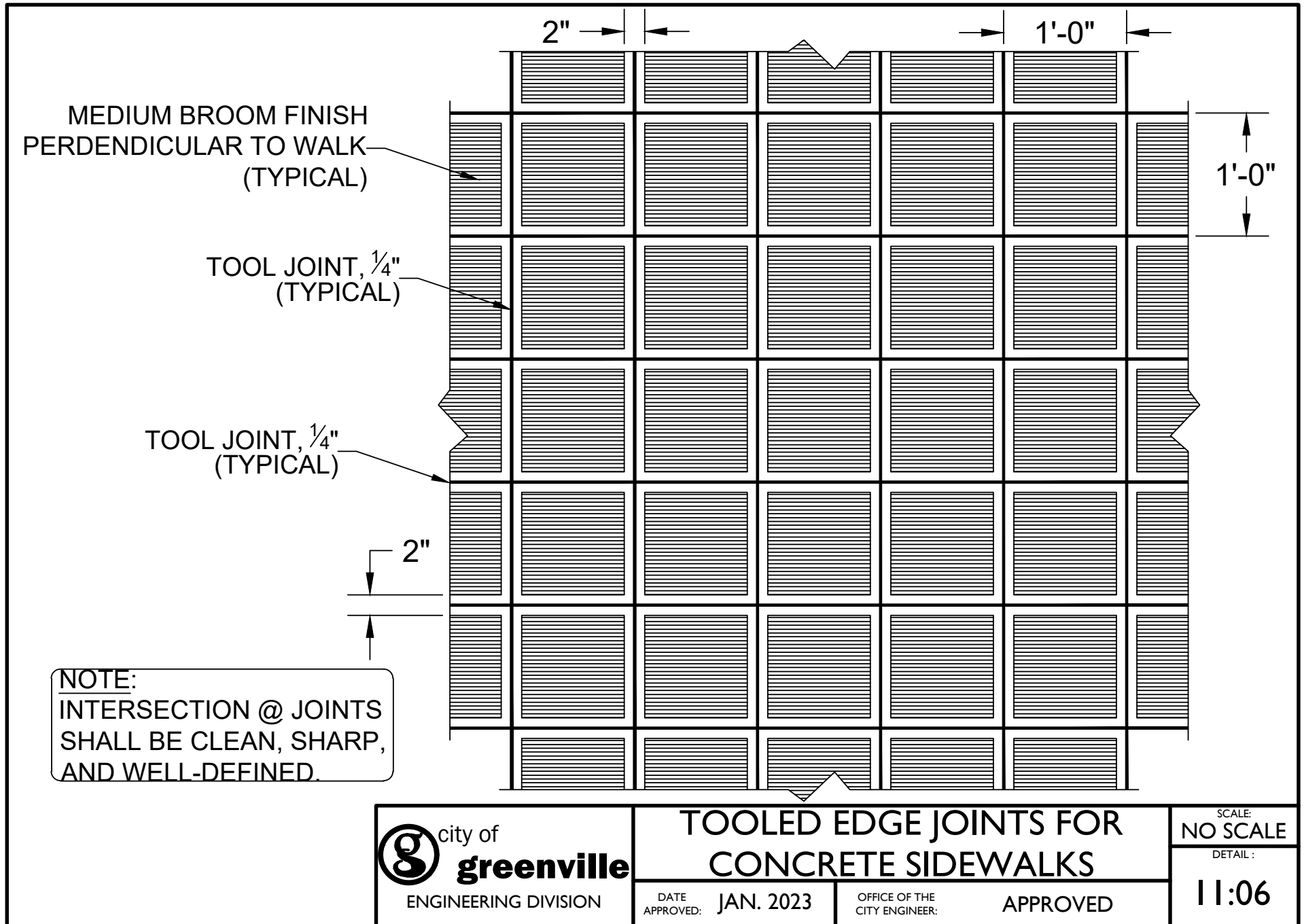


ENGINEERING DIVISION

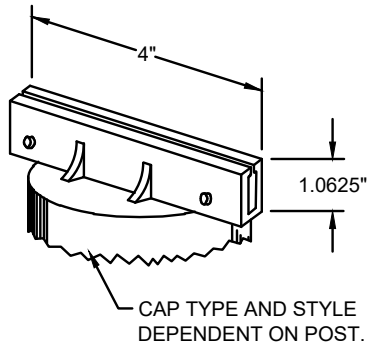
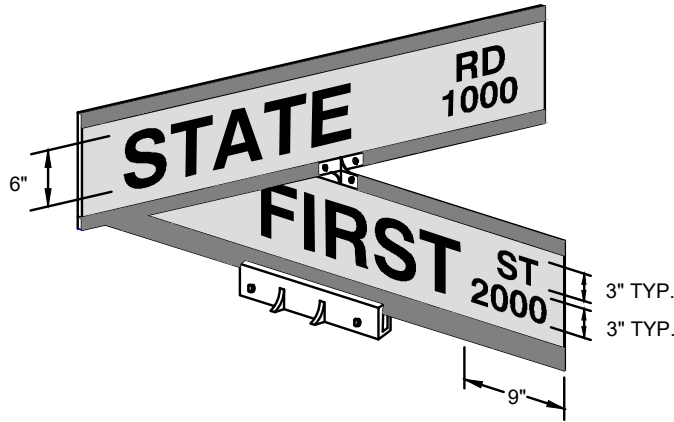
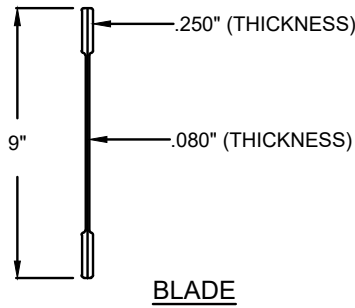
CURB EDGE PATCHDATE APPROVED: **JAN. 2023**OFFICE OF THE
CITY ENGINEER:**APPROVED**SCALE:
NO SCALE

DETAIL :

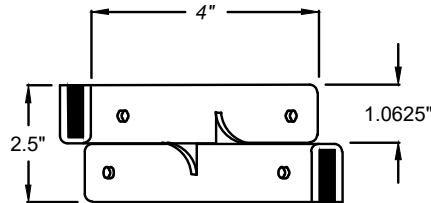
11:05



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CAP WITH BLADE BRACKET



NOTE

1. ALL STREET NAME SIGNS ARE SUBJECT TO APPROVAL BY THE CITY ENGINEER.
2. BLADES SHALL BE .080" THICK EXTRUDED ALUMINUM 6063T5 OR 6063T6 ALLOY WITH A THICKENED EDGE.
3. CAP SHALL BE DIE CAST AND POLISHED ALUMINUM #380 ALLOY, OR APPROVED EQUAL, SLOTTED FOR .25" EXTRUDED BLADE. CAP SHALL BE TAPPED TO RECEIVE AND INCLUDE 2 STAINLESS STEEL SET SCREWS FOR BLADE MOUNTING. SET SCREWS TO HAVE ALLEN HEADS.
4. BLADE SPACER BRACKET SHALL MEET SAME SPECIFICATIONS AS THE CAP WITH 2 SCREWS TO EACH BLADE MOUNTING.
5. THE FACE OF ALL BLADES SHALL MEET RETROREFLECTIVITY REQUIREMENTS TO SHOW THE SAME SHAPE AND SIMILAR COLOR BOTH DAY AND NIGHT. THE LEGEND AND BACKGROUND SHALL BE OF CONTRASTING COLORS. CITY OF GREENVILLE SIGNS SHOULD HAVE WHITE LETTERS ON A GREEN BACKGROUND.
6. PRIMARY LETTERS SHALL BE 6" HIGH UPPER CASE, FHWA SERIES B AND PREFIX/SUFFIX LETTERS SHALL BE 3" HIGH, UPPER CASE, FHWA SERIES C. FOR LOCAL ROADS WITH SPEED LIMITS OF 25 MPH OR LESS, A 6" BLADE WITH 4" HIGH PRIMARY LETTERS MAY BE USED WITH APPROVAL OF THE CITY ENGINEER.
7. BLOCK NUMBERS MAY BE PROVIDED ON SIGNS AND SHALL CORRESPOND TO OFFICIALLY APPROVED ADDRESSES. IF PROVIDED, BLOCK NUMBERS SHALL BE PLACED IN THE LOWER RIGHT CORNER AND SHALL BE 3" HIGH, FHWA SERIES C.
8. ALL MATERIALS TO BE APPLIED TO A PREPARED ALUMINUM BLADE THAT HAS BEEN CLEANED AND ALL FOREIGN MATERIAL REMOVED.
9. LETTERS, NUMBERS AND SPACING SHALL CONFORM TO THE LATEST EDITION OF THE STANDARD HIGHWAY SIGNS BOOK AND THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
10. ALL STREET NAME SIGNS SHALL BE INSTALLED PER THE SPECIFICATIONS OF THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES. LOCATIONS ARE TO BE APPROVED BY THE CITY ENGINEER PRIOR TO INSTALLATION.



STREET NAME SIGN

DATE APPROVED: **JAN. 2023**

OFFICE OF THE CITY ENGINEER:

APPROVED

SCALE:
NO SCALE
DETAIL :

12:00

NOTE

1. THE WIDTH AND SHAPE OF THE MEDIAN SHALL BE DESIGNATED ON THE PLANS.

2. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION INSPECTION BUREAU AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE. THE CITY WILL INSPECT BASE, FORMS, GRADE AND ALIGNMENT.

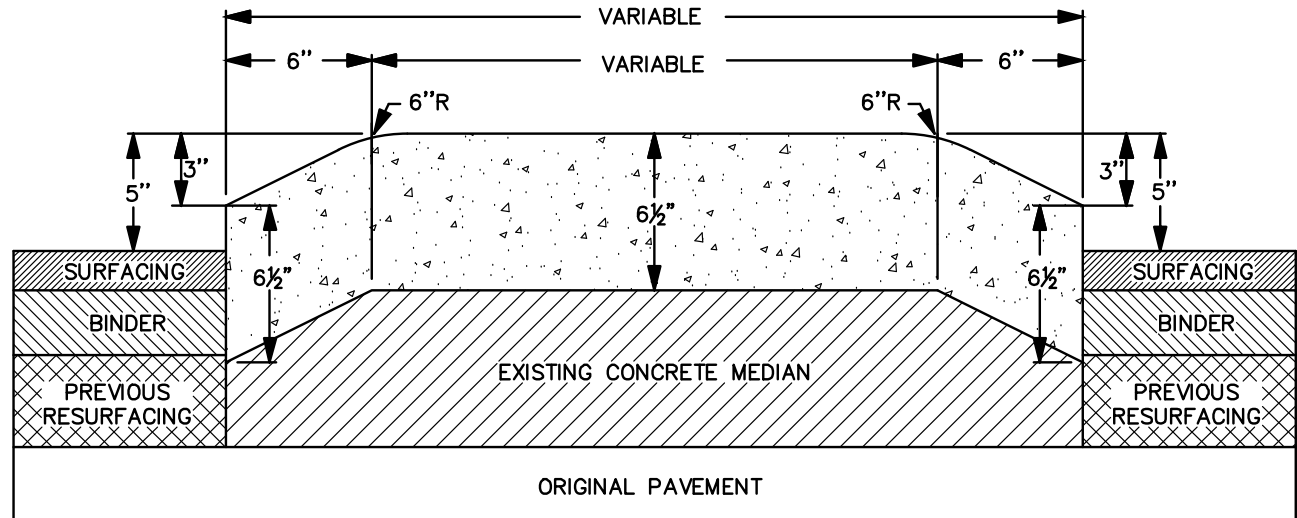
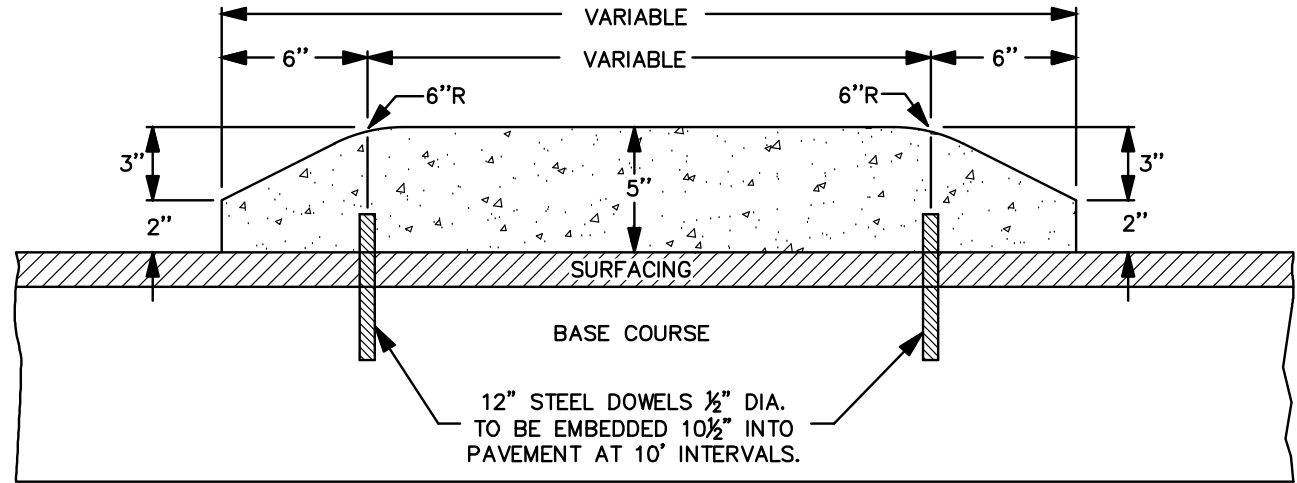
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4. CONCRETE MEDIAN SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 720.4 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.

5. EXPANSION JOINTS, ½ INCH THICK, SHALL BE PLACED IN THE MEDIAN ADJACENT TO EXISTING OR NEW PAVEMENT & STRUCTURES AND AT UNIFORM INTERVALS OF NOT MORE THAN 50 FEET. EXPANSION JOINTS SHALL MEET SCDOT SPECIFICATION SECTION 702.2.2.1.

6. TRANSVERSE SCORING LINES (CONTRACTION JOINTS) IN THE MEDIAN SHALL BE PLACED BETWEEN EXPANSION JOINTS AT UNIFORM INTERVALS OF NOT MORE THAN 25 FEET.

7. CONTRACTION JOINTS SHALL BE AT A DEPTH OF NOT LESS THAN A QUARTER OF THE MEDIAN DEPTH (1¼" TYPICAL) AND NOT LESS THAN ¼ INCH OR MORE THAN ½ INCH IN WIDTH. THE CORNERS OF THE SCORING LINES SHALL HAVE A ½ INCH MINIMUM RADII.



CONCRETE MEDIAN

DATE APPROVED: JAN. 2023

OFFICE OF THE
CITY ENGINEER:

APPROVED

SCALE:
NO SCALE
DETAIL :

12:01

NOTE

1. THE WIDTH AND SHAPE OF THE MEDIAN SHALL BE DESIGNATED ON THE PLANS.

2. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION INSPECTION BUREAU AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE. THE CITY WILL INSPECT BASE, FORMS, GRADE AND ALIGNMENT.

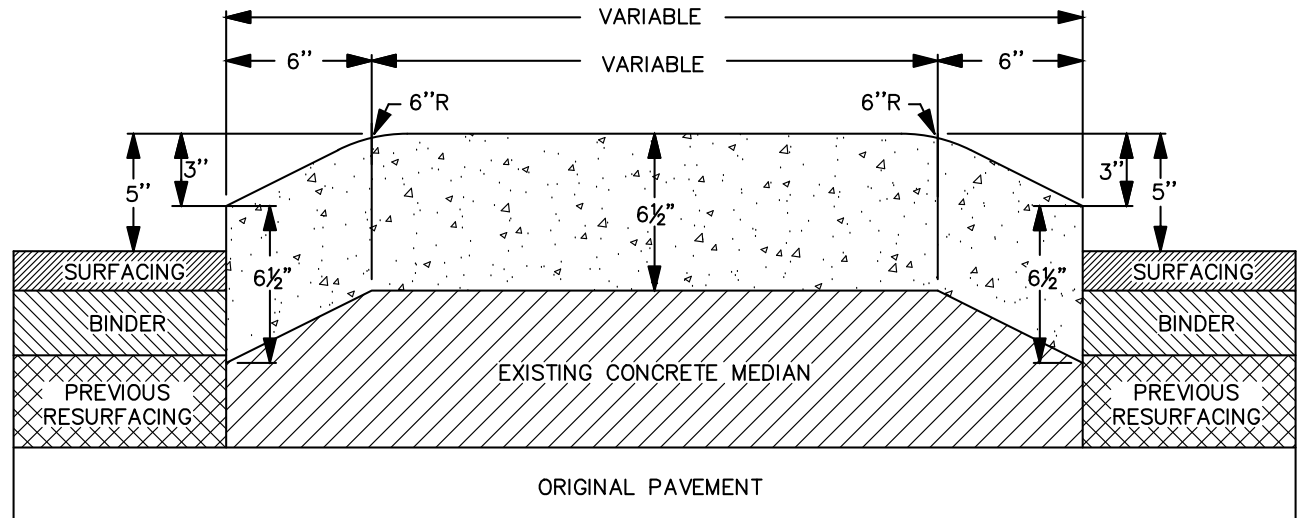
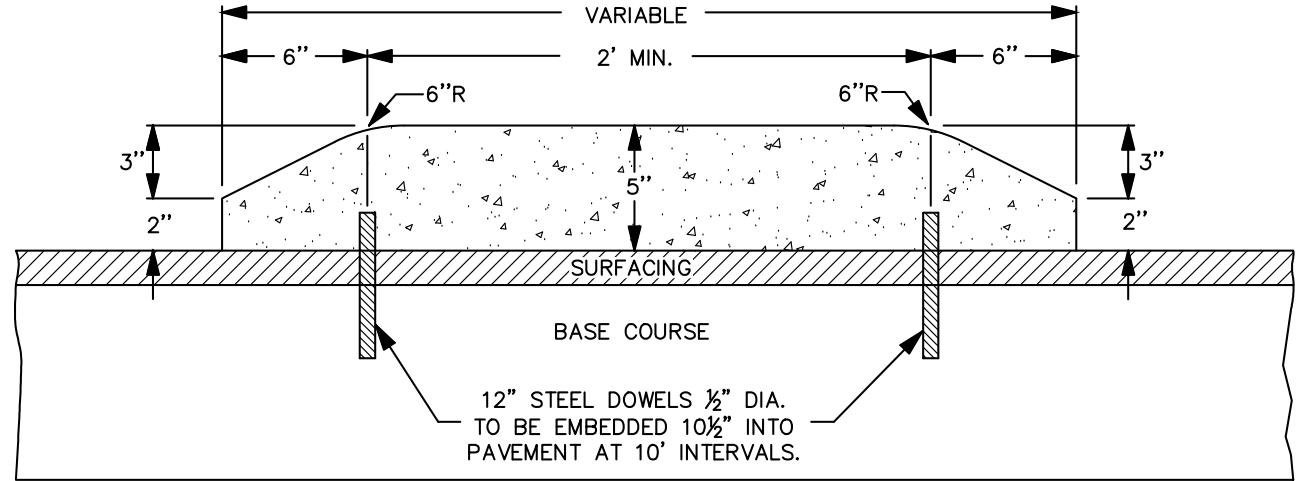
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4. CONCRETE MEDIAN SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 720.4 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.

5. EXPANSION JOINTS, ½ INCH THICK, SHALL BE PLACED IN THE MEDIAN ADJACENT TO EXISTING OR NEW PAVEMENT & STRUCTURES AND AT UNIFORM INTERVALS OF NOT MORE THAN 50 FEET. EXPANSION JOINTS SHALL MEET SCDOT SPECIFICATION SECTION 702.2.2.1.

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7. CONTRACTION JOINTS SHALL BE AT A DEPTH OF NOT LESS THAN A QUARTER OF THE MEDIAN DEPTH (1¼" TYPICAL) AND NOT LESS THAN ¼ INCH OR MORE THAN ½ INCH IN WIDTH. THE CORNERS OF THE SCORING LINES SHALL HAVE A ½ INCH MINIMUM RADII.



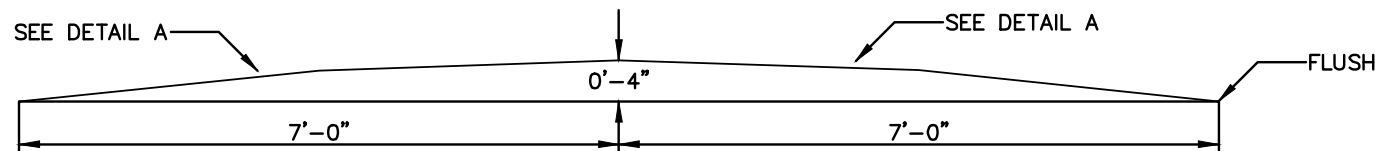
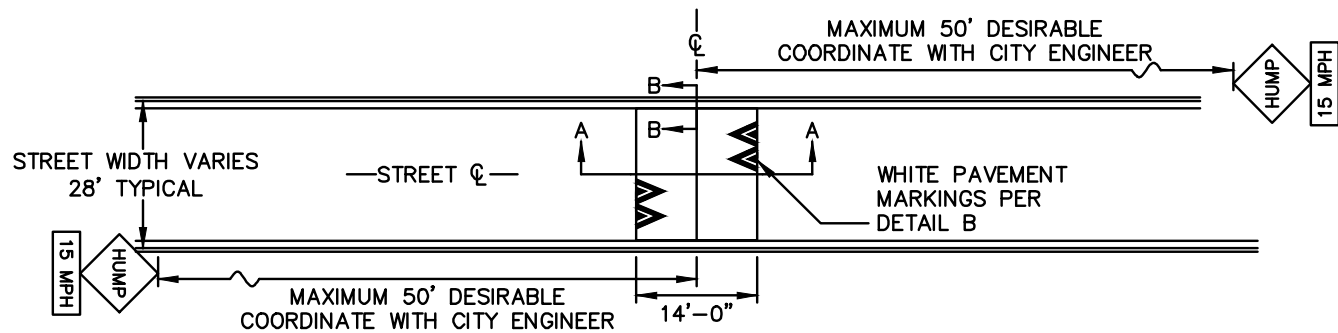
CONCRETE MEDIAN

DATE APPROVED: **OCT. 2023**

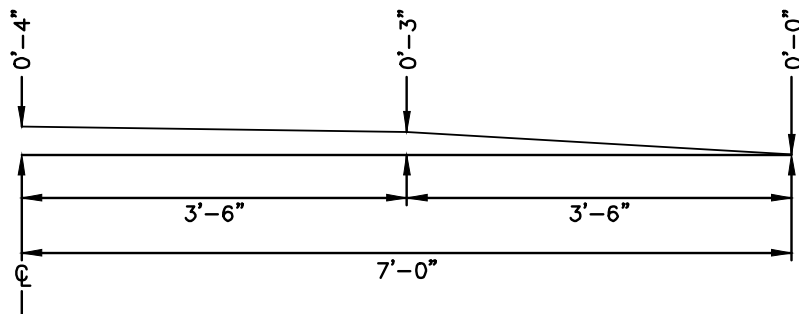
OFFICE OF THE
CITY ENGINEER:

SCALE:
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DETAIL :

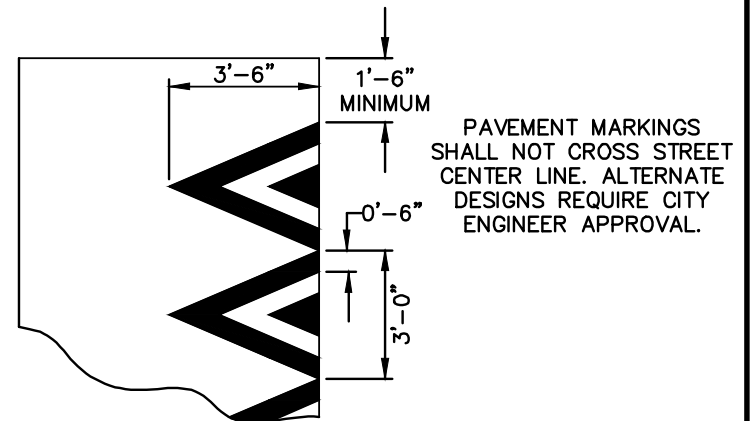
12:01



SECTION A-A



DETAIL A



DETAIL B - WHITE PAVEMENT MARKINGS



SPEED HUMP

DATE APPROVED: JAN. 2023

OFFICE OF THE
CITY ENGINEER:

APPROVED

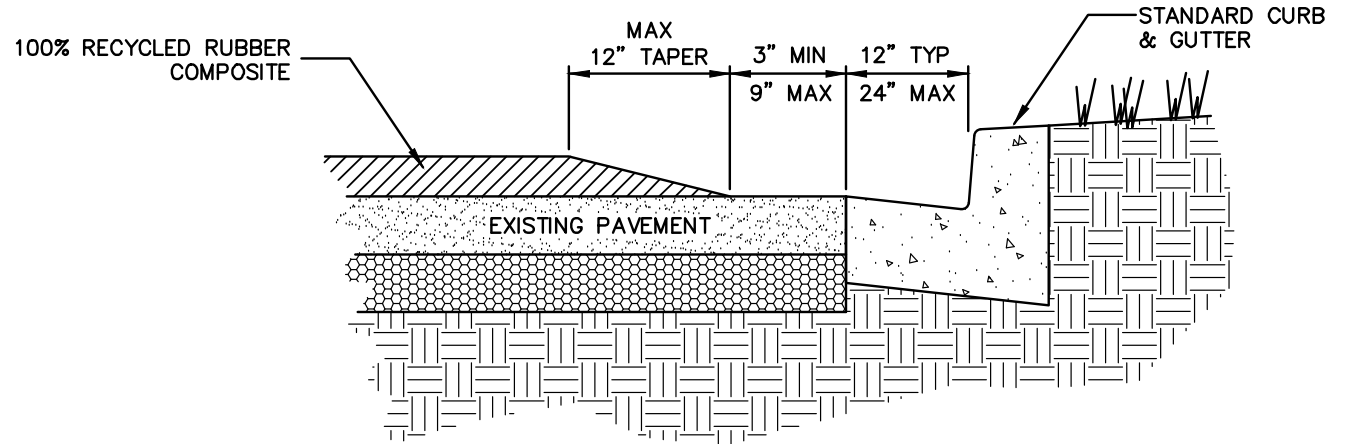
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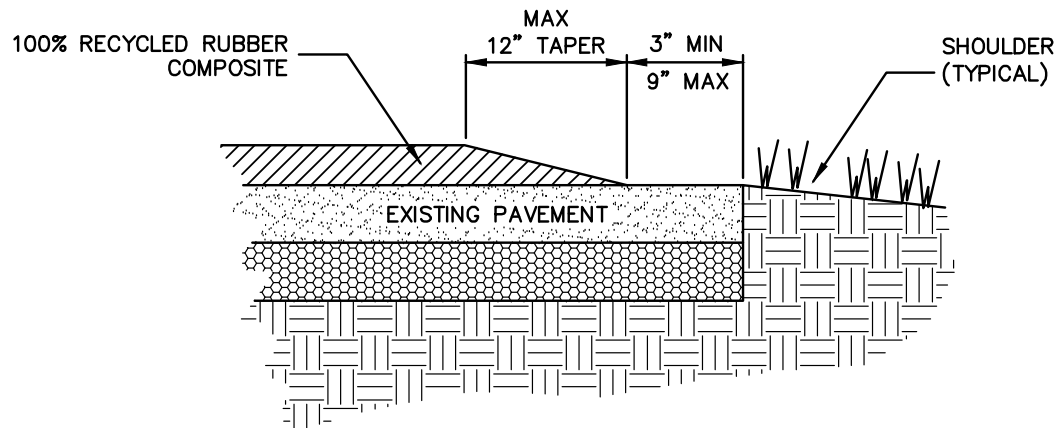
12:02

SHEET 1 OF 2

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SECTION B-B: TYPICAL EDGE TREATMENT



SECTION B-B: ALTERNATE EDGE TREATMENT FOR STREETS WITHOUT CURB & GUTTER

NOTE

1. ALL SIGNAGE AND PAVEMENT MARKINGS SHALL MEET MUTCD REGULATIONS AND MUST BE APPROVED BY THE CITY ENGINEER PRIOR TO INSTALLATION.



SPEED HUMP

DATE APPROVED: **JAN. 2023**

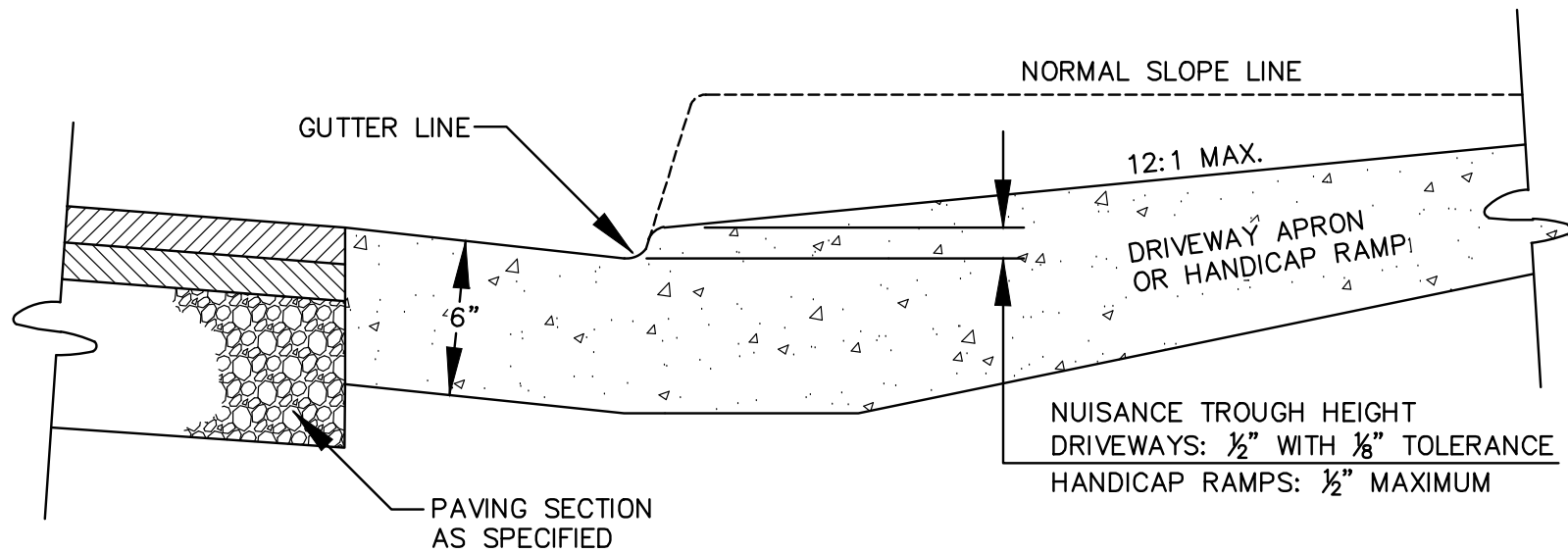
OFFICE OF THE CITY ENGINEER:

APPROVED

SCALE:
NO SCALE

DETAIL:

12:02
SHEET 2 OF 2



NOTE

1. INSTALLATION OF NUISANCE TROUGH ONLY WHEN DIRECTED BY CITY ENGINEER.
2. ON HANDICAP RAMPS, VERTICAL DISCONTINUITIES BETWEEN $\frac{1}{4}$ " AND $\frac{1}{2}$ " MAXIMUM SHALL BE BEVELED AT 2:1 MINIMUM. THE BEVEL SHALL BE APPLIED ACROSS THE ENTIRE LEVEL CHANGE.
3. DRIVEWAY APRON AND HANDICAP RAMP PER CITY OF GREENVILLE DETAIL.
4. CONCRETE SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.



NUISANCE TROUGH

DATE APPROVED: JAN. 2023

OFFICE OF THE CITY ENGINEER:

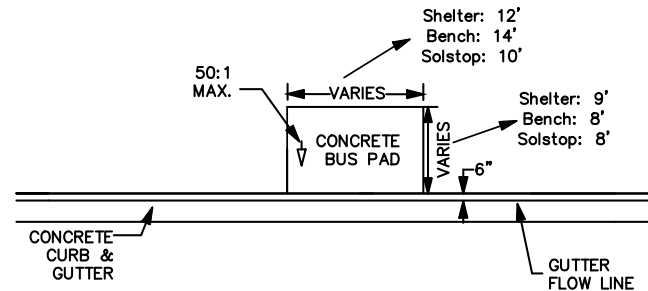
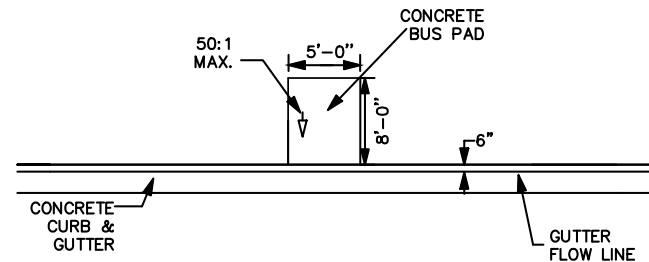
APPROVED

SCALE:
NO SCALE
DETAIL :

12:03

NOTE

1. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION INSPECTION BUREAU AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE. THE CITY WILL INSPECT SUBGRADE, FORMS, GRADE AND ALIGNMENT.
2. BUS STOPS TO BE CONSTRUCTED WHERE APPROVED BY THE CITY ENGINEER.
3. BUS PAD TO BE DIMENSIONED BASED ON AMENITY TYPE.
4. BUS STOP SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 720.4 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. DRIVE SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.
5. BUS STOPS TO HAVE SCORING LINES (CONTRACTION JOINTS) AND $\frac{1}{2}$ " EXPANSION JOINTS WHERE SHOWN.
6. LANDING PAD SHALL BE A MINIMUM OF 5' WIDE.
7. EXPANSION JOINTS SHALL MEET SCDOT SPECIFICATION SECTION 702.2.2.1. TRANSVERSE AND LONGITUDINAL CONTRACTION JOINTS SHALL BE A DEPTH OF 1" AND NOT LESS THAN $\frac{1}{4}$ " OR MORE THAN $\frac{1}{2}$ " IN WIDTH. THE CORNERS OF THE SCORING LINES SHALL HAVE A $\frac{1}{2}$ INCH MINIMUM RADII.
8. WHERE ANY PORTION OF THE ADJACENT ROADWAY MUST BE RECONSTRUCTED, ROADWAY SURFACE SHALL BE SAWCUT STRAIGHT AND SMOOTH TO A DEPTH OF NO LESS THAN 2". THE ENTIRE SECTION SHALL BE REMOVED AND PATCHED AS DIRECTED BY THE CITY ENGINEER. IF THE REMOVED SECTION IS LESS THAN 12" IN WIDTH, CONCRETE SHALL BE USED AS A BASE COURSE AND THEN CAPPED WITH A 2" ASPHALT OVERLAY.
9. SIDEWALK AND CURB REPLACEMENT PER CITY OF GREENVILLE DETAILS.
10. BUS PAD SLOPE SHALL BE NO STEEPER THAN 8.33% OR ROADWAY SLOPE IN THE DIRECTION PARALLEL TO THE ROADWAY, WHICHEVER IS GREATER.
11. CUT/FILL SLOPES ADJACENT TO BUS STOP PADS SHALL BE 3:1 MAX.

AMENITY BUS STOP PLAN**BASIC BUS STOP PLAN**

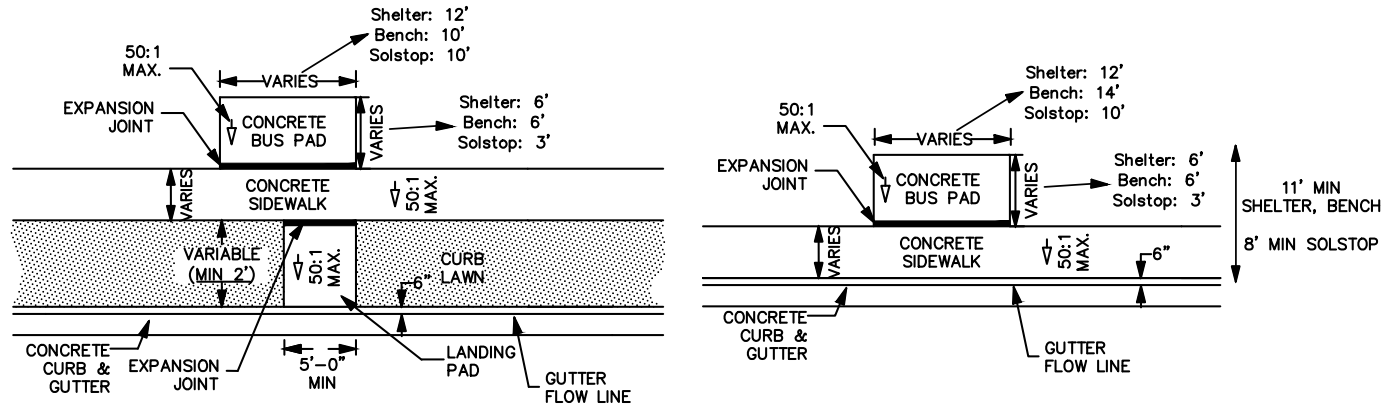
GREENLINK BUS STOP WITHOUT SIDEWALK

DATE
APPROVED:OFFICE OF THE
CITY ENGINEER:SCALE:
NO SCALE
DETAIL:12:04
SHEET 1 OF 1

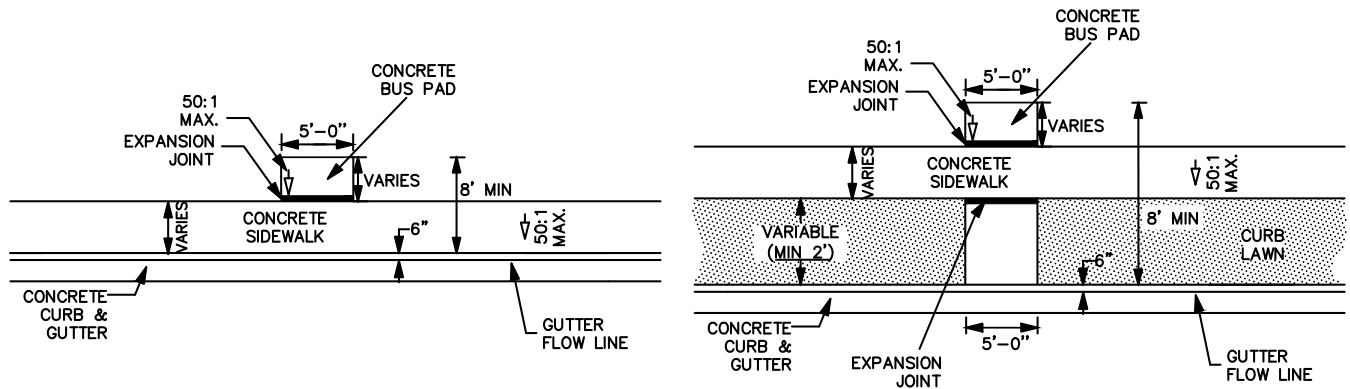
NOTE

1. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION INSPECTION BUREAU AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE. THE CITY WILL INSPECT SUBGRADE, FORMS, GRADE AND ALIGNMENT.
2. BUS STOPS TO BE CONSTRUCTED WHERE APPROVED BY THE CITY ENGINEER.
3. BUS PAD TO BE DIMENSIONED BASED ON AMENITY TYPE.
4. BUS STOP SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 720.4 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. DRIVE SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.
5. BUS STOPS TO HAVE SCORING LINES (CONTRACTION JOINTS) AND $\frac{1}{2}$ " EXPANSION JOINTS WHERE SHOWN.
6. LANDING PAD SHALL BE A MINIMUM OF 5' WIDE.
7. EXPANSION JOINTS SHALL MEET SCDOT SPECIFICATION SECTION 702.2.2.1. TRANSVERSE AND LONGITUDINAL CONTRACTION JOINTS SHALL BE A DEPTH OF 1" AND NOT LESS THAN $\frac{1}{4}$ " OR MORE THAN $\frac{1}{2}$ " IN WIDTH. THE CORNERS OF THE SCORING LINES SHALL HAVE A $\frac{1}{2}$ INCH MINIMUM RADII.
8. WHERE ANY PORTION OF THE ADJACENT ROADWAY MUST BE RECONSTRUCTED, ROADWAY SURFACE SHALL BE SAWCUT STRAIGHT AND SMOOTH TO A DEPTH OF NO LESS THAN 2". THE ENTIRE SECTION SHALL BE REMOVED AND PATCHED AS DIRECTED BY THE CITY ENGINEER. IF THE REMOVED SECTION IS LESS THAN 12" IN WIDTH, CONCRETE SHALL BE USED AS A BASE COURSE AND THEN CAPPED WITH A 2" ASPHALT OVERLAY.
9. SIDEWALK AND CURB REPLACEMENT PER CITY OF GREENVILLE DETAILS.
10. BUS PAD SLOPE SHALL BE NO STEEPER THAN 8.33% OR ROADWAY SLOPE IN THE DIRECTION PARALLEL TO THE ROADWAY, WHICHEVER IS GREATER.
11. CUT/FILL SLOPES ADJACENT TO BUS STOP PADS SHALL BE 3:1 MAX.

AMENITY BUS STOP PLAN



BASIC BUS STOP PLAN



**GREENLINK BUS STOP ALONG
SIDEWALK**

DATE
APPROVED:

OFFICE OF THE
CITY ENGINEER:

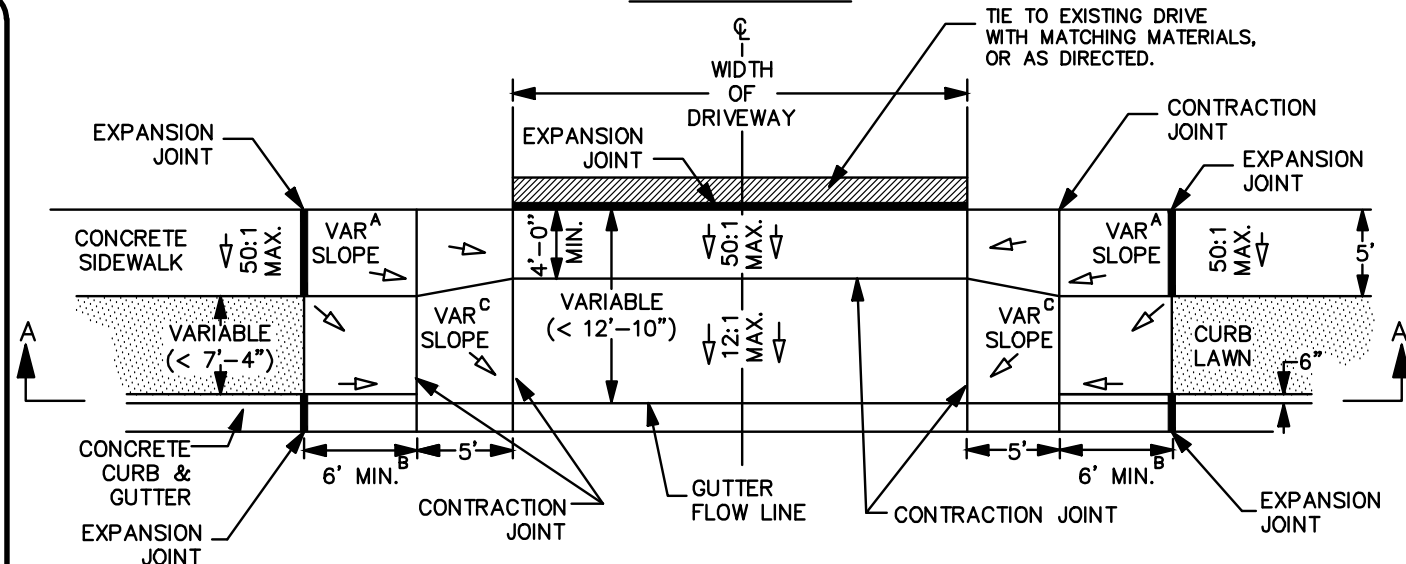
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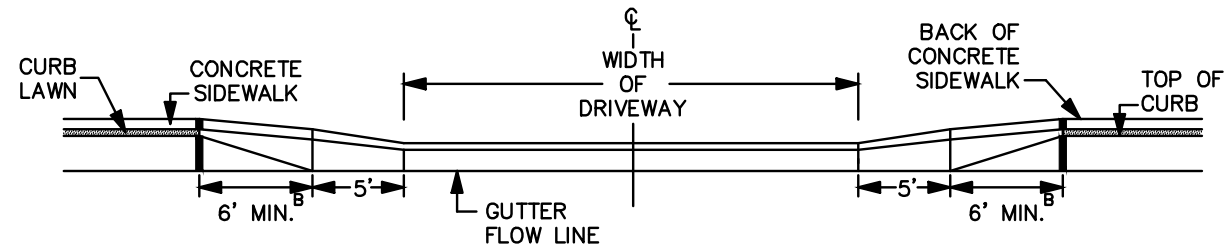
12:05
SHEET 1 OF 2

NOTE

1. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION INSPECTION BUREAU AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE. THE CITY WILL INSPECT SUBGRADE, FORMS, GRADE AND ALIGNMENT.
2. DRIVEWAYS TO BE CONSTRUCTED WHERE APPROVED BY THE CITY ENGINEER.
3. DRIVEWAY WIDTH (W) SHALL BE:
ONE WAY DRIVE: 12' TO 16'
TWO WAY DRIVE: 20' TO 40'
4. DRIVEWAY SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 720.4 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. DRIVE SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.
5. DRIVEWAY TO HAVE SCORING LINES (CONTRACTION JOINTS) AND $\frac{1}{2}$ " EXPANSION JOINTS WHERE SHOWN.
6. WHERE THE WIDTH OF A DRIVEWAY IS 15' OR GREATER, A CONTRACTION JOINT SHALL BE PLACED IN THE CENTER OF THE DRIVE. IF THE WIDTH EXCEEDS 30 FEET, TWO (2) UNIFORMLY SPACED JOINTS SHALL BE USED.
7. EXPANSION JOINTS SHALL MEET SCDOT SPECIFICATION SECTION 702.2.2.1. TRANSVERSE AND LONGITUDINAL CONTRACTION JOINTS SHALL BE A DEPTH OF 1" AND NOT LESS THAN $\frac{1}{4}$ " OR MORE THAN $\frac{1}{2}$ " IN WIDTH. THE CORNERS OF THE SCORING LINES SHALL HAVE A $\frac{1}{2}$ INCH MINIMUM RADII.
8. WHERE ANY PORTION OF THE ADJACENT ROADWAY MUST BE RECONSTRUCTED, ROADWAY SURFACE SHALL BE SAWCUT STRAIGHT AND SMOOTH TO A DEPTH OF NO LESS THAN 2". THE ENTIRE SECTION SHALL BE REMOVED AND PATCHED AS DIRECTED BY THE CITY ENGINEER. IF THE REMOVED SECTION IS LESS THAN 12" IN WIDTH, CONCRETE SHALL BE USED AS A BASE COURSE AND THEN CAPPED WITH A 2" ASPHALT OVERLAY.
9. SIDEWALK AND CURB REPLACEMENT PER CITY OF GREENVILLE DETAILS.
10. GUTTER LINE TYPICALLY INSTALLED WITH SMOOTH TRANSITION AS SHOWN. INSTALLATION OF A NUISANCE TROUGH, PER STANDARD DETAIL, MAY BE REQUIRED AT THE DIRECTION OF THE CITY ENGINEER.

DRIVEWAY PLAN**FOOTNOTES:**

- A. SIDEWALKS ARE TO BE CONSTRUCTED ON A 50:1 MAX. CROSS SLOPE. THE SIDE SLOPES OF THE RAMP ARE NOT TO EXCEED 12:1 AT ANY LOCATION WHERE PEDESTRIAN TRAFFIC CROSSES THE RAMP.
- B. 6' MINIMUM LENGTH ONLY APPLIES IF THE CURB LINE IS ON A 0% GRADE. LENGTH OF TAPER WILL VARY BY THE SLOPE OF THE ROADWAY. MAXIMUM SLOPE OF CURB TAPER SHALL BE 12:1.
- C. THE FLARED SLOPE IN THE SIDEWALK ON EITHER SIDE OF THE DRIVEWAY MAY REQUIRE MODIFICATION DUE TO ELEVATION DIFFERENCES BETWEEN THE CURB AND THE SIDEWALK. MAXIMUM SLOPE SHALL BE 12:1.

SECTION A-A

COMMERCIAL DRIVEWAY I

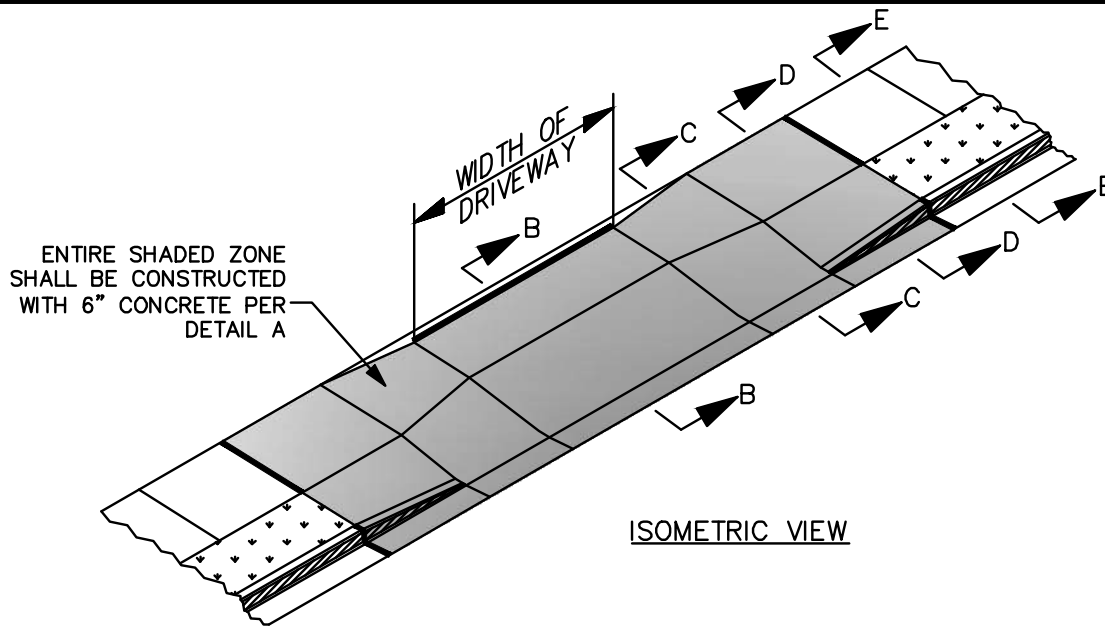
CURB LAWN LESS THAN 7'-4"

DATE APPROVED: JAN. 2023

OFFICE OF THE CITY ENGINEER:

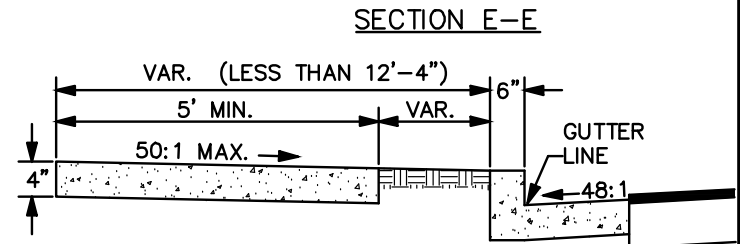
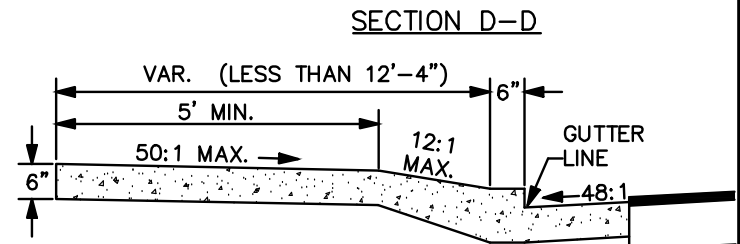
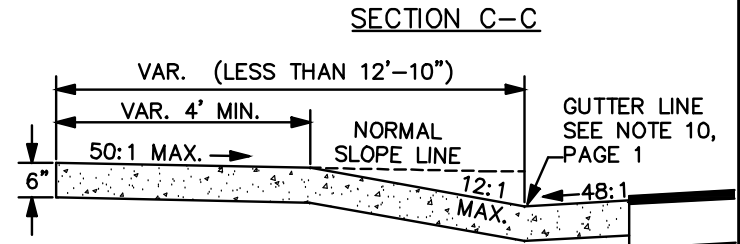
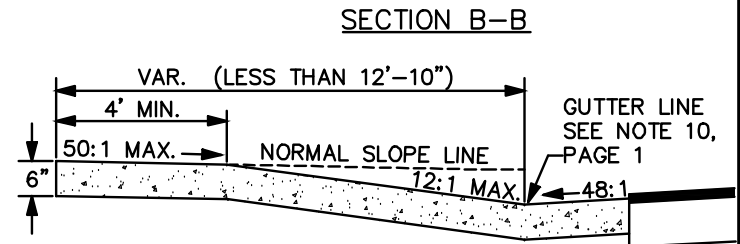
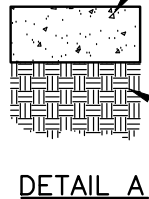
APPROVED

SCALE:
NO SCALE
DETAIL:13:00
SHEET 1 OF 2



ENTIRE SHADED ZONE SHALL BE CONSTRUCTED WITH 6" CONCRETE PER DETAIL A

- 6" CONCRETE APRON**
1. CONCRETE SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.
 2. DRIVEWAY APRON SHALL BE POURED MONOLITHICALLY FROM BACK OF SIDEWALK TO FACE OF GUTTER.
- SUBGRADE**
1. THE SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95 PERCENT OF THE STANDARD PROCTOR DENSITY, FINISHED TO A SMOOTH, FIRM SURFACE, AND SHALL BE MOIST AT THE TIME THE CONCRETE IS PLACED.
 2. THE CONTRACTOR SHALL UNDERCUT AND REPLACE UNSUITABLE SOIL WITH COMPACTED AGGREGATE BASE COURSE MEETING SCDOT STANDARD SPECIFICATION 305.



COMMERCIAL DRIVEWAY I CURB LAWN LESS THAN 7'-4"

DATE APPROVED: JAN. 2023

OFFICE OF THE CITY ENGINEER:

APPROVED

SCALE:
NO SCALE

DETAIL :

13:00
SHEET 2 OF 2

1. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION INSPECTION BUREAU AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE. THE CITY WILL INSPECT SUBGRADE, FORMS, GRADE AND ALIGNMENT.

3. DRIVEWAY WIDTH (W) SHALL BE:
ONE WAY DRIVE: 12' TO 16'
TWO WAY DRIVE: 20' TO 40'

5. DRIVEWAY TO HAVE SCORING LINES
(CONTRACTION JOINTS) AND 1/2" EXPANSION
JOINTS WHERE SHOWN.

7. EXPANSION JOINTS SHALL MEET SCDOT SPECIFICATION SECTION 702.2.2.1. TRANSVERSE AND LONGITUDINAL CONTRACTION JOINTS SHALL BE A DEPTH OF 1" AND NOT LESS THAN 1/4" OR MORE THAN 1/2" IN WIDTH. THE CORNERS OF THE SCORING LINES SHALL HAVE A 1/2 INCH MINIMUM RADII.

9. SIDEWALK AND CURB REPLACEMENT PER CITY OF GREENVILLE DETAILS.

10. GUTTER LINE TYPICALLY INSTALLED WITH SMOOTH TRANSITION AS SHOWN. INSTALLATION OF A NUISANCE TROUGH, PER STANDARD DETAIL, MAY BE REQUIRED AT THE DIRECTION OF THE CITY ENGINEER.

[illegible]

A. SIDEWALKS ARE TO BE CONSTRUCTED ON A 50:1 MAX. CROSS SLOPE. IT SHOULD NOT BE NECESSARY TO RAMP THE SIDEWALK AT THE DRIVE. IN NO CASE SHALL THE SIDE SLOPES OF A RAMP EXCEED 12:1 AT ANY LOCATION WHERE PEDESTRIAN TRAFFIC CROSSES THE RAMP.

C. THE FLARED SLOPE IN THE SIDEWALK ON EITHER SIDE OF THE DRIVEWAY MAY REQUIRE MODIFICATION DUE TO ELEVATION DIFFERENCES BETWEEN THE CURB AND THE SIDEWALK. MAXIMUM SLOPE SHALL BE 12:1.

The diagram illustrates a cross-section of a driveway and its surrounding areas. Key components and dimensions include:

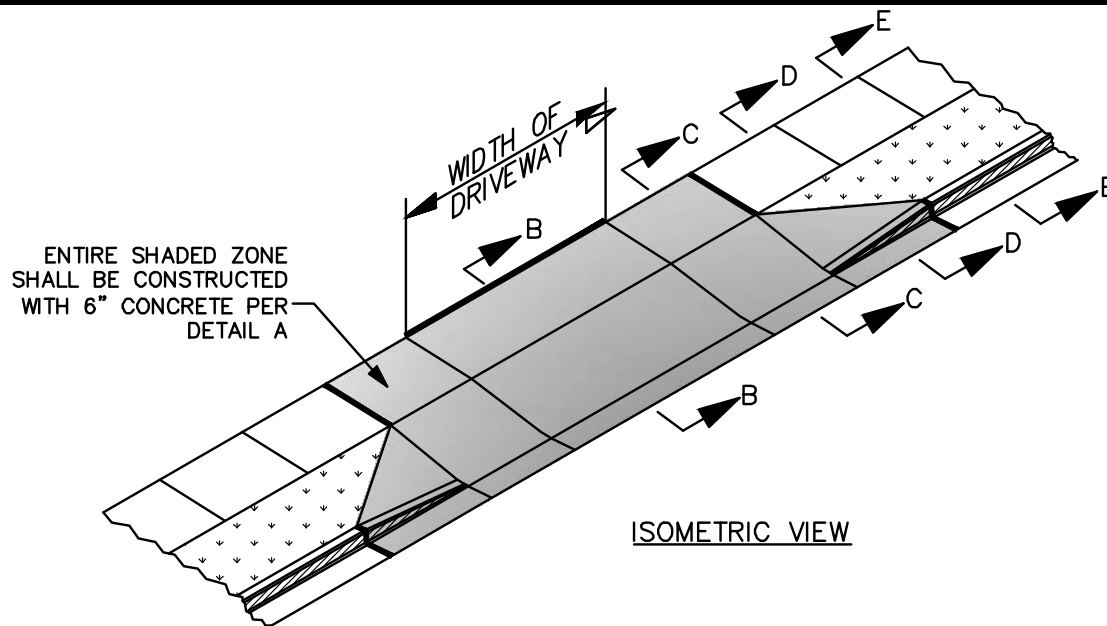
- DRIVEWAY:** The central paved area, with a centerline marked by a vertical line and the label "WIDTH OF DRIVEWAY".
- GUTTER FLOW LINE:** Indicated by an upward arrow pointing to the edge of the driveway.
- CONCRETE SIDEWALK:** Located on both sides of the driveway, with a sloped transition from the driveway edge.
- CURB LAWN:** The area beyond the concrete sidewalk, shown with a hatched pattern.
- BACK OF CONCRETE SIDEWALK:** The outer edge of the sidewalk.
- TOP OF CURB:** The top edge of the concrete curb.
- Dimensions:**
 - A minimum width of **6' MIN.** is specified for the concrete sidewalk on each side.
 - A **5'** dimension is shown between the gutter flow line and the back of the concrete sidewalk.



DATE APPROVED: JAN. 2023

APPROVED

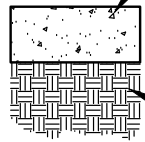
SHEET 1 OF 2



6" CONCRETE APRON

1. CONCRETE SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SCDOT SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.

2. DRIVEWAY APRON SHALL BE POURED MONOLITHICALLY FROM BACK OF SIDEWALK TO FACE OF GUTTER.



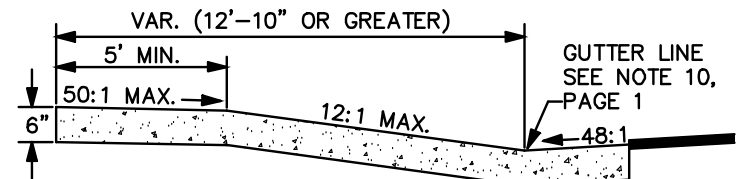
DETAIL A

SUBGRADE

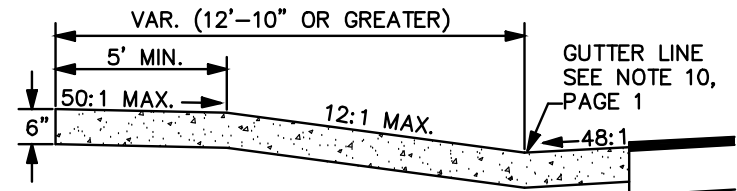
1. THE SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95 PERCENT OF THE STANDARD PROCTOR DENSITY, FINISHED TO A SMOOTH, FIRM SURFACE, AND SHALL BE MOIST AT THE TIME THE CONCRETE IS PLACED.

2. THE CONTRACTOR SHALL UNDERCUT AND REPLACE UNSUITABLE SOIL WITH COMPACTED AGGREGATE BASE COURSE MEETING SCDOT STANDARD SPECIFICATION 305.

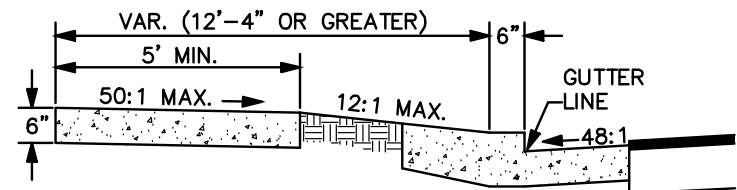
SECTION B-B



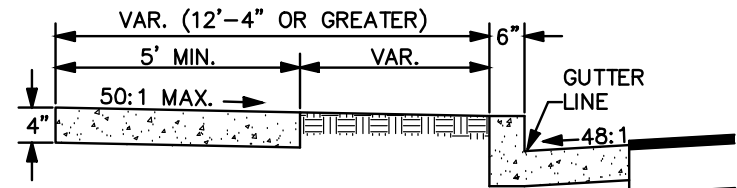
SECTION C-C



SECTION D-D



SECTION E-E



ENGINEERING DIVISION

COMMERCIAL DRIVEWAY II CURB LAWN 7'-4" OR GREATER

DATE APPROVED: JAN. 2023

OFFICE OF THE
CITY ENGINEER:

APPROVED

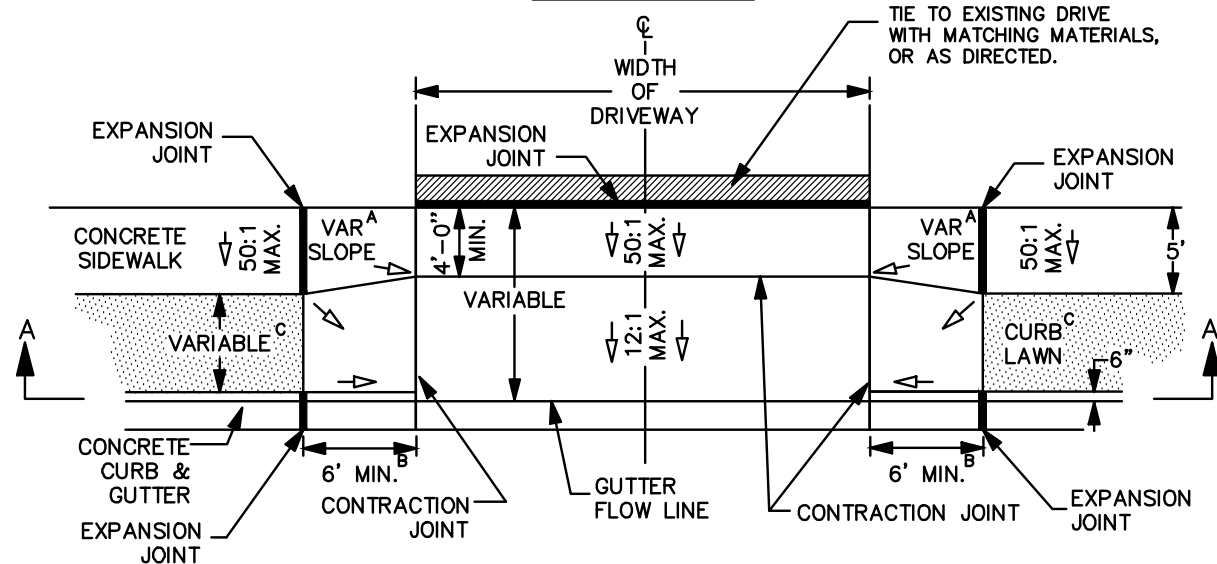
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DETAIL:

13:01
SHEET 2 OF 2

NOTE

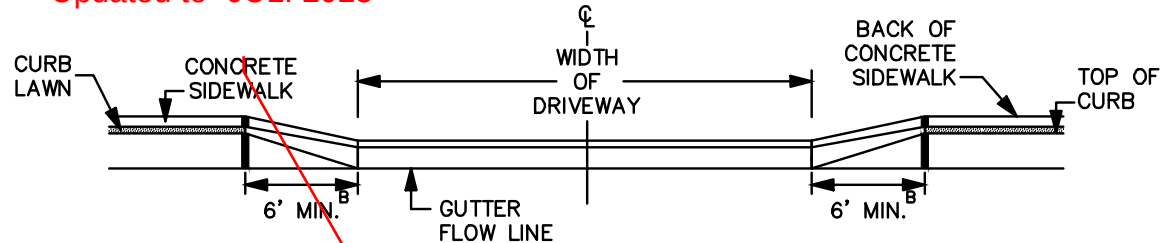
1. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION INSPECTION BUREAU AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE. THE CITY WILL INSPECT SUBGRADE, FORMS, GRADE AND ALIGNMENT.
2. DRIVEWAYS TO BE CONSTRUCTED WHERE APPROVED BY THE CITY ENGINEER.
3. DRIVEWAY WIDTH (W) SHALL BE 10' MIN. TO 24' MAX.
4. DRIVEWAY SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 720.4 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. DRIVE SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.
5. DRIVEWAY TO HAVE SCORING LINES (CONTRACTION JOINTS) AND $\frac{1}{2}$ " EXPANSION JOINTS WHERE SHOWN.
6. WHERE THE WIDTH OF A DRIVEWAY IS 15' OR GREATER, A CONTRACTION JOINT SHALL BE PLACED IN THE CENTER OF THE DRIVE. IF THE WIDTH EXCEEDS 30 FEET, TWO (2) UNIFORMLY SPACED JOINTS SHALL BE USED.
7. EXPANSION JOINTS SHALL MEET SCDOT SPECIFICATION SECTION 702.2.2.1. TRANSVERSE AND LONGITUDINAL CONTRACTION JOINTS SHALL BE A DEPTH OF 1" AND NOT LESS THAN $\frac{1}{4}$ " OR MORE THAN $\frac{1}{2}$ " IN WIDTH. THE CORNERS OF THE SCORING LINES SHALL HAVE A $\frac{1}{2}$ INCH MINIMUM RADII.
8. WHERE ANY PORTION OF THE ADJACENT ROADWAY MUST BE RECONSTRUCTED, ROADWAY SURFACE SHALL BE SAWCUT STRAIGHT AND SMOOTH TO A DEPTH OF NO LESS THAN 2". THE ENTIRE SECTION SHALL BE REMOVED AND PATCHED AS DIRECTED BY THE CITY ENGINEER. IF THE REMOVED SECTION IS LESS THAN 12" IN WIDTH, CONCRETE SHALL BE USED AS A BASE COURSE AND THEN CAPPED WITH A 2" ASPHALT OVERLAY.
9. SIDEWALK AND CURB REPLACEMENT PER CITY OF GREENVILLE DETAILS.
10. GUTTER LINE TYPICALLY INSTALLED WITH SMOOTH TRANSITION AS SHOWN. INSTALLATION OF A NUISANCE TROUGH, PER STANDARD DETAIL, MAY BE REQUIRED AT THE DIRECTION OF THE CITY ENGINEER.

DRIVEWAY PLAN**FOOTNOTES:**

- A. SIDEWALKS ARE TO BE CONSTRUCTED ON A 50:1 MAX. CROSS SLOPE. THE SIDE SLOPES OF THE RAMP ARE NOT TO EXCEED 12:1 AT ANY LOCATION WHERE PEDESTRIAN TRAFFIC CROSSES THE RAMP.
- B. 6' MINIMUM LENGTH ONLY APPLIES IF THE CURB LINE IS ON A 0% GRADE. LENGTH OF TAPER WILL VARY BY THE SLOPE OF THE ROADWAY. MAXIMUM SLOPE OF CURB TAPER SHALL BE 12:1.
- C. ON NEW STREETS, THE MINIMUM CURB LAWN SHALL BE IN ACCORDANCE WITH THE APPLICABLE STREET SECTION. ALONG THE FRONTAGE OF EXISTING STREETS, THE MINIMUM CURB LAWN WIDTH SHALL BE IN ACCORDANCE WITH THE PREVAILING LAWN WIDTH OR THE WIDTH ASSOCIATED WITH THE STREET CLASSIFICATION, AT THE DISCRETION OF THE CITY ENGINEER. IN RESTRICTED CONDITIONS, THE MINIMUM CURB LAWN WIDTH SHALL BE 2'-6".

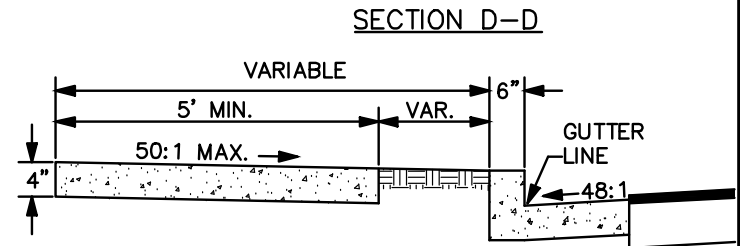
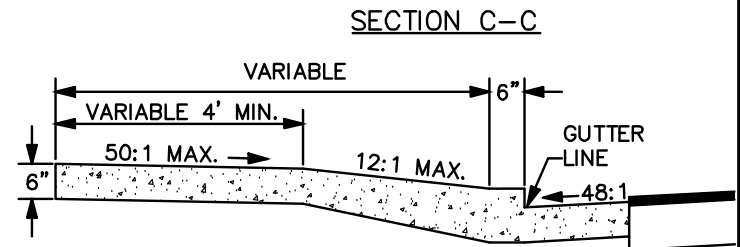
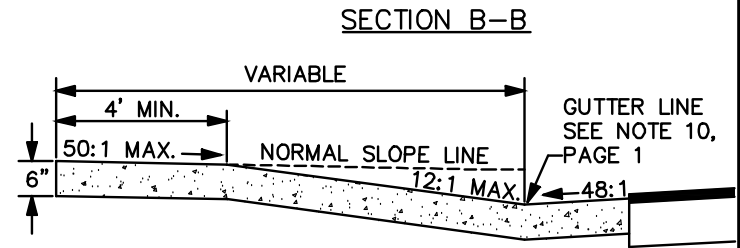
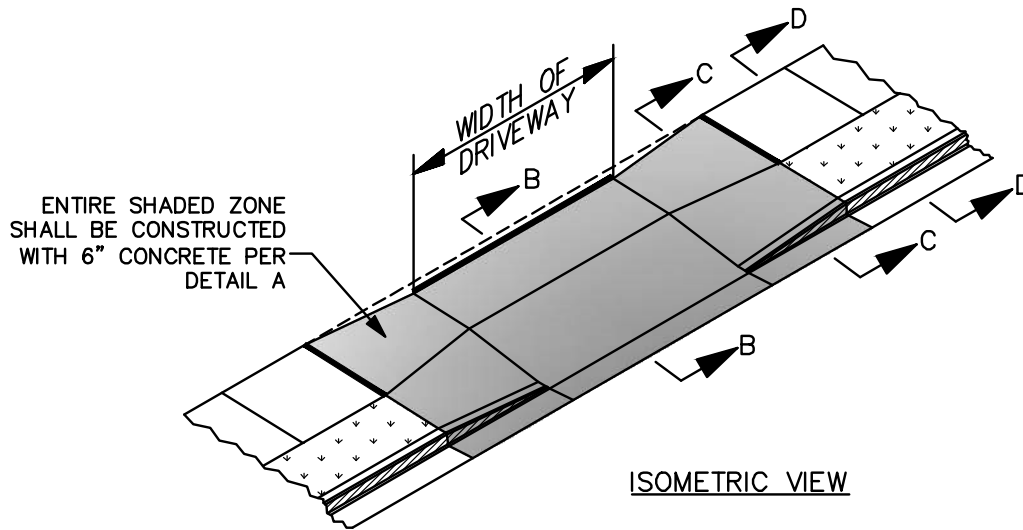
SECTION A-A

Updated to "JUL. 2025"

**RESIDENTIAL DRIVEWAY**DATE APPROVED: **JAN. 2023**

OFFICE OF THE CITY ENGINEER:

APPROVEDSCALE:
NO SCALE
DETAIL:**13:02**
SHEET 1 OF 2



- 6" CONCRETE APRON**
1. CONCRETE SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.
 2. DRIVEWAY APRON SHALL BE POURED MONOLITHICALLY FROM BACK OF SIDEWALK TO FACE OF GUTTER.
- SUBGRADE**
1. THE SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95 PERCENT OF THE STANDARD PROCTOR DENSITY, FINISHED TO A SMOOTH, FIRM SURFACE, AND SHALL BE MOIST AT THE TIME THE CONCRETE IS PLACED.
 2. THE CONTRACTOR SHALL UNDERCUT AND REPLACE UNSUITABLE SOIL WITH COMPACTED AGGREGATE BASE COURSE MEETING SCDOT STANDARD SPECIFICATION 305.
- DETAIL A

Updated to "JUL. 2025"



RESIDENTIAL DRIVEWAY

DATE APPROVED: ~~JAN. 2023~~

OFFICE OF THE
CITY ENGINEER:

APPROVED

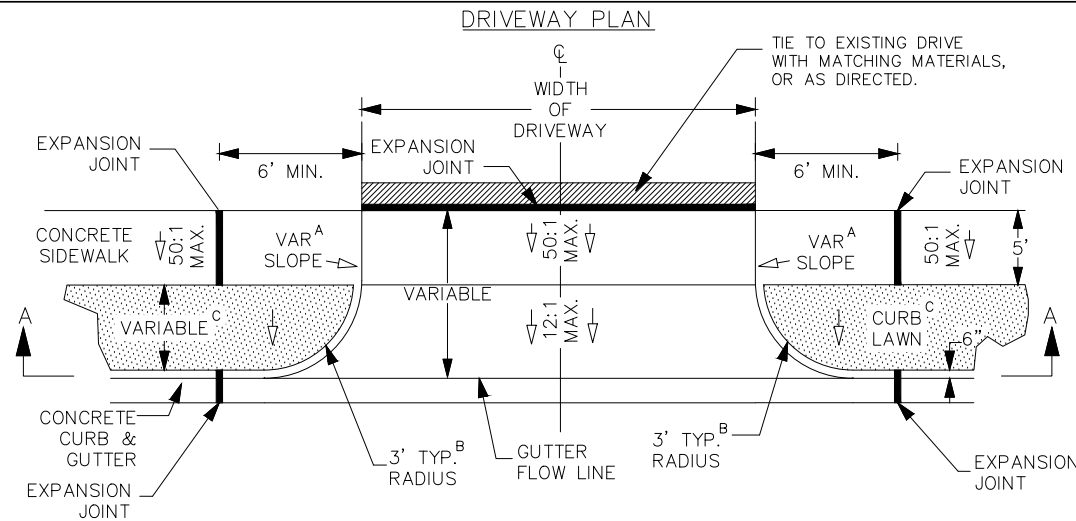
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DETAIL :

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SHEET 2 OF 2

NOTE

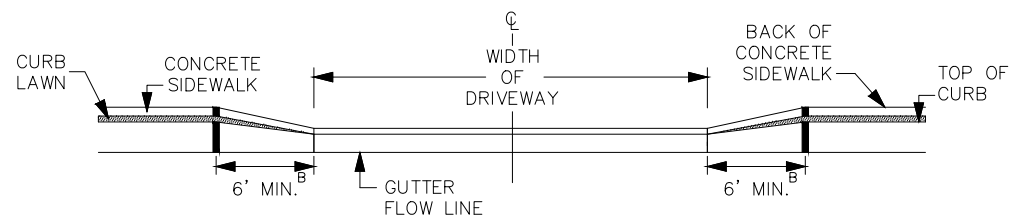
1. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION INSPECTION BUREAU AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE. THE CITY WILL INSPECT SUBGRADE, FORMS, GRADE AND ALIGNMENT.
2. DRIVEWAYS TO BE CONSTRUCTED WHERE APPROVED BY THE CITY ENGINEER.
3. DRIVEWAY WIDTH (W) SHALL BE 10' MIN. TO 24' MAX.
4. DRIVEWAY SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 720.4 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. DRIVE SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.
5. DRIVEWAY TO HAVE SCORING LINES (CONTRACTION JOINTS) AND $\frac{1}{2}$ " EXPANSION JOINTS WHERE SHOWN.
6. WHERE THE WIDTH OF A DRIVEWAY IS 15' OR GREATER, A CONTRACTION JOINT SHALL BE PLACED IN THE CENTER OF THE DRIVE. IF THE WIDTH EXCEEDS 30 FEET, TWO (2) UNIFORMLY SPACED JOINTS SHALL BE USED.
7. EXPANSION JOINTS SHALL MEET SCDOT SPECIFICATION SECTION 702.2.2.1. TRANSVERSE AND LONGITUDINAL CONTRACTION JOINTS SHALL BE A DEPTH OF 1" AND NOT LESS THAN $\frac{1}{4}$ " OR MORE THAN $\frac{1}{2}$ " IN WIDTH. THE CORNERS OF THE SCORING LINES SHALL HAVE A $\frac{1}{2}$ INCH MINIMUM RADII.
8. WHERE ANY PORTION OF THE ADJACENT ROADWAY MUST BE RECONSTRUCTED, ROADWAY SURFACE SHALL BE SAWCUT STRAIGHT AND SMOOTH TO A DEPTH OF NO LESS THAN 2". THE ENTIRE SECTION SHALL BE REMOVED AND PATCHED AS DIRECTED BY THE CITY ENGINEER. IF THE REMOVED SECTION IS LESS THAN 12" IN WIDTH, CONCRETE SHALL BE USED AS A BASE COURSE AND THEN CAPPED WITH A 2" ASPHALT OVERLAY.
9. SIDEWALK AND CURB REPLACEMENT PER CITY OF GREENVILLE DETAILS.
10. GUTTER LINE TYPICALLY INSTALLED WITH SMOOTH TRANSITION AS SHOWN. INSTALLATION OF A NUISANCE TROUGH, PER STANDARD DETAIL, MAY BE REQUIRED AT THE DIRECTION OF THE CITY ENGINEER.



FOOTNOTES:

- A. SIDEWALKS ARE TO BE CONSTRUCTED ON A 50:1 MAX. CROSS SLOPE. THE SIDE SLOPES OF THE RAMP ARE NOT TO EXCEED 12:1 AT ANY LOCATION WHERE PEDESTRIAN TRAFFIC CROSSES THE RAMP.
- B. 3' TYPICAL RADIUS WIDTH TO VARY DEPENDING ON CURB LAWN WIDTH. RADIUS NOT TO BE LESS THAN 3'.
- C. ON NEW STREETS, THE MINIMUM CURB LAWN WIDTH SHALL BE IN ACCORDANCE WITH THE APPLICABLE STREET SECTION. ALONG THE FRONTAGE OF EXISTING STREETS, THE MINIMUM CURB LAWN WIDTH SHALL BE IN ACCORDANCE WITH THE PREVAILING LAWN WIDTH OR THE WIDTH ASSOCIATED WITH THE STREET CLASSIFICATION, AT THE DISCRETION OF THE CITY ENGINEER. IN RESTRICTED CONDITIONS, THE MINIMUM CURB LAWN WIDTH SHALL BE 2'-6".

SECTION A-A



**city of
greenville**
ENGINEERING DIVISION

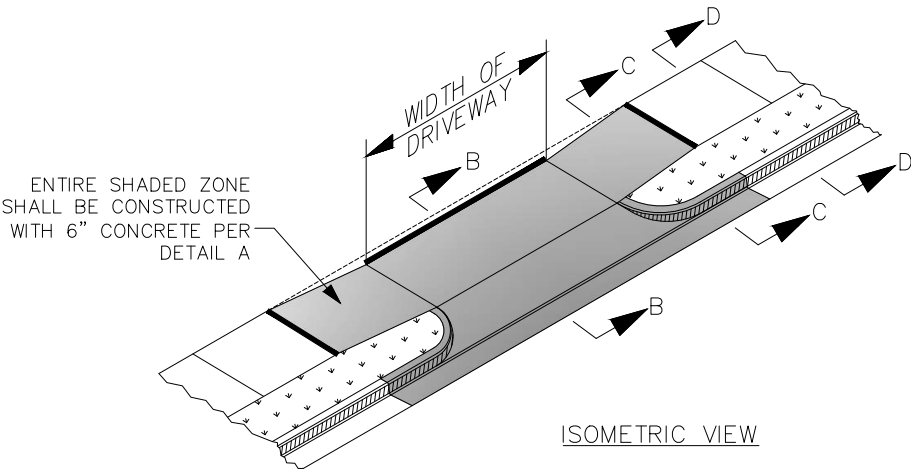
RADIAL RESIDENTIAL DRIVEWAY

DATE APPROVED: **JUL. 2025**

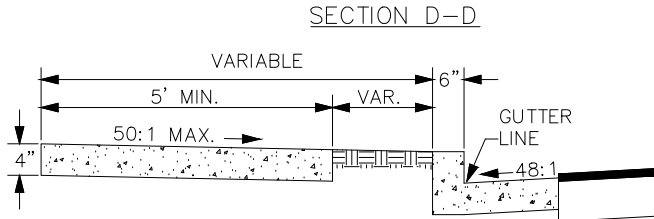
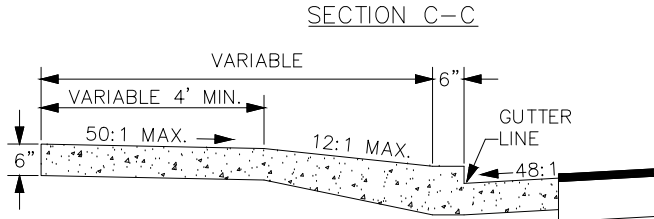
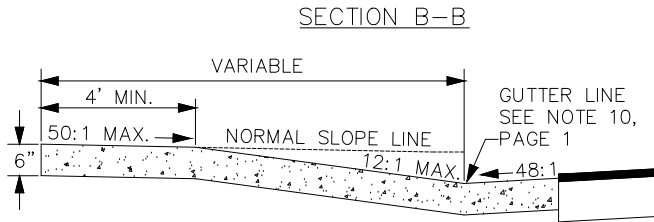
OFFICE OF THE CITY ENGINEER: **APPROVED**

SCALE: **NO SCALE**
DETAIL: **13:03**
SHEET 1 OF 2

THIS DOCUMENT AND ANY ILLUSTRATIONS HEREON ARE PROVIDED AS STANDARD CONSTRUCTION DETAILS WITHIN THE CITY OF GREENVILLE, SC. DEVIATION FROM, OR MODIFICATION OF, THIS DOCUMENT REQUIRES APPROVAL OF THE CITY OF GREENVILLE. THE CITY OF GREENVILLE SHALL NOT BE HELD LIABLE FOR DAMAGES AS A RESULT OF MISUSE OR CHANGES TO THIS DOCUMENT. THE APPROVAL SIGNATURE AND LOGO SHALL BE REMOVED IF ANY PORTION OF THIS DOCUMENT IS MODIFIED.

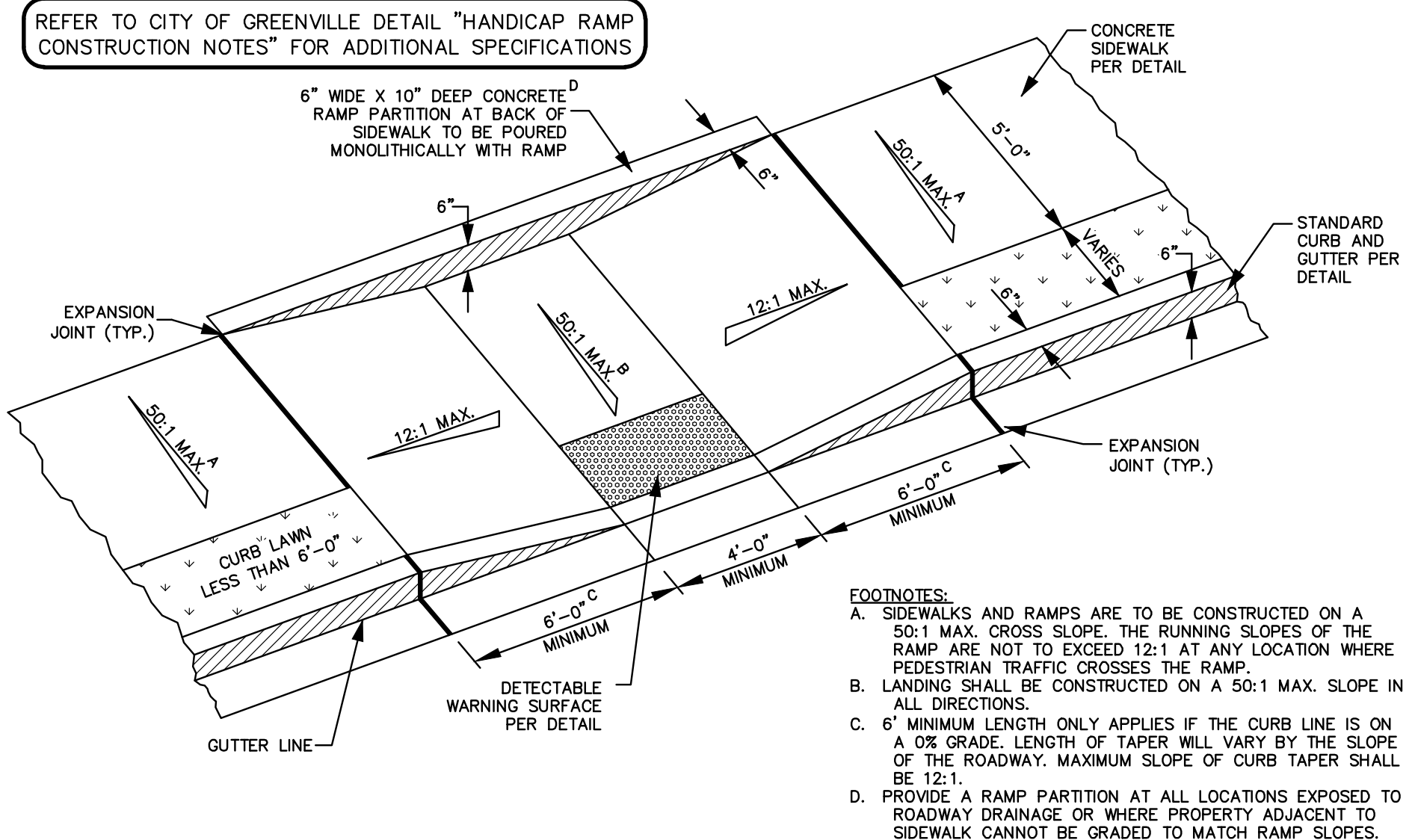


- 6" CONCRETE APRON**
1. CONCRETE SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.
 2. DRIVEWAY APRON SHALL BE POURED MONOLITHICALLY FROM BACK OF SIDEWALK TO FACE OF GUTTER.
- SUBGRADE**
1. THE SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95 PERCENT OF THE STANDARD PROCTOR DENSITY, FINISHED TO A SMOOTH, FIRM SURFACE, AND SHALL BE MOIST AT THE TIME THE CONCRETE IS PLACED.
 2. THE CONTRACTOR SHALL UNDERCUT AND REPLACE UNSUITABLE SOIL WITH COMPACTED AGGREGATE BASE COURSE MEETING SCDOT STANDARD SPECIFICATION 305.
- DETAIL A



 city of greenville ENGINEERING DIVISION	RADIAL RESIDENTIAL DRIVEWAY		SCALE: NO SCALE
	DATE APPROVED: JUL. 2025	OFFICE OF THE CITY ENGINEER: APPROVED	DETAIL: 13:03
			SHEET 2 OF 2

THIS DOCUMENT AND ANY ILLUSTRATIONS HEREON ARE PROVIDED AS STANDARD CONSTRUCTION DETAILS WITHIN THE CITY OF GREENVILLE, SC. DEVIATION FROM, OR MODIFICATION OF, THIS DOCUMENT REQUIRES APPROVAL OF THE CITY OF GREENVILLE. THE CITY OF GREENVILLE SHALL NOT BE HELD LIABLE FOR DAMAGES AS A RESULT OF MISUSE OR CHANGES TO THIS DOCUMENT. THE APPROVAL SIGNATURE AND LOGO SHALL BE REMOVED IF ANY PORTION OF THIS DOCUMENT IS MODIFIED.



FOOTNOTES:

- A. SIDEWALKS AND RAMPS ARE TO BE CONSTRUCTED ON A 50:1 MAX. CROSS SLOPE. THE RUNNING SLOPES OF THE RAMP ARE NOT TO EXCEED 12:1 AT ANY LOCATION WHERE PEDESTRIAN TRAFFIC CROSSES THE RAMP.
- B. LANDING SHALL BE CONSTRUCTED ON A 50:1 MAX. SLOPE IN ALL DIRECTIONS.
- C. 6' MINIMUM LENGTH ONLY APPLIES IF THE CURB LINE IS ON A 0% GRADE. LENGTH OF TAPER WILL VARY BY THE SLOPE OF THE ROADWAY. MAXIMUM SLOPE OF CURB TAPER SHALL BE 12:1.
- D. PROVIDE A RAMP PARTITION AT ALL LOCATIONS EXPOSED TO ROADWAY DRAINAGE OR WHERE PROPERTY ADJACENT TO SIDEWALK CANNOT BE GRADED TO MATCH RAMP SLOPES.



ENGINEERING DIVISION

HANDICAP RAMP I
CURB LAWN LESS THAN 6'-0"

DATE APPROVED: JAN. 2023

OFFICE OF THE
CITY ENGINEER:

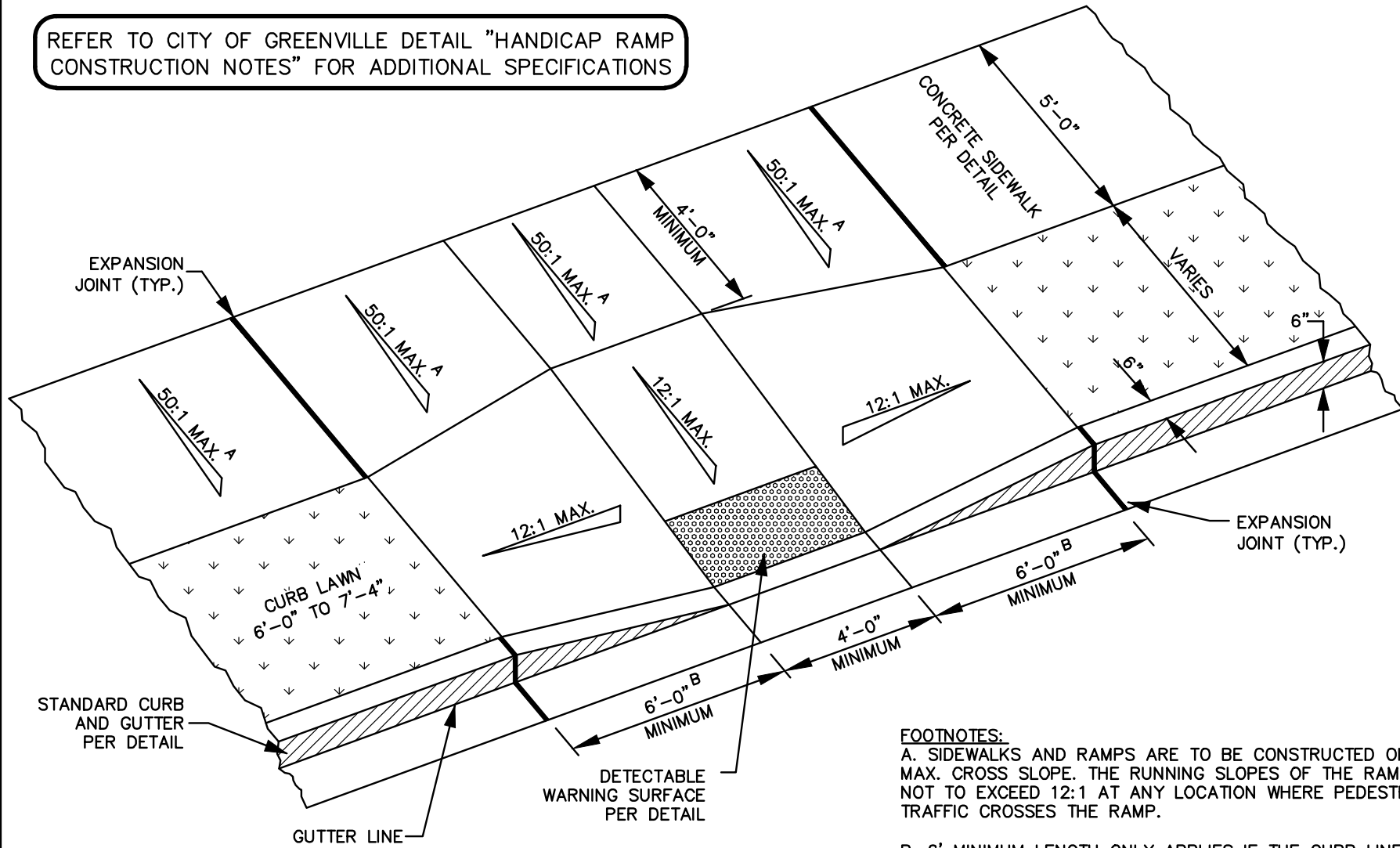
APPROVED

SCALE:
NO SCALE

DETAIL :

14:00

REFER TO CITY OF GREENVILLE DETAIL "HANDICAP RAMP CONSTRUCTION NOTES" FOR ADDITIONAL SPECIFICATIONS



FOOTNOTES:

A. SIDEWALKS AND RAMPS ARE TO BE CONSTRUCTED ON A 50:1 MAX. CROSS SLOPE. THE RUNNING SLOPES OF THE RAMP ARE NOT TO EXCEED 12:1 AT ANY LOCATION WHERE PEDESTRIAN TRAFFIC CROSSES THE RAMP.

B. 6' MINIMUM LENGTH ONLY APPLIES IF THE CURB LINE IS ON A 0% GRADE. LENGTH OF TAPER WILL VARY BY THE SLOPE OF THE ROADWAY. MAXIMUM SLOPE OF CURB TAPER SHALL BE 12:1.



ENGINEERING DIVISION

HANDICAP RAMP II **CURB LAWN 6'-0" TO 7'-4"**

DATE APPROVED: **JAN. 2023**

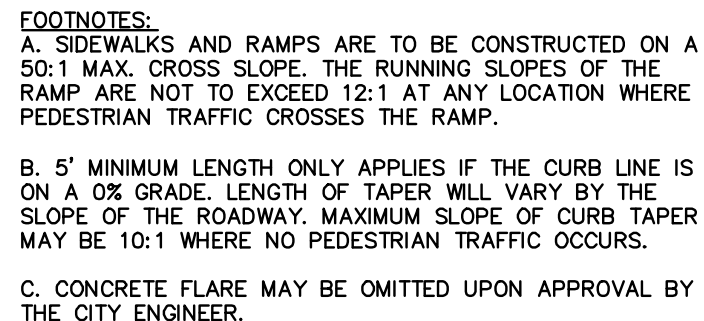
OFFICE OF THE CITY ENGINEER:

APPROVED

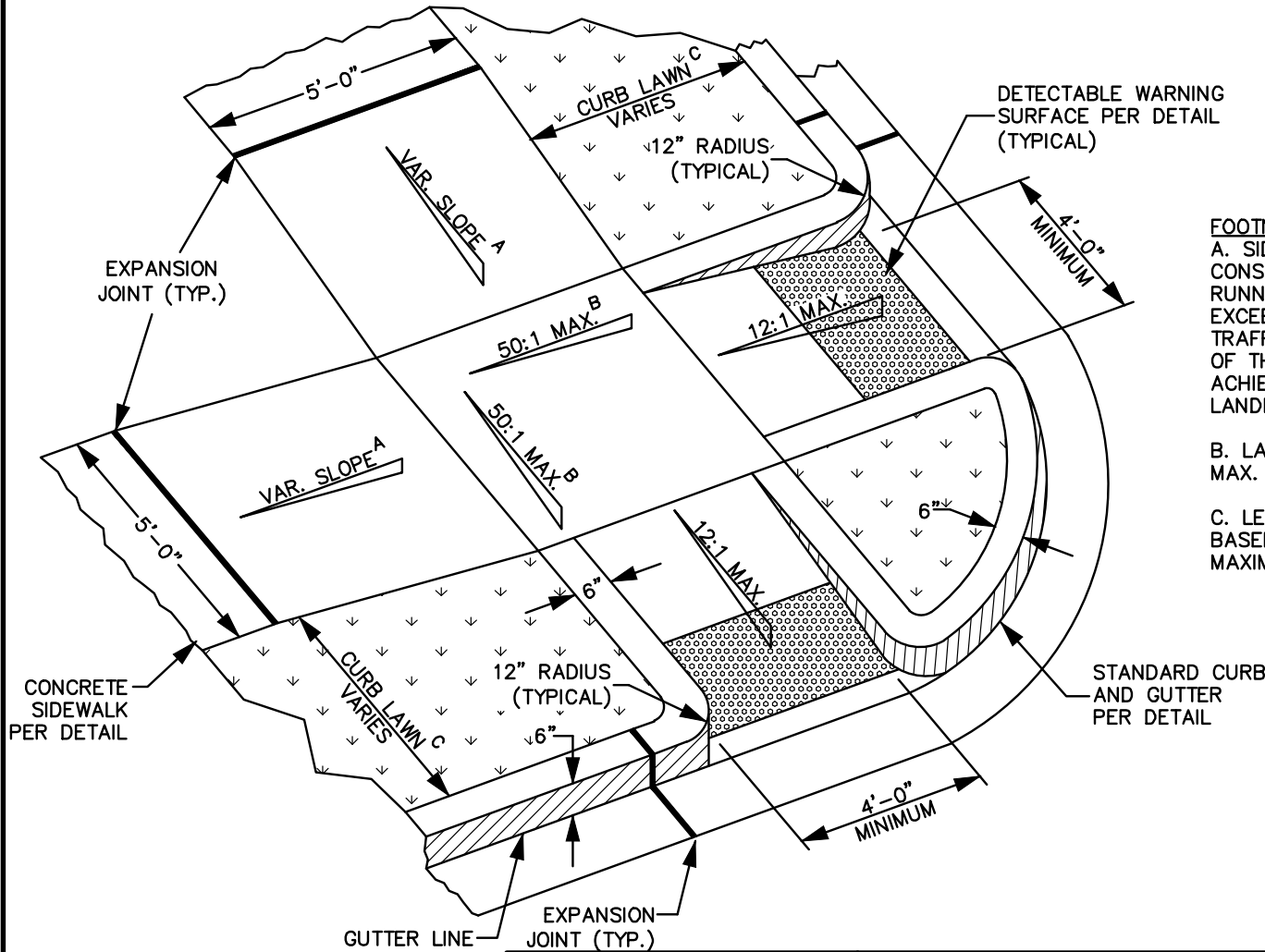
SCALE:
NO SCALE

DETAIL :

14:01



REFER TO CITY OF GREENVILLE DETAIL "HANDICAP RAMP CONSTRUCTION NOTES" FOR ADDITIONAL SPECIFICATIONS



FOOTNOTES:

A. SIDEWALKS AND RAMPS ARE TO BE CONSTRUCTED ON A 50:1 MAX. CROSS SLOPE. THE RUNNING SLOPES OF THE RAMP ARE NOT TO EXCEED 12:1 AT ANY LOCATION WHERE PEDESTRIAN TRAFFIC CROSSES THE RAMP. THE RUNNING SLOPE OF THE PANELS WILL VARY BASED ON THE GRADE ACHIEVED BY THE RETURN CURB RAMP AND THE LANDING.

B. LANDING SHALL BE CONSTRUCTED ON A 50:1 MAX. SLOPE IN ALL DIRECTIONS.

C. LENGTH OF RETURN CURB RAMP WILL VARY BASED ON THE WIDTH OF THE CURB LAWN. MAXIMUM SLOPE OF RAMP SHALL BE 12:1.



ENGINEERING DIVISION

HANDICAP RAMP IV RETURN CURB

DATE APPROVED: JAN. 2023

OFFICE OF THE CITY ENGINEER:

APPROVED

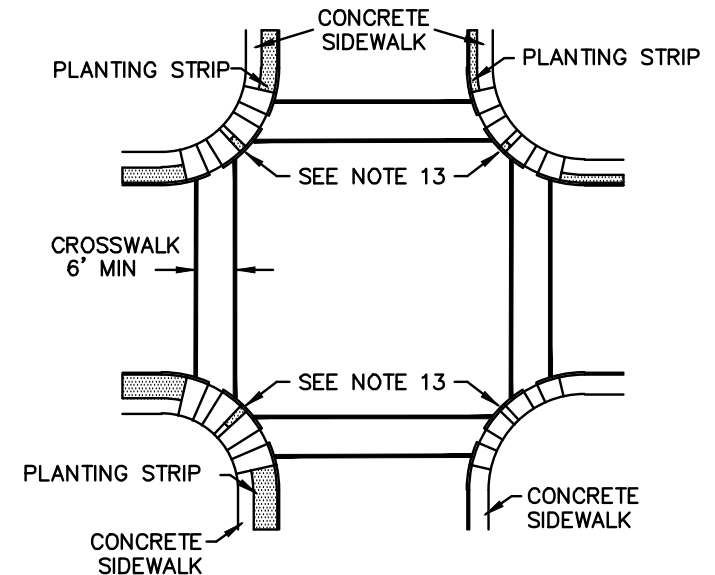
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DETAIL:

14:03

NOTE

1. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION INSPECTION BUREAU AT LEAST 24 HOURS PRIOR TO PLACING CONCRETE. THE CITY WILL INSPECT SUBGRADE, FORMS, GRADE AND ALIGNMENT.
2. CONCRETE SHALL BE 4" THICK AND SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.
3. THE SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95 PERCENT OF THE STANDARD PROCTOR DENSITY, FINISHED TO A SMOOTH, FIRM SURFACE, AND SHALL BE MOIST AT THE TIME THE CONCRETE IS PLACED. IF NECESSARY, THE CONTRACTOR SHALL UNDERCUT AND REPLACE UNSUITABLE SOIL WITH COMPACTED AGGREGATE BASE COURSE MEETING SCDOT STANDARD SPECIFICATION 305.
4. RAMP SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 720.4 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION.
5. RAMP SURFACE SHALL RECEIVE A MEDIUM BROOM FINISH.
6. DETECTABLE WARNING SURFACE SHALL BE INSTALLED TO COMPLY WITH CITY OF GREENVILLE DETAIL AND MOST CURRENT ADAAG GUIDELINES.
7. RAMP TO HAVE SCORING LINES (CONTRACTION JOINTS) AND $\frac{1}{2}$ " EXPANSION JOINTS WHERE SHOWN.
8. EXPANSION JOINTS AND SCORING LINES SHALL CONFORM TO CITY OF GREENVILLE DETAIL.
9. SIDEWALK AND CURB REPLACEMENT PER CITY OF GREENVILLE DETAILS.
10. GUTTER LINE TYPICALLY INSTALLED WITH SMOOTH TRANSITION. INSTALLATION OF A NUISANCE TROUGH, PER STANDARD DETAIL, MAY BE REQUIRED AT THE DIRECTION OF THE CITY ENGINEER.
11. THE RAMP OPENING (AT THE FULLY DEPRESSED CURB) SHALL BE LOCATED WITHIN THE PARALLEL BOUNDARIES OF THE CROSSWALK MARKINGS.
12. DRAINAGE STRUCTURES, MAST ARMS, LIGHT POLES AND OTHER OBSTRUCTIONS SHALL NOT BE PLACED IN LINE WITH RAMPS. LOCATION OF THE RAMP SHALL TAKE PRECEDENCE OVER LOCATION OF OBSTRUCTIONS EXCEPT WHERE EXISTING OBSTRUCTIONS ARE BEING UTILIZED IN THE NEW CONSTRUCTION.
13. AT ALL LOCATIONS, NOT LESS THAN 2 FEET OF FULL HEIGHT CURB SHALL BE PLACED BETWEEN THE RAMPS.
14. LOCATION AND TYPE OF RAMP SHALL CLEARLY BE DENOTED ON THE PLANS.
15. CROSSWALKS SHALL BE DESIGNATED WHERE DIRECTED BY CITY ENGINEER.
16. WHEN SIDEWALK IS LOWERED TO GUTTER ELEVATION, PROVIDE DRAINAGE STRUCTURE UPHILL OF PEDESTRIAN RAMP WHERE POSSIBLE.
17. WHERE RAMP EXCEEDS 7'-0", DESIGN SHOULD CONSIDER THE ADDITION OF BOLLARDS TO DISCOURAGE VEHICULAR MOVEMENTS ONTO PEDESTRIAN RAMPS. MINIMUM 3'-0" CLEAR BETWEEN BOLLARDS MUST BE MAINTAINED.



TYPICAL LOCATION OF ACCESSIBLE RAMPS
AND PEDESTRIAN CROSSWALKS



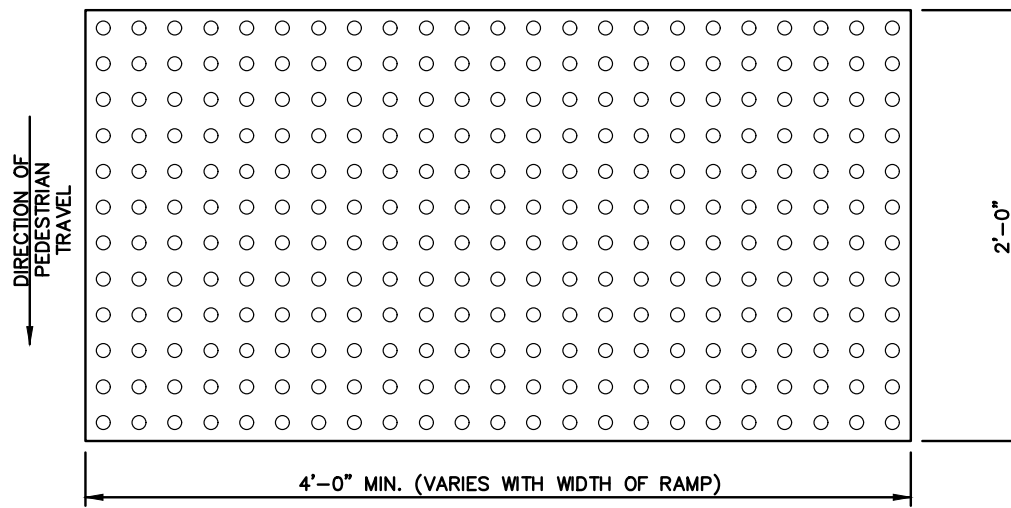
HANDICAP RAMP CONSTRUCTION NOTES

DATE
APPROVED: JAN. 2023

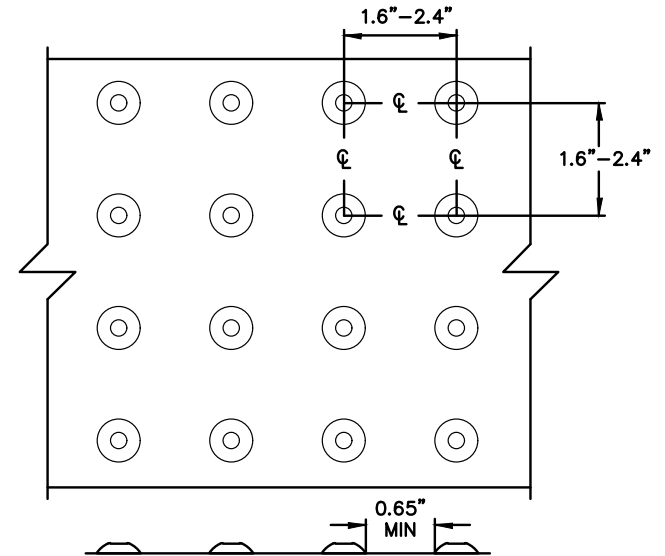
OFFICE OF THE
CITY ENGINEER: APPROVED

SCALE:
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DETAIL:

14:04

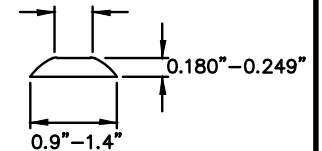


TRUNCATED DOME PLAN VIEW



TRUNCATED DOME SPACING

50-65% OF ACTUAL
BASE DIAMETER



TRUNCATED DOME SECTION

NOTE

- DETECTABLE WARNING SURFACES SHALL BE PROVIDED AT THE FOLLOWING LOCATIONS:
 - WHERE A SIDEWALK CROSSES A VEHICULAR WAY, EXCLUDING UN-SIGNALIZED DRIVEWAY CROSSINGS.
 - WHERE A RAIL SYSTEM CROSSES A PEDESTRIAN FACILITY THAT IS NOT SHARED WITH VEHICLES.
 - AT ISLANDS AND MEDIANS THAT ARE CUT THROUGH LEVEL WITH THE ROADWAY.
- AT CURB RAMPS AND BLENDED TRANSITIONS, DETECTABLE WARNING SURFACES SHALL BE LOCATED SO THE EDGE NEAREST THE GUTTER LINE IS 6" MINIMUM AND 8" MAXIMUM DISTANCE FROM THE GUTTER LINE. THE SURFACE SHALL EXTEND A MINIMUM OF 24" ONTO THE RAMP IN THE DIRECTION OF TRAVEL FOR THE FULL WIDTH OF THE CURB RAMP (MINIMUM 4 FEET).
- AT RAIL CROSSINGS, THE DETECTABLE WARNING SURFACE SHALL BE 24" DEEP AND FULL WIDTH OF THE SIDEWALK (MINIMUM 4 FEET). THE EDGE OF THE SURFACE NEAREST THE RAIL CROSSING IS 6" MINIMUM AND 8" MAXIMUM DISTANCE FROM THE VEHICLE DYNAMIC ENVELOPE (6' FROM THE NEAREST RAIL) UNLESS OTHERWISE NOTED BY THE RAILROAD.
- DETECTABLE WARNING INSTALLED ON A RAMP LOCATED WITHIN A RADIUS SHALL BE CUT AND FIT TO FOLLOW THE RADIUS AND EDGE OFFSET TOLERANCES.
- ALL DETECTABLE WARNING INSTALLATIONS IN NEW CONSTRUCTION SHALL BE OF A RIGID PRECAST OR EMBEDDED PRODUCT UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER. SELECTED PRODUCTS SHALL MEET CITY SPECIFICATIONS AND THE APPROVAL BY THE CITY ENGINEER FOR MATERIAL TYPE AND INSTALLATION PRACTICE.
- ALTERNATIVE RETRO FIT MATS WILL ONLY BE ALLOWED ON EXISTING RAMPS WITH PRIOR APPROVAL BY THE CITY ENGINEER FOR MATERIAL TYPE AND INSTALLATION PRACTICE (E.G. RESURFACING PROJECTS).
- DETECTABLE WARNING SURFACES SHALL CONSIST OF AN AREA OF TRUNCATED DOMES ALIGNED IN A SQUARE GRID PATTERN. THE BASE OF THESE DOMES SHALL BE 0.90"-1.40". THE TOP DIAMETER OF THE DOMES SHALL BE 50%-65% OF THE ACTUAL BASE DIAMETER, WITH A MINIMUM INDIVIDUAL HEIGHT OF 0.180" AND A MAXIMUM HEIGHT OF 0.249". THE AVERAGE OF TEN (10) INDIVIDUAL NODES PICKED AT RANDOM IN ANY SQUARE FOOT AREA SHALL MEASURE 0.180"-0.249" IN HEIGHT. THE DETECTABLE WARNING DOMES SHALL HAVE A CENTER-TO-CENTER SPACING OF 1.6-2.4".
- DETECTABLE WARNING DOMES SHALL BE ALIGNED ON A SQUARE GRID IN THE PREDOMINANT DIRECTION OF TRAVEL TO PERMIT WHEELS TO ROLL BETWEEN DOMES.
- IF PAVERS ARE TO BE USED, PAVERS SHALL BE 6" THICK AND CAST FROM 5000 PSI CONCRETE, OR APPROVED EQUAL.
- IF EMBEDDED PANELS ARE TO BE USED, PANELS SHALL BE RIGID WITH TURN DOWN EDGES EMBEDDED IN CONCRETE TO REDUCE TRIP HAZARD. ARMOR TILE ADA CAST IN PLACE SYSTEM, OR APPROVED EQUAL.
- IF SURFACE MOUNTED PANELS ARE TO BE USED, PANELS SHALL BE RIGID, EPOXY AND ANCHOR MOUNTED. ARMOR TILE ADA SURFACE APPLIED TACTILE PANELS, OR APPROVED EQUAL.
- FOR ALL DETECTABLE WARNING SURFACES, THE CITY OF GREENVILLE'S DEFAULT COLOR IS COLONIAL RED (FEDERAL COLOR NUMBER 20109). WHEN A SPECIFIC PROJECT REQUIRES ANOTHER COLOR OTHER THAN COLONIAL RED, IT MUST MEET THE APPROVAL OF ALL APPLICABLE DEPARTMENTS. THE COLOR SELECTED SHALL CONTRAST EITHER LIGHT- ON-DARK OR DARK-ON LIGHT. THE MANUFACTURER AND/OR ENGINEER MUST CERTIFY TO THE CITY ENGINEER THAT THE COLOR SELECTED MEETS THE 70% CONTRAST SPECIFICATIONS OF THE ADAAG.

*ADAPTED FROM SCDOT STANDARD DRAWING 720-912-01



city of
greenville

ENGINEERING DIVISION

DETECTABLE WARNING SURFACE

DATE
APPROVED: JAN. 2023

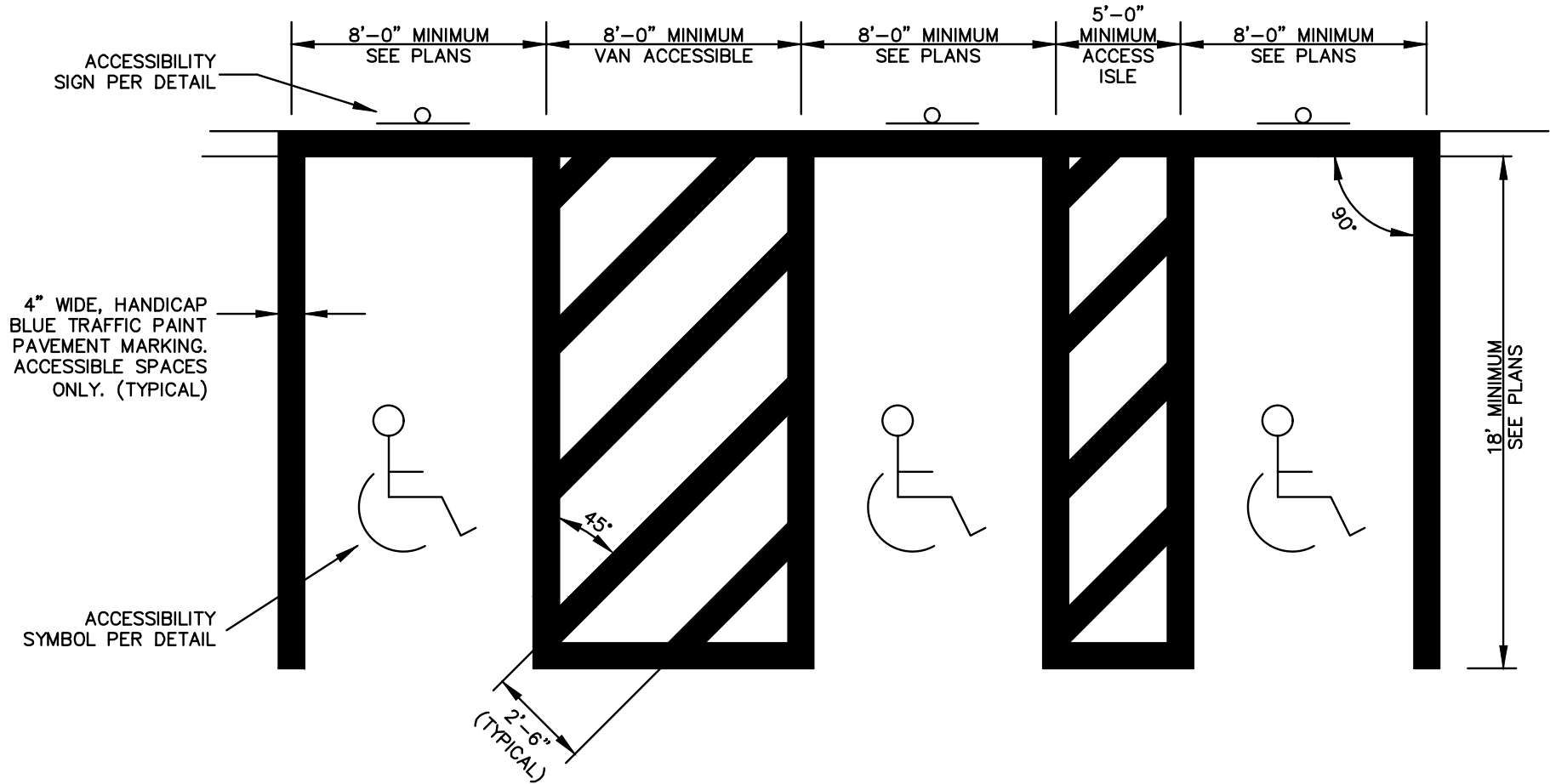
OFFICE OF THE
CITY ENGINEER:

APPROVED

SCALE:
NO SCALE

DETAIL :

14:05

**NOTE**

1. FINISH GRADE ACROSS HANDICAP ACCESSIBLE SPACES AND AISLES SHALL NOT EXCEED 2% (50:1) IN ANY DIRECTION.
2. 90° PARKING LAYOUT SHOWN. STRIPING ORIENTATION AND DIMENSIONS SIMILARLY SHALL APPLY TO ANGLED PARKING ALIGNMENT.



HANDICAP ACCESSIBILITY STRIPING

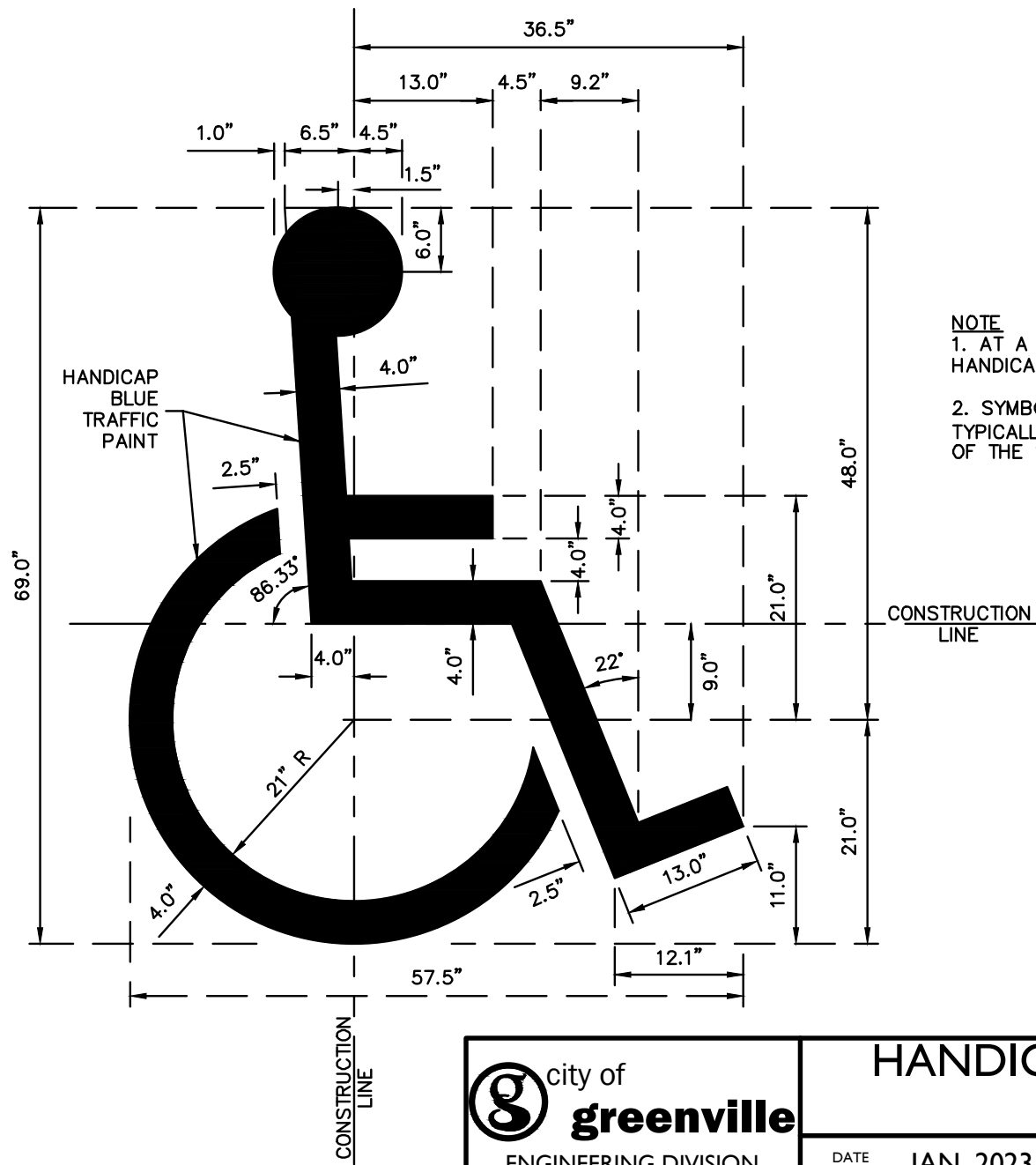
DATE
APPROVED: JAN. 2023

OFFICE OF THE
CITY ENGINEER:

APPROVED

SCALE:
NO SCALE
DETAIL :

14:06

**NOTE**

1. AT A MINIMUM, THE SYMBOL SHALL RECEIVE A DOUBLE COAT OF HANDICAP BLUE TRAFFIC PAINT.

2. SYMBOL SHALL BE CENTERED ON THE WIDTH OF THE STALL AND TYPICALLY SHOULD BE INSTALLED LENGTHWISE IN THE BOTTOM $\frac{1}{3}$ OF THE SPACE CLOSEST TO THE TRAVEL AISLE.



HANDICAP ACCESSIBILITY SYMBOL

DATE
APPROVED: JAN. 2023

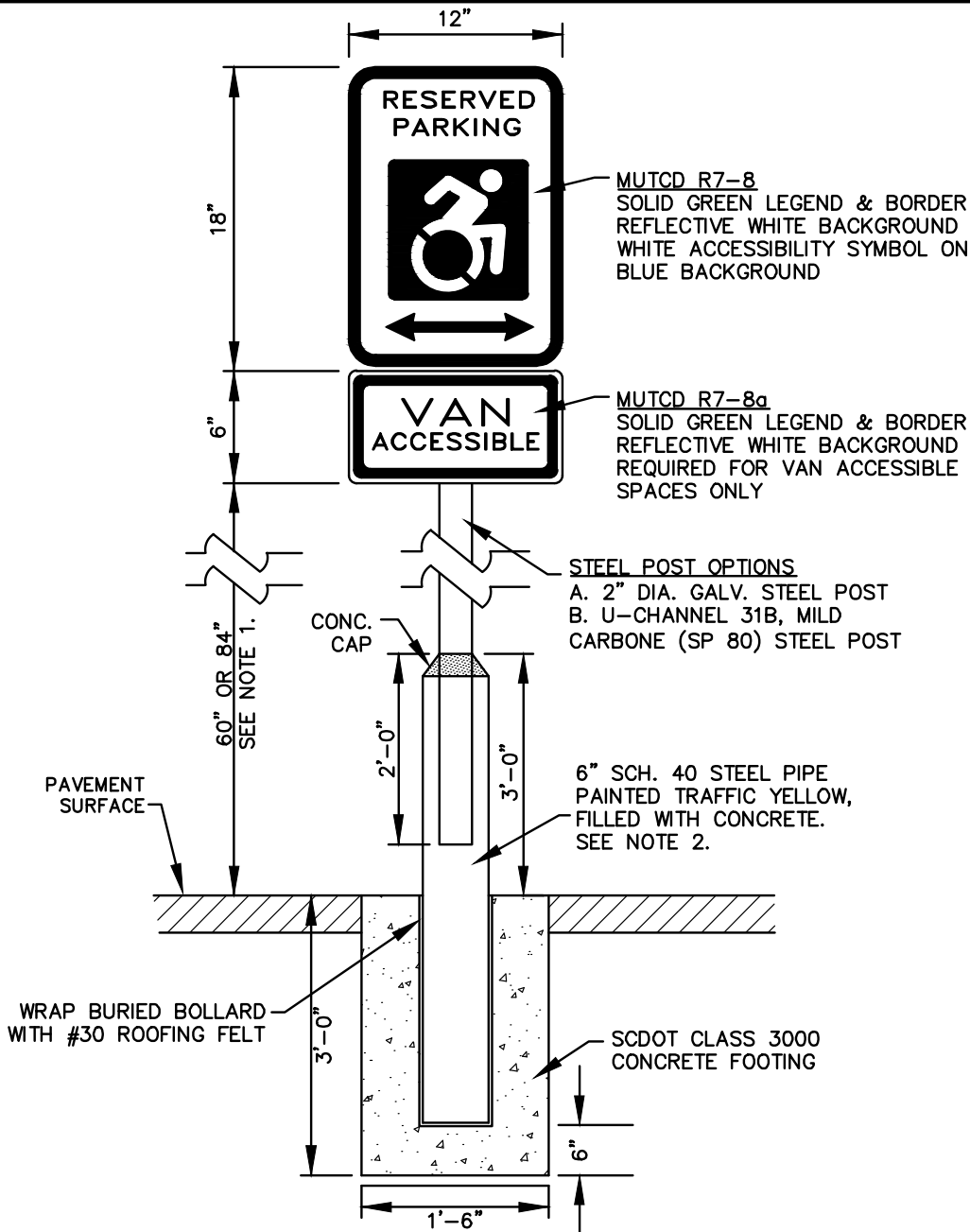
OFFICE OF THE
CITY ENGINEER:

APPROVED

SCALE:
NO SCALE

DETAIL :

14:07



NOTE

1. 12"x18" ACCESSIBILITY SIGN (R7-8) SHALL BE MOUNTED 7' FROM FINISH GRADE TO BOTTOM EDGE OF SIGN FACE. MOUNTING HEIGHT MAY BE REDUCED TO 5' IF PLACED IN A LANDSCAPE AREA IN WHICH PEDESTRIANS ARE NOT EXPECTED TO USE.
2. BOLLARD MAY BE OMITTED IF INSTALLED IN LANDSCAPE AREAS. WHEN INSTALLED IN LANDSCAPE AREAS, MOUNTING POST SHALL BE DRIVEN A MINIMUM OF 3' BELOW FINISH GRADE. ALTERNATE MOUNTING POSTS MUST BE APPROVED BY THE CITY ENGINEER PRIOR TO CONSTRUCTION.
3. SIGNAGE SHALL BE INSTALLED IN FRONT OF EACH ACCESSIBLE SPACE, CENTERED ON THE WIDTH OF THE SPACE.
4. REFER TO AMERICANS WITH DISABILITIES ACT AND ARCHITECTURAL BARRIERS ACT ACCESSIBILITY GUIDELINES (ADAAG), LATEST EDITION, FOR REQUIRED NUMBER OF ACCESSIBLE SPACES. PER ADAAG, ONE VAN ACCESSIBLE SPACE SHALL BE PROVIDED, MINIMUM, WITH ADDITIONAL VAN ACCESSIBLE SPACES PER ADAAG REQUIREMENTS.
5. ALL SIGNAGE SHALL BE ENGINEER GRADE .080 ALUMINUM REFLECTIVE SIGN MEETING THE MOST CURRENT REQUIREMENTS OF THE MUTCD AND ADAAG.



ENGINEERING DIVISION

HANDICAP ACCESSIBILITY SIGN

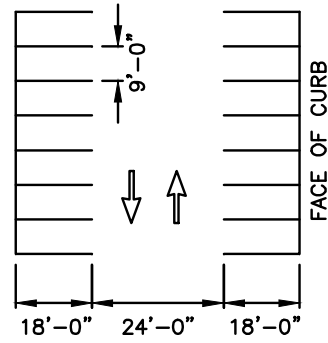
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OFFICE OF THE
CITY ENGINEER:

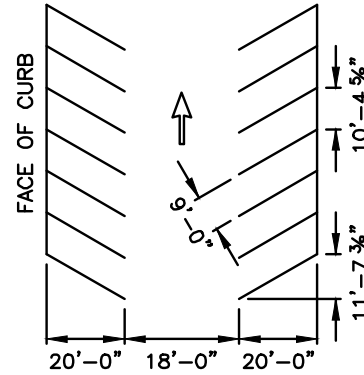
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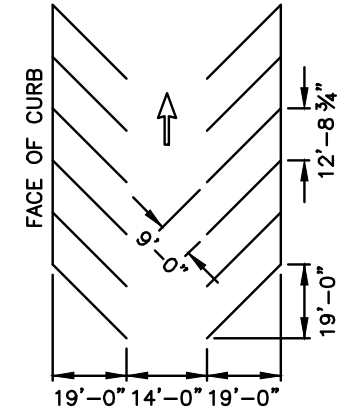
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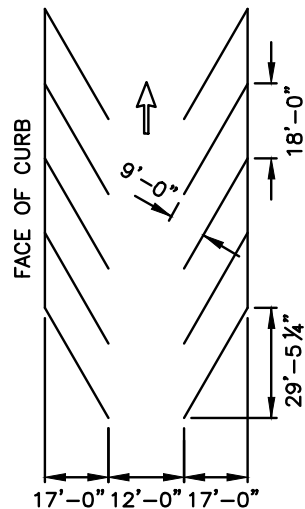
PARKING ANGLE 90°



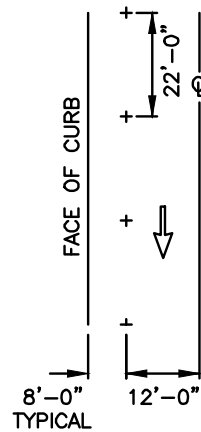
PARKING ANGLE 60°



PARKING ANGLE 45°



PARKING ANGLE 30°



PARALLEL PARKING

NOTE

1. FOR ACCESSIBLE PARKING STANDARDS, SEE CITY OF GREENVILLE DETAILS.
2. PAVEMENT MARKINGS SHALL BE 4" WHITE PAINT UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER PRIOR TO CONSTRUCTION.
3. ALTERNATIVE PARKING ANGLES, AISLE WIDTHS, AND OPERATION (TWO-WAY ANGLED PARKING OR REVERSE-ANGLE PARKING) MUST BE SUBMITTED TO THE CITY ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.
4. PARALLEL PARKING STALLS SHOULD BE MARKED WITH 2' X 2' CROSS MARKS BETWEEN SPACES AND 1' X 2' T MARKS AT ENDS OF ROWS.



ENGINEERING DIVISION

PARKING STANDARDS

DATE APPROVED: JAN. 2023

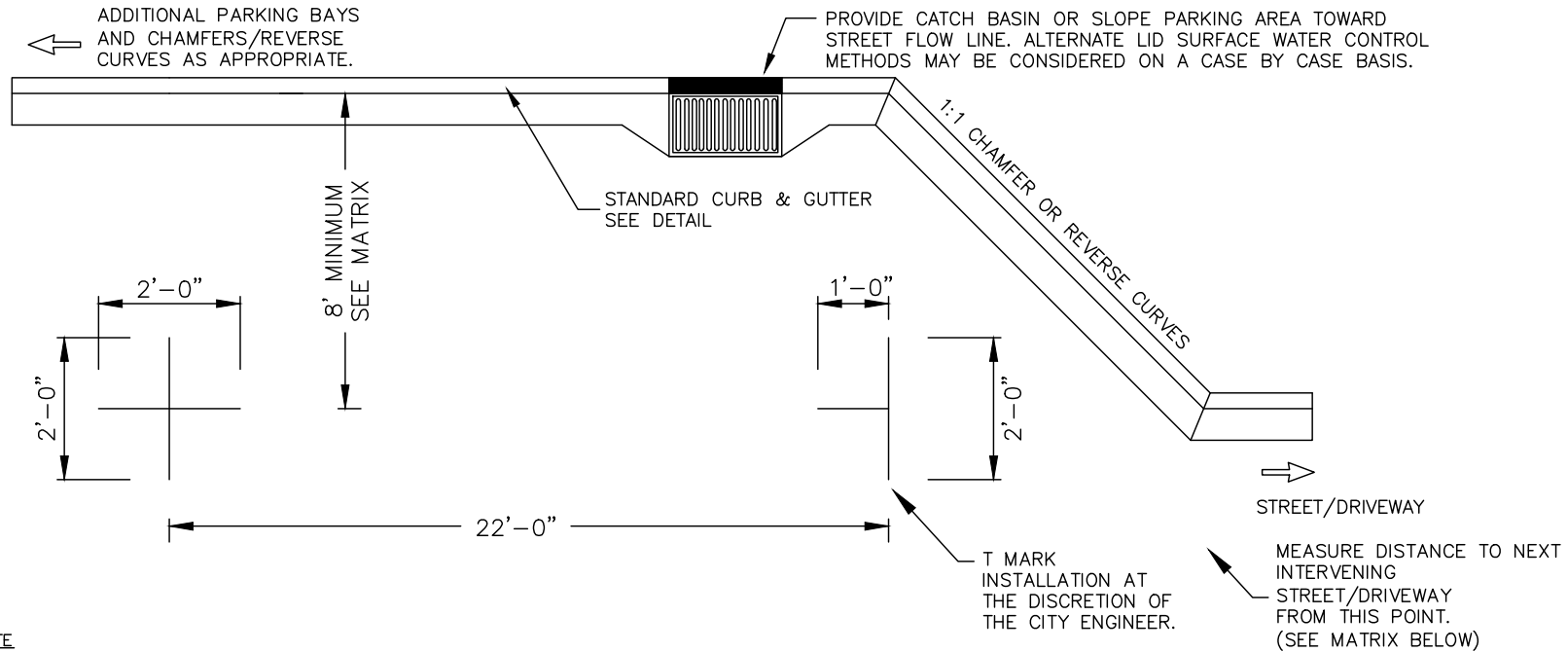
OFFICE OF THE CITY ENGINEER:

APPROVED

SCALE:
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DETAIL :

15:00

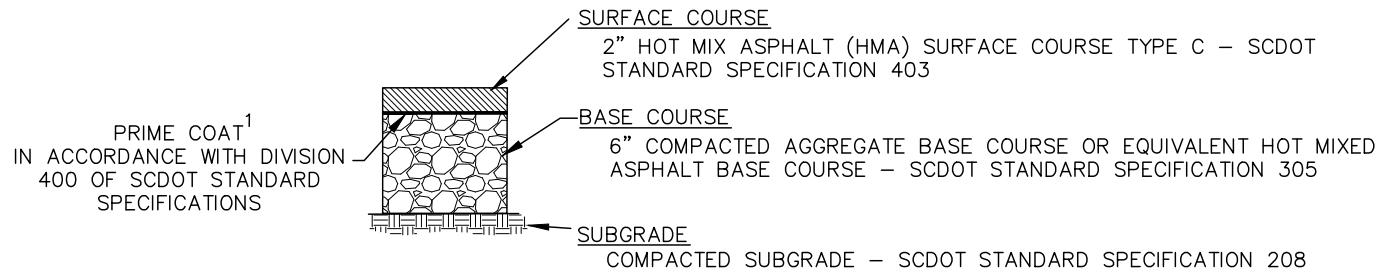


NOTE

1. ALL PARKING STRIPING SHALL BE 4" WIDE WHITE THERMOPLASTIC.
2. USE 2' X 2' CROSS MARKS BETWEEN SPACES. USE 1' X 2' T MARKS AT ENDS OF ROWS, WHERE DETERMINED APPLICABLE BY THE CITY ENGINEER.
3. PARALLEL ACCESSIBLE SPACES AND LOADING ZONES TO BE REVIEWED BY THE CITY ENGINEER ON A CASE-BY-CASE BASIS. ALL ACCESSIBLE SPACES SHALL MEET ADA REQUIREMENTS.
4. GREATER SEPARATION FROM INTERVENING STREETS THAN THE DISTANCES PROVIDED IN THE MATRIX MAY BE REQUIRED AT THE CITY ENGINEER'S DISCRETION.
5. THE DESIGN ENGINEER SHALL CONFER WITH THE CITY ENGINEER REGARDING STALL DEPTH.
6. POSITIVE DRAINAGE SHALL BE PROVIDED EITHER BY INSTALLING APPROPRIATE DRAINAGE STRUCTURES OR SLOPING PARKING AREA TO STREET FLOW LINE.

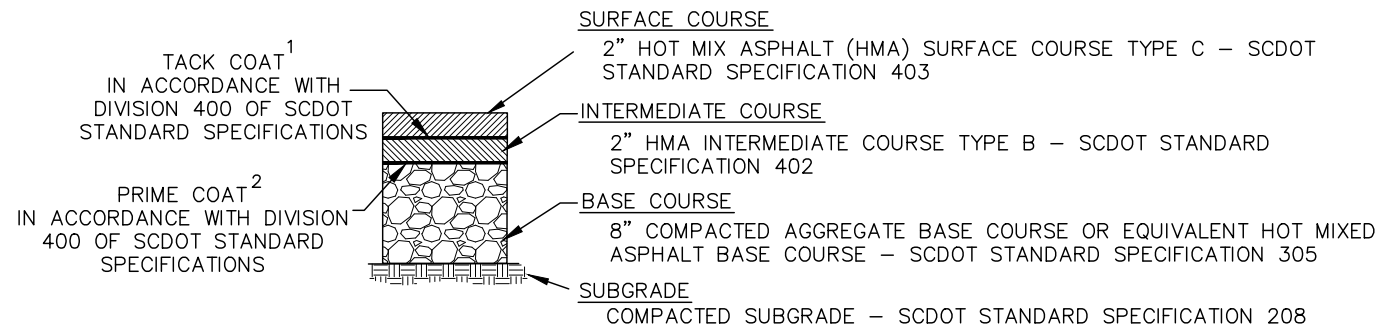
PARALLEL PARKING BAY LOCATED ON	MINIMUM DISTANCE TO NEXT INTERVENING STREET			TYPICAL STALL DEPTH
	DRIVEWAY	LOCAL RESIDENTIAL	COLLECTOR	
LOCAL RESIDENTIAL	10'	30'	30'	8'
COLLECTOR	25'	30'	35'	8'-6"

 city of greenville ENGINEERING DIVISION	ON-STREET PARALLEL PARKING		SCALE: NO SCALE
	DATE APPROVED: OCT. 2023	OFFICE OF THE CITY ENGINEER:	DETAIL : 15:01



STANDARD DUTY PAVEMENT SECTION

1. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 – 0.30 GAL PER SQUARE YARD



HEAVY DUTY PAVEMENT SECTION

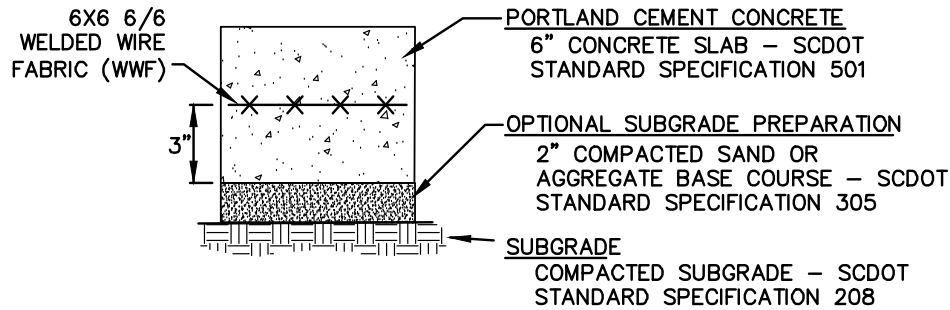
1. APPLICATION RATE FOR LAYING ANY HMA ON EXISTING PAVEMENTS SHALL BE 0.05 – 0.15 GAL PER SQUARE YARD
2. APPLICATION RATE FOR MACADAM AND RECYCLED PORTLAND CEMENT BASE COURSE SHALL BE 0.25 – 0.30 GAL PER SQUARE YARD

NOTE:

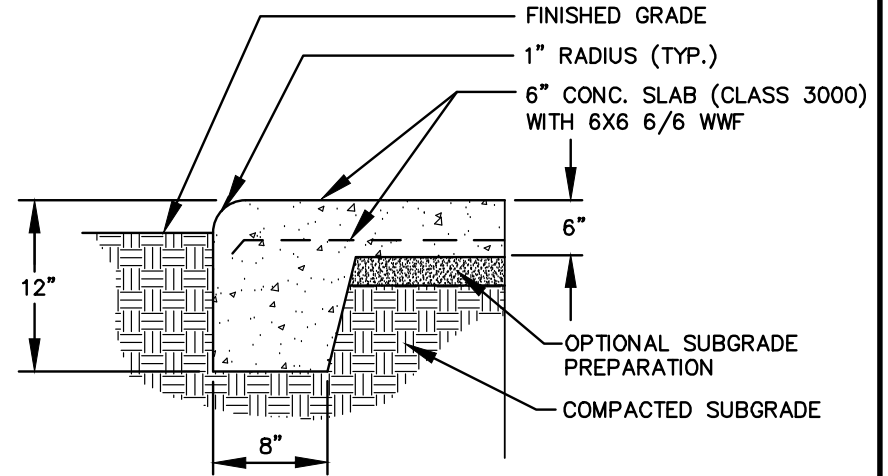
1. ASPHALT PAVEMENT SECTIONS NOT FOR USE IN TRAVEL WAYS
2. GREENVILLE HAS THE AUTHORITY TO CHANGE HMA TYPE FOR SPECIFIC PROJECTS BASED ON CIRCUMSTANTIAL CONDITIONS

 city of greenville ENGINEERING DIVISION	ASPHALT PAVEMENT SECTIONS	SCALE: NO SCALE
	DATE APPROVED: OCT. 2023	OFFICE OF THE CITY ENGINEER: 16:00

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STANDARD DUTY PAVEMENT SECTION



EDGE TREATMENT

NOTE

1. CONCRETE SHALL BE SCDOT CLASS 3000 IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 701 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. CONCRETE SHALL BE "READY MIX" HAVING A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI AND BE AIR ENTRAINED.
2. PAVEMENT TO HAVE LONGITUDINAL, EXPANSION, AND TRANSVERSE CONTRACTION JOINTS AS SHOWN ON THE PLANS OR SPECIFIED IN THE SPECIAL PROVISIONS. CONSTRUCT JOINTS IN ACCORDANCE WITH SCDOT STANDARD SPECIFICATION 501.4.13.
3. PAVEMENT SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE APPLICABLE REQUIREMENTS OF SECTION 501 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. SURFACE SHALL TYPICALLY RECEIVE A MEDIUM BROOM FINISH UNLESS OTHERWISE DIRECTED ON THE PLANS OR IN THE SPECIAL PROVISIONS.
4. THE SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95 PERCENT OF THE STANDARD PROCTOR DENSITY AND FINISHED TO A SMOOTH, FIRM SURFACE AND SHALL BE MOIST AT THE TIME THE CONCRETE IS PLACED.
5. EDGES OF SLAB SHALL BE THICKENED AS SHOWN IN THE DETAIL.



CONCRETE PAVEMENT SECTION

DATE APPROVED: **JAN. 2023**

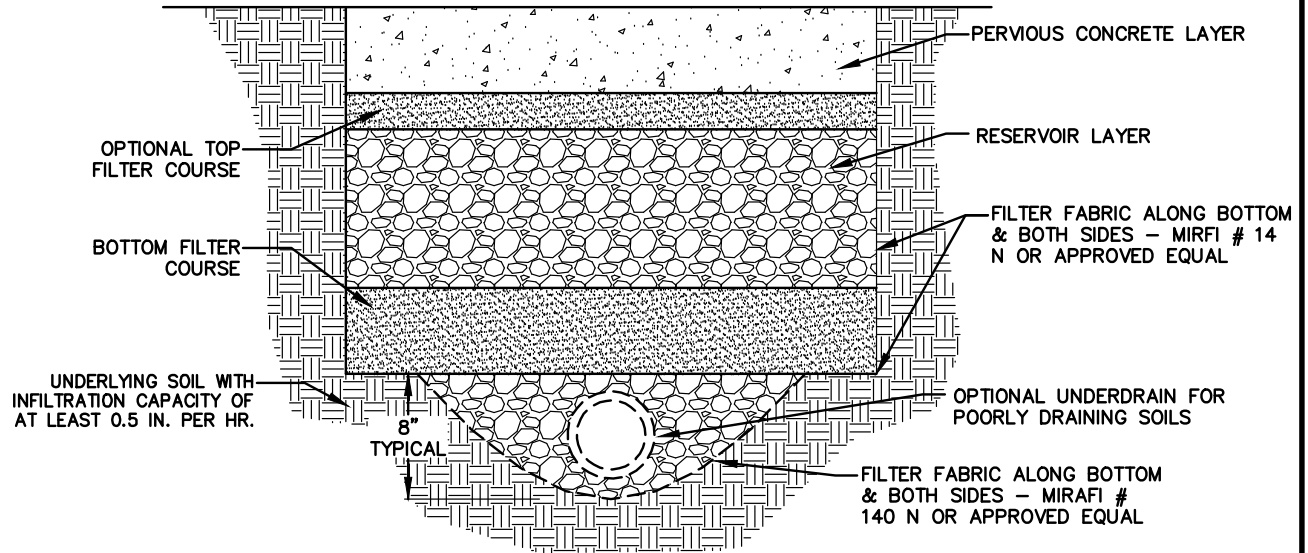
OFFICE OF THE CITY ENGINEER: **APPROVED**

SCALE:
NO SCALE
DETAIL :

16:01

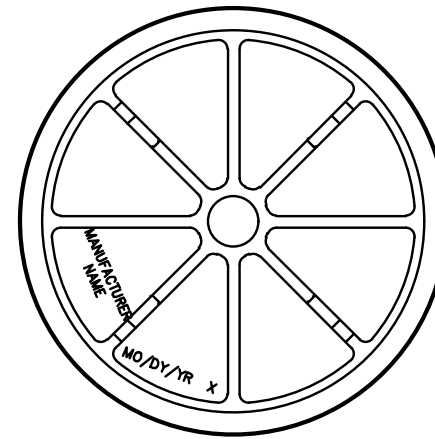
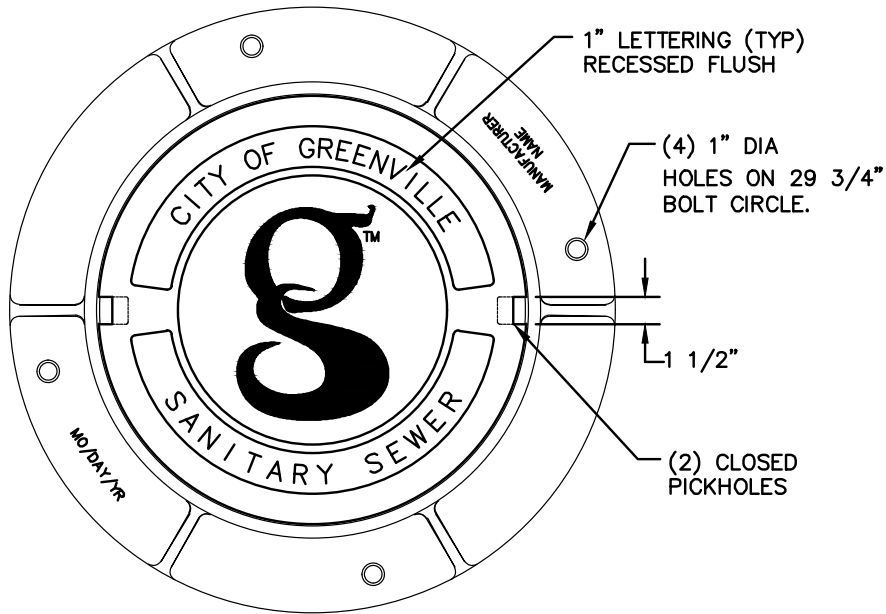
NOTE

1. FINAL DIMENSIONS OF EACH LAYER OF THE PERVIOUS CONCRETE PAVING SECTION MUST BE DETERMINED BY THE DESIGN ENGINEER AND SHOWN HEREIN.
2. **PERVIOUS CONCRETE LAYER** – THE POROUS CONCRETE LAYER CONSISTS OF AN OPEN-GRADED CONCRETE MIXTURE USUALLY RANGING FROM A MINIMUM DEPTH OF 4 INCHES TO 6 INCHES OR GREATER DEPENDING ON REQUIRED BEARING STRENGTH AND PAVEMENT DESIGN REQUIREMENTS. POROUS CONCRETE SHOULD CONTAIN APPROXIMATELY 18 PERCENT VOIDS (POROSITY = 0.18). MIX DESIGN SHOULD OMIT FINE AGGREGATE AND USE A 3/8 INCH MAXIMUM SIZE COARSE AGGREGATE. PLACEMENT SHALL FOLLOW PUBLISHED GUIDELINES.
3. **OPTIONAL TOP FILTER LAYER** – CONSISTS OF A 0.5 INCH DIAMETER CRUSHED STONE TO A DEPTH OF 1 TO 2 INCHES FOR STABILIZATION OF THE PERVIOUS PAVEMENT LAYER.
4. **RESERVOIR LAYER** – THE RESERVOIR GRAVEL BASE COURSE CONSISTS OF WASHED, BANK-RUN GRAVEL, 1.5 TO 2.5 INCHES IN DIAMETER WITH APPROXIMATELY 40% VOID SPACE. THE DEPTH OF THIS LAYER IS TYPICALLY 2 TO 4 FEET DEPENDING ON THE DESIRED STORAGE VOLUME, WHICH IS A FUNCTION OF THE SOIL INFILTRATION RATE AND VOID SPACES. THE LAYER MUST HAVE A MINIMUM DEPTH OF 6 INCHES. THE LAYER SHOULD DRAIN COMPLETELY IN 48 TO 72 HOURS. AGGREGATE CONTAMINATED WITH SOIL SHALL NOT BE USED.
5. **BOTTOM FILTER LAYER** – THE SURFACE OF THE SUBGRADE SHOULD BE A 6 INCH LAYER OF SAND (ASTM C-33 CONCRETE SAND) OR A 2 INCH THICK LAYER OF 0.5 INCH CRUSHED STONE, AND BE COMPLETELY FLAT TO PROMOTE INFILTRATION ACROSS THE ENTIRE SURFACE. THIS LAYER SERVES TO STABILIZE THE RESERVOIR LAYER, TO PROTECT THE UNDERLYING SOIL FROM COMPACTION, AND ACT AS THE INTERFACE BETWEEN THE RESERVOIR LAYER AND THE FILTER FABRIC COVERING THE UNDERLYING SOIL.
6. **FILTER FABRIC** – THE ENTIRE TRENCH AREA, INCLUDING THE SIDES, SHALL BE LINED WITH FILTER FABRIC (MIRAFI # 140 N OR APPROVED EQUIVALENT) PRIOR TO PLACEMENT OF THE AGGREGATE.
7. **UNDERLYING SOIL** – THE UNDERLYING SOIL SHOULD HAVE AN INFILTRATION CAPACITY OF AT LEAST 0.5 IN/HR (MEASURED AT SUBGRADE ELEVATION) AS CONFIRMED BY FIELD GEOTECHNICAL TESTS. MINIMUM GEOTECHNICAL TESTING IS ONE TEST HOLE PER 5000 SQUARE FEET, WITH A MINIMUM OF TWO BORINGS TAKEN WITHIN THE PROPOSED LIMITS OF THE FACILITY. POORLY DRAINING SOILS WILL REQUIRE THE INSTALLATION OF AN UNDERDRAIN SYSTEM.
8. PIT EXCAVATION SHOULD BE LIMITED TO THE WIDTH AND DEPTH SPECIFIED IN THE DESIGN. EXCAVATED MATERIAL SHOULD BE PLACED AWAY FROM THE OPEN TRENCH AS NOT TO JEOPARDIZE THE STABILITY OF THE TRENCH SIDEWALLS. THE BOTTOM OF THE EXCAVATED TRENCH SHOULD NOT BE LOADED SO AS TO CAUSE COMPACTION, AND SHOULD BE SCARIFIED PRIOR TO PLACEMENT OF THE BOTTOM FILTER LAYER. THE SIDES OF THE TRENCH SHALL BE TRIMMED OF ALL LARGE ROOTS. THE SIDEWALLS SHALL BE UNIFORM WITH NO VOIDS AND SCARIFIED PRIOR TO BACKFILLING. ALL INFILTRATION TRENCH FACILITIES SHOULD BE PROTECTED DURING SITE CONSTRUCTION, AND SHOULD BE CONSTRUCTED AFTER UPSTREAM AREAS HAVE BEEN STABILIZED.
9. AN OBSERVATION WELL CONSISTING OF PERFORATED PVC PIPE 4 TO 6 INCHES IN DIAMETER SHOULD BE PLACED AT THE DOWNSTREAM END OF THE FACILITY TO CONFIRM INFILTRATION RATES.
10. A WARNING SIGN SHALL BE PLACED AT THE FACILITY THAT STATES, "PERVIOUS PAVING USED ON THIS SITE TO REDUCE POLLUTION. DO NOT RESURFACE WITH NON-POROUS MATERIAL. CALL 864-232-2273 FOR MORE INFORMATION."

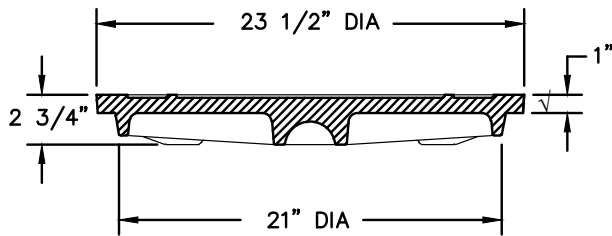


 city of greenville ENGINEERING DIVISION	PERVIOUS CONCRETE PAVEMENT SECTION		SCALE: NO SCALE
	DATE APPROVED: JAN. 2023	OFFICE OF THE CITY ENGINEER: APPROVED	DETAIL : 16:02

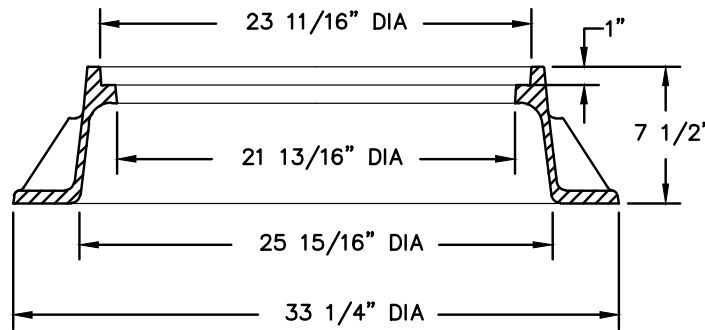
THIS DOCUMENT AND ANY ILLUSTRATIONS HEREON ARE PROVIDED AS STANDARD CONSTRUCTION DETAILS WITHIN THE CITY OF GREENVILLE, SC. DEVIATION FROM, OR MODIFICATION OF, THIS DOCUMENT REQUIRES APPROVAL OF THE CITY OF GREENVILLE. THE CITY OF GREENVILLE SHALL NOT BE HELD LIABLE FOR DAMAGES AS A RESULT OF MISUSE OR CHANGES TO THIS DOCUMENT. THE APPROVAL SIGNATURE AND LOGO SHALL BE REMOVED IF ANY PORTION OF THIS DOCUMENT IS MODIFIED.



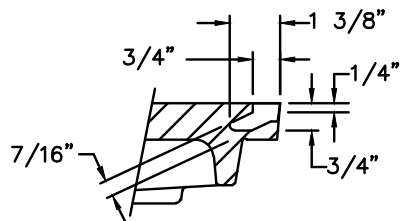
COVER BOTTOM VIEW



COVER SECTION



FRAME SECTION



PICKHOLE DETAIL

NOTE

1. ALL WASTEWATER MANHOLE ASSEMBLIES INSTALLED WITHIN THE CITY SHALL CONFORM TO THIS DETAIL AND CITY OF GREENVILLE SPECIFICATIONS.
2. COVER SHALL BE GRAY IRON CONFORMING TO ASTM A48 CL35B AND SHALL WEIGH APPROXIMATELY 130 POUNDS WITHIN ACCEPTABLE TOLERANCE.
3. FRAME SHALL BE GRAY IRON CONFORMING TO ASTM A48 CL35B AND SHALL WEIGH APPROXIMATELY 160 POUNDS WITHIN ACCEPTABLE TOLERANCE.
4. MANHOLE ASSEMBLY SHALL BE UNDIPPED.
5. "✓" DESIGNATES MACHINED SURFACE.
6. LETTERING SHALL BE TRUE TYPE ARIAL FONT HAVING $\frac{1}{8}$ " RELIEF. LOGO SHALL HAVE $\frac{1}{4}$ " RELIEF.
7. EJIW PRODUCT NO. 41384176, US FOUNDRY SERIES 421, OR APPROVED EQUAL.



ENGINEERING DIVISION

HEAVY DUTY RING & COVER WASTEWATER UTILITY

DATE APPROVED: JAN. 2023

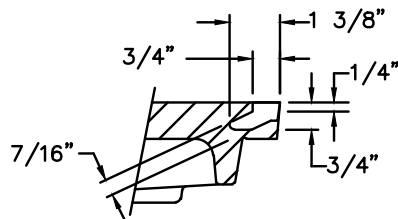
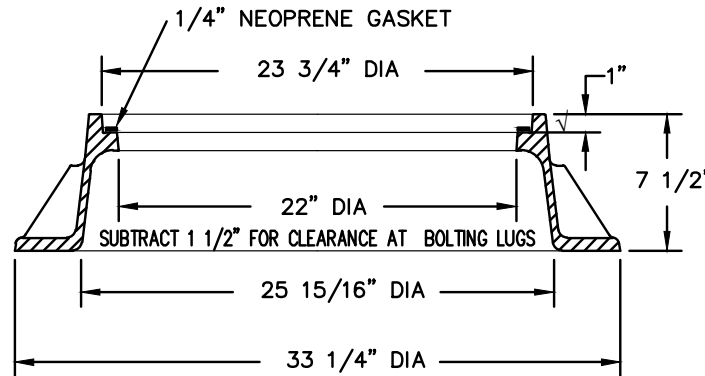
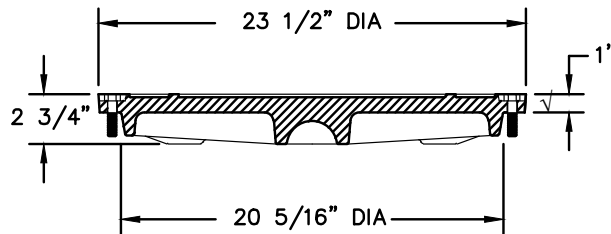
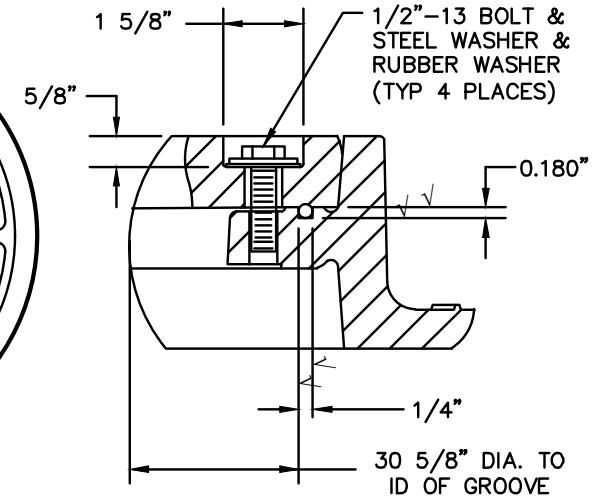
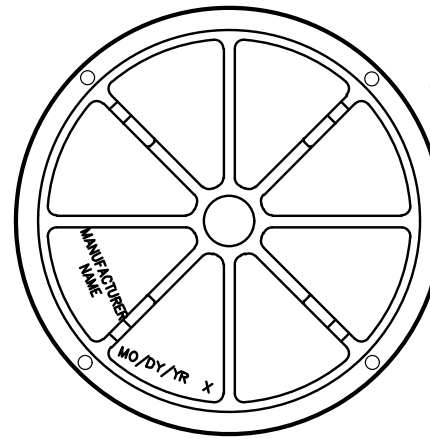
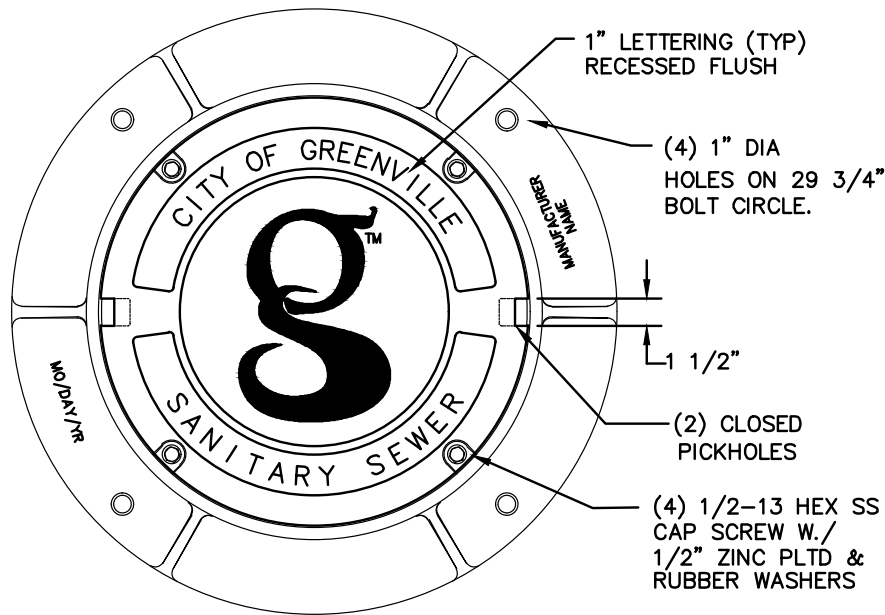
OFFICE OF THE
CITY ENGINEER:

APPROVED

SCALE:
NO SCALE

DETAIL:

20:00



NOTE

1. ALL WASTEWATER MANHOLE ASSEMBLIES INSTALLED WITHIN THE CITY SHALL CONFORM TO THIS DETAIL AND CITY OF GREENVILLE SPECIFICATIONS.
2. COVER SHALL BE GRAY IRON CONFORMING TO ASTM A48 CL35B AND SHALL WEIGH APPROXIMATELY 130 POUNDS WITHIN ACCEPTABLE TOLERANCE.
3. FRAME SHALL BE GRAY IRON CONFORMING TO ASTM A48 CL35B AND SHALL WEIGH APPROXIMATELY 160 POUNDS WITHIN ACCEPTABLE TOLERANCE.
4. MANHOLE ASSEMBLY SHALL BE UNDIPPED.
5. "V" DESIGNATES MACHINED SURFACE.
6. LETTERING SHALL BE TRUE TYPE ARIAL FONT HAVING 1/8" RELIEF. LOGO SHALL HAVE 1/4" RELIEF.
7. EJIW PRODUCT SERIES V-2384, US FOUNDRY PRODUCT NO. 8015480, OR APPROVED EQUAL.



ENGINEERING DIVISION

WATERTIGHT RING & COVER WASTEWATER UTILITY

DATE
APPROVED: JAN. 2023

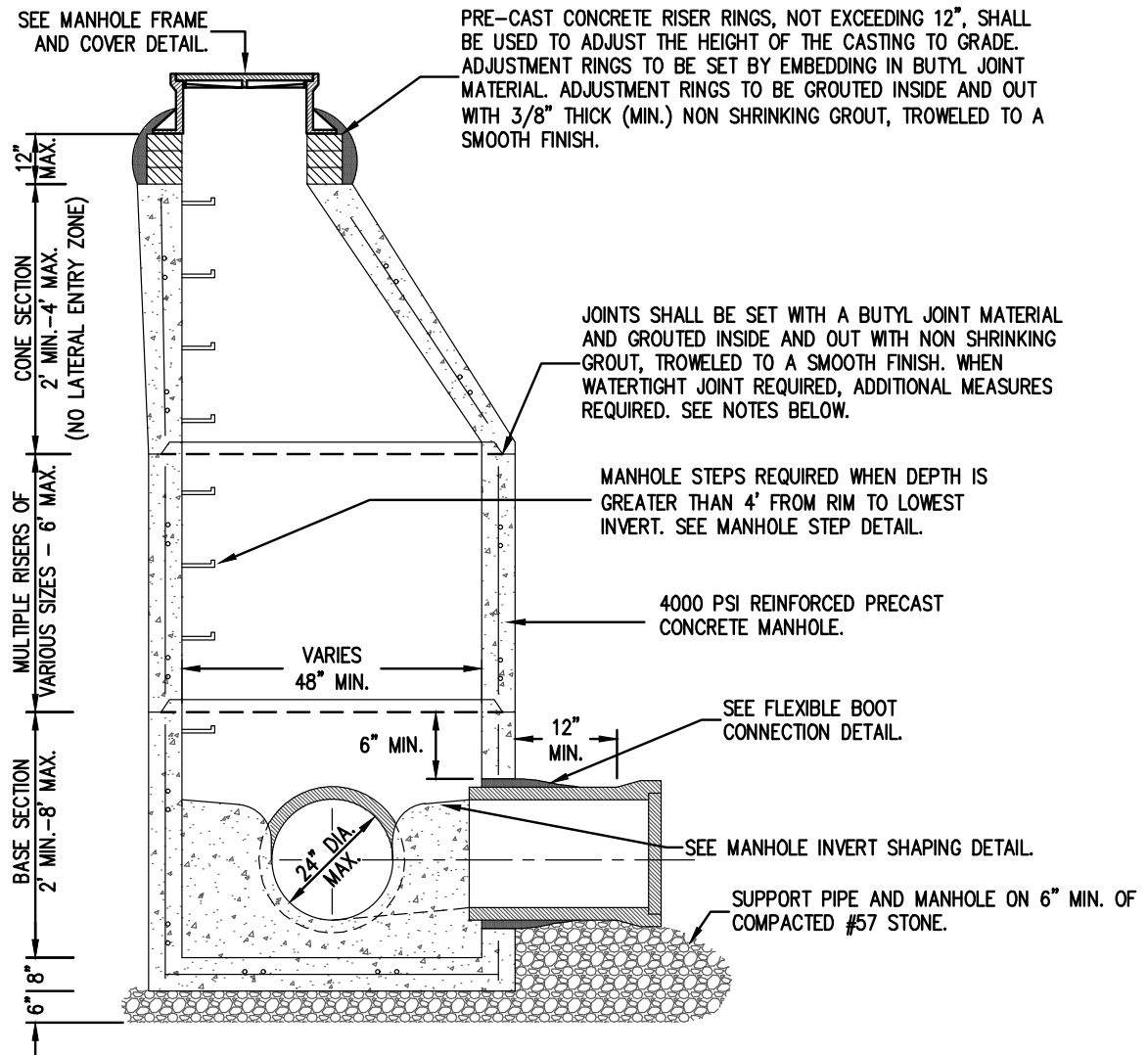
OFFICE OF THE
CITY ENGINEER:

APPROVED

SCALE:
NO SCALE

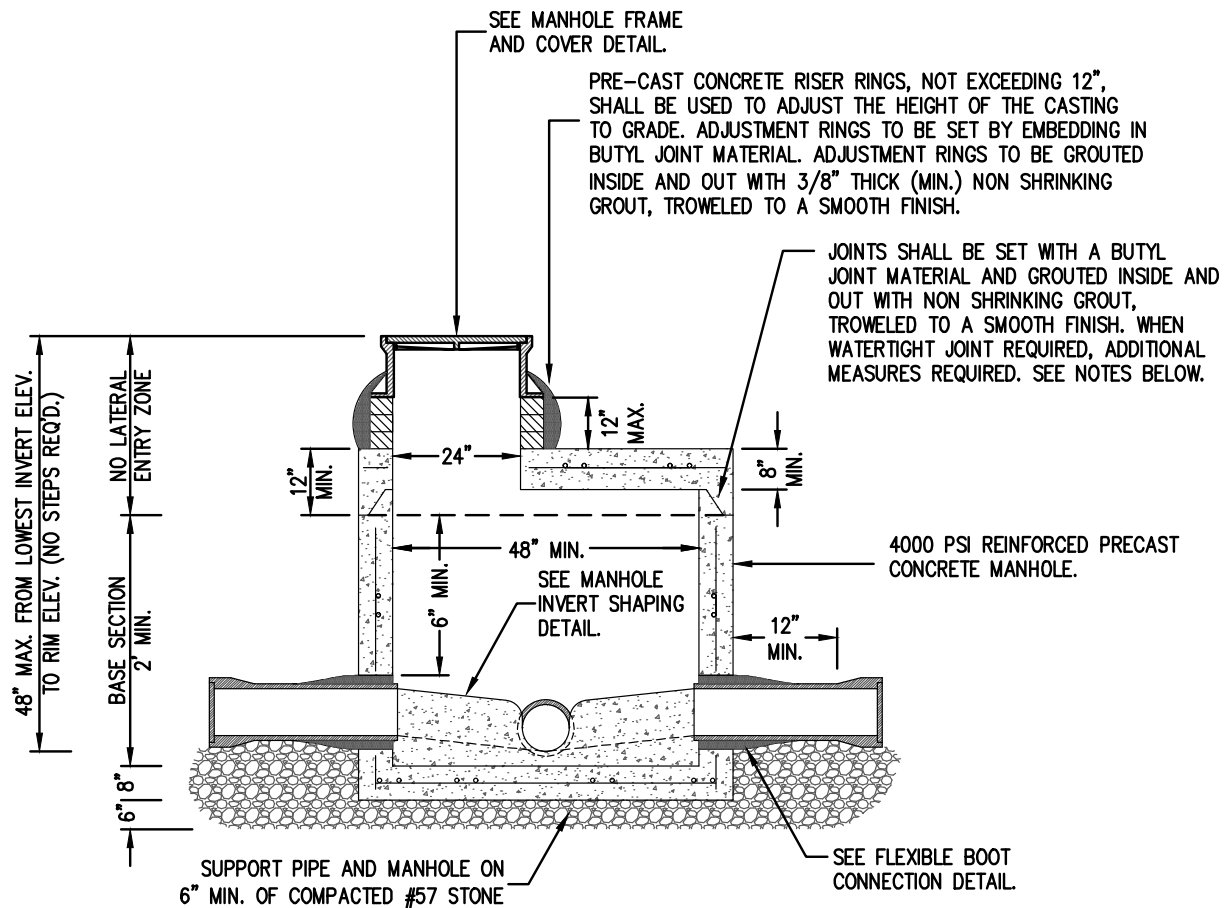
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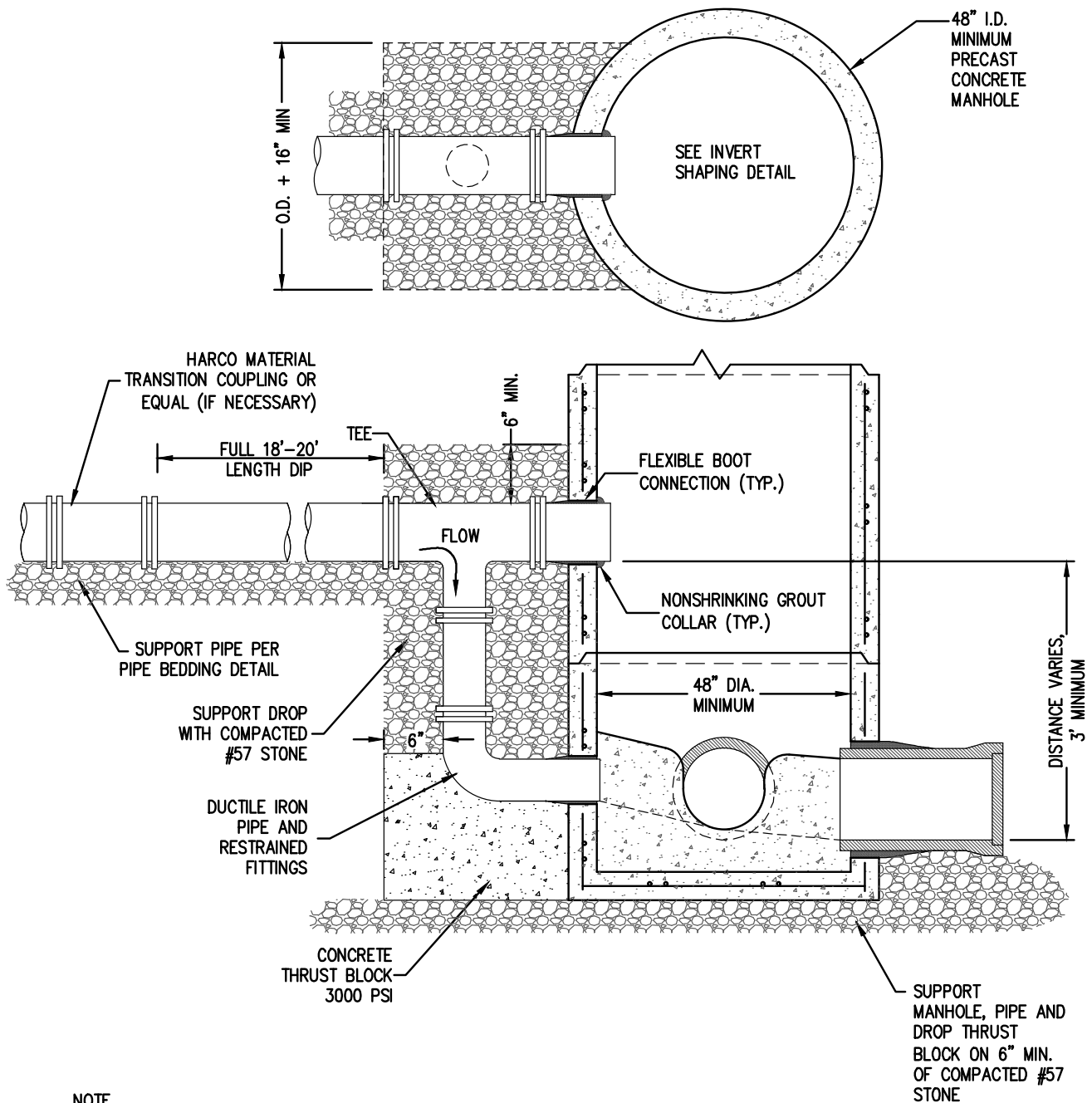
NOTE

1. PRECAST CONCRETE MANHOLE SHALL BE IN CONFORMANCE WITH CITY SPECIFICATIONS AND IN ACCORDANCE WITH ASTM C-478.
2. ECCENTRIC CONE SECTION SHALL BE USED. CONCENTRIC CONE SECTION IS NOT PERMITTED.
3. DOG HOUSE TYPE MANHOLES ARE NOT PERMITTED.
4. WHEN MANHOLE DEPTH IS GREATER THAN 12' FROM RIM TO LOWEST INVERT, 60" DIA. SHALL BE REQUIRED. FOR MANHOLE DEPTHS GREATER THAN 20', PRIOR APPROVAL FROM THE CITY ENGINEER IS REQUIRED.
5. MANHOLE WALLS SHALL BE 5" THICK MINIMUM FOR 48" INSIDE DIAMETER MANHOLES AND 6" MINIMUM FOR 60" DIAMETER MANHOLES.
6. PROVIDE A MAXIMUM OF TWO LIFT HOLES PER SECTION. PLUG HOLES WITH RUBBER PLUG AND GROUT INSIDE AND OUT WITH NON SHRINKING GROUT FOR A WATERTIGHT SEAL.
7. MAXIMUM OF THREE INLET TRIBUTARIES PERMITTED PER MANHOLE WITHOUT PRIOR APPROVAL OF CITY ENGINEER.
8. MINIMUM 0.1' DROP IN ELEVATION FROM THE LOWEST TRIBUTARY INLET TO THE INVERT OF THE OUTLET.
9. CONNECTIONS TO A PRECAST MANHOLE MUST BE CORED AND REQUIRE A FLEXIBLE BOOT CONNECTION, KOR-N-SEAL OR APPROVED EQUAL. CORING NOT PERMITTED WITHIN 6" OF BARREL SECTION JOINT. CONNECTIONS TO EXISTING MANHOLES SUBJECT TO ADDITIONAL REQUIREMENTS. SEE CITY SPECIFICATIONS, FLEXIBLE BOOT CONNECTION DETAIL, AND MANHOLE INVERT SHAPING DETAILS FOR ADDITIONAL INFORMATION.
10. RE-CORING OR OVER CORING IS NOT PERMITTED ON NEW MANHOLES THAT WERE FABRICATED OR INSTALLED INCORRECTLY.
11. BUTYL JOINT MATERIAL SHALL COMPLY WITH ASTM C990.
12. NON SHRINKING GROUT SHALL BE IN CONFORMANCE WITH ASTM C1107, ASTM C827, CRD C621 SUCH AS 1107 ADVANTAGE GROUT BY DAYTON SUPERIOR, OR APPROVED EQUAL.
13. IN CORROSIVE CONDITIONS AS DIRECTED BY THE CITY ENGINEER (E.G. RECEIVING FORCE MAIN DISCHARGE), MANHOLE INTERIOR WALLS SHALL RECEIVE A 10 MIL MINIMUM THICKNESS ACID RESISTANT COATING, NOVOCOAT SP2000, OR APPROVED EQUAL.
14. WHEN A WATERTIGHT MANHOLE IS REQUIRED AS DIRECTED BY THE CITY ENGINEER, JOINTS SHALL BE SEALED WITH O-RING GASKETS IN CONFORMANCE WITH ASTM C443 AND NON SHRINKING GROUT. ADDITIONALLY THE MANHOLE SHALL RECEIVE WATERPROOFING BY ONE OF THE FOLLOWING METHODS: (A.) EXTERIOR OF THE MANHOLE SHALL RECEIVE A 40 MIL COATING BITUMINOUS COAL TAR EPOXY CONFORMING TO AWWA C210 PER CITY SPECIFICATIONS. (B.) MANHOLES SHALL BE PRECAST WITH WATERPROOFING ADMIXTURE IPANEX BY IPA SYSTEMS IN ACCORDANCE WITH THE MANUFACTURER'S DOSAGE AND MIXING INSTRUCTIONS.



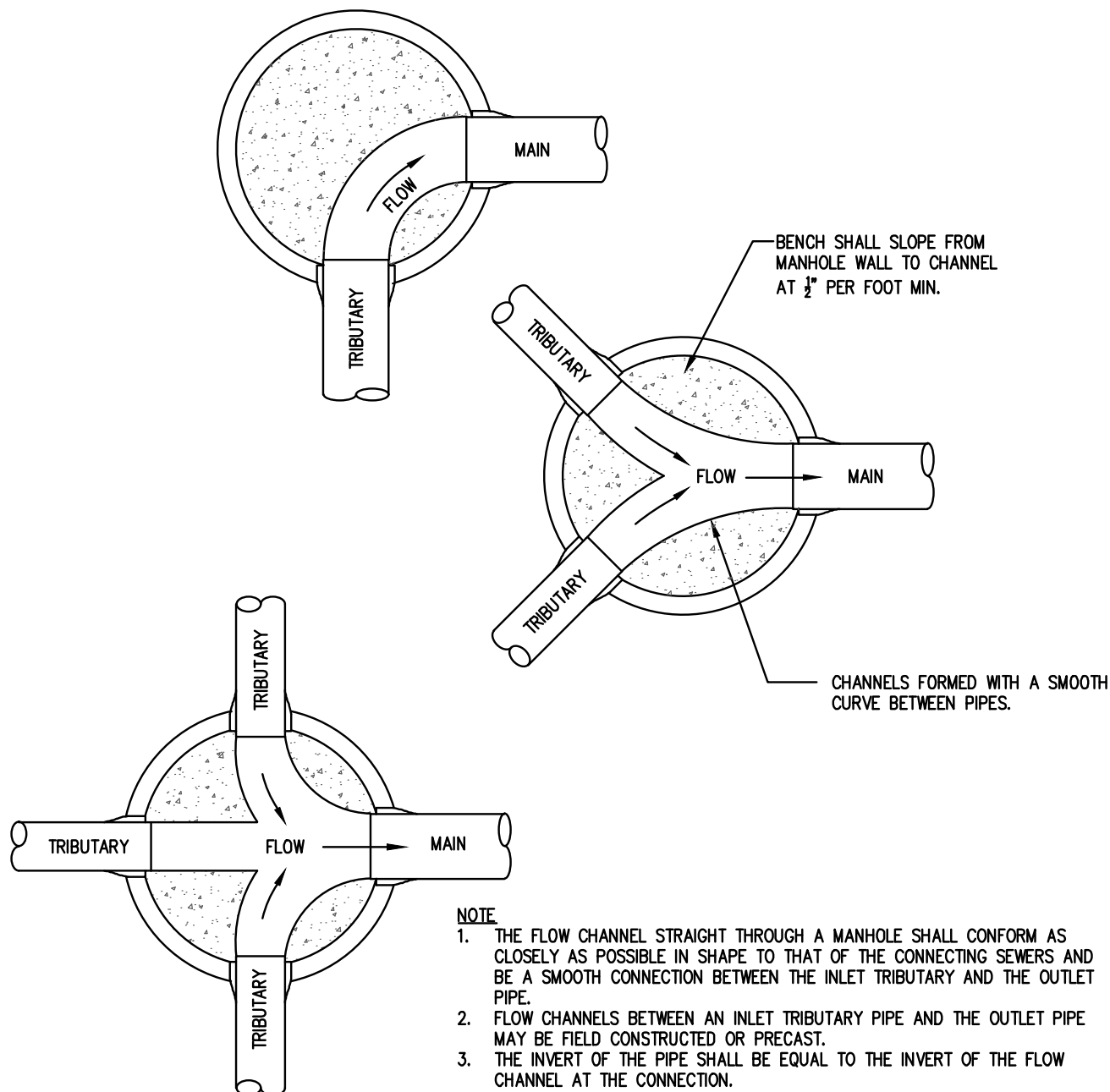
NOTE

1. PRECAST CONCRETE MANHOLE SHALL BE IN CONFORMANCE WITH CITY SPECIFICATIONS AND IN ACCORDANCE WITH ASTM C-478.
2. FLAT SLAB TOP SHALL BE AASHTO H-20 TRAFFIC RATED. 24" CLEAR MANHOLE OPENING SHALL BE CAST ECCENTRICALLY INTO FLAT SLAB TOP AS SHOWN. MST INC. CONCRETE PRODUCTS OR APPROVED EQUAL.
3. ECCENTRIC SHALLOW CONE SECTION MAY BE USED IN LIEU OF FLAT SLAB TOP. CONCENTRIC CONE SECTION IS NOT PERMITTED.
4. DOG HOUSE TYPE MANHOLES ARE NOT PERMITTED.
5. MANHOLE WALLS SHALL BE 5" THICK MINIMUM FOR 48" INSIDE DIAMETER MANHOLES AND 6" MINIMUM FOR 60" DIAMETER MANHOLES.
6. PROVIDE A MAXIMUM OF TWO LIFT HOLES PER SECTION. PLUG HOLES WITH RUBBER PLUG AND GROUT INSIDE AND OUT WITH NON SHRINKING GROUT FOR A WATERTIGHT SEAL.
7. MAXIMUM OF THREE INLET TRIBUTARIES PERMITTED PER MANHOLE WITHOUT PRIOR APPROVAL OF CITY ENGINEER.
8. MINIMUM 0.1' DROP IN ELEVATION FROM THE LOWEST TRIBUTARY INLET TO THE INVERT OF THE OUTLET.
9. CONNECTIONS TO A PRECAST MANHOLE MUST BE CORED AND REQUIRE A FLEXIBLE BOOT CONNECTION, KOR-N-SEAL OR APPROVED EQUAL. CORING NOT PERMITTED WITHIN 6" OF BARREL SECTION JOINT. CONNECTIONS TO EXISTING MANHOLES SUBJECT TO ADDITIONAL REQUIREMENTS. SEE CITY SPECIFICATIONS, FLEXIBLE BOOT CONNECTION DETAIL, AND MANHOLE INVERT SHAPING DETAILS FOR ADDITIONAL INFORMATION.
10. RE-CORING OR OVER CORING IS NOT PERMITTED ON NEW MANHOLES THAT WERE FABRICATED OR INSTALLED INCORRECTLY.
11. BUTYL JOINT MATERIAL SHALL COMPLY WITH ASTM C990.
12. NON SHRINKING GROUT SHALL BE IN CONFORMANCE WITH ASTM C1107, ASTM C827, CRD C621 SUCH AS 1107 ADVANTAGE GROUT BY DAYTON SUPERIOR, OR APPROVED EQUAL.
13. IN CORROSIVE CONDITIONS AS DIRECTED BY THE CITY ENGINEER (E.G. RECEIVING FORCE MAIN DISCHARGE), MANHOLE INTERIOR WALLS SHALL RECEIVE A 10 MIL MINIMUM THICKNESS ACID RESISTANT COATING, NOVOCOAT SP2000, OR APPROVED EQUAL.
14. WHEN A WATERTIGHT MANHOLE IS REQUIRED AS DIRECTED BY THE CITY ENGINEER, JOINTS SHALL BE SEALED WITH O-RING GASKETS IN CONFORMANCE WITH ASTM C443 AND NON SHRINKING GROUT. ADDITIONALLY THE MANHOLE SHALL RECEIVE WATERPROOFING BY ONE OF THE FOLLOWING METHODS: (A.) EXTERIOR OF THE MANHOLE SHALL RECEIVE A 40 MIL COATING BITUMINOUS COAL TAR EPOXY CONFORMING TO AWWA C210 PER CITY SPECIFICATIONS. (B.) MANHOLES SHALL BE PRECAST WITH WATERPROOFING ADMIXTURE IPANEX BY IPA SYSTEMS IN ACCORDANCE WITH THE MANUFACTURER'S DOSAGE AND MIXING INSTRUCTIONS.



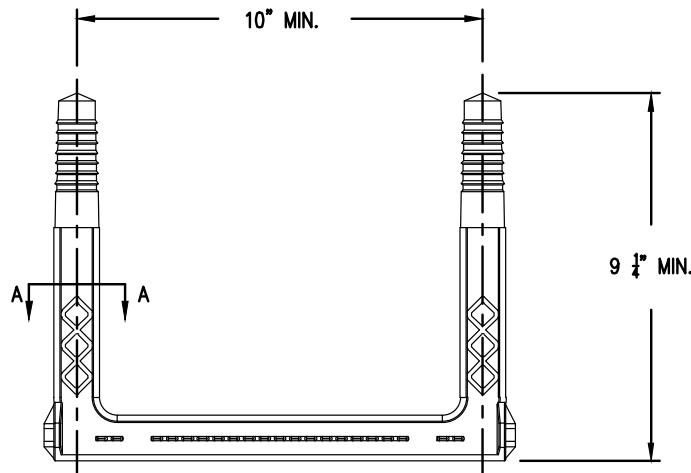
NOTE

1. LOCATION OF STEPS SHALL NOT CONFLICT WITH DROP CONNECTION.
2. PROVIDE CHANNEL WITH CONTINUOUS INVERT FROM DROP CONNECTION TO INVERT OF SEWER MAIN.
3. SEE DETAIL OF STANDARD PRECAST CONCRETE MANHOLE FOR ADDITIONAL DETAILS AND REQUIREMENTS.
4. NO EXTERNAL DROP SHALL BE ADDED TO BRICK MANHOLES.
5. DROP CONNECTION DETAILS ARE BASED ON DUCTILE IRON PIPE AND RESTRAINED FITTINGS WITH MEGA-LUGS.
6. CONNECTIONS TO WASTEWATER MAINS OF OTHER MATERIAL SHALL BE MADE WITH HARCO MATERIAL TRANSITION COUPLING OR APPROVED EQUAL.
7. MINIMUM DISTANCE FROM OUTSIDE OF DROP PIPE TO NEAREST MANHOLE JOINT SHALL BE 6".
8. MINIMUM CLEARANCE FROM OUTSIDE OF DROP PIPE TO MANHOLE WALL SHALL BE 12".
9. SLOPE OF MAIN SEWER LINE APPROACH TO THE DROP ASSEMBLY SHOULD BE NO GREATER THAN 5%.
10. CONTRACTOR SHALL ENSURE CONCRETE THRUST BLOCK IS SUFFICIENTLY CURED PRIOR TO INSTALLATION OF REMAINDER OF DROP ASSEMBLY.

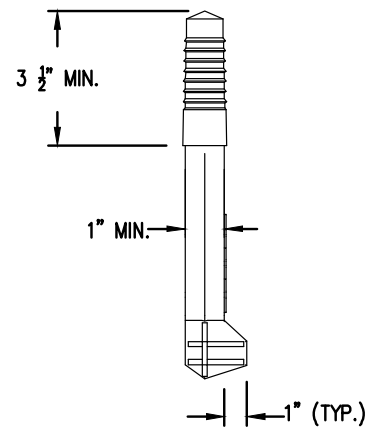


NOTE

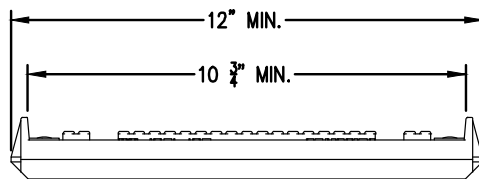
1. THE FLOW CHANNEL STRAIGHT THROUGH A MANHOLE SHALL CONFORM AS CLOSELY AS POSSIBLE IN SHAPE TO THAT OF THE CONNECTING SEWERS AND BE A SMOOTH CONNECTION BETWEEN THE INLET TRIBUTARY AND THE OUTLET PIPE.
2. FLOW CHANNELS BETWEEN AN INLET TRIBUTARY PIPE AND THE OUTLET PIPE MAY BE FIELD CONSTRUCTED OR PRECAST.
3. THE INVERT OF THE PIPE SHALL BE EQUAL TO THE INVERT OF THE FLOW CHANNEL AT THE CONNECTION.
4. THE CHANNEL WALLS SHALL BE FORMED OR SHAPED TO THE FULL HEIGHT OF THE CROWN OF THE OUTLET SEWER IN SUCH A MANNER TO NOT OBSTRUCT MAINTENANCE, INSPECTION OR FLOW IN THE SEWERS AND TO PREVENT SOLIDS DEPOSITION.
5. CURVED FLOW CHANNELS MAY REQUIRE INCREASED CHANNEL SLOPE TO MAINTAIN ACCEPTABLE FLOW VELOCITY.
6. MAXIMUM DIFFERENCE IN ELEVATION BETWEEN THE INVERT OF THE TRIBUTARY INLET AND THE MANHOLE INVERT SHALL BE 18 INCHES. ELEVATION DIFFERENCES GREATER THAN 18 INCHES REQUIRE A DROP MANHOLE.
7. NO TRIBUTARY INLET, INCLUDING SERVICE CONNECTIONS, NOR DROP MANHOLE PIPES SHALL DISCHARGE ONTO THE SURFACE OF THE BENCH.
8. BENCH AND CHANNELS TO BE FORMED USING CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI.
9. CONCRETE SHALL BE TROWELED TO A SMOOTH FINISH.



PLAN



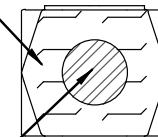
SIDE



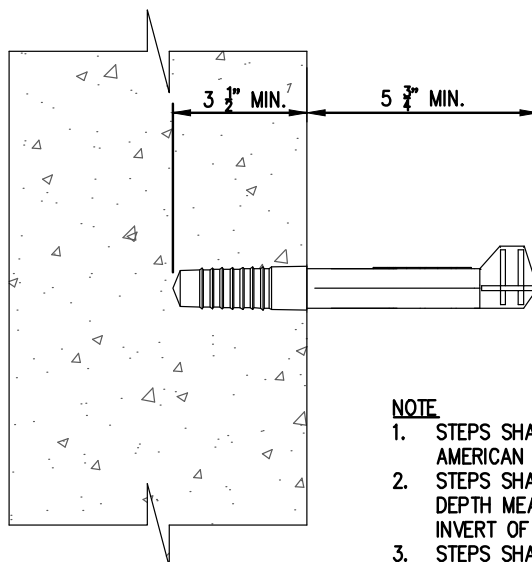
FRONT

COPOLYMER
POLYPROPYLENE
PLASTIC PER ASTM
D4101

1/2" DIA. GRADE 60 STEEL
REINFORCEMENT PER ASTM
A615 POWDER EPOXY
COATED PER ASTM A934

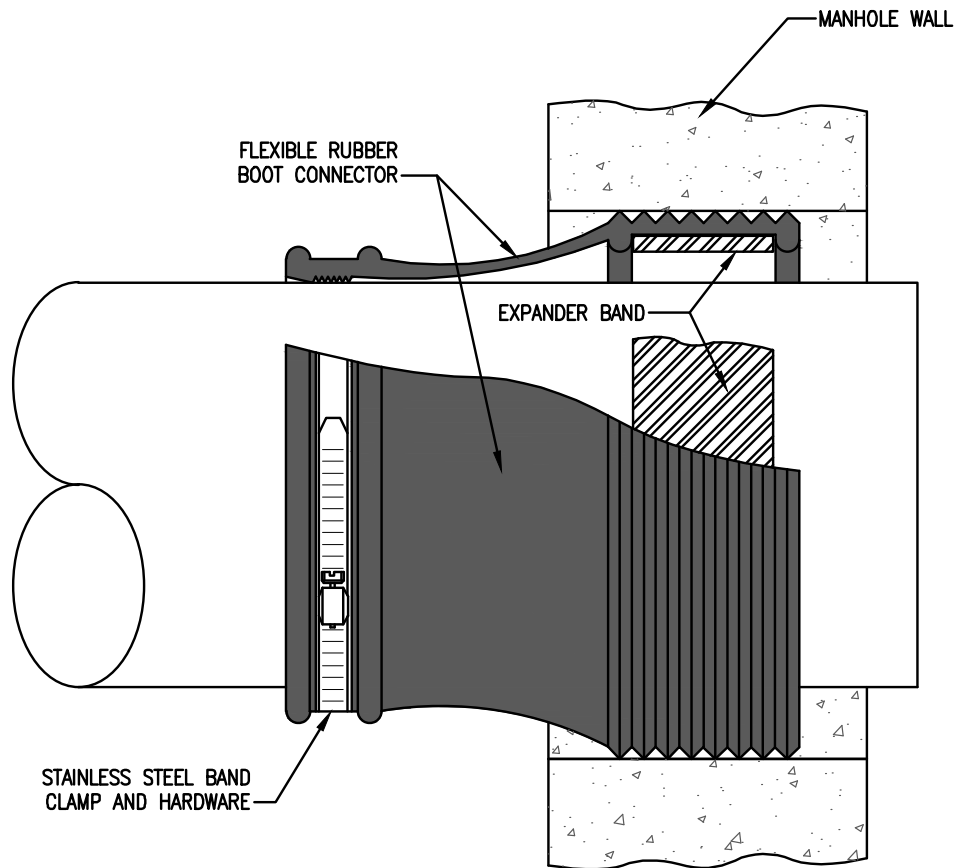


SECTION A-A



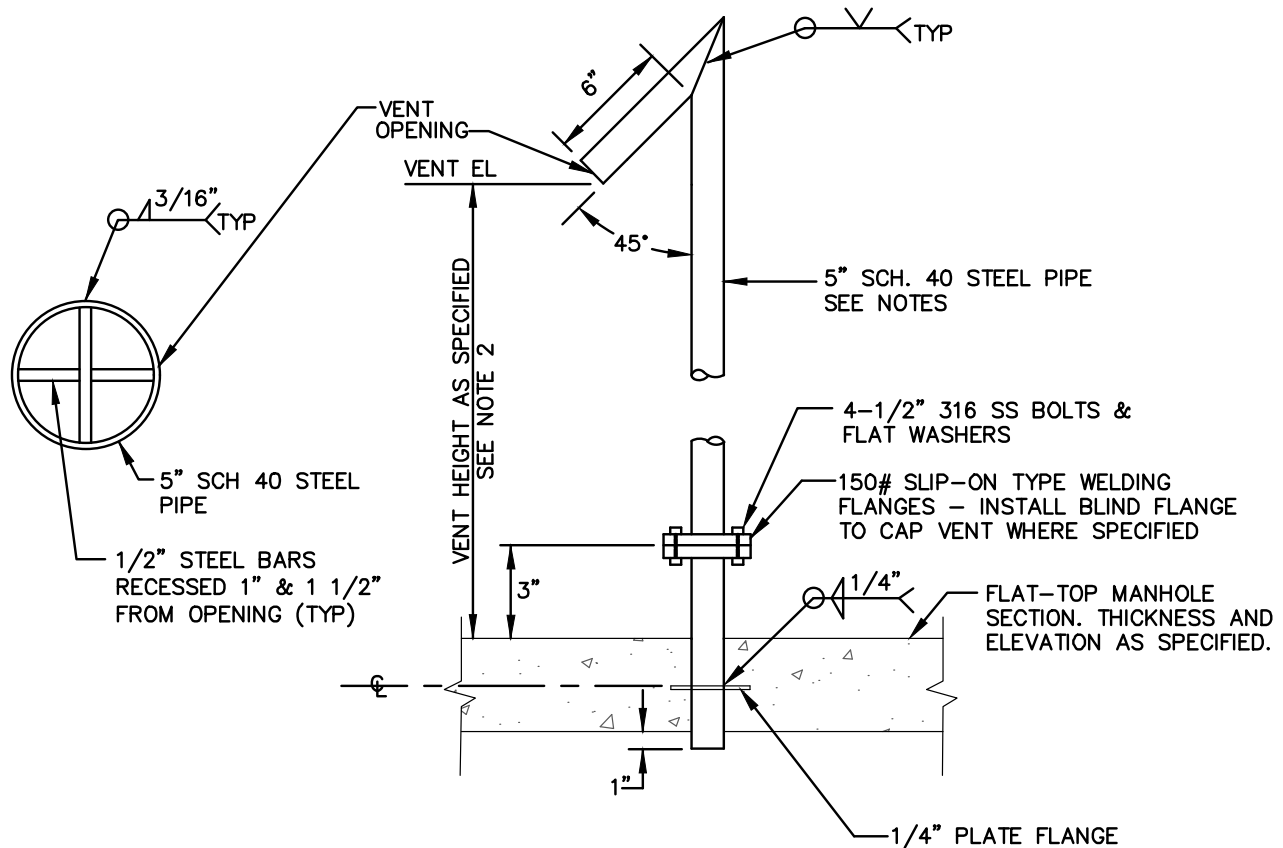
NOTE

1. STEPS SHALL CONFORM TO ASTM C478 AND OSHA STANDARDS. ML 10 BY AMERICAN STEP COMPANY, INC., OR APPROVED EQUAL.
2. STEPS SHALL BE INSTALLED IN ALL STRUCTURES GREATER THAN 4 FEET OF DEPTH MEASURED FROM THE TOP OF THE MANHOLE COVER TO THE LOWEST INVERT OF THE FLOW CHANNEL.
3. STEPS SHALL BE PLACED 12-16 INCHES CENTER TO CENTER ON WALL, AND PROTRUDE A MINIMUM OF 5 3/4 INCHES FROM THE INSIDE FACE OF STRUCTURE WALL. STEP SPACING WITHIN A SINGLE STRUCTURE SHALL BE MAINTAINED WITHIN 1" OF THE AVERAGE STEP SPACING FOR THAT STRUCTURE.
4. STEPS SHALL BE LOCATED TO ALLOW DIRECT ACCESS FROM THE SURFACE TO THE TABLE.



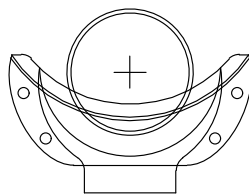
NOTE

1. ALL PIPE CONNECTIONS INTO PRECAST MANHOLES SHALL BE INSTALLED BY CORING AND UTILIZE A FLEXIBLE BOOT SUCH AS KOR-N-SEAL® OR APPROVED EQUAL.
2. THE FLEXIBLE BOOT SHALL BE IN CONFORMANCE WITH THE LATEST CITY STANDARD SPECIFICATIONS AND IN ACCORDANCE WITH ASTM C923, ASTM A666, AND ASTM A240.
3. THE INSTALLED PIPE SHALL HAVE A SMOOTH, FORMED INVERT; BORING OR CHIPPING OF THE EXISTING TABLE TO THE FLOW CHANNEL IS REQUIRED.
4. CORINGS FOR BOOT CONNECTORS SHALL NOT BE MADE WITHIN SIX INCHES OF A MANHOLE BARREL SECTION JOINT.
5. OTHER THAN PRECAST CONCRETE MANHOLES AND WITHOUT THE WRITTEN APPROVAL OF THE CITY ENGINEER, EXISTING MANHOLES MAY NOT BE CORED.
6. RE-CORING OR OVER CORING AN EXISTING CONNECTION MAY NOT BE ACCEPTED BY THE CITY AND SHOULD BE AVOIDED.

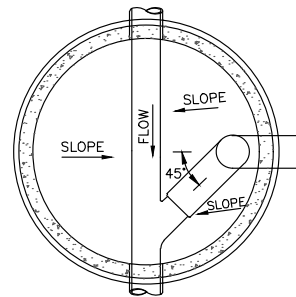


NOTE

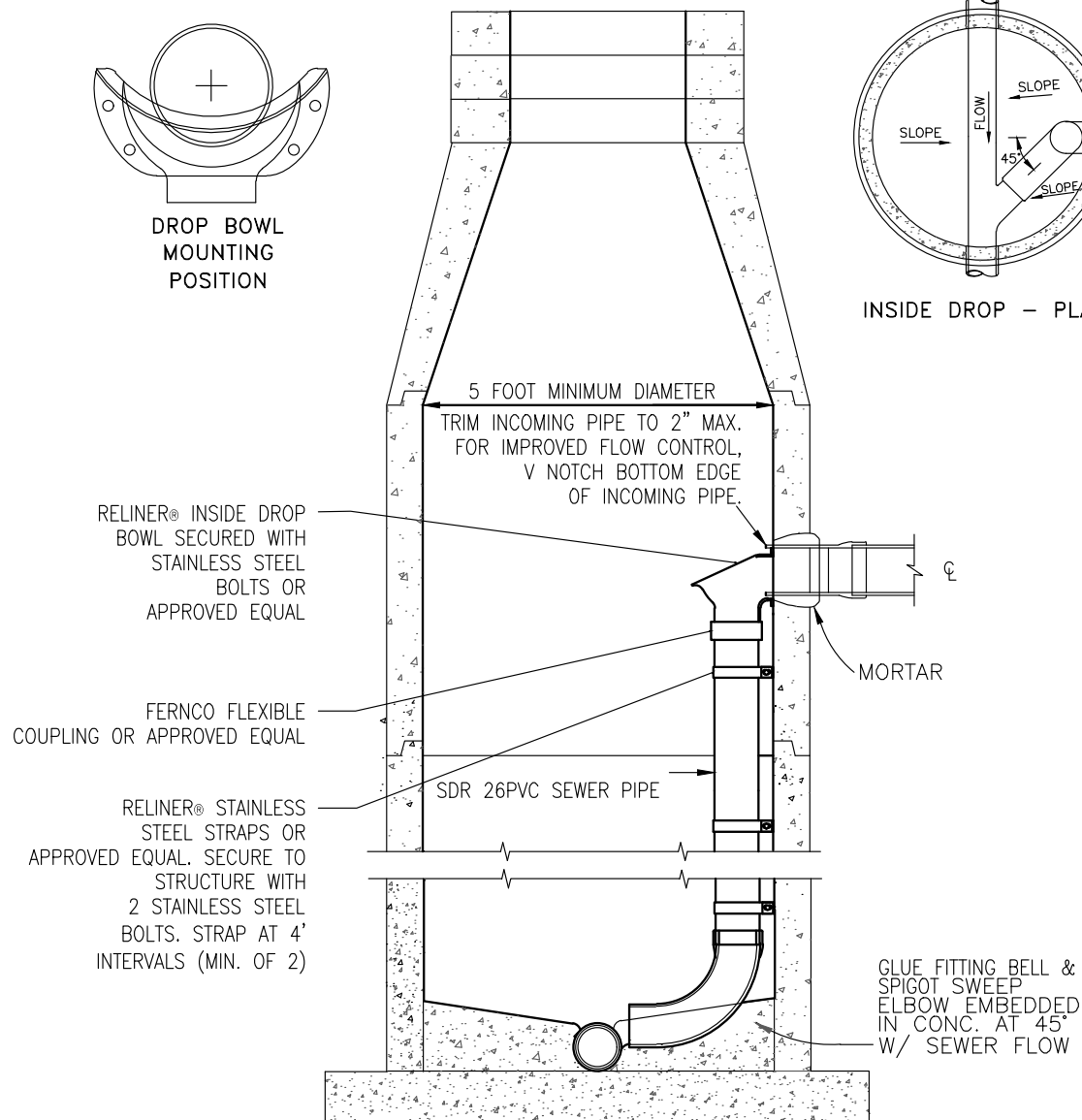
1. FIVE INCH DIAMETER FLANGED BY PLAIN END STEEL WALL PIPE SHALL BE CAST IN PLACE (PLUMB) WITH BOLT HOLES IN FLANGE STRADDLING THE CENTER LINES. PIPE TO BE COATED PER VENT PIPE SPECIFICATIONS.
2. FIVE INCH DIAMETER STEEL VENT PIPE TO BE FURNISHED WITH COMPATIBLE FLANGE AND ALL NECESSARY STAINLESS STEEL HARDWARE FOR BOLTED ATTACHMENT.
3. VENT OUTLET TO POINT DOWNSTREAM.
4. PROVIDE SCREEN ON END OF VENT PIPES. SCREEN TO BE MADE OF 2 STEEL BARS WELDED TO INSIDE OF PIPE.
5. ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION AND BEFORE BEING CAST-IN-PLACE.
6. TOP OF VENT OPENING TO BE 2 FEET ABOVE THE 100-YEAR FLOOD ELEVATION. IF MANHOLE COVER/TOP SLAB IS ABOVE 100-YEAR FLOOD ELEVATION, VENT OPENING TO BE 2 FEET ABOVE TOP SLAB.
7. VENTS TO BE INSTALLED EVERY 1,000 FEET OR AS APPROVED BY THE CITY ENGINEER.



DROP BOWL
MOUNTING
POSITION



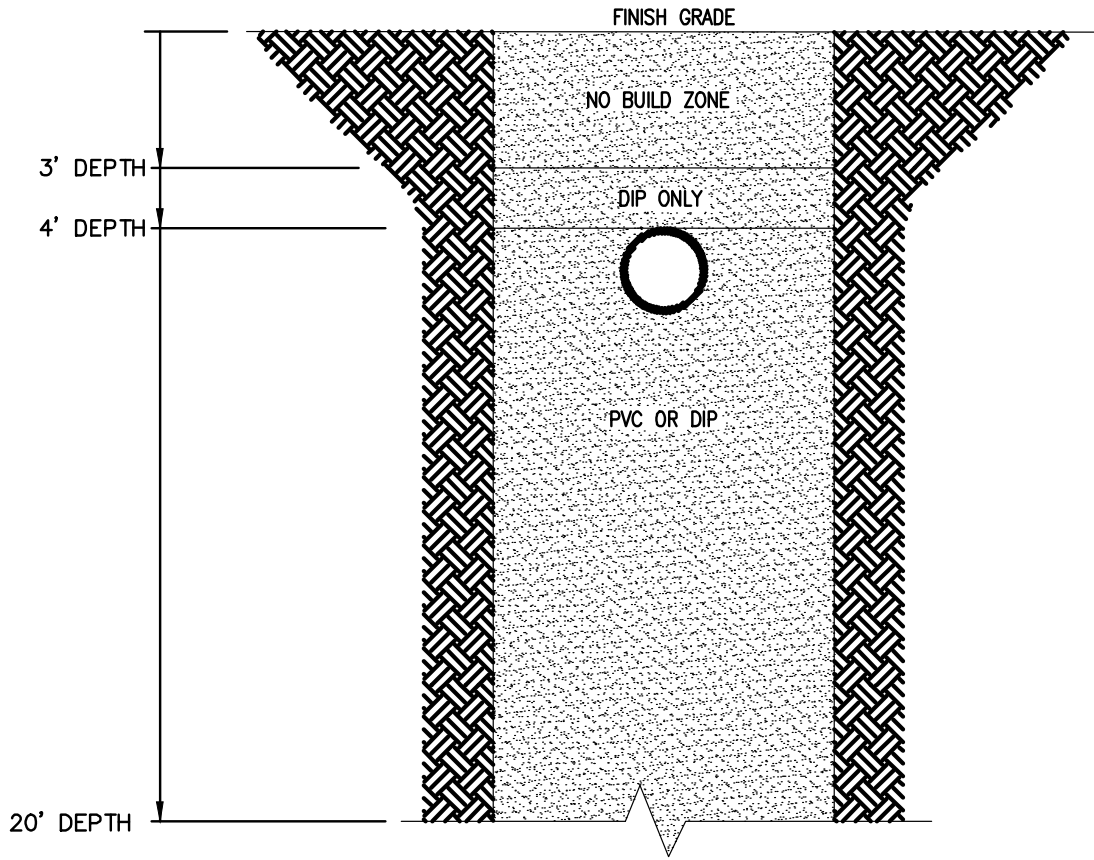
INSIDE DROP - PLAN



INSIDE DROP CONNECTION

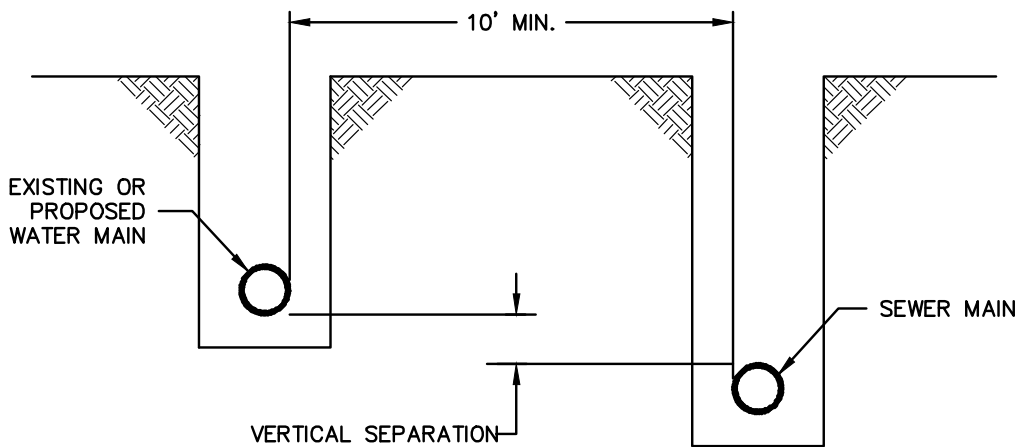
NOTE

1. LOCATION OF STEPS SHALL NOT CONFLICT WITH DROP CONNECTION.
2. PROVIDE CHANNEL WITH CONTINUOUS INVERT FROM DROP CONNECTION TO INVERT OF SEWER MAIN.
3. SEE DETAIL OF STANDARD PRECAST CONCRETE MANHOLE FOR ADDITIONAL DETAILS AND REQUIREMENTS.
4. CONNECTIONS TO WASTEWATER MAINS OF OTHER MATERIAL SHALL BE MADE WITH HARCO MATERIAL TRANSITION COUPLING OR APPROVED EQUAL.
5. SLOPE OF MAIN SEWER LINE APPROACH TO THE DROP ASSEMBLY SHOULD BE NO GREATER THAN 5%.
6. ALL INSIDE DROP CONNECTIONS FOR SERVICES AND COLLECTOR SEWERS SHALL USE THE DROP BOWL, OR APPROVED EQUAL AS PRODUCED BY:
RELINER-DURAN, INC.
53 MT. ARCHER RD,
LYME, CT 06371
7. SECURE DROP PIPE TO MANHOLE WALL WITH RELINER-DURAN, INC STAINLESS STEEL ADJUSTABLE CLAMPING BRACKETS, OR APPROVED EQUAL.



NOTE

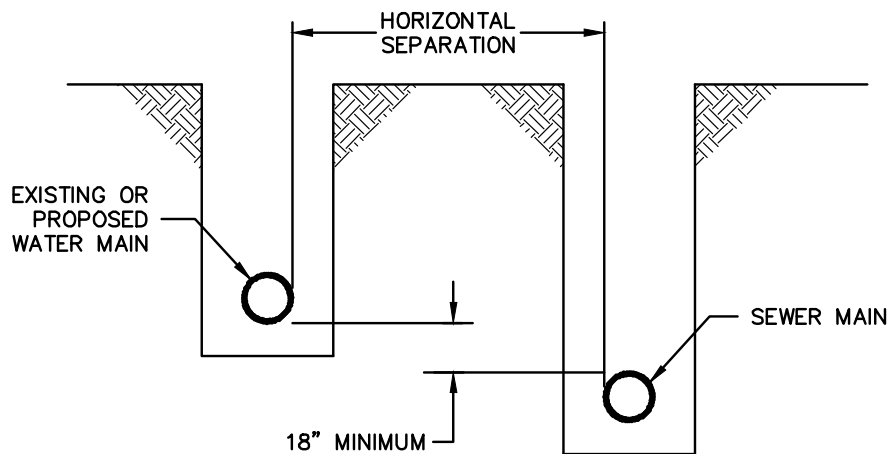
1. COVER DEPTH SHALL BE MEASURED FROM FINISHED GRADE SURFACE TO THE TOP OF PIPE.
2. INSTALLATIONS DEEPER THAN 20 FEET REQUIRE DUCTILE IRON PIPE (DIP) AND PRIOR APPROVAL BY THE CITY ENGINEER. BURIAL DEPTHS LESS THAN 3.0 FEET WILL NOT BE PERMITTED.
3. POLY VINYL CHLORIDE (PVC) SEWER PIPE SHALL BE SDR 26 OR SDR 35 MEETING ASTM D3034 FOR 4" TO 15" DIAMETER PIPE OR ASTM F679 FOR 18" TO 36" DIAMETER PIPE. PIPE SHALL BE MADE FROM PVC COMPOUNDS HAVING A CELL CLASSIFICATION OF 12454B AS DEFINED IN ASTM D1784. PIPE SHALL INCORPORATE AN INTEGRAL BELL JOINT WITH A SINGLE RUBBER GASKET CONFORMING TO ASTM F477. JOINTS SHALL BE IN ACCORDANCE WITH ASTM D3212, AND BE FURNISHED COMPLETE WITH ALL NECESSARY ACCESSORIES. PIPE, FITTINGS AND ACCESSORIES SHALL BE IN CONFORMANCE WITH CITY SPECIFICATIONS.
4. DIP SEWER PIPE SHALL BE ASPHALT COATED CEMENT MORTAR LINED CLASS 50 DUCTILE IRON PIPE. DIP SHALL BE PRESSURE CLASS 150. DIP SHALL BE DESIGNED AND MANUFACTURED IN ACCORDANCE WITH ANSI/AWWA C150/A21.50 AND C151/A21.51. PIPE SHALL HAVE A STANDARD 1-MIL ASPHALTIC COATING APPLIED ON THE EXTERIOR OF THE PIPE IN ACCORDANCE WITH ANSI/AWWA C151/A21.51. PIPE SHALL ALSO HAVE A CEMENT-MORTAR LINING ON THE INTERIOR IN ACCORDANCE WITH ANSI/AWWA C104/A21.4. ALL PIPE SHALL BE FURNISHED WITH PUSH-ON TYPE JOINTS, SUCH AS TYTON® OR FASTITE®. JOINTS SHALL BE IN ACCORDANCE WITH ANSI/AWWA C111/A21.11, AND BE FURNISHED COMPLETE WITH ALL NECESSARY ACCESSORIES. PIPE, FITTINGS AND ACCESSORIES SHALL BE IN CONFORMANCE WITH CITY SPECIFICATIONS.
5. WHEN SOIL TESTS IN ACCORDANCE WITH APPENDIX A OF ANSI/AWWA C105/A21.5 AND/OR PERFORMANCE HISTORY INDICATE THAT CONDITIONS ARE CORROSIVE TO DIP, POSITIVE CORROSION PROTECTION IS REQUIRED IN ACCORDANCE WITH CITY SPECIFICATIONS.
6. WHEN DIP IS USED TO TRANSPORT SEPTIC SEWAGE, SPECIALLY LINED PIPE IS REQUIRED IN ACCORDANCE WITH CITY SPECIFICATIONS.



TYPICAL INSTALLATION
(MINIMUM 10' HORIZONTAL SEPARATION)

NOTE

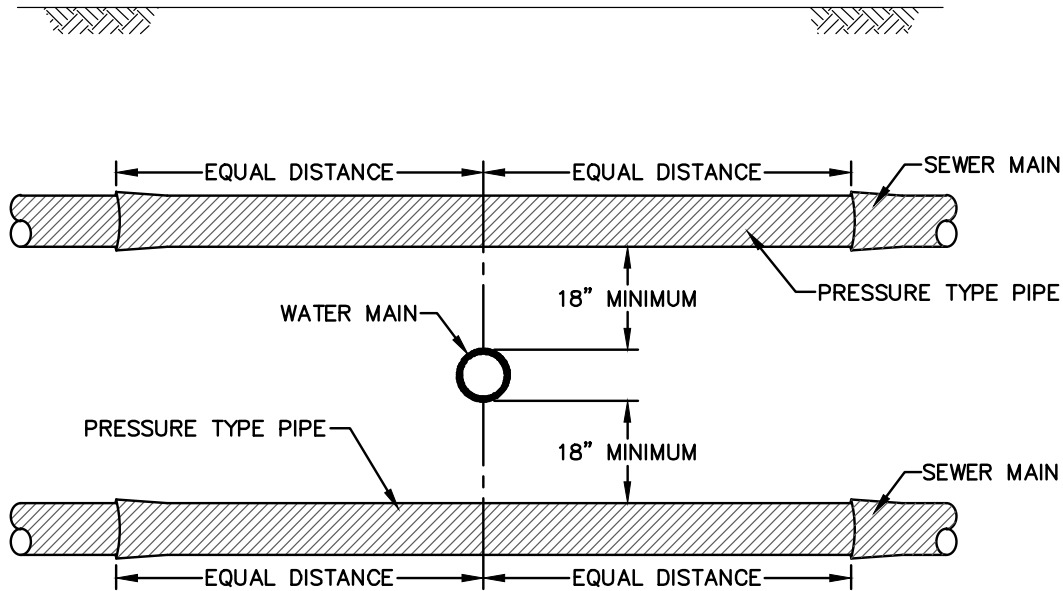
1. THERE ARE NO VERTICAL SEPARATION REQUIREMENTS WHEN HORIZONTAL SEPARATION IS 10' OR GREATER.



INSTALLATION WHERE HORIZONTAL SEPARATION IS LESS THAN 10'
(USED ONLY WHEN LOCAL CONDITIONS PREVENT TYPICAL INSTALLATION)

NOTE

1. THE SEWER MUST BE LAID IN A SEPARATE TRENCH FROM THE WATER.
2. THE TOP OF THE SEWER MAIN MUST BE A MINIMUM OF 18" BELOW THE BOTTOM OF THE WATER MAIN.
3. WHERE THE MINIMUM 18" SEPARATION CANNOT BE OBTAINED, THE FOLLOWING SPECIFICATIONS APPLY:
 - A. ALL REASONABLE EFFORT MUST BE MADE FOR THE SEWER LINE TO BE LOCATED UNDER THE WATER MAIN.
 - B. SEWER MAIN SHALL BE CONSTRUCTED OF SLIP TYPE OR MECHANICAL JOINT PIPE COMPLYING WITH ANSI/AWWA C900 OR ANSI/AWWA C600, PUBLIC WATER SUPPLY STANDARDS FROM NEAREST UPSTREAM MANHOLE TO THE NEAREST DOWNSTREAM MANHOLE.
 - C. ENTIRE LINE SHALL BE TESTED AT A HIGHER PRESSURE AS SPECIFIED IN THE HORIZONTAL/VERTICAL SEPARATION SECTION OF THE DESIGN SPECIFICATION MANUAL TO ASSURE WATER TIGHTNESS PRIOR TO BACKFILLING.

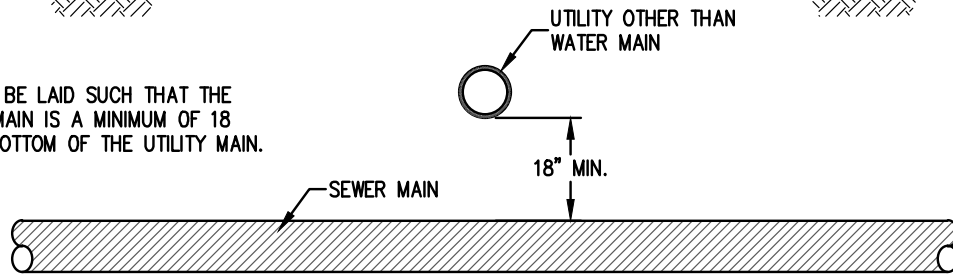


NOTE

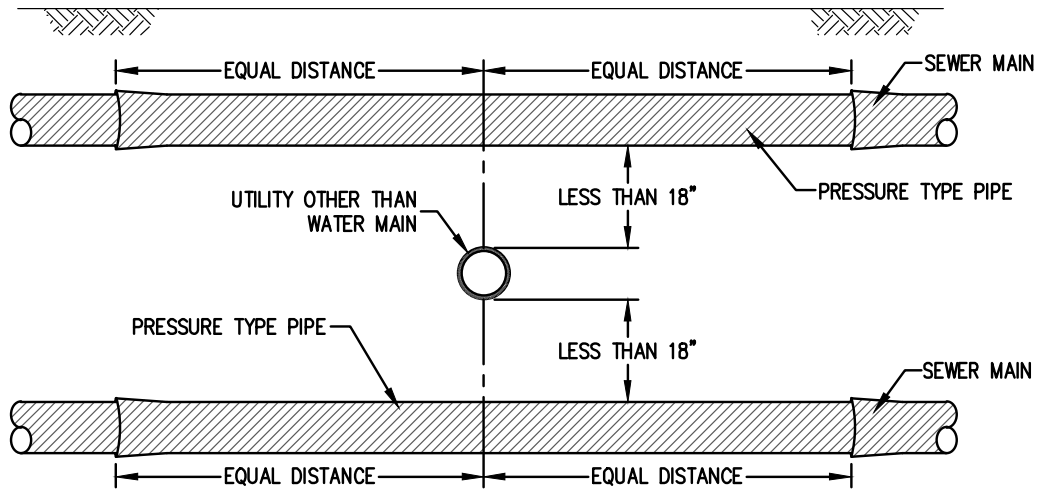
1. ALL REASONABLE EFFORT MUST BE MADE FOR THE SEWER LINE TO CROSS UNDER THE WATER MAIN.
2. THE SEWER SHALL BE LAID SUCH THAT THE OUTSIDE EDGE OF THE SEWER MAIN IS A MINIMUM OF 18 INCHES FROM THE OUTSIDE EDGE OF THE WATER MAIN.
3. THE CROSSING SHALL BE ARRANGED SO THAT THE SEWER JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE WATER MAIN JOINTS.
4. SEWER MAIN SHALL BE CONSTRUCTED OF SLIP TYPE OR MECHANICAL JOINT PIPE COMPLYING WITH ANSI/AWWA C900 OR ANSI/AWWA C600, PUBLIC WATER SUPPLY STANDARDS FROM NEAREST UPSTREAM MANHOLE TO THE NEAREST DOWNSTREAM MANHOLE.
5. ENTIRE LINE SHALL BE TESTED AT A HIGHER PRESSURE AS SPECIFIED IN THE HORIZONTAL/VERTICAL SEPARATION SECTION OF THE DESIGN SPECIFICATION MANUAL TO ASSURE WATER TIGHTNESS PRIOR TO BACKFILLING.
6. THE CROSSING SHALL HAVE ADEQUATE STRUCTURAL SUPPORT TO PREVENT DAMAGE TO THE MAIN.

NOTE

1. THE SEWER SHALL BE LAID SUCH THAT THE TOP OF THE SEWER MAIN IS A MINIMUM OF 18 INCHES BELOW THE BOTTOM OF THE UTILITY MAIN.



TYPICAL INSTALLATION
(SEWER MAIN CROSSING UNDER UTILITY OTHER THAN WATER MAIN)



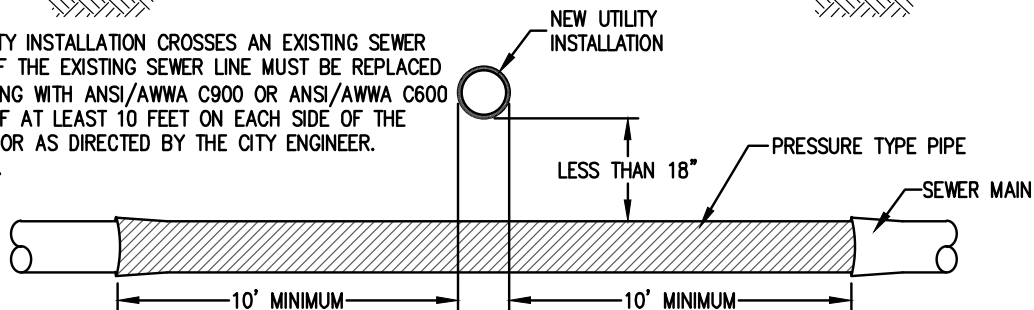
INSTALLATION WHERE VERTICAL SEPARATION IS LESS THAN 18"
(USED ONLY WHEN LOCAL CONDITIONS PREVENT TYPICAL INSTALLATION)

NOTE

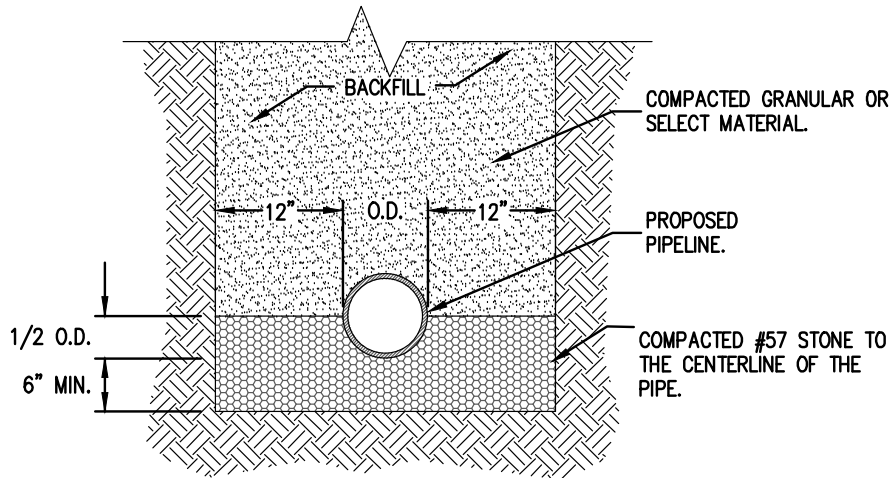
1. SEWER MAIN SHALL BE CONSTRUCTED OF SLIP TYPE OR MECHANICAL JOINT PIPE COMPLYING WITH ANSI/AWWA C900 OR ANSI/AWWA C600, PUBLIC WATER SUPPLY STANDARDS FROM NEAREST UPSTREAM MANHOLE TO THE NEAREST DOWNSTREAM MANHOLE.
2. THIS SECTION OF THE SEWER LINE SHALL BE PRESSURE TESTED IN ACCORDANCE WITH CITY SPECIFICATIONS ALONG WITH THE REMAINDER OF THE SEWER SYSTEM.
3. THE CROSSING SHALL HAVE ADEQUATE STRUCTURAL SUPPORT TO PREVENT DAMAGE TO THE MAIN.
4. THE CROSSING SHALL BE ARRANGED SO THAT THE SEWER JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE UTILITY MAIN JOINTS.

NOTE

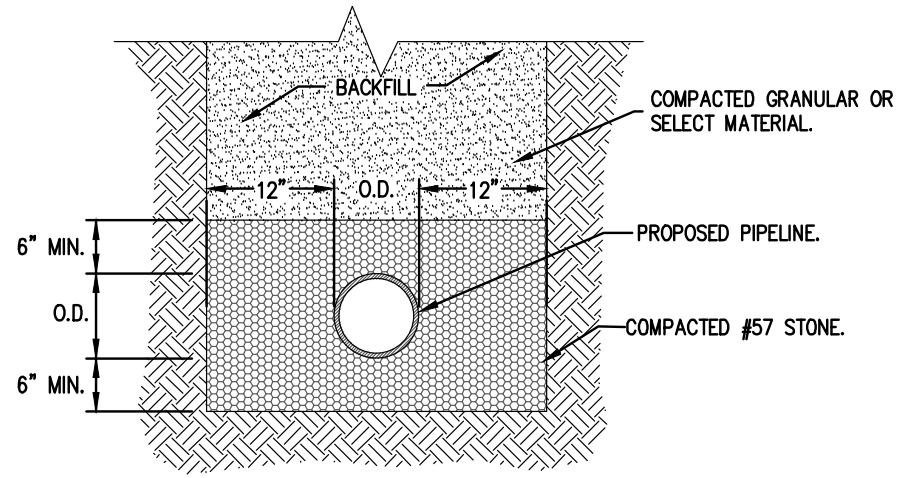
1. WHEN A NEW UTILITY INSTALLATION CROSSES AN EXISTING SEWER LINE, A SECTION OF THE EXISTING SEWER LINE MUST BE REPLACED WITH PIPE COMPLYING WITH ANSI/AWWA C900 OR ANSI/AWWA C600 FOR A DISTANCE OF AT LEAST 10 FEET ON EACH SIDE OF THE CROSSING UTILITY, OR AS DIRECTED BY THE CITY ENGINEER.
2. NOTES 2-4 ABOVE.



NEW UTILITY MAIN INSTALLATION
(USED ONLY WHEN LOCAL CONDITIONS PREVENT 18" MINIMUM CLEARANCE)



DUCTILE IRON PIPE



PVC PIPE

NOTE

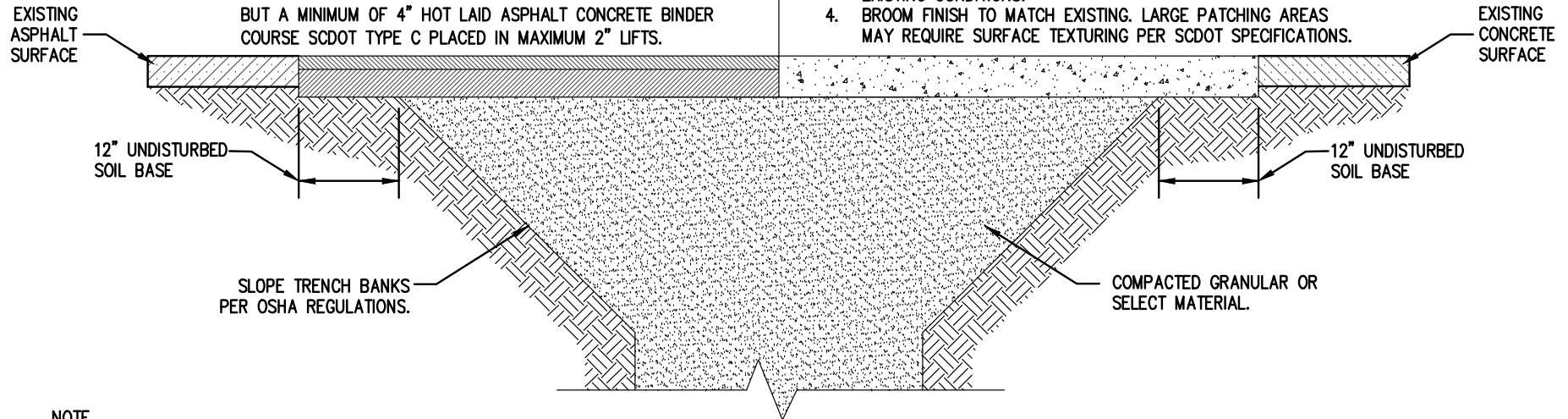
1. CONTRACTOR SHALL NOTIFY CITY OF GREENVILLE CONSTRUCTION INSPECTION BUREAU A MINIMUM OF 72 HOURS PRIOR TO BEGINNING CONSTRUCTION ACTIVITIES.
2. PVC PIPE SHALL BE INSTALLED AS SHOWN AND IN CONFORMANCE WITH THE LATEST CITY SPECIFICATIONS AND IN ACCORDANCE WITH ASTM D2321.
3. DUCTILE IRON PIPE SHALL BE INSTALLED AS SHOWN AND IN CONFORMANCE WITH THE LATEST CITY SPECIFICATIONS AND IN ACCORDANCE WITH SECTIONS 4.3.1 THROUGH 4.3.5 (EXCEPT 4.3.3.5, 4.3.4.4, AND 4.3.5.1.1), 5.1.1, AND 6.1 OF ANSI/AWWA C600 AS WELL AS THE APPLICABLE PORTIONS ASTM D2321 FOR NON-RIGID PIPE INSTALLATION.
4. EACH SECTION OF SEWER PIPE SHALL BE LAID TO THE APPROPRIATE LINE AND GRADE, AS DESIGNED AND PERMITTED, WORKING IN THE UPSTREAM DIRECTION WITH THE BELL END LAID UPGRADE.
5. TRENCH BOTTOM, PIPE BEDDING, AND ALL OTHER PLACEMENT AND COMPACTION OPERATIONS SHALL BE INSPECTED BY THE CITY OF GREENVILLE CONSTRUCTION INSPECTION BUREAU IN ACCORDANCE WITH CITY SPECIFICATIONS.
6. AS REQUESTED, THE CONTRACTOR SHALL SUPPLY RELIABLE TESTING DATA CONFIRMING THE MINIMUM STANDARDS ARE MET. THE CITY MAY NOT ACCEPT WORK IF THE CONTRACTOR FAILS TO PRODUCE SUFFICIENT TESTING RESULTS.
7. ALL TRENCH WORK SHALL BE IN COMPLIANCE WITH THE LATEST EDITION OF OSHA PART 1926 SUBPART P APPENDIX B OF THE CODE OF FEDERAL REGULATIONS.
8. TRENCH WIDTHS SHALL BE WIDER TO PERMIT THE PLACEMENT OF TIMBER SUPPORTS, SHEETING, BRACING, AND APPURTENANCES AS REQUIRED BY OSHA REGULATIONS.
9. TRENCH BOTTOM SHALL BE FREE OF WATER BEFORE PLACEMENT OF BEDDING.
10. UNSUITABLE SOIL SHALL BE REMOVED & BACKFILLED WITH APPROVED STONE AS DIRECTED BY THE CITY OF GREENVILLE CONSTRUCTION INSPECTION BUREAU.
11. CONTRACTOR SHALL SHAPE RECESSES BY HAND FOR PIPE BELL.
12. WHEN PLACED WITHIN THE R/W AND ALL TRAVELED SURFACES, BACKFILL MATERIAL SHALL BE CLEAN, SELECT MATERIAL PLACED IN 6" LIFTS & COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM D698.
13. WHEN PLACED OUTSIDE THE R/W, BACKFILL MATERIAL SHALL BE CLEAN, SELECT MATERIAL COMPACTED TO 90% STANDARD PROCTOR DENSITY PER ASTM D698.
14. COMPACTION TESTING SHALL BE PERFORMED PER CITY OF GREENVILLE SPECIFICATIONS.
15. SELECT BACKFILL MATERIAL IS NATIVE SOIL EXCAVATED FROM THE TRENCH FREE OF ROCKS, FOREIGN MATERIAL, AND FROZEN EARTH. UNSUITABLE NATIVE SOIL SHALL NOT BE USED.
16. PIPE SHALL RECEIVE A MINIMUM 36" OF COVER BEFORE ALLOWING VEHICLES OR CONSTRUCTION EQUIPMENT TO TRAFFIC THE TRENCH SURFACE AND AT LEAST 48" OF COVER BEFORE USING A HYDROHAMMER FOR COMPACTION.

ASPHALT SURFACE REPAIR

1. SEAL SAW CUT EDGE WITH CRS-2 ASPHALT EMULSION, OR APPROVED EQUAL, PRIOR TO PLACING NEW PAVING.
2. SURFACE COURSE SHALL BE 220#/SYD (2") HOT LAID ASPHALT CONCRETE SURFACE COURSE SCDOT TYPE C.
3. BINDER COURSE DEPTH SHALL MATCH EXISTING PAVEMENT DEPTH BUT A MINIMUM OF 4" HOT LAID ASPHALT CONCRETE BINDER COURSE SCDOT TYPE C PLACED IN MAXIMUM 2" LIFTS.

CONCRETE SURFACE REPAIR

1. MINIMUM SCDOT CLASS 4000 PORTLAND CEMENT CONCRETE FOR PATCHING.
2. EXPANSION AND CONTRACTION JOINTS SHALL BE PLACED TO MATCH EXISTING.
3. JOINTS SHALL BE EITHER TROWLED OR SAW CUT TO MATCH EXISTING CONDITIONS.
4. BROOM FINISH TO MATCH EXISTING. LARGE PATCHING AREAS MAY REQUIRE SURFACE TEXTURING PER SCDOT SPECIFICATIONS.



NOTE

1. CONTRACTOR SHALL NOTIFY CITY OF GREENVILLE CONSTRUCTION INSPECTION BUREAU A MINIMUM OF 72 HOURS PRIOR TO BEGINNING CONSTRUCTION ACTIVITIES.
2. AS REQUESTED, THE CONTRACTOR SHALL SUPPLY RELIABLE TESTING DATA CONFIRMING THE MINIMUM STANDARDS ARE MET. THE CITY MAY NOT ACCEPT WORK IF THE CONTRACTOR FAILS TO PRODUCE SUFFICIENT TESTING RESULTS.
3. TRENCHES SHALL BE PROOF-ROLLED IN THE PRESENCE OF THE CITY TO VERIFY COMPACTION PRIOR TO PLACING PAVEMENT.
4. ALL TRENCH WORK SHALL BE IN COMPLIANCE WITH THE LATEST EDITION OF OSHA PART 1926 SUBPART P APPENDIX B OF THE CODE OF FEDERAL REGULATIONS.
5. WITHIN THE R/W AND ALL TRAVELED SURFACES, BACKFILL MATERIAL SHALL BE CLEAN, SELECT MATERIAL PLACED IN 6" LIFTS & COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM D698. COMPACTION TESTING SHALL BE PERFORMED PER CITY OF GREENVILLE SPECIFICATIONS.
6. SELECT BACKFILL MATERIAL IS NATIVE SOIL EXCAVATED FROM THE TRENCH FREE OF ROCKS, FOREIGN MATERIAL, AND FROZEN EARTH. UNSUITABLE NATIVE SOIL SHALL NOT BE USED.
7. UNSUITABLE SOIL SHALL BE REMOVED & BACKFILLED WITH APPROVED STONE AS DIRECTED BY THE CITY OF GREENVILLE CONSTRUCTION INSPECTION BUREAU.
8. ALL EDGES IN PAVED AREAS SHALL BE FULL DEPTH SAW CUT. ALL CUTS SHALL BE NEAT, CLEAN & STRAIGHT.
9. IF TOP WIDTH OF TRENCH(S) EXCEEDS 50% OF THE TOTAL ROAD WIDTH, FULL DEPTH REPLACEMENT OF THE ENTIRE ROADWAY SHALL BE REQUIRED FOR THE LENGTH OF THE TRENCH(S).
10. IF TOP WIDTH OF TRENCH(S) EXCEEDS 50% OF THE WIDTH OF ANY TRAVEL LANE, FULL DEPTH REPLACEMENT OF THE ENTIRE IMPACTED TRAVEL LANE SHALL BE REQUIRED.
11. IF DISTANCE BETWEEN EDGE OF PATCH & EXISTING EDGE OF PAVEMENT IS LESS THAN ONE FOOT, ROAD PATCH SHALL BE EXTENDED TO EDGE OF EXISTING PAVEMENT.
12. ALL PATCHES SHALL BE SMOOTH AND LEVEL (+/- 1/4") WITH EXISTING SURFACE.
13. CONCRETE SHALL BE A MINIMUM DESIGN OF SCDOT CL4000. CONTRACTOR SHALL MAINTAIN STREET UNTIL CONCRETE HAS SUFFICIENT STRENGTH TO SUPPORT FINAL PAVING INSTALLATION. HIGH EARLY STRENGTH CONCRETE MAY BE USED.
14. TRAFFIC CONTROL SHALL BE PROVIDED PER THE LATEST EDITION OF THE MUTCD. SUBMITTAL AND APPROVAL OF A TRAFFIC CONTROL PLAN BY THE CONSTRUCTION INSPECTION BUREAU IS REQUIRED FOR STREETS WITH MORE THAN 400 VEHICLES PER DAY.
15. EXISTING PAVEMENT SECTION INCLUDES ALL PAVEMENT LAYERS FROM FINISH GRADE TO EXISTING SUBGRADE.
16. ALL WORK SHALL COMPLY WITH CITY OF GREENVILLE AND SCDOT SPECIFICATIONS.



ENGINEERING DIVISION

PAVEMENT REPAIR FOR UTILITY CUTS

DATE APPROVED: JAN. 2023

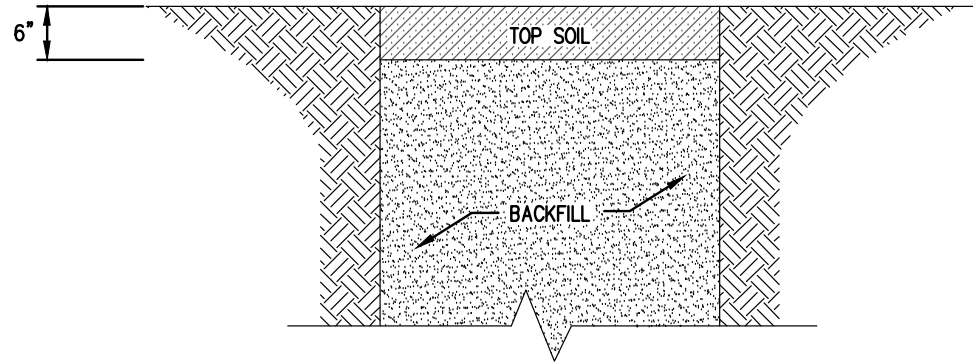
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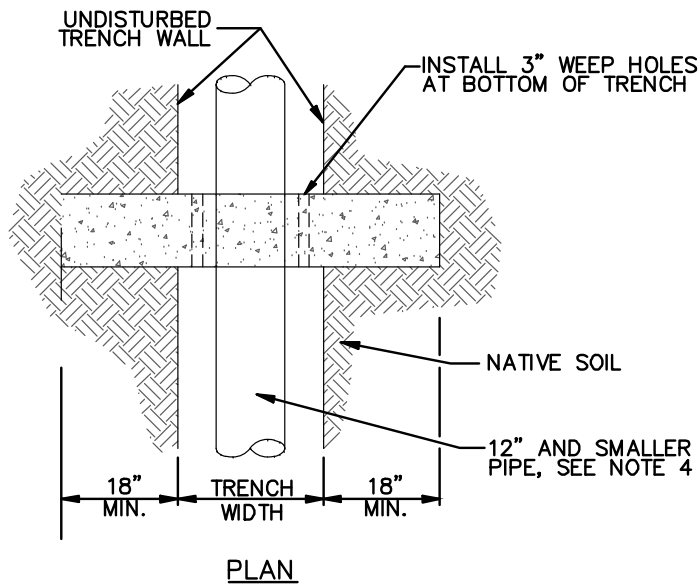
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NOTE

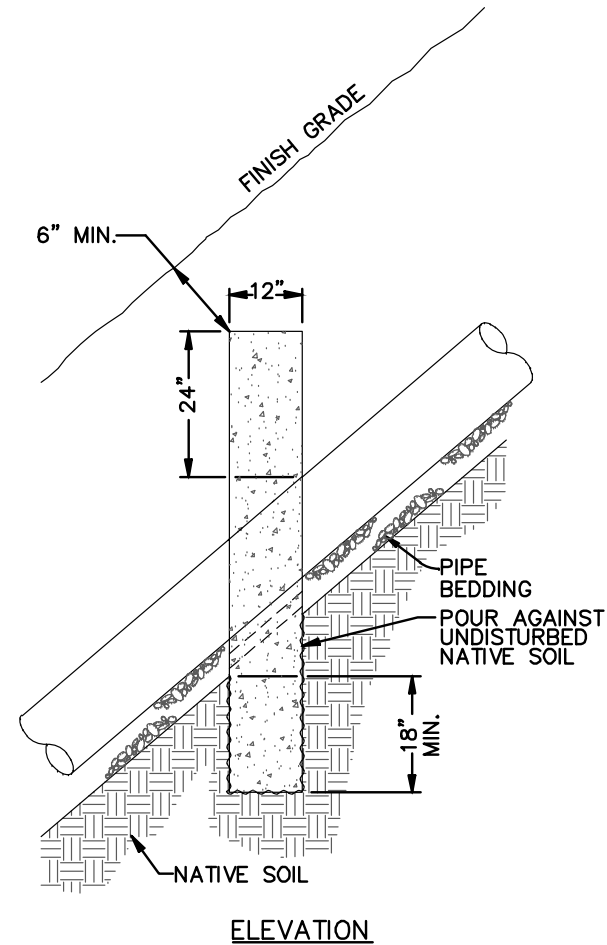
1. CONTRACTOR SHALL NOTIFY CITY OF GREENVILLE CONSTRUCTION INSPECTION BUREAU A MINIMUM OF 72 HOURS PRIOR TO BEGINNING CONSTRUCTION ACTIVITIES.
2. AS REQUESTED, THE CONTRACTOR SHALL SUPPLY RELIABLE TESTING DATA CONFIRMING THE MINIMUM STANDARDS ARE MET. THE CITY MAY NOT ACCEPT WORK IF THE CONTRACTOR FAILS TO PRODUCE SUFFICIENT TESTING RESULTS.
3. ALL TRENCH WORK SHALL BE IN COMPLIANCE WITH THE LATEST EDITION OF OSHA PART 1926 SUBPART P APPENDIX B OF THE CODE OF FEDERAL REGULATIONS.
4. WITHIN THE R/W, TRENCHES SHALL BE PROOF-ROLLED IN THE PRESENCE OF THE CITY TO VERIFY COMPACTION PRIOR TO PLACING FINAL SOIL LIFT WITHIN THE RIGHT-OF-WAY.
5. WITHIN THE R/W, BACKFILL MATERIAL SHALL BE CLEAN, SELECT MATERIAL PLACED IN 6" LIFTS & COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM D698.
6. OUTSIDE THE R/W, BACKFILL MATERIAL SHALL BE CLEAN, SELECT MATERIAL COMPACTED TO 90% STANDARD PROCTOR DENSITY PER ASTM D698.
7. COMPACTION TESTING SHALL BE PERFORMED PER CITY OF GREENVILLE SPECIFICATIONS.
8. SELECT BACKFILL MATERIAL IS NATIVE SOIL EXCAVATED FROM THE TRENCH FREE OF ROCKS, FOREIGN MATERIAL, AND FROZEN EARTH. UNSUITABLE NATIVE SOIL SHALL NOT BE USED.
9. UNSUITABLE SOIL SHALL BE REMOVED & BACKFILLED MATERIAL AS DIRECTED BY THE CITY OF GREENVILLE CONSTRUCTION INSPECTION BUREAU.
10. THE TOP 6" LIFT SHALL BE SCREENED, ORGANIC TOP SOIL.
11. TRENCH SHALL BE STABILIZED IMMEDIATELY PER SCDOT GRASSING SCHEDULE OR AS DIRECTED BY CITY OF GREENVILLE CONSTRUCTION INSPECTION BUREAU.
12. EXISTING LANDSCAPING REMOVED OR DESTROYED AS PART OF THE UTILITY INSTALLATION SHALL BE REPLACED WITH SAME MATERIALS.
13. ALL WORK SHALL COMPLY WITH CITY OF GREENVILLE AND SCDOT SPECIFICATIONS.

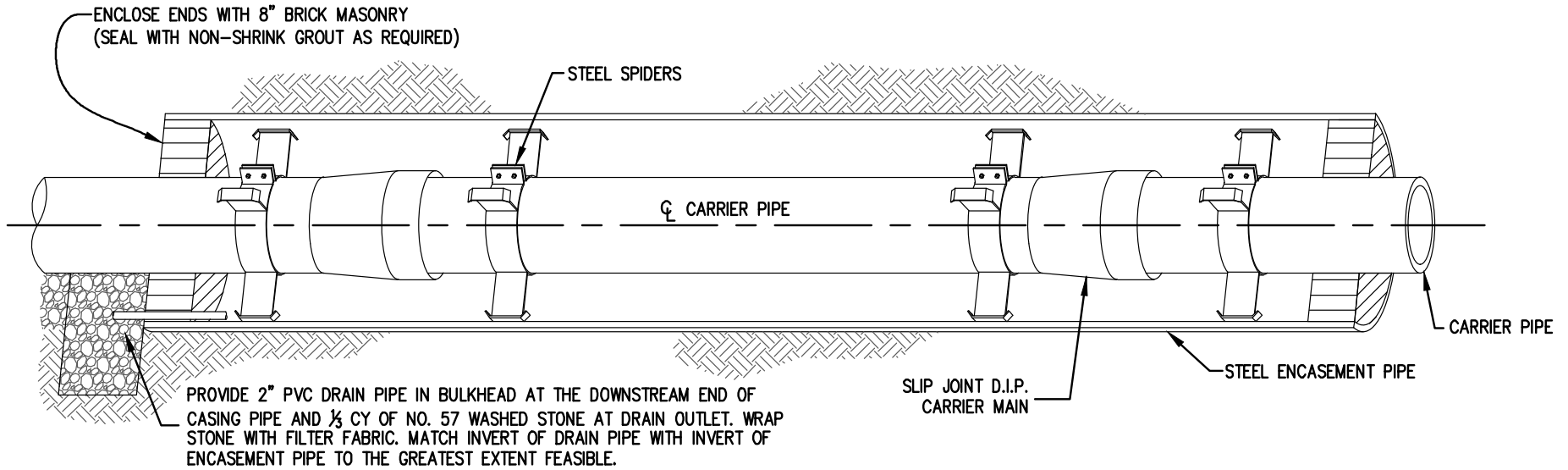


NOTES:

1. POURED IN PLACE CONCRETE PIPE ANCHORS SHALL BE CONSTRUCTED WHEN PIPELINES ARE INSTALLED WITH SLOPES 20% AND GREATER.
2. CONCRETE SHALL BE SUFFICIENTLY CURED AND ALL FORMWORK SHALL BE REMOVED PRIOR TO BACKFILLING TRENCH.
3. ALL CONCRETE SHALL BE MINIMUM 3000 PSI.
4. DIMENSIONS SHOWN HEREIN ARE FOR PIPELINES 12" AND LESS IN DIAMETER. DESIGN EMBEDMENT FOR PIPES LARGER THAN 12" SHALL BE REVIEWED BY THE CITY ENGINEER.
5. ANCHORS SHALL NOT BE PLACED WITHIN 6" OF PIPE JOINT.
6. MAXIMUM CENTER TO CENTER SPACING OF CONCRETE PIPE ANCHORS SHALL BE:

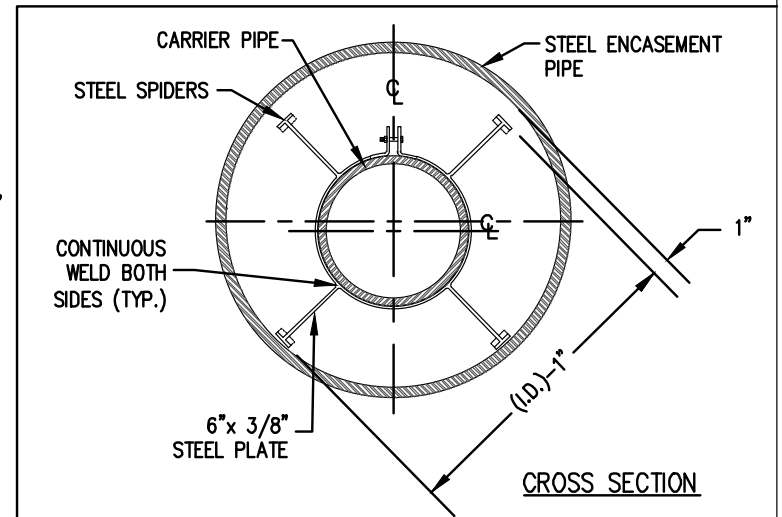
PIPE SLOPE (PERCENT)	20-34.9	35-49.9	50 & UP
MAX. CENTER TO CENTER SPACING (FT)	36'	24'	16'





NOTE

1. STEEL CASING PIPE SHALL BE TYPE S, GRADE B, PLAIN AND BEVELED, WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI AND MANUFACTURED IN ACCORDANCE WITH ASTM A53.
2. STEEL CASING PIPE SHALL BE FURNISHED IN 20' LENGTHS AND ALL JOINTS SHALL BE WELDED IN ACCORDANCE WITH AWWA C206.
3. STEEL CASING PIPE SHALL HAVE MINIMUM WALL THICKNESS AND CATHODICALLY PROTECTED PER CITY OF GREENVILLE SPECIFICATIONS.
4. TO THE SATISFACTION OF THE CITY INSPECTOR, THE CASING PIPE SHALL BE CERTIFIED TO BE TO THE LINE AND GRADE AS SHOWN ON THE APPROVED PLANS PRIOR TO INSTALLING THE CARRIER PIPE.
5. 316 STAINLESS STEEL OR GALVANIZED STEEL WITH COAL TAR EPOXY SPACING "SPIDERS" BY SPIDER MANUFACTURING, INC., OR APPROVED EQUAL, SHALL BE USED FOR SUPPORT OF THE CARRIER PIPE WITHIN THE CASING PIPE.
6. ALL NUTS, BOLTS AND WASHERS SHALL BE 316 STAINLESS STEEL.
7. THE SPACERS SHALL SUPPORT THE FULL LOAD OF THE CARRIER PIPE TO PREVENT DEFLECTION AND MISALIGNMENT. A MINIMUM SPACING OF 2 SPIDERS PER JOINT OF CARRIER PIPE SHALL BE REQUIRED. ADDITIONAL SPIDERS MAY BE REQUIRED TO SUPPORT THE PIPE AND WASTEWATER.
8. THE SPIDERS SHALL BE SPACED EVENLY ALONG THE CARRIER PIPE SUCH THAT EACH SPIDER SUPPORTS APPROXIMATELY THE SAME UNIT WEIGHT OF THE CARRIER MAIN.
9. THE HEIGHT OF EACH SPIDER SHALL BE DESIGNED AND ADJUSTED TO MAINTAIN THE SPECIFIED SLOPE.
10. FOR CROSSINGS UNDER STREAMS, ALL VOID SPACES SHALL BE FILLED BY PRESSURE. THE GROUT MATERIAL SHOULD BE SAND CEMENT SLURRY.
11. SHOULD IT BE NECESSARY TO PROVIDE VARIABLE HEIGHT SKIDS TO ACHIEVE THE LINE AND GRADE AS SHOWN ON THE APPROVED PLANS, THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF THE SPIDER DESIGN SHOWING EACH SPACER, INCLUDING ITS HEIGHT, TO THE CITY INSPECTOR PRIOR TO INSTALLING THE CARRIER PIPE.



STEEL CASING PIPE SELECTION CHART						
DUCTILE IRON PIPE SIZE	4"	6"	8"	10"	12"	14"
STEEL CASING PIPE SIZE	12"	14"	16"	18"	20"	24"

 **city of
greenville**
ENGINEERING DIVISION

STEEL ENCASEMENT AND CARRIER PIPE

DATE APPROVED: **JAN. 2023**

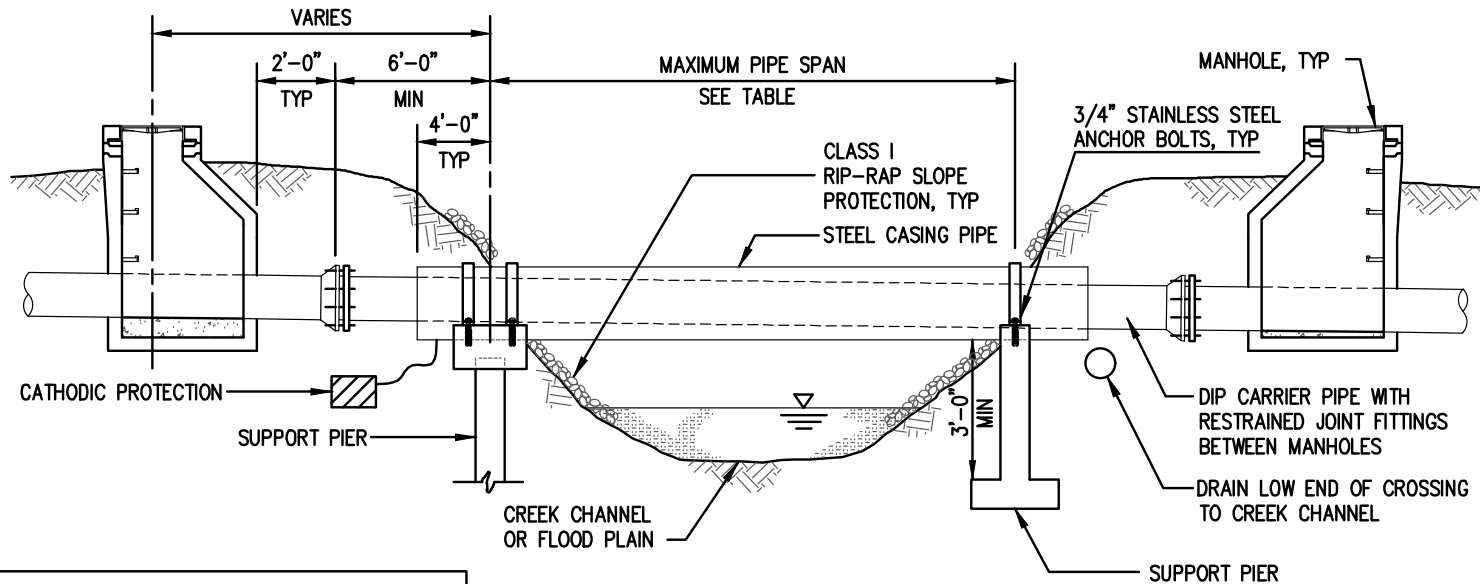
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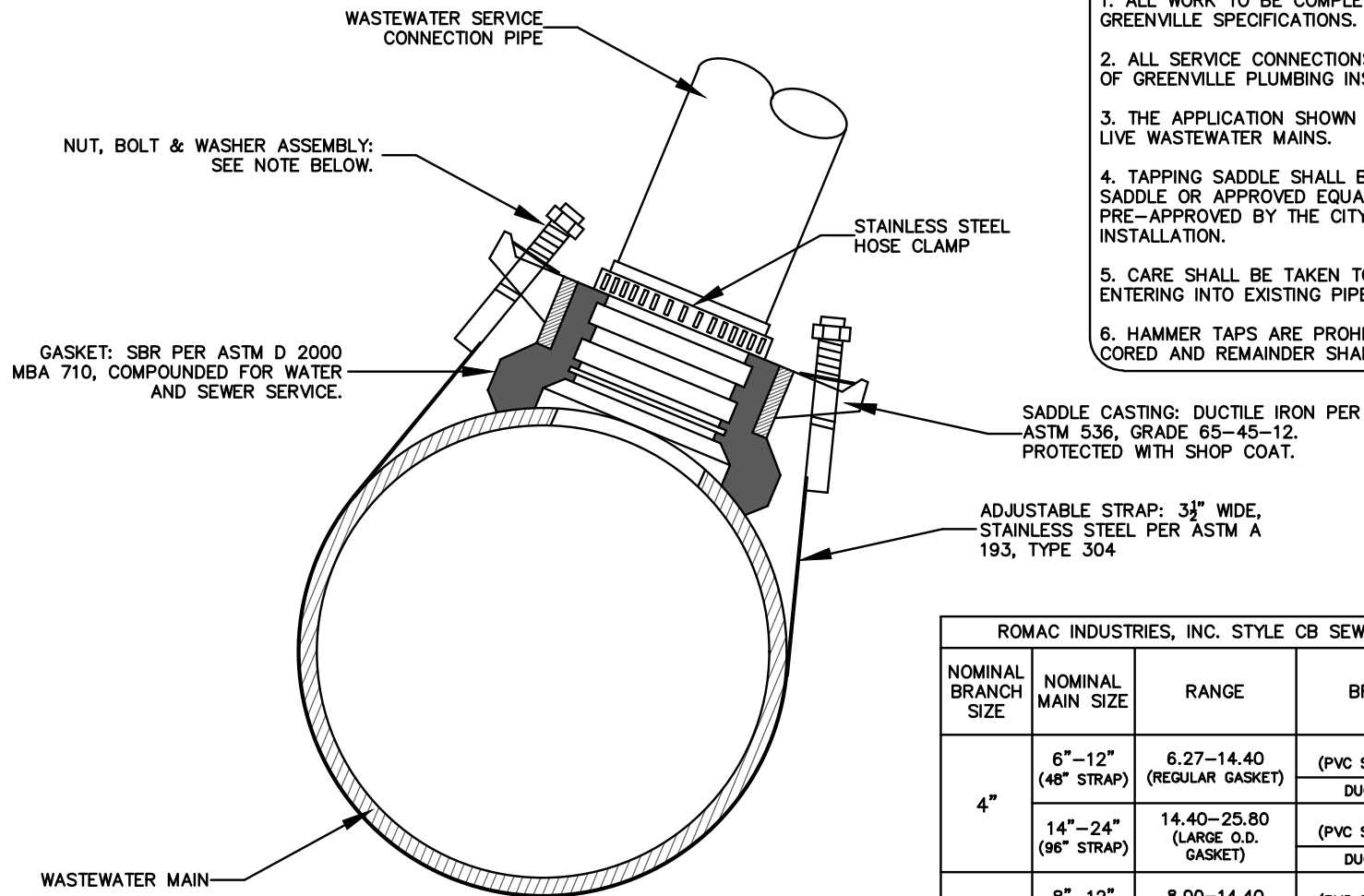


ALLOWABLE SPANS FOR STEEL CASING PIPE

CARRIER PIPE, DIP DIAMETER (IN.)	CASING PIPE, STEEL DIAMETER (IN.)	MINIMUM CASING PIPE WALL THICKNESS (IN.)	ALLOWABLE SPAN (FT.)
6	14	0.2500	40
8	16	0.2500	45
10	18	0.3125	50
12	20	0.3125	50
14	24	0.3125	55
16	26	0.3750	55
18	30	0.3750	60
20	32	0.3750	60
24	36	0.4375	65
30	42	0.4375	65
36	48	0.4375	65
42	56	0.5000	65

NOTE

1. STEEL CASING PIPE SHALL BE TYPE S (SEAMLESS), GRADE B, PLAIN AND BEVELED, WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI AND MANUFACTURED IN ACCORDANCE WITH ASTM A53.
2. STEEL CASING PIPE SHALL BE FURNISHED IN 20' LENGTHS AND ALL JOINTS SHALL BE WELDED IN ACCORDANCE WITH AWWA C206.
3. STEEL CASING PIPE SHALL BE CATHODICALLY PROTECTED IN CONFORMANCE WITH CITY OF GREENVILLE SPECIFICATIONS.
4. STEEL CASING PIPE SHALL HAVE MINIMUM WALL THICKNESS FOR THE ANTICIPATED SPAN AS SHOWN IN THIS DETAIL.
5. THE BOTTOM OF THE CASING PIPE SHALL BE PLACED NO LOWER THAN THE ELEVATION OF THE 50 YEAR FLOOD.
6. ALL CARRIER PIPE JOINTS SHALL BE RESTRAINED JOINTS IN CONFORMANCE WITH CITY OF GREENVILLE STANDARD DRAWINGS AND SPECIFICATIONS.
7. THE CARRIER PIPE SHALL BE SUPPORTED BY 316 STAINLESS STEEL OR GALVANIZED STEEL WITH COAL TAR EPOXY SPACING "SPIDERS" IN CONFORMANCE WITH CITY OF GREENVILLE STANDARD DRAWINGS AND SPECIFICATIONS.
8. ADDITIONAL STEEL ENCASEMENT AND CARRIER PIPE REQUIREMENTS PER CITY OF GREENVILLE STANDARD DRAWINGS AND SPECIFICATIONS.
9. PIERS AND ALL APPURTENANCES THERETO REQUIRE STRUCTURAL ANALYSIS OF HORIZONTAL AND VERTICAL STABILITY BY A SOUTH CAROLINA PROFESSIONAL ENGINEER.
10. ALL REASONABLE EFFORT SHALL BE MADE TO THE SATISFACTION OF THE CITY ENGINEER TO MINIMIZE THE NUMBER OF PIERS LOCATED WITHIN THE FLOODWAY.

**NOTE**

1. ALL WORK TO BE COMPLETED IN ACCORDANCE WITH CITY OF GREENVILLE SPECIFICATIONS.
2. ALL SERVICE CONNECTIONS SHALL BE INSPECTED BY THE CITY OF GREENVILLE PLUMBING INSPECTOR.
3. THE APPLICATION SHOWN HERE IS ONLY FOR TAPPING EXISTING LIVE WASTEWATER MAINS.
4. TAPPING SADDLE SHALL BE ROMAC INDUSTRIES TYPE CB SEWER SADDLE OR APPROVED EQUAL. ALTERNATES SHALL BE PRE-APPROVED BY THE CITY OF GREENVILLE PRIOR TO INSTALLATION.
5. CARE SHALL BE TAKEN TO PROHIBIT NEW CONNECTION FROM ENTERING INTO EXISTING PIPE.
6. HAMMER TAPS ARE PROHIBITED. EXISTING PIPE SHALL BE CORED AND REMAINDER SHALL BE PROPERLY DISPOSED.

ROMAC INDUSTRIES, INC. STYLE CB SEWER SADDLE - 1-800-426-9341					
NOMINAL BRANCH SIZE	NOMINAL MAIN SIZE	RANGE	BRANCH TYPE	BRANCH O.D.	CATALOG NUMBER
4"	6"-12" (48" STRAP)	6.27-14.40 (REGULAR GASKET)	UNIVERSAL ¹ (PVC SDR 35 & SCH. 40)	4.20-4.63	CB-4.63UN
			DUCTILE IRON PIPE	4.8	CB-4.80
	14"-24" (96" STRAP)	14.40-25.80 (LARGE O.D. GASKET)	UNIVERSAL ¹ (PVC SDR 35 & SCH. 40)	4.20-4.63	CB-4.63UNLS
			DUCTILE IRON PIPE	4.80	CB-4.80LS
6"	8"-12" (48" STRAP)	8.00-14.40 (REGULAR GASKET)	UNIVERSAL (PVC SDR 35 & SCH. 40)	6.27-6.66	CB-6.66UN
			DUCTILE IRON PIPE	6.90	CB-6.90
	14"-24" (96" STRAP)	14.40-25.80 (LARGE O.D. GASKET)	UNIVERSAL (PVC SDR 35 & SCH. 40)	6.27-6.66	CB-6.66UNLS
			DUCTILE IRON PIPE	6.90	CB-6.90LS

1. SPECIFIC SADDLES FOR PVC SDR 35 AND SCH. 40 MAY BE USED IN LIEU OF A UNIVERSAL TYPE SADDLE.

NUT, BOLT & WASHER ASSEMBLY:
NUTS TO BE STAINLESS STEEL PER ASTM A 194, TYPE 304. BOLTS TO BE $\frac{1}{2}$ " UNC ROLLED THREAD, LUBRICANT COATED, STAINLESS STEEL PER ASTM A 193, TYPE 304. WASHERS TO BE STAINLESS STEEL PER ASTM A 240, TYPE 304 AND PLASTIC LUBRICATING WASHERS.

 **city of
greenville**
ENGINEERING DIVISION

SADDLE CONNECTION FOR LIVE WASTEWATER MAINS

DATE
APPROVED: JAN. 2023

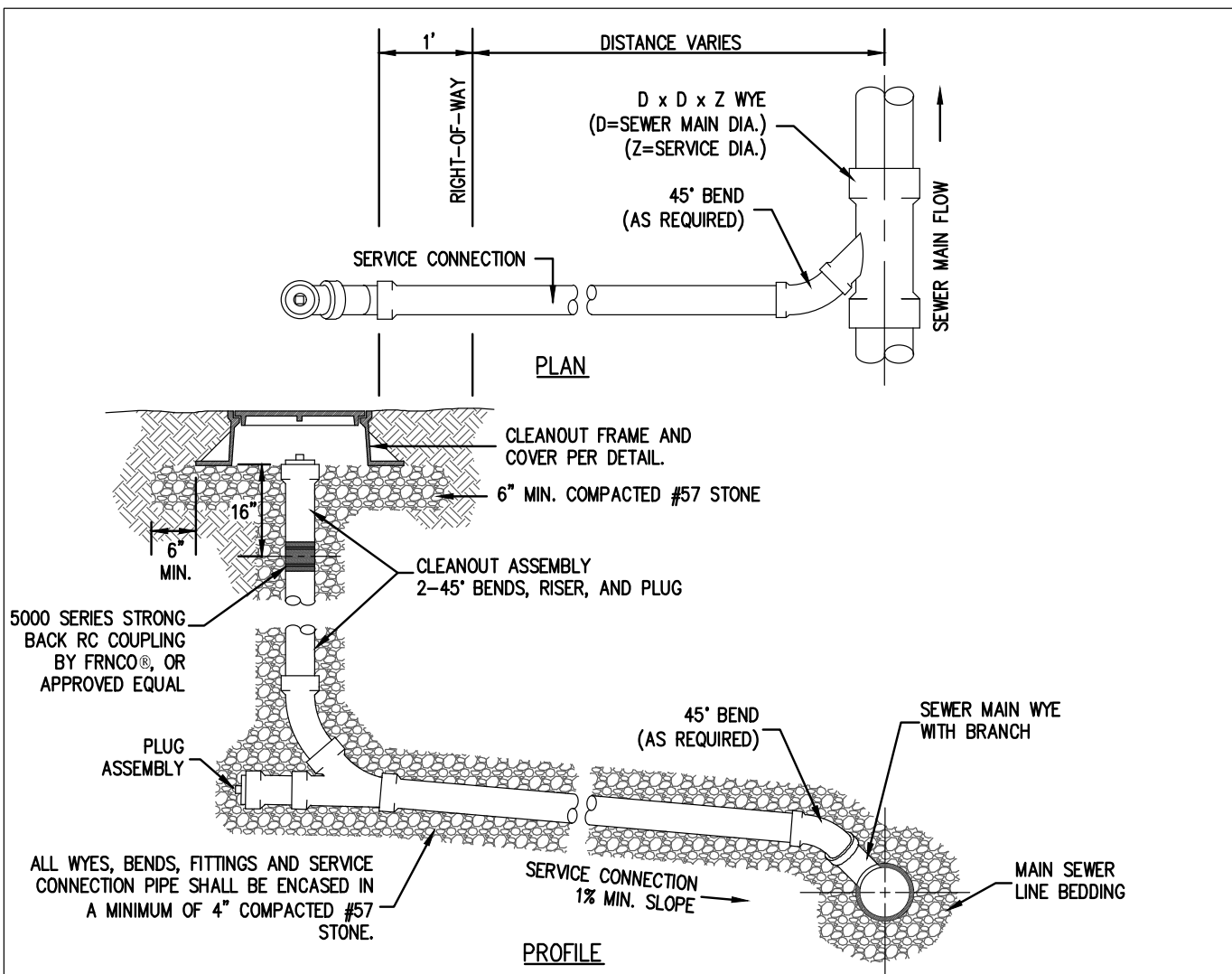
OFFICE OF THE
CITY ENGINEER:

APPROVED

SCALE:
NO SCALE

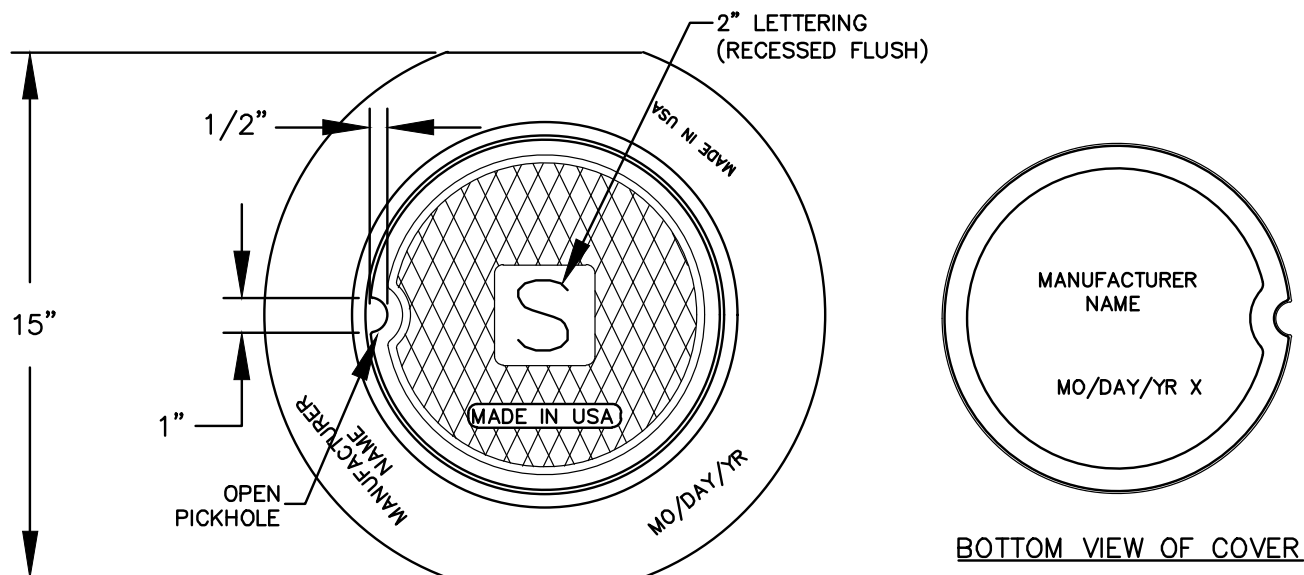
DETAIL:

25:00

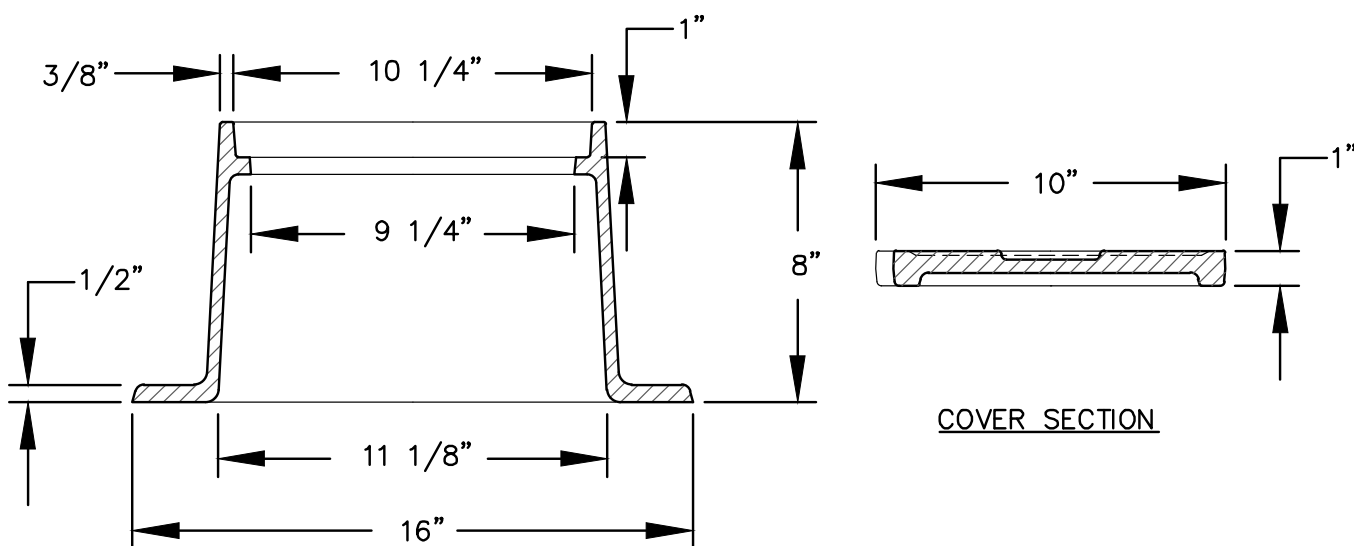


NOTE

- SERVICE CONNECTION DETAIL IS FOR THE INSTALLATION OF A NEW SERVICE CONNECTION STUB OUT AS PART OF A NEW MAIN SEWER LINE INSTALLATION. CONNECTIONS TO EXISTING SEWER LINES OR CONNECTION OF THE BUILDING DRAIN TO THE SERVICE CONNECTION STUB OUT SHALL BE INSTALLED PER THE INTERNATIONAL PLUMBING CODE (IPC) OR INTERNATIONAL RESIDENTIAL CODE (IRC) AS APPROPRIATE.
- WHEN THE BUILDING SEWER IS EXTENDED FROM THE STUB OUT TO THE BUILDING DRAIN, THE BUILDING SEWER AND ITS APPURTENANCES SHALL BE PERMITTED THROUGH AND INSPECTED BY THE CITY OF GREENVILLE BUILDING CODES DIVISION.
- WITHOUT PRIOR KNOWLEDGE OF THE VARIABLES REQUIRED TO SIZE THE SERVICE CONNECTION PER THE IPC OR IRC, THE MINIMUM DIAMETER OF THE SERVICE CONNECTION STUB OUT SHALL BE MINIMUM FOUR (4) INCH DIA. FOR SINGLE FAMILY RESIDENTIAL AND MINIMUM SIX (6) INCH DIA. FOR COMMERCIAL AND MULTIFAMILY DEVELOPMENT.
- MINIMUM SLOPE OF THE SERVICE LATERAL IS 1.0% OR $\frac{1}{8}$ " PER FOOT.
- THE SERVICE CONNECTION STUB OUT AND ITS APPURTENANCES SHALL BE OF THE SAME MATERIAL AS THE MAIN SEWER LINE.
- SERVICE CONNECTION SHALL BE MADE WITH ONE (1) WYE FITTING. THE LONG BRANCH OF THE WYE SHALL HAVE THE SAME INSIDE DIAMETER AS THE WASTEWATER MAIN. TEE FITTINGS ARE NOT PERMITTED.
- THE WYE FITTING SHALL BE SET BETWEEN THE 10 AND 2 O'CLOCK POSITIONS ALONG THE MAIN SEWER LINE PIPE CIRCUMFERENCE.
- NO BENDS GREATER THAN 45° SHALL BE USED IN SERVICE CONNECTION INSTALLATION.
- SERVICE CONNECTIONS SHALL BE A MINIMUM OF THREE (3) FEET FROM PIPE JOINT OR MANHOLE, MEASURED FROM THE NEAREST EDGE OF THE WYE FITTING.
- CONNECTIONS SHALL BE POSITIONED ALONG THE MAIN SEWER LINE TO PROVIDE AN INDIVIDUAL, SEPARATE AND DIRECT CONNECTION FROM THE STRUCTURE TO THE WASTEWATER MAIN. CONNECTIONS SHALL NOT CROSS ADJACENT LOT PROPERTY LINES.
- A SERVICE CONNECTION CLEANOUT SHALL BE INSTALLED ONE (1) FOOT FROM THE RIGHT-OF-WAY LINE OR EASEMENT BOUNDARY WITH A CLEANOUT FRAME AND COVER PER DETAIL.
- SERVICE CONNECTION SHALL BE PLUGGED TO PREVENT INFILTRATION AND SEDIMENTATION OF THE LINE.
- SERVICE CONNECTIONS SHALL NOT BE CONNECTED TO A NEWLY CONSTRUCTED MAIN SEWER LINE UNTIL A PERMIT TO OPERATE (PTO) HAS BEEN OFFICIALLY ISSUED BY SCDHEC. CONTACT CITY OF GREENVILLE ENGINEERING (467-4400) WITH ANY QUESTIONS.



TOP VIEW

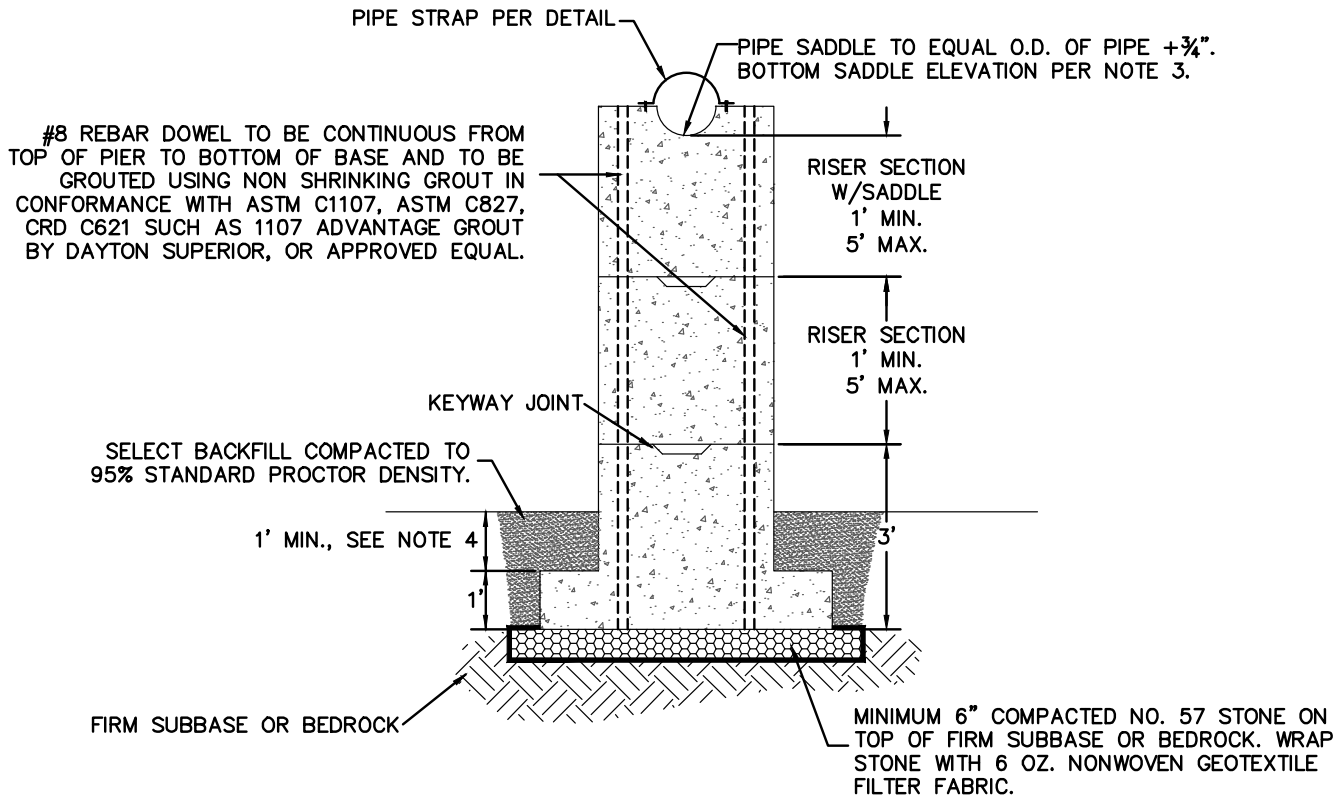


FRAME SECTION

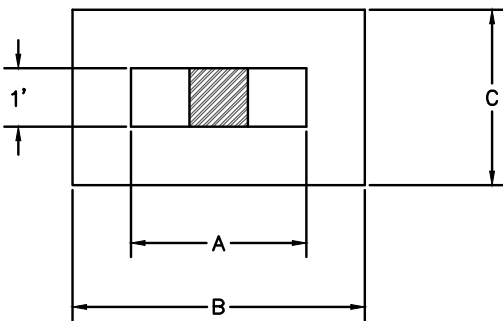
COVER SECTION

NOTE

1. ALL GRAY IRON CASTINGS SHALL CONFORM TO ASTM A48 CL35B AND SHALL BE OF UNIFORM QUALITY.
2. ALL CASTINGS SHALL BE UNDIPPED.
3. ALL CASTINGS SHALL HAVE THE FOLLOWING AVERAGE WEIGHTS:
FRAME: 39 LBS.
COVER: 14 LBS.
TOTAL: 53 LBS.
4. ALL CASTINGS SHALL BE H-20 TRAFFIC RATED.
5. CASTINGS SHALL BE EJCO SERIES 1564, OR APPROVED EQUAL.



SECTION

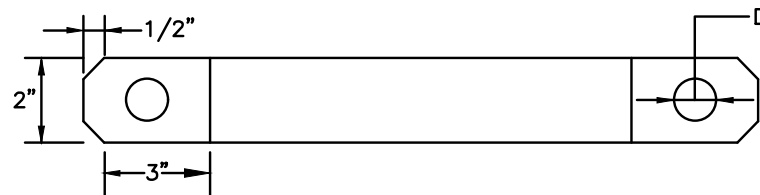
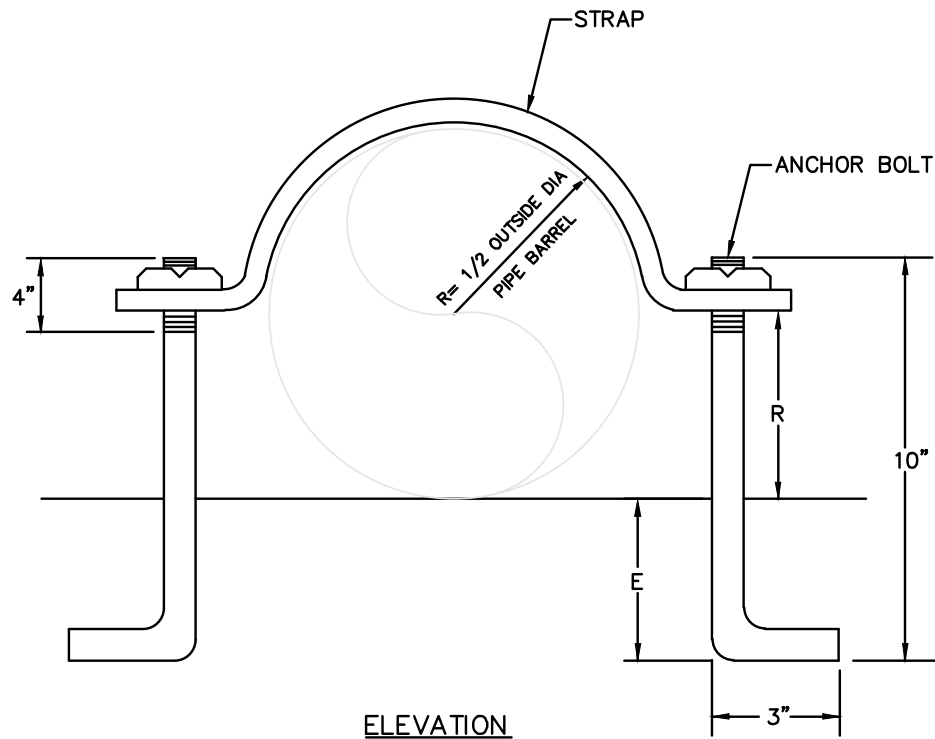


PIPE SIZE	A	B	C
8", 10", 12" & 14"	3'	5'	3'
16" - 24"	4'	6'	3'

PLAN

NOTE

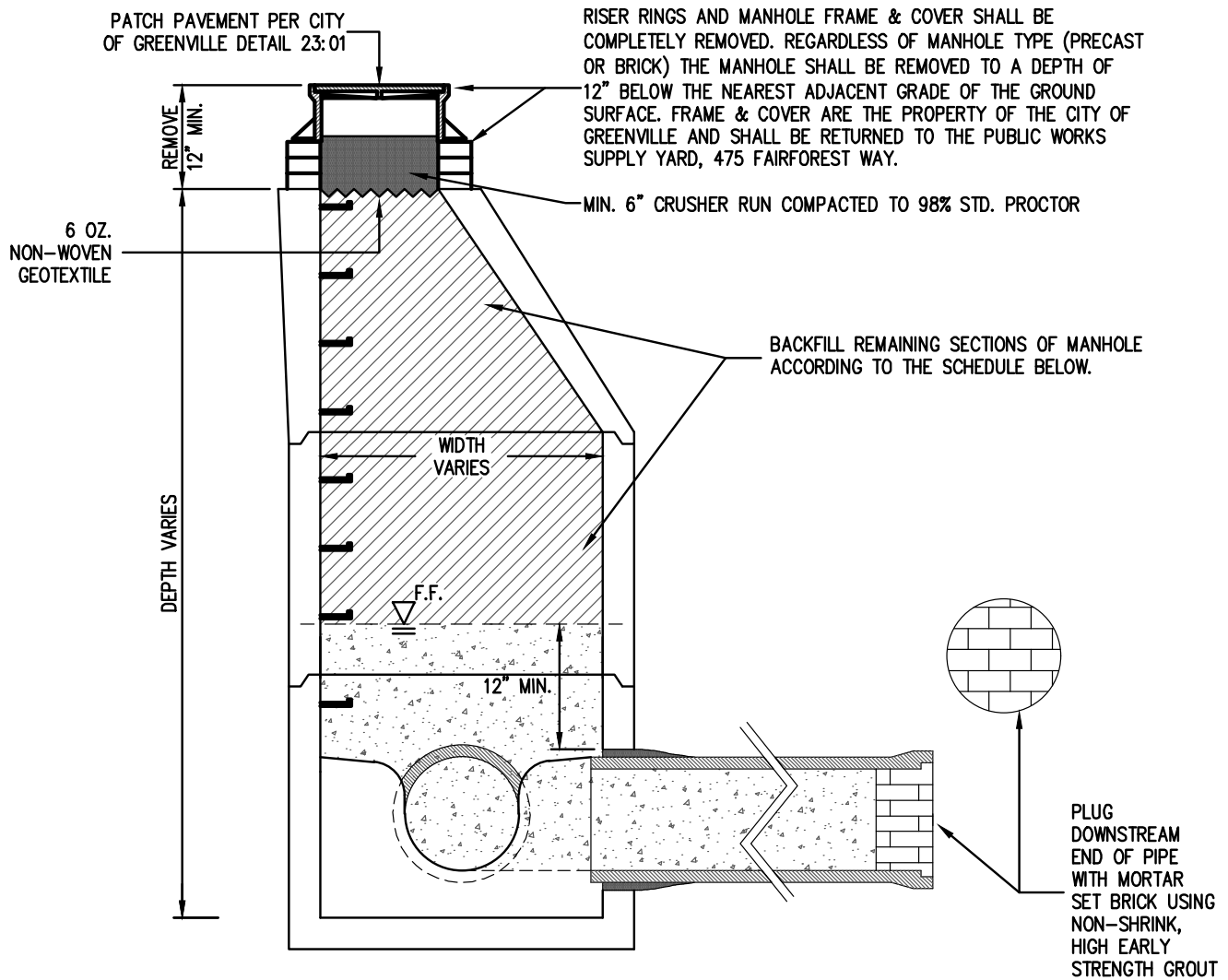
1. THIS DETAIL IS ONLY APPLICABLE FOR INDIVIDUAL SERVICE CONNECTIONS WITH SHORT SPANS. ALL OTHER CROSSINGS MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH OTHER CITY STANDARDS FOR AERIAL CROSSINGS.
2. AERIAL SEWER SERVICE CONNECTION PIPE MUST BE DUCTILE IRON PIPE WITH RESTRAINED JOINTS IN CONFORMANCE WITH CITY OF GREENVILLE REGULATIONS.
3. BOTTOM SADDLE ELEVATION TO BE NO LOWER THAN THE ELEVATION OF THE 50 YEAR FLOOD, OR AS DIRECTED BY THE CITY ENGINEER.
4. MINIMUM COVER TO BE DETERMINED BY GEOTECHNICAL ENGINEER TO ENSURE HORIZONTAL AND VERTICAL STABILITY.
5. STEEL PIPE CASING WITH SPACERS PER CITY DETAILS MAY BE USED TO SPAN LONGER DISTANCES.
6. PRECAST CONCRETE SHALL BE MIN. 4000 PSI.
7. REINFORCEMENT TO MEET ASTM A615.
8. SECTIONS SHALL HAVE RECESSED STEEL HOOKS FOR LIFTING.
9. ALTERNATE PIER DESIGN MUST BE REVIEWED BY THE CITY ENGINEER.
10. PIERS BY MST CONCRETE PRODUCTS (864-639-2894), OR APPROVED EQUAL.



PIPE SIZE	STRAP	ANCHOR BOLT	D	E
1" – 3"	1/8" THICK	3/8" DIA.	7/16"	5"
3 1/2" – 12"	1/4" THICK	1/2" DIA.	9/16"	5"
14" – 36"	3/8" THICK	3/4" DIA.	13/16"	6"

NOTE

1. ANCHOR BOLTS AND STRAPS SHALL BE GALVANIZED AND HOT ASPHALT DIPPED.
2. HOLES TO BE DRILLED IN STRAP.
3. PROVIDE WASHERS UNDER STRAP SUCH THAT STRAP IS PULLED DOWN TIGHT.



NOTE

1. BACKFILL REMAINING SECTIONS OF MANHOLE ACCORDING TO THE FOLLOWING SCHEDULE:

PRECAST MANHOLE

- PLACE BACKFILL A MINIMUM OF 24 HOURS TO A MAXIMUM OF 72 HOURS AFTER PLACEMENT OF FLOWABLE FILL AS DEPICTED BELOW.
- BACKFILL WITH WASHED NO. 57 STONE IN 12" LIFTS ENSURING COMPLETE CONSOLIDATION OF EACH LIFT THROUGH VIBRATORY OR OTHER COMPACTIVE EFFORT.

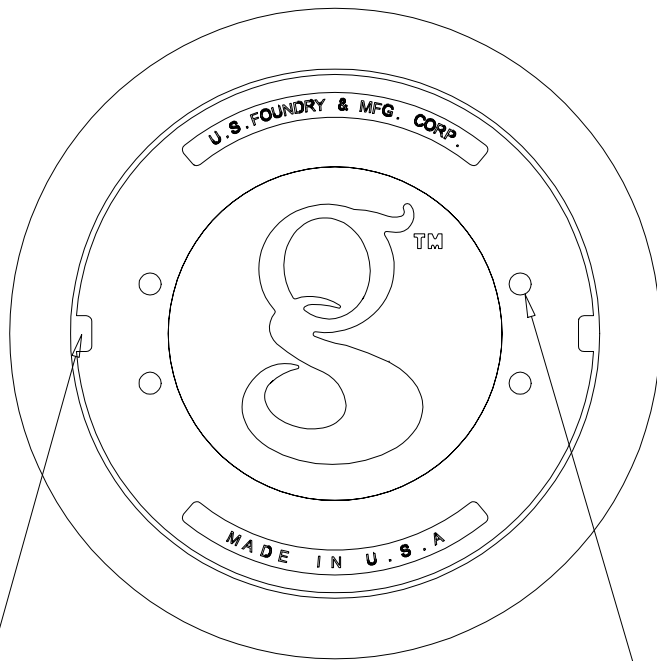
BRICK MANHOLE

- PLACE BACKFILL A MINIMUM OF 72 HOURS TO A MAXIMUM OF 7 DAYS AFTER PLACEMENT OF FLOWABLE FILL AS DEPICTED BELOW.
- BACKFILL WITH FLOWABLE FILL.

- FLOWABLE FILL SHALL BE 500 PSI MIX.
- DOWNSTREAM PLUG SHALL BE SET A MINIMUM OF 24-HOURS PRIOR TO FLOWABLE FILL PLACEMENT IN THE CORRESPONDING UPSTREAM MANHOLE THAT IS TO BE ABANDONED.
- CONTRACTOR SHALL MAKE ALL NECESSARY PROVISIONS TO PREVENT FLOWABLE FILL OR ANY OTHER DEBRIS FROM IMPACTING REMAINING PORTIONS OF THE WASTEWATER SYSTEM.
- NON SHRINKING GROUT SHALL BE IN CONFORMANCE WITH ASTM C1107, ASTM C827, CRD C621 SUCH AS 1107 ADVANTAGE GROUT BY DAYTON SUPERIOR, OR APPROVED EQUAL.

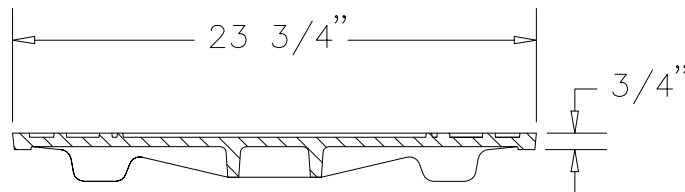
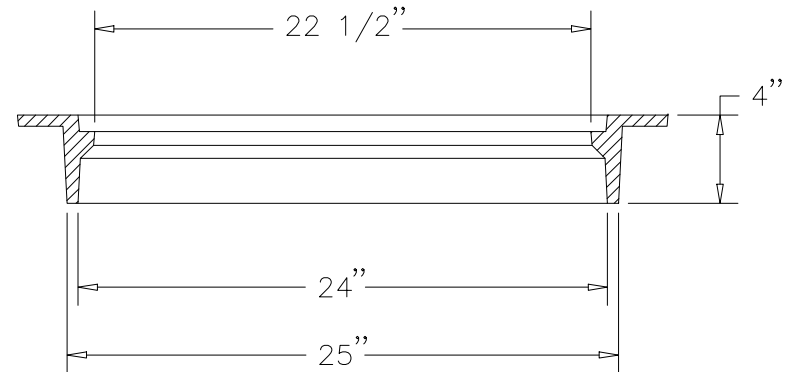
1. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES BY CALLING PALMETTO UTILITY PROTECTION SERVICE AT 811 THREE (3) DAYS PRIOR TO CONSTRUCTION.
2. THE CONTRACTOR SHALL CONTACT THE CITY OF GREENVILLE, CONSTRUCTION INSPECTION BUREAU, (864) 467-8890, A MINIMUM OF 72 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITY.
3. THE CONTRACTOR SHALL PROVIDE THE CONSTRUCTION INSPECTION BUREAU AND THE ENVIRONMENTAL ENGINEERING BUREAU WITH A CURRENT CONSTRUCTION SCHEDULE PRIOR TO CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE FOR CONDUCTING ALL WORK IN ACCORDANCE WITH THE LATEST REQUIREMENTS OF THE OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION.
5. ALL MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE STANDARD DETAILS AND SPECIFICATIONS OF THE CITY OF GREENVILLE, SOUTH CAROLINA AND ALL OTHER APPLICABLE GOVERNING AUTHORITIES. BELOW ARE WASTEWATER GENERAL NOTES BUT IN ALL CASES THE CONTRACTOR SHALL REFER TO THE SPECIFICATIONS AND DETAILS FOR ADDITIONAL MORE DETAILED CONSIDERATIONS.
6. ALL TRENCHES WITHIN THE RIGHT-OF-WAY SHALL BE COMPACTED TO 95% OF STANDARD PROCTOR DENSITY AND ALL OTHER TRENCHES SHALL BE COMPACTED TO 90% OF STANDARD PROCTOR DENSITY TO PREVENT SETTLEMENT AND DAMAGE TO PAVING AND PIPELINE. STANDARD PROCTOR TESTING SHALL BE IN CONFORMANCE WITH ASTM D698. ALL FILL IS TO BE FREE OF ROOTS, TRASH, AND ORGANIC MATTER AND SHALL BE PLACED IN 6" LIFTS. NO STONE LARGER THAN SIX (6) INCHES SHALL BE USED AS BACKFILL. FOR TRENCHES OUTSIDE OF A PAVED SURFACE, THE TOP 6" LIFT SHALL BE SCREENED ORGANIC TOPSOIL AND BE PERMANENTLY STABILIZED WITH VEGETATIVE COVER.
7. ALL PVC PIPE SHALL BE SDR 26, SDR 35, OR C900 MEETING ASTM STANDARDS. ALL DIP SEWER PIPE SHALL BE ASPHALT COATED CEMENT MORTAR LINED CLASS 50 DUCTILE IRON PIPE MEETING ANSI/AWWA STANDARDS WITH SPECIAL CONSIDERATION GIVEN TO CORROSIVE AND SEPTIC CONDITIONS. ALL PIPE SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST REVISION OF ASTM D2321 (PVC AND DIP) AND APPLICABLE ANSI/AWWA C600 STANDARDS (DIP) AND IN CONFORMANCE WITH THE STANDARD DETAIL, LATEST REVISION.
8. MANHOLES SHALL HAVE A MINIMUM INSIDE DIAMETER OF FOUR (4) FEET AND BE PRECAST 4000 PSI REINFORCED CONCRETE CONFORMING TO ASTM C-478 WITH PREFORMED OPENINGS. THE MANHOLE SHALL BE CONSTRUCTED WITH A FLOW CHANNEL TO PROVIDE A SMOOTH CONNECTION BETWEEN THE INLET TRIBUTARY AND THE OUTLET PIPE.
9. CONNECTIONS MADE AT MANHOLES SHALL BE NO HIGHER THAN 18" ABOVE MANHOLE INVERT. CONNECTIONS HIGHER THAN 18" ABOVE THE MANHOLE INVERT MUST HAVE AN INTERNAL DROP CONSTRUCTED PER CITY OF GREENVILLE DETAILS AND SPECIFICATIONS.
10. EACH INDIVIDUALLY OWNED PARCEL AND EACH BUILDING HAVING PLUMBING FIXTURES INSTALLED, WHICHEVER IS APPLICABLE, SHALL HAVE AT LEAST ONE DIRECT AND INDIVIDUAL CONNECTION TO A CITY WASTEWATER MAIN WITHOUT CROSSING ADJACENT PROPERTY LINES.
 - (A.) NEW CONNECTIONS TO AN EXISTING WASTEWATER MAIN THAT IS ACTIVELY CARRYING FLOW SHALL BE ACCOMPLISHED WITH A TAPPING SADDLE - ROMAC INDUSTRIES TYPE CB, OR APPROVED EQUAL.
 - (B.) NEW CONNECTIONS CONSTRUCTED AS PART OF A NEW MAIN INSTALLATION SHALL BE ACCOMPLISHED WITH A WYE FITTING AND SET BETWEEN THE 10 AND 2 O'CLOCK POSITIONS. THE LONG BRANCH OF THE WYE SHALL HAVE THE SAME INSIDE DIAMETER AS THE MAIN. STRAIGHT TEE CONNECTIONS WILL NOT BE ACCEPTED. SERVICE CONNECTION LATERALS SHALL TERMINATE ONE (1) FOOT BEYOND THE RIGHT-OF-WAY OR EASEMENT BOUNDARY WITH A CLEANOUT AND AN AIR/WATER TIGHT PLUG PER THE STANDARD DETAILS.
11. SERVICE CONNECTIONS SHALL BE A MINIMUM OF THREE (3) FEET FROM PIPE JOINTS OR MANHOLES MEASURED FROM THE NEAREST EDGE OF THE WYE FITTING.
12. THE CONTRACTOR SHALL NOT CONNECT SERVICE LATERALS TO EXISTING OR NEW MANHOLES WITHOUT PRIOR WRITTEN APPROVAL FROM THE CITY ENGINEER.
13. THE LOCATION OF THE TERMINUS OF THE SERVICE LATERAL AND CLEANOUT SHALL BE MARKED BY A 2" X 4" TREATED POST PAINTED GREEN DRIVEN A MINIMUM OF THREE (3) FEET AND PROTRUDING APPROXIMATELY THREE (3) FEET ABOVE FINAL GRADE.
14. SANITARY SEWER SERVICE LATERALS SHALL NOT BE CONNECTED TO A NEWLY CONSTRUCTED SANITARY SEWER MAIN UNTIL A PERMIT TO OPERATE HAS BEEN OFFICIALLY ISSUED BY SCDHEC AND RECEIVED BY THE CITY ENGINEER. CONTACT THE CITY OF GREENVILLE ENVIRONMENTAL ENGINEERING BUREAU AT (864) 467-4400 WITH ANY QUESTIONS.
15. PRESSURE AND DEFLECTION TEST TO BE PERFORMED ON ALL LINES AND VACUUM TEST ON ALL MANHOLES IN THE PRESENCE OF A CITY OF GREENVILLE REPRESENTATIVE AND A REPRESENTATIVE OF THE ENGINEER. ALL TESTS SHALL BE IN CONFORMANCE WITH CITY OF GREENVILLE AND SCDHEC SPECIFICATIONS.
16. THE CONTRACTOR SHALL PROVIDE TO THE DESIGN ENGINEER A RECORD DRAWING OF THE SANITARY SEWER SYSTEM. THE DRAWINGS SHALL, AT A MINIMUM, INCLUDE THE SANITARY SEWER MAIN AND MANHOLE LOCATIONS, PIPE MATERIAL FOR THE MAIN AND THE SERVICE LATERALS, THE DISTANCE OF EACH SERVICE CONNECTION TO THE DOWNSTREAM MANHOLE, LENGTH OF EACH SERVICE LATERAL, AND THE LOCATION AND DEPTH OF EACH SERVICE LATERAL TERMINUS. THE ENGINEER SHALL USE THIS DOCUMENTATION AS WELL AS INFORMATION OBTAINED BY A SURVEYOR TO PREPARE RECORD DRAWINGS. THE ENGINEER CANNOT APPLY FOR FINAL APPROVAL UNTIL THIS INFORMATION IS OBTAINED FROM THE CONTRACTOR.
17. THERE SHALL BE A 25-FOOT EASEMENT (12.5' EACH SIDE OF CENTERLINE) ESTABLISHED ON ALL WASTEWATER MAINS.

 city of greenville ENGINEERING DIVISION	WASTEWATER GENERAL NOTES		SCALE: NO SCALE
			DETAIL : 29:00
	DATE APPROVED: JAN. 2023	OFFICE OF THE CITY ENGINEER: APPROVED	



(4) - 1" DIA.
VENT HOLES

(2)-PENETRATING PICK HOLES



NOTE

1. ALL PEDESTRIAN RATED STORMWATER MANHOLE ASSEMBLIES INSTALLED WITHIN THE CITY SHALL CONFORM TO THIS DETAIL, CITY OF GREENVILLE SPECIFICATIONS, AND ADA SPECIFICATIONS.
2. COVER SHALL BE GRAY IRON CONFORMING TO ASTM A48 CL35B AND SHALL WEIGH APPROXIMATELY 70 POUNDS WITHIN ACCEPTABLE TOLERANCE.
3. FRAME SHALL BE GRAY IRON CONFORMING TO ASTM A48 CL35B AND SHALL WEIGH APPROXIMATELY 85 POUNDS WITHIN ACCEPTABLE TOLERANCE.
4. MANHOLE ASSEMBLY SHALL BE UNDIPPED.
5. "v" DESIGNATES MACHINED SURFACE.
6. LETTERING SHALL BE TRUE TYPE ARIAL FONT HAVING $\frac{1}{8}$ " RELIEF. LOGO SHALL HAVE $\frac{1}{4}$ " RELIEF.
7. US FOUNDRY PRODUCT 1258 RING & OJ COVER, OR APPROVED EQUAL.

*FOR SIDEWALK USE ONLY



LIGHT DUTY MANHOLE STORMWATER UTILITY

DATE
APPROVED: JUL. 2025

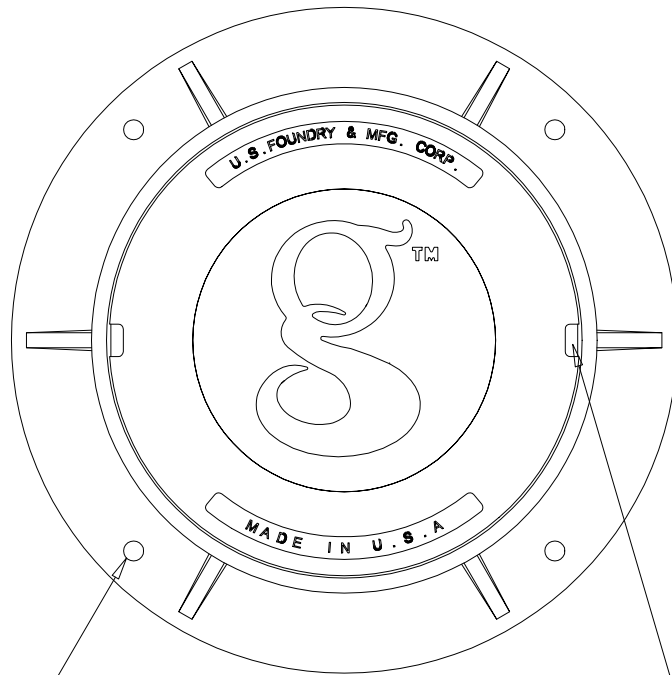
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CITY ENGINEER:

APPROVED

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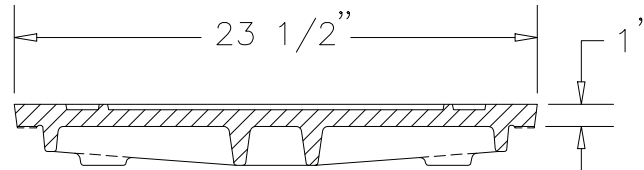
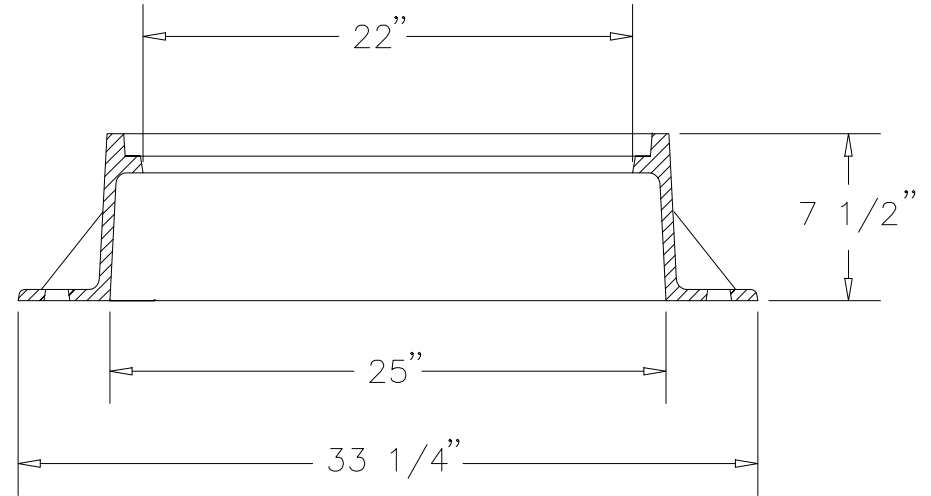
DETAIL :

30:00



(4) — ANCHOR HOLES

(2) — NON PENETRATING PICKHOLES



NOTE

1. ALL TRAFFIC RATED STORMWATER MANHOLE ASSEMBLIES INSTALLED WITHIN THE CITY SHALL CONFORM TO THIS DETAIL AND CITY OF GREENVILLE SPECIFICATIONS.
2. COVER SHALL BE GRAY IRON CONFORMING TO ASTM A48 CL35B AND SHALL WEIGH APPROXIMATELY 130 POUNDS WITHIN ACCEPTABLE TOLERANCE.
3. FRAME SHALL BE GRAY IRON CONFORMING TO ASTM A48 CL35B AND SHALL WEIGH APPROXIMATELY 160 POUNDS WITHIN ACCEPTABLE TOLERANCE.
4. MANHOLE ASSEMBLY SHALL BE UNDIPPED.
5. "✓" DESIGNATES MACHINED SURFACE.
6. LETTERING SHALL BE TRUE TYPE ARIAL FONT HAVING $\frac{1}{8}$ " RELIEF. LOGO SHALL HAVE $\frac{1}{4}$ " RELIEF.
7. US FOUNDRY PRODUCT 668 RING AND OK COVER, OR APPROVED EQUAL.

*FOR ROADWAY USE ONLY



HEAVY DUTY MANHOLE STORMWATER UTILITY

DATE APPROVED: JUL. 2025

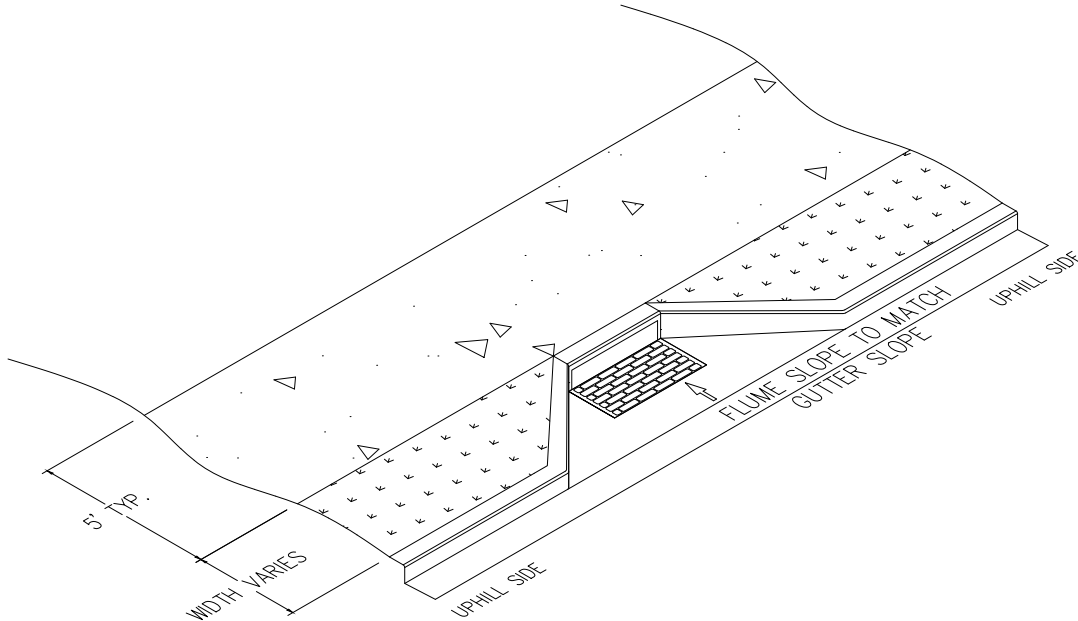
OFFICE OF THE
CITY ENGINEER:

APPROVED

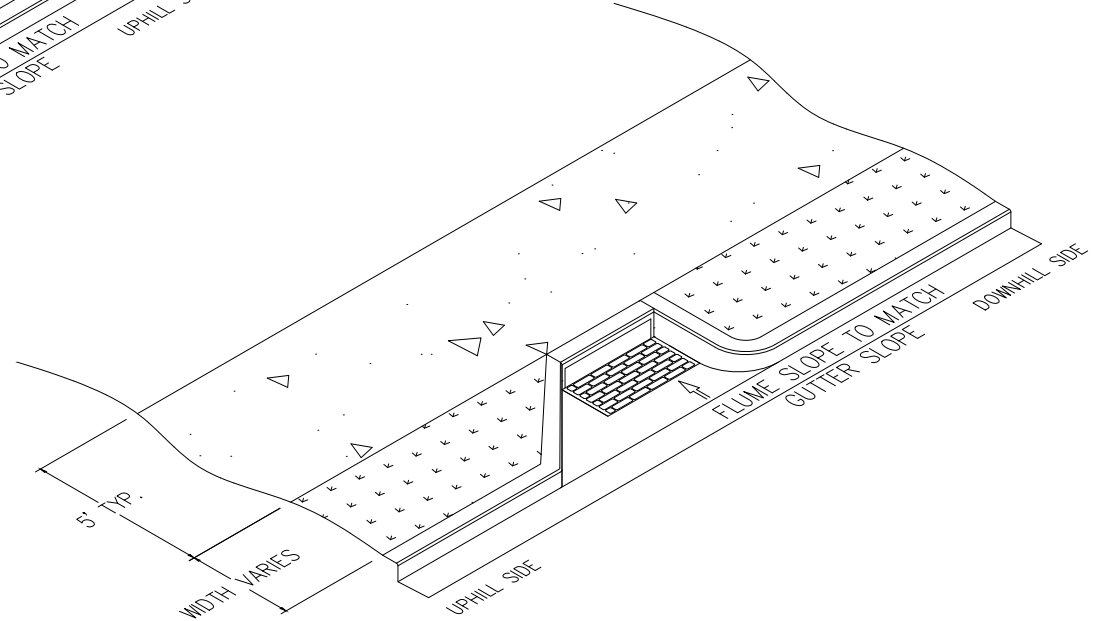
SCALE:
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DETAIL :

30:01

CATCH BASIN FLUME CONFIGURATION (A)



CATCH BASIN FLUME CONFIGURATION (B)



**FLUME CAN BE USED WITH TYPE 1 CB AS SHOWN, AS WELL AS TYPE 16, TYPE 17, AND TYPE 18 CATCH BASINS.

NOTE

1. THE CATCH BASIN USED IN THE FLUME SHOULD BE CONSTRUCTED TO SCDOT SPECIFICATION, SEE APPLICABLE CB DETAIL FOR REBAR REQUIREMENTS.
2. THE CONTRACTOR IS TO ENSURE PROPER SLOPE OF THE FLUME AS TO ENSURE PROPER DRAINAGE INTO THE CATCH BASIN.
3. CONFIGURATION (A) FOR THE FLUME IS TO BE USED WHERE THE BOX WILL BE THE LOW POINT FOR WATER COMING FROM EITHER DIRECTION.
4. CONFIGURATION (B) FOR THE FLUME IS TO BE USED WHERE THERE IS AN UPHILL SIDE AND A DOWNHILL SIDE. THE PORTION OF CURB AND GUTTER PERPENDICULAR TO THE ROADWAY SHALL BE THE DOWNHILL SIDE IN THIS USE.



CATCH BASIN FLUME

DATE APPROVED: JUN. 2025

OFFICE OF THE CITY ENGINEER: APPROVED

SCALE:
NO SCALE

DETAIL :
31:00
SHEET 1 OF 1



APPENDIX B - Engineering Division Forms



appendix D

ENGINEERING DIVISION FORMS

August 2008: Initial Release
June 2010: Wastewater Utility Checklist, inspections forms, and warranty agreement added.
April 2012: Updated wastewater main warranty form and included sample warranty bond.
May 2016: Updated Maintenance/Warranty Bond for Sanitary Sewer Systems.
July 2017: Added Field Report for HMA Paving form

Wastewater Utility

Wastewater Construction Permit Application Checklist	1
Wastewater Final Performance Testing Forms and	3
Tables Wastewater Utility Maintenance/Warranty	5
Agreement Wastewater Maintenance/Warranty Period	7
Bond	8
Field Report for HMA Paving	



SC DHEC Wastewater Construction Permit Application Checklist City of Greenville Delegated Review Program (DRP)

- D The completed original **SC DHEC Construction Permit Application** (DHEC 1970, 03/2008) plus two (2) copies.
- D Application fee of **\$75.00** for a collection/transmission system submitted as a DRP project check. Make check payable to SCDHEC/Bureau of Finance with the name of the project identified on the check.
- D One (1) complete sanitary plan set.
- D Two (2) copies of the appropriate design calculations, signed and sealed.
- D Two (2) copies of a separate detailed 8 ½" x 11" location map.
- D Two (2) copies of the **letter of flow acceptance** from the entity providing treatment of the wastewater. *To obtain a letter of flow acceptance from WCRSA, submit a Preliminary Sanitary Sewer Agency Review Form to the City; the City will complete the appropriate section and return the form and a conditional O&M letter to the design engineer.*
- D Two (2) copies of the 208 Plan **certification from the appropriate Council of Governments** (COG) in designated 208 areas or from SC DHEC in non-designated 208 areas.
- D Review and inspection fee. Make check payable to City of Greenville with the name of the project identified on the check. The following is the current fee schedule based on total length of line:

1 - 300 ft.	\$128.50
301 - 1000 ft.	\$261.00
More than 1000 ft.	\$393.50

Include the following items as applicable to the project –

- D Three (3) copies of construction easements, *unless the project owner has the right of eminent domain or the proposed wastewater system is within an existing easement or the right-of-way.*
- D Two (2) copies of SC DHEC Water Quality Division permit and other applicable agency approvals, *for placement in navigable waters.*
- D Two (2) copies of the letter from the organization agreeing to be responsible for O&M of the wastewater system, *if the City of Greenville will not be responsible for O&M.*

**Submit this completed checklist with application directly to the
City of Greenville, Engineering Division**



WASTEWATER FINAL PERFORMANCE TEST

Page _____ of _____

Project: _____

DRP Number: _____

Contractor: _____

Engineer: _____

Inspector(s): _____

Date: _____

**All parties shall print names and initial above.*

*All parties shall print names and initial above.

				Pipe		Air Pressure Test				Mandrel Test		
Begin MH/Sta		End MH/Sta		Length (ft)	Size / Material	Held		PASS	FAIL	Test		
						Pressure (psi)	Time			PASS	FAIL	N/A
Pass	Fail	Pass	Fail									
Pass	Fail	Pass	Fail									
Pass	Fail	Pass	Fail									
Pass	Fail	Pass	Fail									
Pass	Fail	Pass	Fail									
Pass	Fail	Pass	Fail									
Pass	Fail	Pass	Fail									
Pass	Fail	Pass	Fail									

**Refer to City of Greenville Performance Requirements for manhole and main sewer line testing times.*

**All manholes shall be tested per ASTM C1244 and all main sewer lines per ASTM F1417.*

Notes:



PERFORMANCE REQUIREMENTS

Minimum Specified Time Required for a 1.0 psig Pressure Drop for Size and Length of Pipe Indicated, ASTM F1417

Pipe Diameter (in)	Minimum Time (min:s)	Length for Min. Time (ft)	Time for Longer Length (s)
4	3:46	597	0.380(L)
6	5:40	398	0.854(L)
8	7:34	298	1.520(L)
10	9:26	239	2.374(L)
12	11:20	199	3.418(L)
15	14:10	159	5.342(L)
18	17:00	133	7.692(L)
21	19:50	114	10.470(L)
24	22:40	99	13.674(L)

Note:

1. Testing time shall be measured for the pressure to drop from 3.5 psig to 2.5 psig.
 2. Caution must be taken not to over pressurize the system.
 3. Pipe is acceptable if the time for the pressure reading to drop from 3.5 psig to 2.5 psig meets or exceeds the minimum listed in column 2.
 3. L=length of pipe above the minimum listed in column 3.
- Multiply the length (L) by the coefficient given for the additional testing time required.

Minimum Test Times for Various Manhole Diameters, ASTM C1244

Depth (ft)	Diameter (in)		
	48	60	72
	Time (s)		
4 or less	10	13	16
6	15	20	25
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

Note:

1. Testing time shall be measured for the vacuum to drop from 10 in. Hg (4.91 psig) to 9 in. Hg (4.42 psig).
2. Pipe is acceptable if the time for the vacuum reading to drop from 10 in. Hg to 9 in. Hg meets or exceeds the minimum listed in columns 2, 3, or 4, as appropriate.

MAINTENANCE/WARRANTY AGREEMENT FOR

THIS AGREEMENT is dated _____, and is by, between and among the **CITY OF GREENVILLE (“City”)** and _____ (**“Owner”**).

IN CONSIDERATION OF the recitals and the mutual covenants and agreements set forth herein, and pursuant to the requirements of the City, the parties hereto agree as follows:

SECTION 1. RECITALS.

A. On _____, the Owner received a Permit to Construct (**“PTC”**), permit number _____ for the installation of sanitary sewer main and services (**“Improvements”**) more fully shown on the approved **“As-Built”** drawings in connection therewith.

B. The City Engineer has reviewed the Improvements, and has determined that the Owner has satisfactorily installed and completed the Improvements in accordance with the approved PTC.

C. The City Engineer has recommended that a Permit to Operate (**“PTO”**) be issued for the Improvements and that the City assumes ownership and maintenance responsibility of the Improvements as public improvements (**“Public Improvements”**) pursuant to the Land Management Ordinance and the Design and Specifications Manual. These improvements are the _____ more fully shown on the approved **“As-Built”** drawings.

D. The Owner has agreed to enter into this Agreement to warrant, and ensure the maintenance of, all of the Improvements by the Owner for a period of **one year** after the latter of the issuance of the PTO or receipt of fully executed easement documents.

SECTION 2. WARRANTY OF IMPROVEMENTS.

A. Scope of Warranty. The Owner warrants that the Improvements and all of their components shall be free from defects and flaws in design, workmanship, and materials; shall strictly conform to the requirements of the Agreement; and shall be fit, sufficient and suitable for the purposes expressed in, or reasonably inferred from, the Agreement. The warranty herein expressed shall be in addition to any other warranties expressed in this Agreement, or expressed or implied by law, which are hereby reserved unto the City.

B. Length of Warranty; Repairs; Extension of Warranty. The Owner shall, promptly and without charge to the City, correct any failure to fulfill the above warranty that may be discovered or develop at any time within one year after acceptance of the Improvements by the City or such longer period as may be prescribed by law. The above warranty shall be extended automatically to cover all repaired and replacement parts and labor provided or performed under such warranty and the Owner’s obligation to maintain the Improvements shall be extended for a period of one year from the date of such repair or replacement. The time period established in this Subsection B relates only to the specific obligation of the Owner to maintain the Improvements and shall not be construed to establish a period of limitation with respect to other obligations that the Owner has under any other agreement.

SECTION 3. BOND FOR MAINTENANCE WARRANTY.

As security to the City for the performance by the Owner of the Owner's obligations to maintain the Improvements pursuant to and in accordance with this Agreement, the Owner has posted a bond, or acceptable equivalent, in the amount of \$_____ in accordance with the requirements of the City that were in effect at the time of the execution of the Agreement. Such bond shall be released only after the necessary repairs are completed pursuant to Section 2 above and in accordance with the terms of the Land Management Ordinance and the Design and Specifications Manual.

SECTION 4. RIGHT OF ENTRY.

In the event that the Owner fails to fulfill the warranty within the timeframe established by the City, then the Owner, by this Agreement, grants the City or its contractors the right of entry onto its property to bring the Improvements into compliance.

SECTION 5. TERM.

This Agreement may be released upon expiration of the maintenance period in Section 2 above.

CITY OF GREENVILLE:

 City Manager

ATTEST:

By: _____

Title: _____

_____:

By: _____

Print Name: _____

Title: _____

ATTEST:

By: _____

Title: _____

MAINTENANCE/WARRANTY PERIOD BOND FOR SANITARY SEWER SYSTEM

BOND NO.: _____ PRINCIPAL AMOUNT: \$ _____

PROJECT: _____

KNOW ALL MEN BY THESE PRESENTS, that we **(Name & address of developer)**, as Principal, and **(Name & address of surety)**, a corporation duly admitted to conduct business as a corporate surety in the State of South Carolina, as Surety, are held and firmly bound unto the City of Greenville, Post Office Box 2207, Greenville, SC 29602, as Oblige, in the penal sum of \$ _____ lawful money of the United States of America, for the payment of which well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, **(Name of developer)** has agreed to maintain, repair, and correct deficiencies associated with the sanitary sewer system ("Project") as provided for in the attached maintenance/ warranty agreement ("Agreement").

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the **said** Principal shall fail to perform in accordance with the terms of the Agreement, the Surety, upon receipt of a written notice of the Oblige stating that the Project has not been maintained, repaired and/or deficiencies have not been corrected, shall pay the Oblige such amount up to the Principal amount of this Bond which will allow the Oblige to perform the work or will reimburse the Oblige for work performed in accordance with the Agreement.

This obligation shall remain in force for the duration of the warranty period including extensions.

Signed, sealed and dated this _____ day of _____ 20____ _

WITNESSES:

(Name of Developer)

PRINCIPAL

By: _____
 (Name/Title)

WITNESSES:

(Name of Surety)

SURETY

By: _____
 (Name/Title)

Approved as to form:

Reviewed By:

Leigh Paoletti

City Attorney's Office

Engineering



FIELD REPORT FOR HMA PAVING

Project: _____

Date: _____

Road Name: _____

Contractor: _____

Type of Mix: _____ Thickness: _____

Control Strip:

		Site 1	Site 2	Site 3	
Roller	Passes	Density	Density	Density	Avg Density

Twelve Random Readings:

Note: Omit highest and lowest Reading when calculating Target Density

Established Target Density: _____

Roller Pattern: _____

Roadway Density Readings:

Average Nuclear Roadway Density: _____ Compaction % _____

Contractor Representative (Print name & Sign): _____

City of Greenville Inspector (Print Name & Sign): _____

Remarks (Lift number, etc): _____



APPENDIX C - Selected City Ordinances and Policies



city of
greenville

Design and Specifications Manual

appendix E

SELECTED CITY ORDINANCES AND POLICIES

August 2008: Initial Release

June 2010: Added City of Greenville Policy: Right of Way Easement Maintenance for Wastewater and Stormwater Systems. Includes Stormwater and Light Ordinance by reference only.

The latest version of the stormwater ordinance may be viewed via the online repository municode.com. After navigating to the City of Greenville library, the stormwater ordinance may be found at § 19-7 and Appendices A through H of the Land Management Ordinance.

Lighting Ordinance

The latest version of the lighting ordinance may be viewed via the online repository municode.com. After navigating to the City of Greenville library, the lighting ordinance may be found at § 19-6.4 of the Land Management Ordinance.

City of Greenville Policy

Rights of Way and Easements Maintenance for Wastewater and Stormwater Systems

CITY OF GREENVILLE POLICY

RIGHT OF WAYS AND EASEMENTS MAINTAINENCE FOR WASTEWATER & STORMWATER SYSTEMS

DEPARTMENT OF PUBLIC WORKS

The City of Greenville, under the Wastewater and Stormwater Utilities, is responsible for the maintenance and operation of the wastewater and stormwater collection and conveyance systems. These systems include manholes, pipes, open channels, inlets, catch-basins, and service connections at the main to individual properties. While the City has clear rights to access the parts of the system within either the public Right Of Way (R-0-W) or dedicated easements much of the conveyance system is on private property where the City can not and should not legally enter without first obtaining written permission from the property owner. It should be noted that this may not apply to certain survey activities or activities deemed necessary by the City to protect the public health, safety and welfare.

As a part of the Consent Agreement and Consent Order with EPA the City is required to develop and implement a plan for maintaining accessibility to our wastewater infrastructure for inspection, maintenance and repair. For consistency and for the same maintenance reasons, the same policy should also apply to the City's stormwater infrastructure. This access must accommodate modern equipment such as television trucks, jet and vacuum trucks, excavators, back-hoes and dump trucks. Ideally, the City wishes to locate, to the greatest extent possible, as much of the underground utilities within the public R-0-W or within easements adjacent to the public R-0-W. This not only allows the greatest accessibility to the infrastructure but also greatly reduces the City's effort in maintaining a "Clear Zone" while minimizing the impacts to privately owned properties. With this in mind, the following policy for maintaining the City's underground infrastructure is recommended.

Policy:

The City of Greenville shall maintain to the greatest extent possible a "CLEAR ZONE" above and around its entire wastewater and stormwater infrastructure. This Clear Zone shall ideally be the width of the easement but no less than seven and a half feet (7.5') on either side of the outside edge of the infrastructure. Asphalt paths, concrete sidewalks, roads, parking lots, grass, shrubs and other plantings whose natural height does not exceed three feet are permitted in this "Clear Zone"; however, like all other items not defined for uses in the easement, they are at risk and subject to removal at any time. All other objects, including trees, buildings, fences and other items that would inhibit the City's ability to access and maintain its infrastructure are prohibited.

When installing new infrastructure or replacing existing systems the City of Greenville desires that, whenever possible, wastewater and stormwater systems are located in and adjacent to the Public Road R-0-W. Infrastructure located beyond the R-0-W should be placed in suitable easements sited to maximize the City ability to maintain a "CLEAR ZONE" while minimizing the impacts to private property. These easements should be clearly marked and identifiable and generally run along common property lines.

Written applications for Encroachments into a City Easement may be submitted to the City Engineer for review. This application shall clearly document the location of the easement and associated infrastructure and the size and limits of the encroachment. The City Engineer, at his discretion, may permit or deny activities or allow changes to the width of the easement

City of Greenville Policy
Department of Public Works

and/or "Clear Zone". The decision shall be based upon best engineering judgment and current engineering standards and construction/maintenance practices.

Definitions:

Clear Zone: An area over the underground infrastructure where access must be preserved in order for the City to effectively maintain the public underground infrastructure. As such, objects such as large trees, fences, buildings, etc. which interfere with the City's ability to access and maintain the wastewater and stormwater systems are prohibited. Generally this Clear Zone is the total width of the easement; however, where possible it should never be less than fifteen feet in width, centered on the underground system.

Easement: A portion of property dedicated for a particular use, in the case of wastewater and stormwater, conveying sewerage through the property. The dedication can be general, i.e. a Utility Easement where any utility can locate their infrastructure, or specific, a Wastewater Easement to the City of Greenville where only wastewater infrastructure can be placed in the easement and the City has the right to allow or deny other wastewater providers use of the easement. The property owner maintains ownership of the easement area but has given certain rights, including access for inspection and maintenance, in this area. The property owner has also forfeited certain rights to utilize this area for consideration of the public utility, including placing a structure or fence in the area.

The table below outlines the minimum acceptable easement widths. These minimum widths are centered on the underground pipe and based on pipe size, depth of bury and compliance with OSHA requirements.

MINIMUM EASEMENT REQUIREMENTS					
Pipe Size	Bottom Width	Trench Depth			
		4' and less	4' to 7'	7' to 10'	10' and deeper
8" to 12"	3.0 feet	15'	15'	20'	25'
15" to 24"	4.0 feet	15'	20'	20'	25'
27" to 36"	5.0 feet	20'	20'	20'	25'
42" to 48"	6.0 feet	20'	20'	25'	30'
> 48"	Pipe OD plus 30' (15' either side of the outside of the pipe)				

The City may require larger easement widths where the City deems necessary to access and maintain its infrastructure. Reasons for a larger easement include but are not limited to remote locations, adverse slopes, poor site conditions etc.

Generally there are three types of easements:

Platted Easement: During the subdivision of a parcel the City requires a surveyed drawing of the parcel showing existing and new lot lines, road R-0-WS, and easements. If the City currently has infrastructure or new infrastructure is planned for the subdivision an appropriate easement is dedicated and shown on the plat.

City of Greenville Policy Department of Public Works

Descriptive Easement: If new easements are required or obtained rather than re-platting a property a descriptive easement attached to the plat is used. Referencing the existing plat this type of easement uses meets and bounds (distances and bearings) to describe an easement without actually producing a drawing.

Prescriptive Easement: This is an unwritten/undocumented easement based on the City having and maintaining public infrastructure on private property. This easement is ambiguous and often requires legal interpretation and court action to settle the existence of and actual size. Generally it requires that the City has documented maintenance activities, there is some evidence of the infrastructure that a reasonable person would notice and that the improvements have existed for a certain period of time. The actual width of the easement is also questionable as some courts have ruled that the easement is restricted to the edge of (or outside diameter) of the infrastructure while other rulings have been more liberal allowing for not only the infrastructure but also a reasonable area for access and equipment.

Right of Way (R-0-W): The portion of land owned by a governmental agency, City, County, State, etc., for the construction and maintenance of public streets, roads and public access or rights-of-way. Other public/private agencies may locate infrastructure, such as water mains, oil and gas pipelines, telecommunication lines, power lines, and sewer mains, in this area; however, these other agencies are subject to the authority and wishes of the governmental agency's controlling this property. In general the following order of hierarchy is given to underground utilities:

- 1) Gravity Flow Systems
 - a. Stormwater - Largest pipes under gravity flow
 - b. Wastewater - Second largest pipes under gravity flow
- 2) Pressure Flow Systems
 - a. Wastewater and Stormwater- Largest pipes under pressure flow
 - b. Potable Water
 - c. Natural Gas/Petroleum
- 3) Conduit Systems
 - a. Electric Power
 - b. Telephone and Communication
 - c. Television

This order of hierarchy or precedence is based on pipes size type of operation with preference given to the larger pipes operating under gravity flow first, pipes operating under pressure flow second and pipes acting as conduit with pulled systems last. Priority is also given to essential systems that are necessary for living in an urban area such as water, wastewater and power.

City of Greenville Policy

Department of Public Works

Goals:

1. Install new and/or relocate existing wastewater and stormwater systems into or adjacent to the Public R-0-W whenever possible.
2. Address maintaining a "Clear Zone" above infrastructure outside the R-0-W on publicly owned property before attempting to address infrastructure outside the R-0-W on privately owned property. Utilize these activities to further refine the Clear Zone Policy
3. Disseminate information to property owners about the rights, restrictions and encumbrances on their property, noting the location of the City underground infrastructure on their property and the associated easement(s).
4. With a refined Clear Zone Policy and the necessary easements implement the policy on private property.

The City's primary goal in locating new and maintaining existing infrastructure should be to install or relocate wastewater and stormwater systems into the Public R-0-W whenever possible. However, due to such things as topography, available land and cost, not all wastewater and stormwater infrastructure can be feasibly located in and adjacent to the R-0-W. For those segments not in or near the road, accessibility requirements must be balanced with property impacts. These impacts could include such items as tree loss, building removal, fence demolition and the perception that the City is condemning private property. In order to gain a better understanding of the results of maintaining a "Clear Zone" a focus should be given to segments located on public property, allowing to City the greatest freedom to experiment with a variety of options that balance the needs with the impacts. Therefore the second goal should be to address maintaining a "Clear Zone" above infrastructure outside the R-0-W on publicly owned property before attempting to address infrastructure outside the R-0-W on privately owned property.

While the City focuses on relocating infrastructure to the R-0-W and addressing infrastructure on publicly owned property information regarding the infrastructure on privately owned should be disseminated. Individual property owners should be notified of the location size and type of infrastructure as well as the type of easement on their property as well as their rights and the rights of City to own and operate the public infrastructure.

**City of Greenville Policy
Department of Public Works**

Course of Action:

Define the Infrastructure:

1. Utilizing the GIS, first determine the length and location of all parts of the system differentiating between infrastructure located within the public R-0-W and infrastructure located outside of the public R-0-W.
2. For that infrastructure located outside the R-0-W determine which of the following exist:
 - a. Platted Easements
 - b. Descriptive Easements
 - c. Prescriptive Easements
 - d. No Easements
3. Develop a GIS Layer titled "EASEMENT" and plot the existing easements.

For Infrastructure within and adjacent to the Public R-0-W:

1. No Action - A "Clear Zone" allowing access to the City's infrastructure already exists and the City's goal is met. The only maintenance activity is raising manhole access covers to the surface.

For Infrastructure outside the R-0-W:

1. Determine current condition of the infrastructure.
 - a. On a five point scale rate the underground infrastructure as follows
 - i. "5" - New
 - ii. "4" - Good (no problems)
 - iii. "3" - Average (minor cracks, slight mis-alignments, no action is needed currently)
 - iv. "2" - Poor (system is operating but major problems exist and a action plan needs to be put together and implemented)
 - v. "1" - Failed (system is not functioning and immediate attention is required)
 - vi. "0" - Retired
2. Determine if the infrastructure can be relocated to the Public R-0-W
 - a. For the segments where relocation is an option develop a construction plan and schedule for relocating the infrastructure.
 - b. This plan should prioritize the segments based on such things as age, capacity, condition, and location, as well as the cost of relocation verses the cost of continued maintenance outside the R-0-W.
3. Implement the relocation plan as part of the City's annual replacement and new extension programs with the City construction forces. The extent of the relocation will be based on the annual budget for wastewater extensions and replacements.

**City of Greenville Policy
Department of Public Works**

For Infrastructure outside the R-0-W that cannot be relocated:

1. Determine if the infrastructure is on Public or Private Property.
2. Initially for underground infrastructure located on Publicly Owned Property ONLY establish the "Clear Zone" working closely with the other City Departments to minimize the disruptions and maximize the benefits by investigating the following:
 - a. Determining an appropriate method for and the necessary steps needed to evaluate removal of existing trees in the Clear Zone. Include the following:
 - i. Working with City Arborist to determine the overall health of the tree.
 - ii. Removing evasive, non native species in favor of desired local trees
 - iii. Protecting heritage trees.
 - iv. Tree replacement along the edge of the Clear Zone to mitigate the trees removed from the Clear Zone
 - v. Consideration of relocating the underground infrastructure.
 - b. Installing multi-use paths that can be used by pedestrians, bicyclists and City crews to access the underground infrastructure with TV trucks, Vactor and Jet Rod trucks.
 - c. Tree planting along the edge of the Clear Zone to help define the City's easements and reduce the potential of tree growth in the Clear Zone
 - d. Other Ideas
3. Utilize these activities to refine the policy and procedures before working on Private Property

For Infrastructure on private property that cannot be relocated to the R-0-W:

1. Notify property owners of the existence of wastewater/stormwater infrastructure and associated easement on their property (Platted, Descriptive, Prescriptive or None)
2. With Platted and Descriptive Easements notify the property owner of the following
 - A) City's Right's under this easement
 - B) Owner's Restrictions under this easement
 - C) Include a map of the property with the infrastructure and the easements clearly plotted and defined.
3. With Prescriptive Easement notify the property owner of the following:
 - A) City's Right's under this easement
 - B) Owner's Restrictions under this easement
 - C) Include a map of the property with the infrastructure and the desired easements clearly plotted and defined.
 - D) The City's desire to obtain a platted or descriptive easement and initiate negotiations for obtaining the easement

**City of Greenville Policy
Department of Public Works**

4. With No Easement notify the property owner of the following:
 - A) The location of the City's infrastructure
 - B) The City's desire to obtain a platted or descriptive easement and initiate negotiations for obtaining the easement
 - C) Include a map of the property with the infrastructure and the desired easements clearly plotted and defined.
5. Obtain the necessary easements to allow the City to legally enter private property to maintain the public infrastructure.
6. With a final plan for establishing and maintaining a Clear Zone, refined from working on publicly owned property, implement the Clear Zone on privately owned property.

Greenville **Engineering Design and Specifications Manual**





Planning Staff Report to
Greenville Planning Commission
for the August 7, 2025 Public Hearing

PUBLIC HEARING NOT REQUIRED

Applications involving a final development plan are considered at a Public Meeting of the City's Planning Commission but do not require a public hearing. Public feedback was received at the June 24, 2025 Project Preview Meeting.

Docket Number: Z-34-2021 Final Development Plan
Applicant: Marcus McCall / McCall Capital
Property Owner: Enclave Laurens, LLC / Laurens 24, LLC
Property Location: 1439 Laurens Road
Tax Map Number: 0256000600100, 0256000600101, 0256000600102, 0256000600200, 0256000601201
Property Area: 12.79 Acres
Zoning: PD, Planned Development District
Request: FDP Phase I - Mixed-Use Commercial & Residential Building
Recommendation: Approval with Conditions and Comments



Applicable Sections of the City of Greenville Code of Ordinances:

Sec. 2-372 Function, Powers, and Duties of the Planning Commission

Sec 19-1.1.3 Purpose and Intent

Sec.19-1.3 Official Zoning Map

Sec.19-2 Zoning Districts

Sec.19-6.1.3 Planning Commission

Sec.19-6.2.2 Legislative Review

Project Overview:

The Enclave Laurens Planned Development District was originally approved by City Council on January 24, 2022 through Ordinance 2022-04. The original PD provided for up to 400 multifamily residential dwelling units, up to 88,000 SF of commercial space, and a hotel with up to 125 rooms or an additional 60,000 of office space. All buildings must remain at or below 100 feet in height. The original PD application also noted that 10% of the residential units would be workforce housing at 80% AMI for a period of 20 years.

According to the original approval, the project intends to provide a mix of commercial uses, housing to support various income levels, and either a hotel or large office, depending on market demand. Commercial uses are envisioned to be neighborhood retail, sit-down restaurants with outdoor seating, and passive parks and plazas interconnected through multi-modal facilities. The project will also make a connection to the Swamp Rabbit Trail at the northern corner of the site. Architecture was noted as taking inspiration from the surrounding industrial context with “modernized, streamlined, and simplified detailing.” Brick, cementitious, and metal paneling were specifically mentioned, noting a subdued color palette with warm accent materials and minimalist detailing. Per the approved documents, the project must meet or exceed the city’s former multifamily residential development standards and be generally consistent with the current Downtown Design Guidelines.

Land Use Review

The existing zoning is **PD, Planned Development District**. The Future Land Use Map (FLUM) of the GVL2040 Comprehensive Plan recommends **Urban Node Mixed-Use** land uses. Since the original approval, the City has conducted the 2023 citywide rezoning in conjunction with the Greenville Development Code. The Laurens Road corridor was largely zoned to a MX-, Mixed Use District, and adjacent sites along Airport Rd. were zoned IX-, Industrial Flex. Planned Developments, due to their existing vested rights, were not rezoned.



Procedural Requirements:

Pre-Application and Development Meetings

The City and the applicant held a pre-application meeting on May 5, 2025.

Project Preview Meeting

The applicant attended the June 24, 2025, Project Preview Meeting (PPM) at the Prisma Health Welcome Center at Unity Park. Public questions/concerns raised to the applicant during the meeting are attached below.

FDP Phase I Summary:

Proposed Use:

Phase I of the Final Development Plan includes approx. 4,000 SF of neighborhood retail space (office, retail, or restaurant) on the ground floor at the corner of the development's entrance along Airport Road. The proposal includes 244 residential units and associated amenities.

Site & Access:

The project provides full access from Airport Road and right-in/right-out access onto N. Pleasantburg Drive, as well as Swamp Rabbit Trail access that will double as fire department access for a future phase. An internal parking garage includes approximately 369 spaces, and 37 additional surface parking spaces are provided via on-street parking along the internal street for a total of 406 spaces, exceeding the minimum requirement of 303 spaces. The excess in parking spaces may be used to accommodate future phases.

Publicly accessible open space, expansive sidewalks, and private courtyards and amenities account for the open space required for the development, exceeding the minimum requirement by approximately 109,000 SF. As previously mentioned, multimodal Swamp Rabbit Trail access will be provided with Phase I. The project also accounts for future pedestrian connections within the development and to adjacent sites. Bike parking is noted to be provided within the parking garage.

Architecture:

The proposal is for one four-story building, which steps down along the natural grade of the site. The building employs a flat roof and utilizes a combination of red and whitewashed brick, fiber cement lap siding and paneling, fiber cement staggered board and batten, metal balconies and canopies, vinyl windows, aluminum storefronts, and powder-coated aluminum railings. Colors are indicated to be a combination of warm whites and grays. A physical mock-up will be reviewed and approved in the field.

The building is generally broken up into a series of masses through the application of wings and recesses corresponding with contrasting colors and materials.

Staff Analysis:

Variations:

Staff notes that the footprints of several of the buildings reflected in the overall site plan have changed since the PD approval in 2022. The Phase I building remains in the same general configuration, with any major variations to the footprint being limited to the side and rear facades, where recesses have been added to create more expansive outdoor amenity space for residents. The parking structure is also proposed to be wrapped on all 4 sides of the building – an improvement from the previously approved plans.

Modifications have also been made to the primary driveway configuration, removing the walkways in the central drive island and converting parallel spaces to angled parking. While this change improves parking access for the ground-level retail, pedestrian access and safety is diminished along the inside row of parking spaces. Staff recommends additional study to reincorporate walkway(s) to access these parking spaces.



Conformance with Applicable Requirements

1. Planned Development Ordinance

The following items were noted as conditions of approval that must be satisfied for the overall development. These items are not required to be included in Phase I, but may be applicable and should be considered and incorporated where possible:

- Applicant shall work with Greenlink staff to establish or relocate a nearby bus stop adjacent to the development to encourage non-automotive transportation means and to meet the proposed reduction of parking requirements.
- Pedestrian and bicycle infrastructure shall be compliant to the design requirements found in the Swamp Rabbit Trail Extension Design Guidelines. The number of publicly available bicycle spaces shall be 35 spaces.

2. Multifamily Residential Development Standards (previous LMO)

The Phase I building generally conforms with the multifamily design standards. The massing of the building is scaled appropriately through the incorporation of breaks or recesses and application of a base, middle, and cap. Ground-level entrances are provided along the street, and transparency appears to generally comply with the minimum requirement of 20 percent. Service areas have not been identified but are anticipated to be located on the roof or hidden within the parking deck. Any utilities visible from the right-of-way, parking areas, or trail frontage must be screened appropriately. Final compliance with screening requirements and transparency calculations will be verified during permit review.

3. Downtown Design Guidelines

Pedestrian activation within Phase I is achieved through the incorporation of street-level entrances and expansive walkways with good connectivity. Commercial uses have been placed at the building's corner near the entrance into the development to activate the most prominent location of the site; however, the architecture at the corner should incorporate features that actively engage the public realm and create a visual presence at the corner, per PRI 5.7. While some features have been incorporated to distinguish the corner, more architectural prominence should be given to the corner to better engage the public realm.



The project utilizes high-quality materials of a subdued color palette, per the PD approval; however, PRI 6.8 states that brighter, bolder colors may be applied to areas of the building

Z-34-2021: Enclave Laurens FDP - Phase I

where they are secondary to the main body of the building. Staff recommends incorporating brighter or bolder colors at the commercial storefronts to draw attention to areas of higher activation.

As previously stated, utilities may not be located along the ground-floor street wall, and must be fully screened from view, per PUB 12.

The plans provided do not indicate site or architectural lighting, which must conform with the Design Guidelines. Conformance of these elements must be verified during permitting.

Overall, staff finds the proposed plans to be largely in conformance with the applicable development and design standards, with minor modifications necessary.

STAFF RECOMMENDATION:

APPROVE Final Development Plan with Conditions

Staff Comments & Conditions

Planning Staff Conditions:

1. To ensure the workforce housing condition is enforced and monitored for 20 years, the applicant will be required to work with Planning and Community Development staff on a covenant provision prior to the first Certificate of Occupancy (CO).
2. Pedestrian access must be provided connecting the retail spaces to all parking spaces along the central drive aisle via a grade-separated walkway connecting to a protected crosswalk.
3. The building permit submittal must incorporate a minimum of 20% transparency on all street-facing facades per the multifamily development design standards.
4. Utilities may not be located along the ground floor street wall, per PUB 12.1 of the Downtown Design Guidelines. Any utilities visible from the public right-of-way, parking areas, or trails must be located to minimize visual impacts and must be fully screened from view.
5. More prominence should be given to the building's corner through a slight increase in height, material changes, façade articulation, or a combination thereof.
6. Brighter or bolder colors must be incorporated into the commercial storefronts through signage, detailing, canopies, or other architectural elements, per PRI 6.8 of the Downtown Design Guidelines.
7. Site and architectural lighting must be provided in conformance with PUB 9 and PRI 7 of the Downtown Design Guidelines at the time of permitting.
8. A full sign package noting the location of each sign for the project shall be submitted to staff prior to the submittal of the first sign permit. The sign package does not need to be tenant specific.
9. The design and connection to the Swamp Rabbit Trail shall be coordinated with appropriate city staff. Bike parking may be required in addition to the garage spaces indicated.

City Engineer Comments

Recommend: Approve w/ Comments

Comments:

*1. Application review approval is subject to the applicant satisfying all conditions and requirements of the engineering divisions.

Environmental Engineer Comments

Recommend: Approve w/ Comments

Z-34-2021: Enclave Laurens FDP - Phase I

Comments:

- *1. Stormwater control measures shall not be located within any public right of way or spaces.
- *2. Wastewater – Wastewater service for the development will be subject to the following conditions:
 - a. There are existing City sewer mains available to serve this development. The developer must confirm that the existing sewer system/treatment plant has available flow from the City and ReWa by submitting a Sewer Capacity Request Form (Service Lateral Fillable Form aka PSSAR). <https://survey123.arcgis.com/share/0277dbae6a974c5fab9b932b414d59bb>
 - b. The wastewater permitting and acceptance process shall meet those requirements set forth in the City of Greenville Design and Specifications Manual Chapter 8.
 - c. Each building shall have a separate and direct connection to the City's sanitary sewer main.
 - d. Prior to using an existing lateral, the existing lateral must be tested to ensure that it conforms to City of Greenville performance requirements. Provide a video documenting the condition of the existing service connection prior to its reuse. A new lateral will be required if the existing lateral is in poor condition. The final Certificate of Occupancy will not be issued until the lateral is shown to be in good condition or a new lateral is installed.
 - e. Each building shall require a new service fee through ReWa.
 - f. This project will include a Sanitary Sewer Main Extension and will require submittal of a wastewater permit. Submit to the City of Greenville for review via the City's online portal: <https://www.greenvillesc.gov/FormCenter/Engineering-22/SC-DHEC-Wastewater-Construction-Permit-P-385>
 - g. If a sanitary sewer main extension is required to serve newly plat lots, final plat approval will be contingent upon the completion of construction and acceptance by the City of Greenville.
- *3. Stormwater Management – The development must be performed in conformance with the City's stormwater ordinance (Article 19-5.3: Stormwater Management). Specifically, you will need to have a Professional Engineer prepare a non-single family site plan for the development and it will be subject to the following conditions:
 - a. A stormwater plan is required to be submitted with the non-single family site plan permit. Submit the major or minor stormwater plan as appropriate.
 - b. At a minimum, a stormwater plan should include:
 - i. Proposed layout.
 - ii. Appropriate erosion control best management practice standard details.
 - iii. A construction entrance.
 - iv. A concrete washout.
 - v. Silt fence
 - c. The plan should also show any drainage details needed to ensure the development will not adversely impact adjacent properties and will adequately control runoff from offsite.
 - i.. If the proposed development creates a new impervious surface greater than or equal to 0.25 acres, water quantity will be required for the 2,10 & 25 year 24 hour storm event with no significant increase in the 100 year 24 hour storm event.
 - ii.. Any stormwater drainage system conveying offsite water shall be designed in compliance with the Stormwater Ordinance.
 - iii. Water quality treatment is required when either:
 - The proposed development or Larger Common Plan will disturb more than 10,000 square feet.
 - The proposed development disturbs 50% or more of the parcel or larger common plan.
- *4. Floodplain – A portion of the subject property is not located in a FEMA floodplain as determined utilizing 2019 Flood Insurance Rate Maps.

Traffic Engineer Comments

Recommend: Approve w/ Comments

Z-34-2021: Enclave Laurens FDP - Phase I

Comments:

- 1) The previously submitted Traffic Impact Analysis, submitted in Aug 2021, must be updated with current traffic counts and traffic signal timings before a site permit will be issued. The updated TIA must satisfy current standards in the year the site permit is applied for. Refer to Sec 19-5.1.2 of the Greenville Development Code and Chapter 7 of the Engineering Design and Specifications Manual for additional information on TIA requirements. Any mitigation identified within the TIA will be a requirement of the site permit.

Fire Department Comments

Recommend: Approve w/ Conditions

Comments:

As submitted with plans for phase 1, a 26' designated aerial access road on the rear of phase one, states grass pave fire lane. Road shall be designed "Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus and shall be surfaced so as to provide all-weather driving capabilities."

Tree and Landscape Comments

Recommend: Approve w/ Comments

Comments:

1. This project will require significant tree removals. As the project moves into permitting, a full tree inventory per 19-5.2.2.A will be required with the site permit submittal, and mitigation for tree removals must be provided. Preservation of mature trees is strongly recommended wherever feasible.
2. Any trees intended to be saved must be protected with tree protection fencing per Sec. 19-5.2.2.F.
3. Street trees will be required along all public rights-of-way and along all new internal streets.
4. All plant selections in future plans must comply with Div. 19-4.10.



city of greenville

APPLICATION FOR FINAL DEVELOPMENT PLAN (FDP)

Contact Planning & Development (864) 467-4476

Office Use Only:

Application# _____ Fees Paid _____

Date Received _____ Accepted By _____

Date Complete _____ App Deny Conditions _____

APPLICANT/OWNER INFORMATION

*Indicates Required Field

	APPLICANT	PROPERTY OWNER
*Name:	Marcus McCall	Enclave Laurens, LLC & Laurens 24, LLC
*Title:	Manager	McCall Capital, LLC, Manager
*Address:		
*State:		
*Zip:		
*Phone:		
*Email:		

*SELECT REVIEW TYPE: ☒ FDP Planning Commission Review ☐ FDP Staff Review

*PD NAME Enclave Laurens

*PD ORDINANCE # 2022-04

*ORIGINAL APPLICATION # (provide # of rezoning request) Z-34-2021

*STREET ADDRESS 1439 Laurens Rd, Greenville, SC 29607

*TAX MAP # 0256000600100 / 0256000600101
0256000600102 / 02560006001201
0256000600200

*ACREAGE 12.79 Ac

*BUILDING/PHASE Phase 1 FDP

*PROPOSED USE Mixed-Use Commercial + Residential

INSTRUCTIONS

- The application and fee, **made payable to the City of Greenville**, must be submitted to the Planning and Development Office no later than 2:00 on the date reflected on the attached schedule for Planning Commission.
 - PD Final Development Plan (FDP) – Initial Approval \$200.00, *public hearing may be required*
 - PD Final Development Plan (FDP) – Major Modification \$100.00, *public hearing required*
 - PD Final Development Plan (FDP) – Minor Modification \$50.00, *administrative review*
- Staff will review the application for sufficiency pursuant **Section 19-2.2.6, Determination of Sufficiency**, prior to routing the application for staff review. If the application is determined to be insufficient, the Administrator shall contact the Applicant to request that the Applicant resolve the deficiencies. You are encouraged to schedule an application conference with a planner, who will review your application for sufficiency at the time it is submitted. Please call (864) 467-4476 to schedule an appointment.
- If the plan is determined to be inconsistent with the preliminary approval granted by the planning commission (i.e. not a "minor deviation" as defined at **Section 19-2.3.3(D)(7), Minor Deviations**), the administrator shall defer action pending the applicant submitting an application to the commission to consider a revised preliminary plan pursuant to **Section 19-2.2, Common procedures**.

CITY OF GREENVILLE APPLICATION FOR FINAL DEVELOPMENT PLAN (FDP)

PAGE 1 OF 3

4. **Public Notice Requirements.** Final Development Plan (FDP) applications require a planning commission public hearing. The applicant is responsible for sign posting the subject property at least 15 days (but no more than 18 days) prior to the scheduled planning commission hearing date.

(To be filled out at time of application submittal)

N.A. Public Hearing signs are acknowledged as received by the applicant

N.A. Received information for materials board requirements

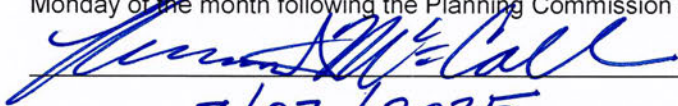
***APPLICANT SIGNATURE** N.A.

5. **Please read carefully:** The applicant and property owner affirm that all information submitted with this application; including any/all supplemental information is true and correct to the best of their knowledge and they have provided full disclosure of the relevant facts.

In addition, the applicant affirms that the applicant or someone acting on the applicant's behalf has made a reasonable effort to determine whether a deed or other document places one or more restrictions on the property that preclude or impede the intended use and has found no record of such a restriction.

If the planning office by separate inquiry determines that such a restriction exists, it shall notify the applicant. If the applicant does not withdraw or modify the application in a timely manner, or act to have the restriction terminated or waived, then the planning office will indicate in its report to the planning commission that granting the requested change would not likely result in the benefit the applicant seeks.

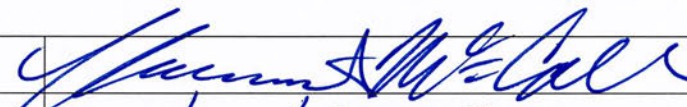
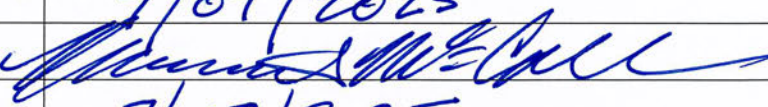
Furthermore, my signature (applicant) indicates that I understand and consent that this matter will appear before the Planning Commission for consideration and that any recommendation, for approval or denial, by the Planning Commission will be presented to the City Council at their next regularly scheduled meeting to be held on the fourth Monday of the month following the Planning Commission meeting in which the matter was heard.


7/07/2025

***APPLICANT SIGNATURE**

DATE

6. To that end, the applicant hereby affirms that the tract or parcel of land subject of the attached application is ___ or is not ☒ restricted by any recorded covenant that is contrary to, conflicts with, or prohibits the requested activity.

*Signatures	
Applicant	
Date	7/07/2025
Property Owner/Authorized Agent	
Date	7/07/2025



SUBMITTAL REQUIREMENTS

At a minimum, the following information shall be provided:

1. Vicinity map, title block, scale, north arrow, legend, and all property lines (reflecting courses and distances).
2. Names and locations of all existing and proposed public and private streets abutting the property or within 100' of the property.
3. Location of all existing and proposed easements transecting, or adjacent to, the property.
4. Location of all streams, ponds, wetlands, drainage ditches, and other watercourses as well as the location of any Regulatory Floodway or Floodplain.
5. Location of all trees as required by **Section 19-6.3.2(A), Tree Inventory Required** and Appendix 'E' of this Manual.
6. Location of all existing man-made features on the property (parking and circulation areas, utilities, fire hydrants, buildings, lighting, etc.).
7. Location, use and arrangement of all proposed buildings, signs, and structures (Residential Buildings shall reflect number and type of units as well as number of bedrooms – Nonresidential Buildings shall reflect floor area and use).
8. Interior and exterior setbacks (buildings-to-buildings and buildings-to-property lines);
9. Location and design of all proposed lighting fixtures pursuant to the requirements of **Section 19-6.4, Exterior Lighting**.
10. Location and design of improvements for all proposed open space and recreation areas.
11. Location, layout, and dimensions of all vehicular and pedestrian circulation areas, parking, loading, and service areas, etc. (including sidewalks, dumpster pads, bicycle paths, etc.).
12. Conformance with the requirements of **Section 19-2.3.13(B), Grading Permit**, or confirmation from the Grading Permit Administrator that an Application has been submitted.

Additional information regarding, but not necessarily limited to, the following:

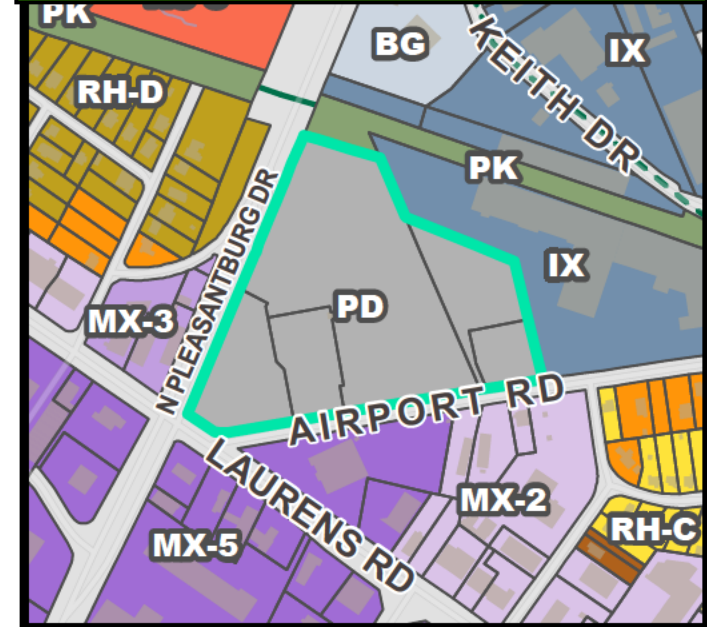
1. Project Phasing
2. Design Requirements, including:
 - Off-Street Parking and Loading
 - Landscaping, Buffering, and Screening
 - Tree Protection
 - Exterior Lighting
 - Design Standards for Non-Residential Development
 - Sign Regulations
 - Streets and Utilities
3. Open Space Preservation and Development
4. Public Facility Improvements and Phasing



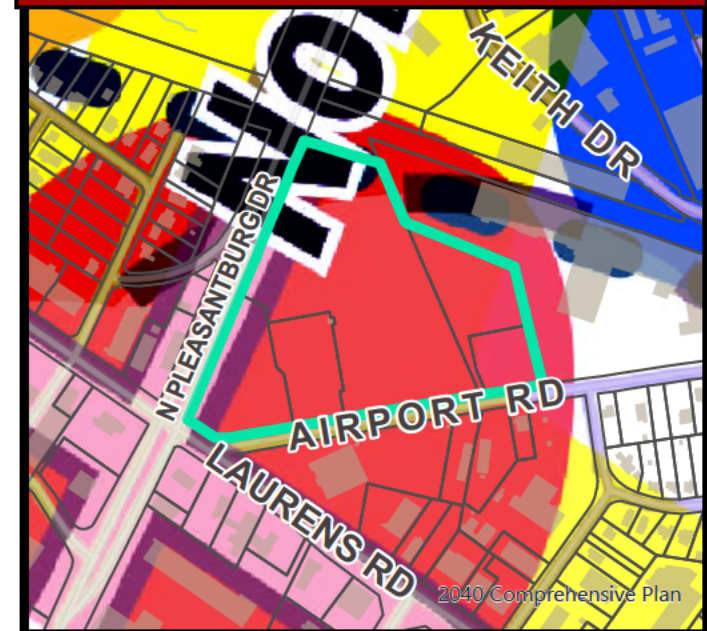
AERIAL VIEW



CURRENT ZONING



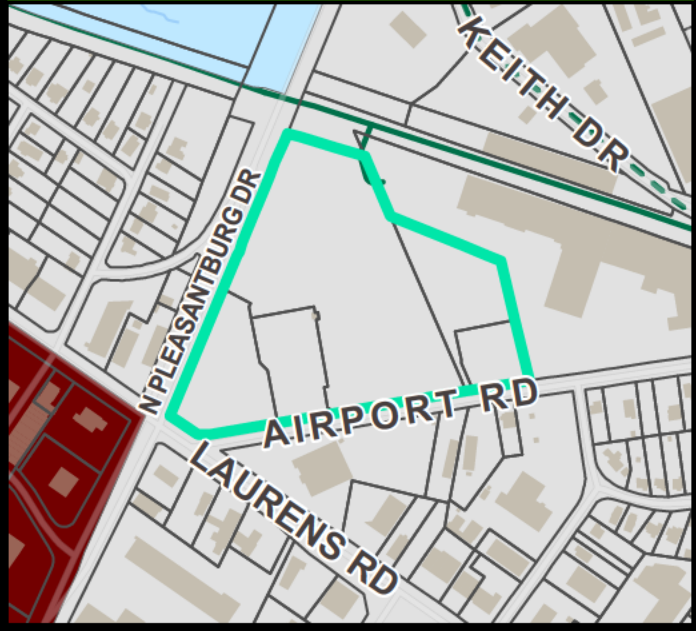
FUTURE LAND USE



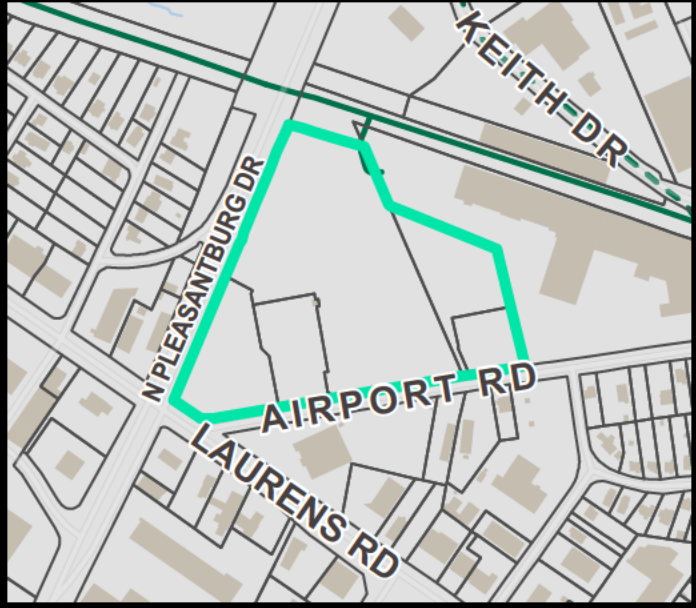
NATURAL / ENVIRONMENTAL FEATURES



SPECIAL EMPHASIS NEIGHBORHOODS



PRESERVATION OVERLAYS



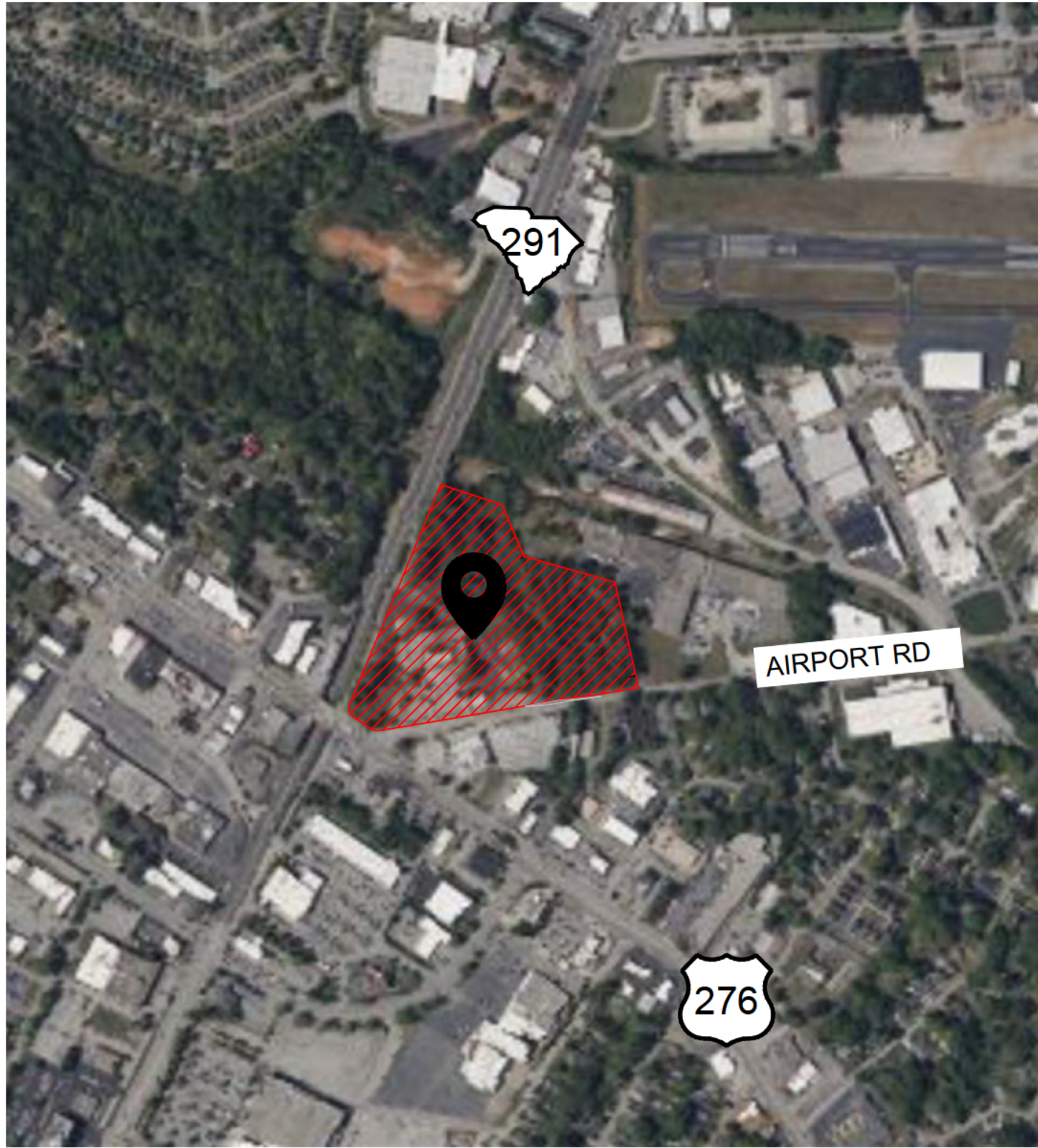
501 WINDY PARK BOULEVARD, SUITE 200, MOUNT PLEASANT, SC 29664 | JUDSON MILLS BUILDING 6000, 701 EASLEY BRIDGE ROAD, SUITE 6000, GREENVILLE, SC 29601 | JAR PETERSON, P.E., 1454 N. DANIEL MORGAN AVENUE, SUITE 300, SPARTANBURG, SC 29306

ENCLAVE LAURENS

GREENVILLE, SC

TMS# 0256000600100, 0256000600101,
0256000600102, 0256000601201, 0256000600200

SITE LOCATION MAP



PROJECT DESCRIPTION

THIS PROJECT CONSISTS OF A MIXED-USE DEVELOPMENT AT THE INTERSECTION OF LAURENS ROAD AND NORTH PLEASANTBURG DRIVE. PHASE ONE WILL INCLUDE THE MULTI-FAMILY BUILDING AND ASSOCIATED AMENITIES, CONNECTION TO THE SWAMP RABBIT TRAIL, MASS GRADING, AND TEMPORARY UTILITY STUBS OUTS FOR FUTURE BUILD OUT OF THE SITE.

GENERAL NOTES

PROJECT SURVEY INFORMATION AND CONTRACTOR VERIFICATION REQUIREMENTS:

1.

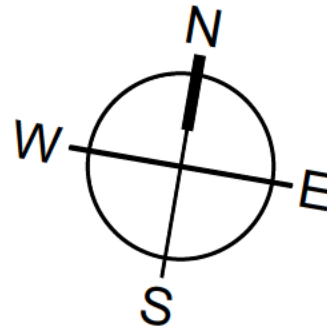
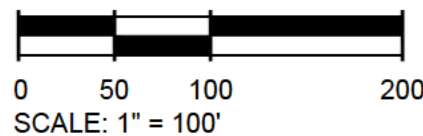
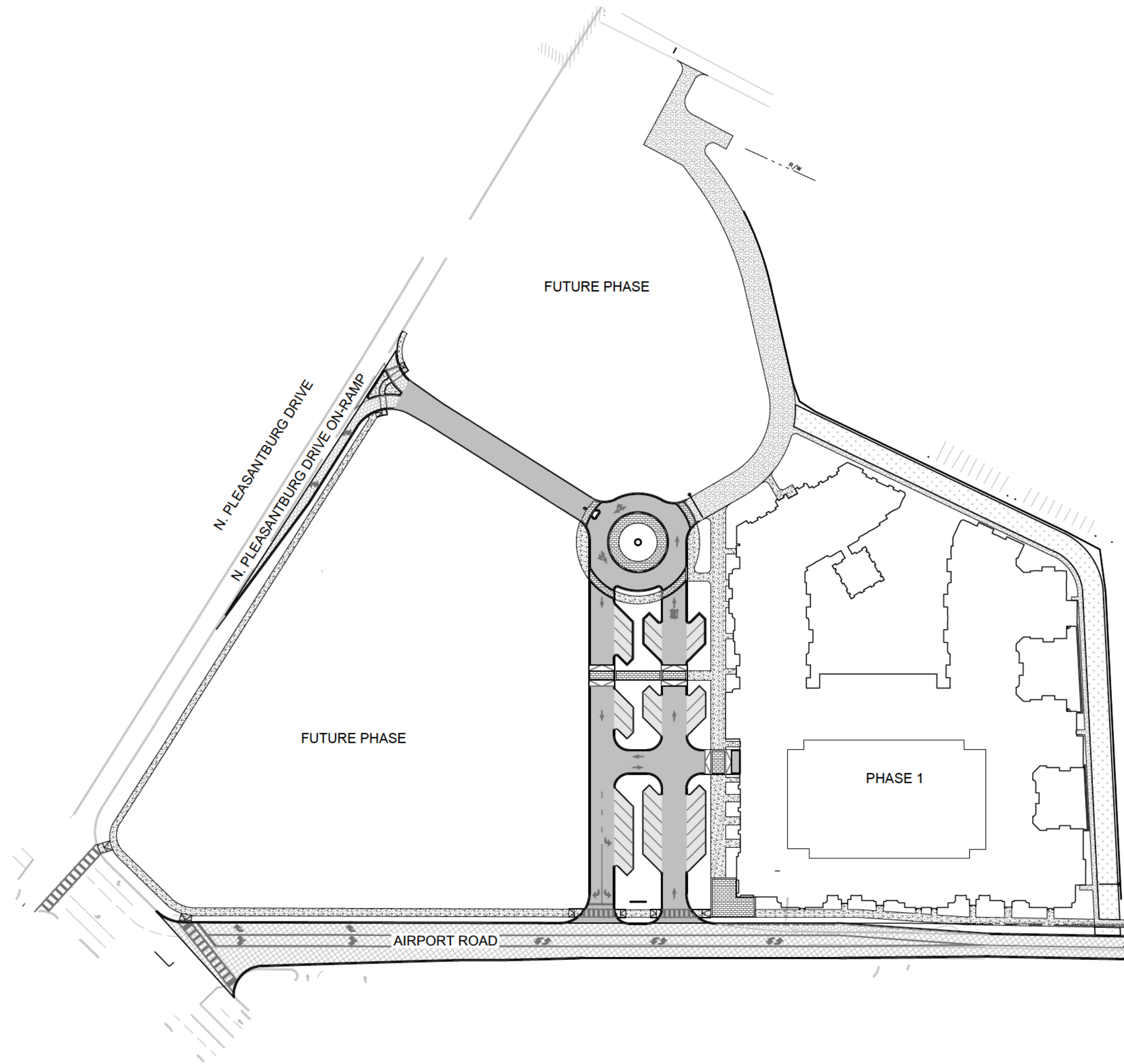
BOUNDARY, TOPOGRAPHIC, TREE, WETLAND DELINEATION, AND OTHER EXISTING CONDITIONS SHOWN ARE FROM SURVEY PREPARED BY FREELAND & ASSOCIATES, INC., TITLED "TOPOGRAPHIC SURVEY FOR MCCALL CAPITAL, LLC," DATED OCTOBER 13, 2014. THE TOPOGRAPHIC AND ELEVATION DATA SHOWN HEREON WAS OBTAINED FROM FREELAND & ASSOCIATES, INC. AND IS NOT CERTIFIED AS CORRECT BY THIS ENGINEER.
2.

PER REFERENCE SURVEY, ALL ELEVATIONS ARE BASED ON NAVD83 VERTICAL DATUM. HORIZONTAL DATUM IS STATE PLANE (SC NAD 83). REFER TO SURVEY FOR BENCHMARK REFERENCE AND/OR LOCATION. CONTACT OWNER FOR ANY MISSING BOUNDARY POINTS, MONUMENTS, OR VERTICAL DATUM BENCHMARKS NEEDED FOR ESTABLISHING CONSTRUCTION STAKING CONTROL.
3.

THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL PERIMETER BOUNDARY PROPERTY CORNERS AND VERIFYING BOUNDARY DATA AGAINST CONSTRUCTION PLANS AND/OR ELECTRONIC FIELD INFORMATION PROVIDED TO THE CONTRACTOR.
4.

PRIOR TO STARTING CONSTRUCTION, INCLUDING LAND DISTURBING ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING CONDITIONS, INCLUDING BUT NOT LIMITED TO TOPOGRAPHIC, TREE, STORM DRAINAGE FACILITIES, AND ALL UTILITIES. EXISTING UTILITIES SHOWN ARE APPROXIMATE AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ENGINEER. THEREFORE, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE EXACT VERTICAL AND HORIZONTAL LOCATIONS OF ALL EXISTING UTILITIES. ANY DISCREPANCIES OR CONFLICTS IDENTIFIED DURING VERIFICATION OF EXISTING CONDITIONS AND UTILITIES SHALL BE REPORTED TO THE OWNER AND ENGINEER. ANY COSTS ASSOCIATED WITH CORRECTIVE WORK OR DAMAGES THAT ARE A RESULT OF THE CONTRACTOR NOT VERIFYING EXISTING CONDITIONS AND THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UTILITIES WILL BE THE CONTRACTOR'S RESPONSIBILITY.

SITE OVERVIEW



PROJECT CONTACTS

DEVELOPER/ OWNER:

MCCALL CAPITAL
531 S. MAIN STREET SUITE 207
GREENVILLE, SC 29601
CONTACT: MARCUS MCCALL
PHONE: (864) 370-0037

ELECTRIC/ GAS UTILITY:

DUKE ENERGY
524 FAIRFOREST WAY
GREENVILLE, SC 29607
PHONE: (864) 234-4130

SURVEY:

FREELAND & ASSOCIATES, INC.
323 WEST STONE AVE.
GREENVILLE, SC 29609
CONTACT: JAMES FREELAND
PHONE: (864) 271-4924

CIVIL ENGINEER & LANDSCAPE ARCHITECT:

SEAMON, WHITESIDE & ASSOCIATES, INC
JUDSON MILLS BUILDING 6000, SUITE 6060
701 EASLEY BRIDGE ROAD
GREENVILLE, SC 29611
CONTACT: WILL BUICE, PE
PHONE: (864) 298-0534

SANITARY SEWER UTILITY:

CITY OF GREENVILLE
206 S. MAIN STREET
GREENVILLE, SC 29602
CONTACT: LUCAS BRYSON
PHONE: (864) 467-4468

WATER UTILITY:

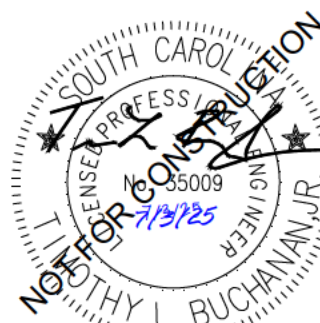
GREENVILLE WATER
407 WEST BROAD STREET
GREENVILLE, SC 29602
CONTACT: ERIC WILLIAMS
PHONE: (864) 241-6000

Sheet List Table	
C1.0	COVER SHEET
C1.1	LEGEND & REVISION NOTES
C2.0	EXISTING CONDITIONS & DEMOLITION PLAN
C5.0	SITE PLAN
C6.0	GRADING PLAN
C6.1	DRAINAGE PLAN
C7.0	UTILITY PLAN
C7.1	SEWER PROFILE

DD SET - 04/04/2025



MOUNT PLEASANT, SC
843.884.1667
GREENVILLE, SC
864.298.0534
SUMMERVILLE, SC
843.972.0710
SPARTANBURG, SC
864.272.1272
CHARLOTTE, NC
980.312.5450
RALEIGH, NC
980.312.5450
WWW.SEAMONWHITESIDE.COM



ENCLAVE LAURENS
MCCALL CAPITAL
LAURENS ROAD
GREENVILLE, SOUTH CAROLINA

DD SET
(NOT FOR CONSTRUCTION)

SW+ PROJECT: 11443
DATE: 1/22/25
DRAWN BY: AC/NH
CHECKED BY: AD/DM

REVISION HISTORY

DD SET	04/04/2025

COVER SHEET

C1.0

FOR PHASE I FDP SUBMITTAL ONLY

THIS DRAWING SHALL NOT BE REPRODUCED IN ANY MANNER OR USED FOR ANY PURPOSE WITHOUT WRITTEN PERMISSION

501 WANDO PARK BOULEVARD, SUITE 200 | MOUNT PLEASANT, SC 29464 | 508 RHETT STREET, SUITE 101 | GREENVILLE, SC 29601

COPYRIGHT © SEAMON WHITESIDE & ASSOCIATES, INC.

SITE DATA:

Total Acreage: 12.79 Ac.

TMS NUMBERS:	EX ZONING:
0256000600100 (7.006 Ac.)	C-3
0256000600101 (1.846 Ac.)	C-3
0256000600102 (1.308 Ac.)	C-3
0256000601201 (1.740 Ac.)	C-3
0256000600200 (0.890 Ac.)	C-3

PROPOSED LAND USE:
Planned Development District (PD)

BUILDING SETBACKS:

AIRPORT ROAD & LAURENS ROAD
Front Yard: 19' (5' building transition zone,
8' sidewalk zone, 6' planting zone)

PLEASANTBURG DRIVE
Front Yard: *15' (10' building transition zone,
6' sidewalk zone, 5' planting zone)

*Portions of the Planting Zone and Sidewalk Zone are located within the public right-of-way.

OTHER EXTERNAL BOUNDARIES
Side / Rear: *5' Min

*Trailside Terrace and connection(s) to trail may encroach upon this setback.

OPEN SPACE:

Required by Ordinance: ±96,000 SF (200 SF / Unit)
Required by GVL2040: ±195,000 SF (35% of Site)
Provided: *±205,191 SF (37% of Site)

*Not including multifamily balconies

IMPERVIOUS AREAS:

Predevelopment Impervious Area: ±4.45 Ac.
Postdevelopment Impervious Area: ±9.20 Ac.
Net Impervious Area: ±4.75 Ac. Increase

PARKING REQUIRED:

USE	SIZE:	PARKING DEMAND:
Commercial (Office / Retail / Restaurant)	±*80,000 SF	160 (2 Spaces / 1,000 SF)
Hotel or Office	±125 Rooms	94 (0.75 Spaces / Room)
Office	±60,000 SF	120 (1 Spaces / 500 SF)
Multifamily	±400 Units	480 (1.2 Spaces / Unit)

TOTAL PARKING REQUIRED: ±734 Spaces or ±760 Spaces

*80,000 SF does not include ±8,000 SF of Trailside Terrace for which dedicated parking is not proposed.

Bicycle parking to meet or exceed the requirements of Section 19-6.1.3.(C) of the Zoning Ordinance.

PARKING PROVIDED:

TOTAL PARKING PROVIDED: ±760 Spaces

Surface Parking: 65 Spaces
Structured Garage: ±695 Spaces

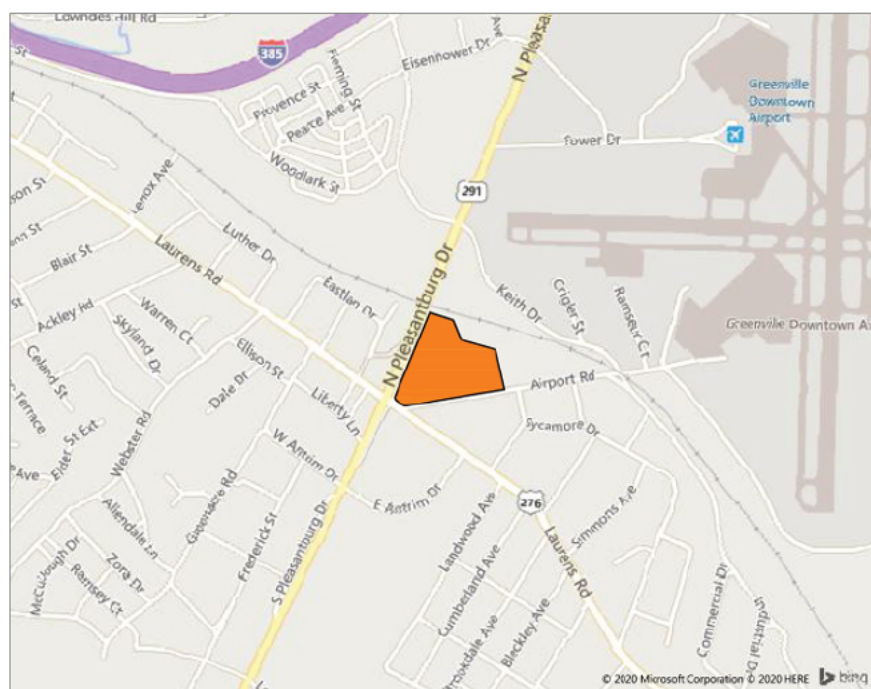
BICYCLE PARKING:

Required: ±17 Spaces
Proposed: Bicycle parking will meet or exceed the requirements of
Section 19-6.1.3.(C) of the Zoning Ordinance.
At least two bicycle parking spaces shall be provided for all sites.

BUILDING HEIGHTS:

USE: All Proposed Uses/Buildings
HEIGHT: 100' Max

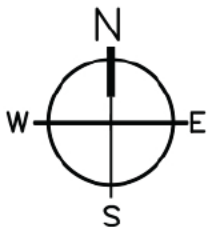
VICINITY MAP



McCALL
CAPITAL



0 25 50 100
SCALE: 1" = 50'



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843.884.1667
GREENVILLE, SC
864.238.0534
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WWW.SEAMONWHITESIDE.COM



ENCLAVE LAURENS
MIXED USE DEVELOPMENT
IN
CITY OF GREENVILLE, SOUTH CAROLINA

SW+ PROJECT: 11433
DATE: 10/31/2024
DRAWN BY: DM
CHECKED BY: NM

REVISION HISTORY

NO.	DESCRIPTION	DATE

MASTER
CONCEPTUAL
SITE PLAN

501 WINDO PARK BOULEVARD, SUITE 200, MOUNT PLEASANT, SC 29464 | JUDSON MILLS BUILDING 600, 701 EASLEY BRIDGE RD, SUITE 600, GREENVILLE, SC 29611 | 1301 PETERSON DR, CHARLOTTE, NC 28217 | 1713 N CEDAR STREET, SUMMERVILLE, SC 29585 | 104 N DANIEL MORGAN AVENUE, SUITE 300, SPARTANBURG, SC 29308
COPYRIGHT © SEAMON WHITESIDE & ASSOCIATES, INC. THIS DRAWING SHALL NOT BE REPRODUCED IN ANY MANNER OR USED FOR ANY PURPOSE WITHOUT WRITTEN PERMISSION

SITE DATA (FULL PD):

Total Acreage: 12.79 Ac.

TMS NUMBERS:

0256000600100 (7.006 Ac.)
0256000600101 (1.846 Ac.)
0256000600102 (1.308 Ac.)
0256000601201 (1.740 Ac.)
0256000600200 (0.890 Ac.)

EX ZONING:

PD
PD
PD
PD
PD

BUILDING SETBACKS:

AIRPORT ROAD & LAURENS ROAD

Front Yard: 19' (5' building transition zone,
8' sidewalk zone, 6' planting zone)

PLEASANTBURG DRIVE

Front Yard: *15' (10' building transition zone,
6' sidewalk zone, 5' planting zone)

*Portions of the Planting Zone and Sidewalk Zone are located within the public right-of-way.

OTHER EXTERNAL BOUNDARIES

Side / Rear: *5' Min

*Trailside Terrace and connection(s) to trail may encroach upon this setback.

OPEN SPACE (FULL PD):

Required by Ordinance: ± 96,000 SF (200 SF / Unit)
Required by GVL2040: ± 195,000 SF (35% of Site)
Provided: * ± 205,191 SF (37% of Site)

*Not including multifamily balconies

PARKING REQUIRED (PHASE 1):

USE	SIZE:	PARKING DEMAND:
Commercial (Office / Retail / Restaurant)	± 4080 SF	10 (2 Spaces / 1,000 SF)
Multifamily	244 Units	293 (1.2 Spaces / Unit)
TOTAL PARKING REQUIRED:		± 303 Spaces

PARKING PROVIDED:

TOTAL PARKING PROVIDED: ± 406 Spaces

Surface Parking:	37 Spaces
Structured Garage:	± 369 Spaces

BICYCLE PARKING:

Required: 24 Short-Term Spaces
61 Long-Term Spaces
Bicycle parking will meet or exceed the requirements of Section 19-4.5.2 of the Development Code. Bike parking will be located in the parking garage. At least two bicycle parking spaces shall be provided for all sites.

BUILDING HEIGHTS:

USE	HEIGHT
All Proposed Uses/Buildings	100' Max (Per Approved PD)

SITE LIGHTING:

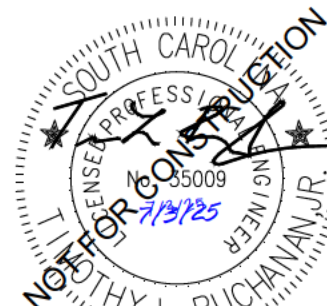
Note: All proposed site lighting shall conform to City of Greenville Development Code requirements.

SITE LEGEND

HEAVY DUTY ASPHALT PAVEMENT	
STANDARD DUTY ASPHALT PAVEMENT	
CONCRETE - SIDEWALK	
HEAVY DUTY CONCRETE PAVEMENT	
MILL AND RESURFACE	
SCDOT ASPHALT PAVEMENT	
HEAVY DUTY PAVERS	
GRASS PAVE FIRE LANE	
PARKING COUNT	12
RETAINING WALL	
ADA ACCESSIBLE PATH	
PROPERTY LINE	



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ENCLAVE LAURENS
MCCALL CAPITAL
LAURENS ROAD
GREENVILLE, SOUTH CAROLINA

DD SET
(NOT FOR CONSTRUCTION)

SW+ PROJECT: 11443
DATE: 1/22/25
DRAWN BY: AC/NH
CHECKED BY: AD/DM

REVISION HISTORY

DD SET 04/04/2025

FDP PHASE 1
SITE PLAN

SITE PLAN NOTES:

- CONTRACTOR TO ENSURE THAT ADA ACCESSIBLE ROUTE MEET THE ADA STANDARDS FOR ACCESSIBLE DESIGN (LATEST ADDITION) AND LOCAL ACCESSIBILITY REGULATIONS.
- ALL ROADWAY AND DRIVEWAY DIMENSIONS ARE SHOWN TO FACE OF CURB WHERE APPLICABLE. WHERE CURB AND GUTTER IS NOT SHOWN, DIMENSIONS ARE SHOWN TO EDGE OF PAVEMENT.
- PAVEMENT SECTION DESIGNS SHALL BE CONFIRMED BY GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTION. CONCRETE JOINT LAYOUTS SHALL BE SUBMITTED TO GEOTECHNICAL ENGINEER FOR REVIEW AND APPROVAL.
- ALL STRIPING WITHIN PUBLIC RIGHT OF WAY BE IN ACCORDANCE WITH AUTHORITY HAVING JURISDICTION REQUIREMENTS.

RETAINING WALL NOTES:

- THE RETAINING WALLS SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR AS A DESIGN / BUILD COMPONENT OF THE PROJECT. SUBMITTALS SHALL BE SIGNED AND SEALED BY A REGISTERED SC PROFESSIONAL ENGINEER AND SUBMITTED TO THE GEOTECHNICAL ENGINEER FOR REVIEW AND TO THE CIVIL ENGINEER FOR GRADING AND LINE REVIEW ONLY. THE DESIGN SHALL ENCOMPASS COMPONENTS AND ASPECTS OF THE RETAINING WALL TO CONSTITUTE A COMPLETE INSTALLATION, INCLUDING BUT NOT LIMITED TO FOUNDATIONS, TIEBACKS, DRAINAGE PROTECTION (SURFACE AND GROUNDWATER), AND EROSION PROTECTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WITH THE GEOTECHNICAL ENGINEER TO PROVIDE ACCEPTABLE BACKFILL MATERIAL FOR THE DESIGN AND INSTALLATION OF THE WALL.
- RETAINING WALL COLOR AND FINISH SHALL BE SUBMITTED TO THE ARCHITECT FOR REVIEW AND APPROVAL.

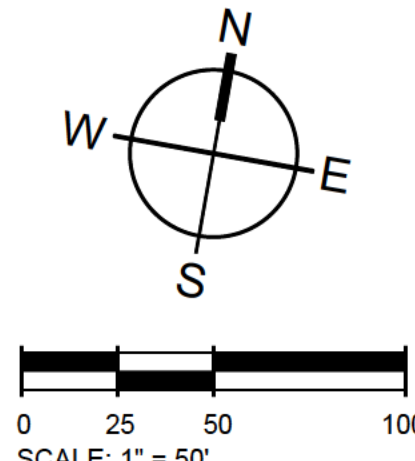
SCDOT & LANE CLOSURE
NOTES PLACEHOLDER

EXISTING UTILITY NOTE:

THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING ANY WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT OCCUR DUE TO THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

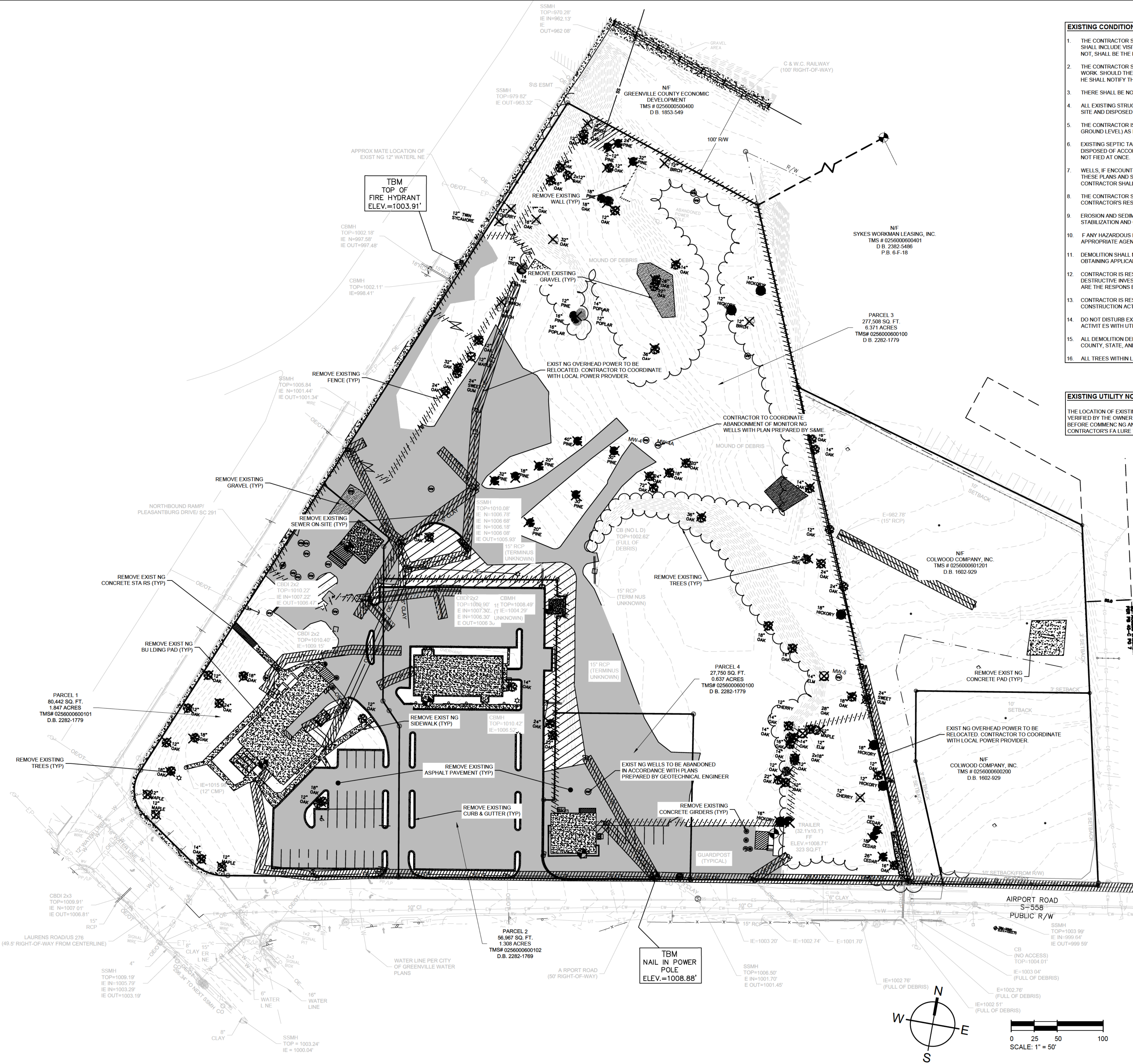


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EXISTING CONDITIONS / DEMOLITION NOTES:

- THE CONTRACTOR SHALL VERIFY ALL ITEMS TO BE DEMOLISHED AND REMOVED FROM THE PROJECT SITE. THE VERIFICATION PROCESS SHALL INCLUDE VISITING AND WALKING THE SITE. ALL ITEMS REQUIRING DEMOLITION/REMOVAL, WHETHER SHOWN ON THIS PLAN OR NOT, SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- THE CONTRACTOR SHALL VERIFY THE EXISTING TOPOGRAPHY AND EXISTING UTILITY LOCATIONS AND ELEVATIONS PRIOR TO BEGINNING WORK. SHOULD THE CONTRACTOR FIND ANY DISCREPANCIES ON THE DRAWING PRIOR TO BEGINNING WORK OR DURING CONSTRUCTION, HE SHALL NOTIFY THE ENGINEER IMMEDIATELY.
- THERE SHALL BE NO BURNING ON THE SITE.
- ALL EXISTING STRUCTURES (IF ENCOUNTERED) AND RELATED FOOTINGS, FOUNDATIONS, STEPS, ETC. ARE TO BE REMOVED FROM THE SITE AND DISPOSED OF ACCORDING TO APPLICABLE CODES.
- THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE REMOVAL AND/OR RELOCATION OF ALL UTILITIES (ABOVE AND BELOW GROUND LEVEL) AS NECESSARY TO FACILITATE CONSTRUCTION. SEE THE SPECIFICATIONS FOR SPECIFIC DIRECTION.
- EXISTING SEPTIC TANKS, GREASE TRAPS AND/OR UNDERGROUND TANKS, IF ENCOUNTERED, ARE TO BE REMOVED FROM THE SITE AND DISPOSED OF ACCORDING TO APPLICABLE CODES. THE LOCATION OF ANY TANKS SHALL BE RECORDED AND THE ENGINEER SHALL BE NOTIFIED AT ONCE.
- WELLS, IF ENCOUNTERED, SHALL BE ACCURATELY LOCATED BY THE CONTRACTOR, PROTECTED, UNLESS DIRECTED OTHERWISE ON THESE PLANS AND SURROUNDING GRADES MAINTAINED SUCH THAT SURFACE RUNOFF CANNOT ENTER THE WELL OPENING. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT ONCE.
- THE CONTRACTOR SHALL CONSULT THE OWNER REGARDING SALVAGE. ANY ITEMS NOT RETAINED BY THE OWNER SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DEMOLISH AND/OR LEGALLY DISPOSE OF.
- EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN PLACE PRIOR TO DEMOLITION AND REMAIN IN PLACE UNTIL FINAL STABILIZATION AND COMPLETION OF CONSTRUCTION ACTIVITIES.
- IF ANY HAZARDOUS MATERIAL IS ENCOUNTERED DURING DEMOLITION, THE CONTRACTOR SHALL COORDINATE WITH THE OWNER AND APPROPRIATE AGENCIES FOR PROPER REMOVAL AND DISPOSAL.
- DEMOLITION SHALL MEET ALL APPLICABLE STATE, LOCAL AND FEDERAL REGULATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING APPLICABLE PERMITS.
- CONTRACTOR IS RESPONSIBLE TO LOCATE ALL UTILITIES AND CONFIRM LOCATION, AND DEPTH IF NECESSARY BY MEANS OF NON-DESTRUCTIVE INVESTIGATION (I.E., POT-HOLING WITH VAC OR WATER). ANY UTILITIES LOCATED BY CONTRACTOR THAT ARE DAMAGED ARE THE RESPONSIBILITY OF THE CONTRACTOR.
- CONTRACTOR IS RESPONSIBLE FOR REPAIR AND/OR REPLACEMENT OF DAMAGED ITEMS NOT TO BE DEMOLISHED DURING CONSTRUCTION ACTIVITIES.
- DO NOT DISTURB EXISTING UTILITIES TO REMAIN IN SERVICE. CONTRACTOR IS TO COORDINATE UTILITY INFRASTRUCTURE DEMOLITION ACTIVITIES WITH UTILITY PROVIDER PRIOR TO COMPLETING THE WORK.
- ALL DEMOLITION DEBRIS IS TO BE REMOVED FROM THE PROJECT SITE AND DISPOSED OF IN ACCORDANCE WITH APPLICABLE CITY, COUNTY, STATE, AND FEDERAL REGULATIONS.
- ALL TREES WITHIN LIMITS OF DISTURBANCE ARE TO BE REMOVED UNLESS NOTED OTHERWISE.

EXISTING UTILITY NOTE:

THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING ANY WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT OCCUR DUE TO THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

DEMOLITION LEGEND

- LIMITS OF EXISTING ASPHALT REMOVAL
- LIMITS OF EXISTING CONCRETE REMOVAL
- LIMITS OF EXISTING GRAVEL REMOVAL
- LIMITS OF UTILITY REMOVAL
- LIMITS OF EXISTING FENCE REMOVAL
- EXISTING TREES TO BE REMOVED



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DD SET (NOT FOR CONSTRUCTION)	
SW+ PROJECT:	11443
DATE:	1/22/25
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EXISTING
CONDITIONS
& DEMOLITION
PLAN

C2.0

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SITE DATA (FULL PD):

Total Acreage: 12.79 Ac.

TMS NUMBERS:

0256000600100 (7.006 Ac.)
0256000600101 (1.846 Ac.)
0256000600102 (1.308 Ac.)
0256000601201 (1.740 Ac.)
0256000600200 (0.890 Ac.)

EX ZONING:

PD
PD
PD
PD
PD

BUILDING SETBACKS:

AIRPORT ROAD & LAURENS ROAD

Front Yard: 19' (5' building transition zone,
8' sidewalk zone, 6' planting zone)

PLEASANTBURG DRIVE

Front Yard: *15' (10' building transition zone,
6' sidewalk zone, 5' planting zone)

*Portions of the Planting Zone and Sidewalk Zone are located within the public right-of-way.

OTHER EXTERNAL BOUNDARIES

Side / Rear: *5' Min

*Trailside Terrace and connection(s) to trail may encroach upon this setback.

OPEN SPACE (FULL PD):

Required by Ordinance: ± 96,000 SF (200 SF / Unit)
Required by GVL2040: ± 195,000 SF (35% of Site)
Provided: * ± 205,191 SF (37% of Site)

*Not including multifamily balconies

PARKING REQUIRED (PHASE 1):

USE	SIZE:	PARKING DEMAND:
Commercial (Office / Retail / Restaurant)	± 4080 SF	10 (2 Spaces / 1,000 SF)
Multifamily	244 Units	293 (1.2 Spaces / Unit)
TOTAL PARKING REQUIRED:		± 303 Spaces

PARKING PROVIDED:

TOTAL PARKING PROVIDED: ± 406 Spaces

Surface Parking:	37 Spaces
Structured Garage:	± 369 Spaces

BICYCLE PARKING:

Required: 24 Short-Term Spaces
61 Long-Term Spaces
Proposed: Bicycle parking will meet or exceed the requirements of Section 19-4.5.2 of the Development Code. Bike parking will be located in the parking garage. At least two bicycle parking spaces shall be provided for all sites.

BUILDING HEIGHTS:

USE	HEIGHT
All Proposed Uses/Buildings	100' Max (Per Approved PD)

SITE LIGHTING:

Note: All proposed site lighting shall conform to City of Greenville Development Code requirements.

SITE PLAN NOTES:

- CONTRACTOR TO ENSURE THAT ADA ACCESSIBLE ROUTE MEET THE ADA STANDARDS FOR ACCESSIBLE DESIGN (LATEST ADDITION) AND LOCAL ACCESSIBILITY REGULATIONS.
- ALL ROADWAY AND DRIVEWAY DIMENSIONS ARE SHOWN TO FACE OF CURB WHERE APPLICABLE. WHERE CURB AND GUTTER IS NOT SHOWN, DIMENSIONS ARE SHOWN TO EDGE OF PAVEMENT.
- PAVEMENT SECTION DESIGNS SHALL BE CONFIRMED BY GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTION. CONCRETE JOINT LAYOUTS SHALL BE SUBMITTED TO GEOTECHNICAL ENGINEER FOR REVIEW AND APPROVAL.
- ALL STRIPING WITHIN PUBLIC RIGHT OF WAY BE IN ACCORDANCE WITH AUTHORITY HAVING JURISDICTION REQUIREMENTS.

RETAINING WALL NOTES:

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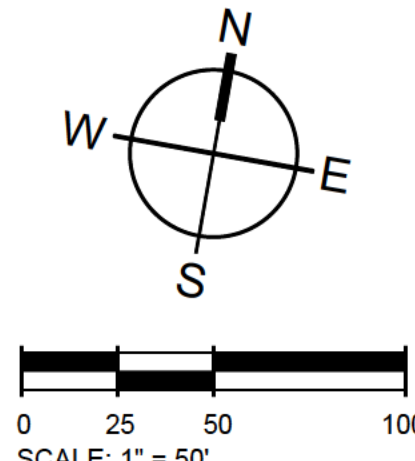
SCDOT & LANE CLOSURE
NOTES PLACEHOLDER

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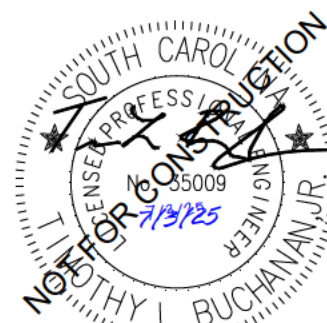


SITE LEGEND

HEAVY DUTY ASPHALT PAVEMENT	
STANDARD DUTY ASPHALT PAVEMENT	
CONCRETE - SIDEWALK	
HEAVY DUTY CONCRETE PAVEMENT	
MILL AND RESURFACE	
SCDOT ASPHALT PAVEMENT	
HEAVY DUTY PAVERS	
GRASS PAVE FIRE LANE	
PARKING COUNT	12
RETAINING WALL	
ADA ACCESSIBLE PATH	
PROPERTY LINE	



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GREENVILLE, SOUTH CAROLINA

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CHECKED BY: AD/DM

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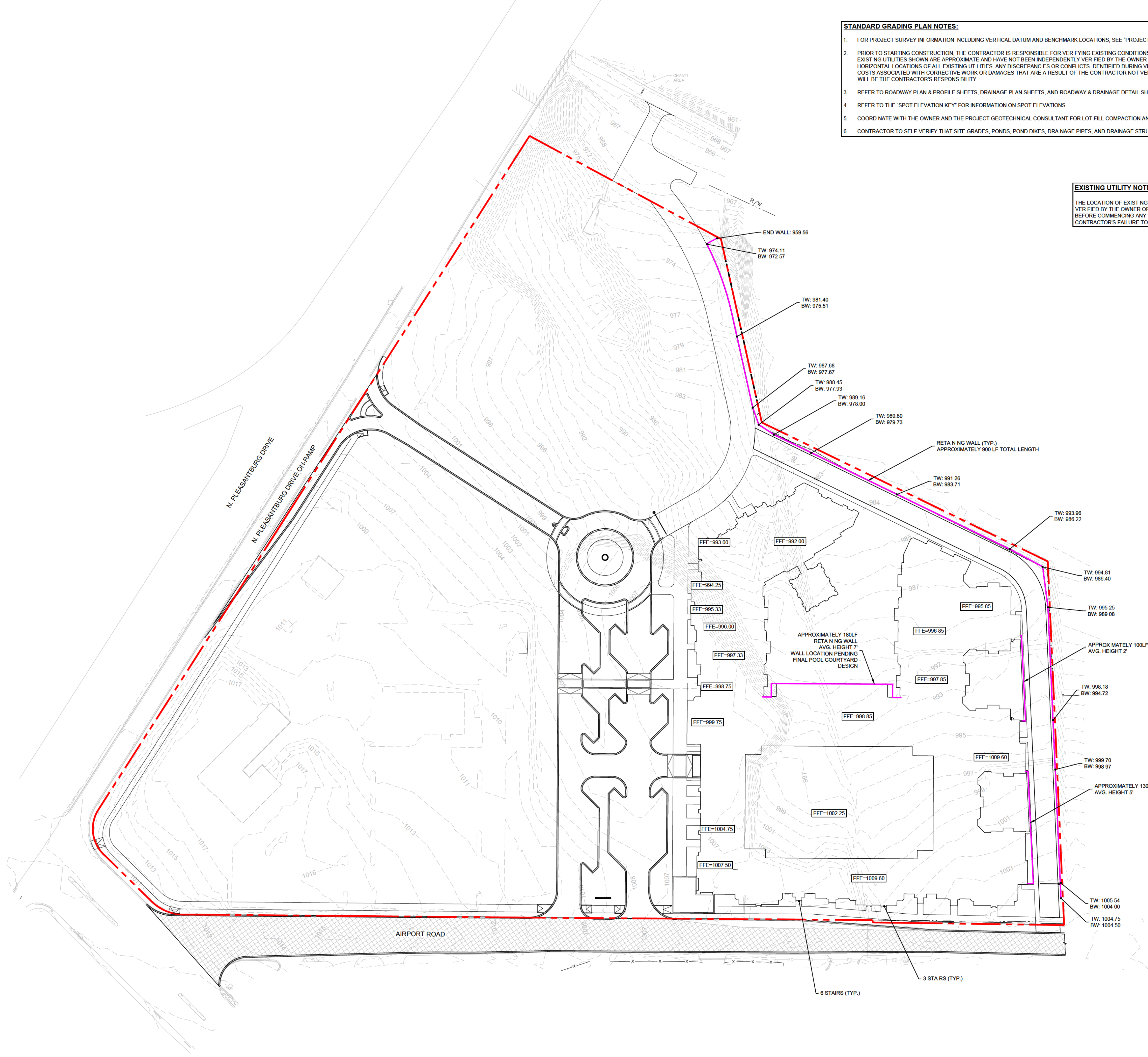
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SITE PLAN

C5.0

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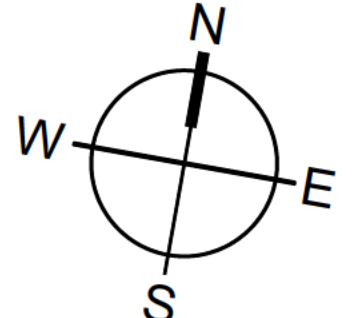
- STANDARD GRADING PLAN NOTES:**
- FOR PROJECT SURVEY INFORMATION INCLUDING VERTICAL DATUM AND BENCHMARK LOCATIONS, SEE "PROJECT SURVEY INFORMATION AND CONTRACTOR VERIFICATION REQUIREMENTS" ON SHEET C1.0.
 - PRIOR TO STARTING CONSTRUCTION, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING CONDITIONS, INCLUDING BUT NOT LIMITED TO TOPOGRAPHIC, TREE, STORM DRAINAGE FACILITIES, AND ALL UTILITIES. EXISTING UTILITIES SHOWN ARE APPROXIMATE AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ENGINEER. THEREFORE, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE EXACT VERTICAL AND HORIZONTAL LOCATIONS OF ALL EXISTING UTILITIES. ANY DISCREPANCIES OR CONFLICTS IDENTIFIED DURING VERIFICATION OF EXISTING CONDITIONS AND UTILITIES SHALL BE REPORTED TO THE OWNER AND ENGINEER. ANY COSTS ASSOCIATED WITH CORRECTIVE WORK OR DAMAGES THAT ARE A RESULT OF THE CONTRACTOR NOT VERIFYING EXISTING CONDITIONS AND THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UTILITIES WILL BE THE CONTRACTOR'S RESPONSIBILITY.
 - REFER TO ROADWAY PLAN & PROFILE SHEETS, DRAINAGE PLAN SHEETS, AND ROADWAY & DRAINAGE DETAIL SHEETS FOR ADDITIONAL DRAINAGE AND GRADING INFORMATION AND REQUIREMENTS.
 - REFER TO THE "SPOT ELEVATION KEY" FOR INFORMATION ON SPOT ELEVATIONS.
 - COORDINATE WITH THE OWNER AND THE PROJECT GEOTECHNICAL CONSULTANT FOR LOT FILL COMPACTION AND TESTING REQUIREMENTS.
 - CONTRACTOR TO SELF-VERIFY THAT SITE GRADES, PONDS, POND DIKES, DRAINAGE PIPES, AND DRAINAGE STRUCTURES ARE CONSTRUCTED PER THE PLANS PRIOR TO REQUESTING FINAL AS-BUILT SURVEY FROM SURVEYOR.

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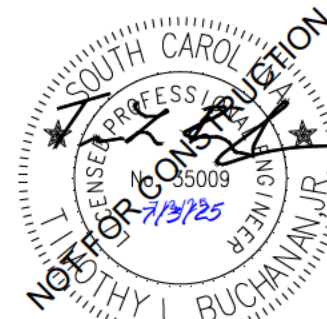
SCALE: 1" = 50'

CUT: 48,436.26 CUBIC YARDS

FILL: 58,333.38 CUBIC YARDS



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GRADING PLAN

C6.0

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STANDARD DRAINAGE PLAN NOTES:

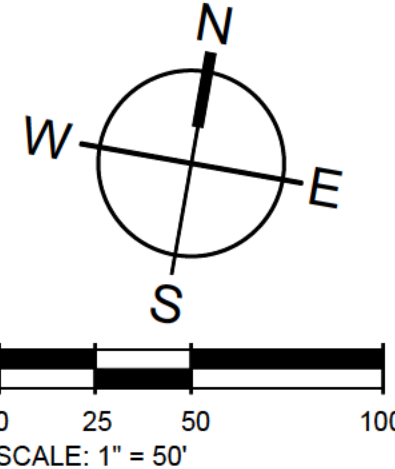
- FOR PROJECT SURVEY INFORMATION INCLUDING VERTICAL DATUM AND BENCHMARK LOCATIONS, SEE "PROJECT SURVEY INFORMATION AND CONTRACTOR VERIFICATION REQUIREMENTS" ON SHEET C1.0.
- PRIOR TO STARTING CONSTRUCTION, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING CONDITIONS, INCLUDING BUT NOT LIMITED TO TOPOGRAPHIC, TREE, STORM DRAINAGE FACILITIES, AND ALL UTILITIES. EXISTING UTILITIES SHOWN ARE APPROXIMATE AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ENGINEER. THEREFORE, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE EXACT VERTICAL AND HORIZONTAL LOCATIONS OF ALL EXISTING UTILITIES. ANY DISCREPANCIES OR CONFLICTS IDENTIFIED DURING VERIFICATION OF EXISTING CONDITIONS AND UTILITIES SHALL BE REPORTED TO THE OWNER AND ENGINEER. ANY COSTS ASSOCIATED WITH CORRECTIVE WORK OR DAMAGES THAT ARE A RESULT OF THE CONTRACTOR NOT VERIFYING EXISTING CONDITIONS AND THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UTILITIES WILL BE THE CONTRACTOR'S RESPONSIBILITY.
- REFER TO DRAINAGE PROFILE SHEETS, ROADWAY PLAN & PROFILE SHEETS, GRADING PLAN SHEETS, AND ROADWAY & DRAINAGE DETAIL SHEETS FOR ADDITIONAL DRAINAGE AND GRADING INFORMATION AND REQUIREMENTS.
- DRAINAGE PIPE LENGTHS PROVIDED REPRESENT DISTANCES FROM CENTER OF BOX TO CENTER OF BOX. DRAINAGE PIPES ARE TO TERMINATE INSIDE THE DRAINAGE STRUCTURES IN ACCORDANCE WITH GOVERNING AUTHORITY REQUIREMENTS OR IN ACCORDANCE WITH SCDOT STANDARD DRAWING 719-000-03 DRAINAGE STRUCTURE GENERAL NOTES.
- ANY NECESSARY UNDERCUTTING OR MUCK AND FILL OPERATIONS ARE TO BE COORDINATED WITH THE OWNER AND THE PROJECT GEOTECHNICAL CONSULTANT PRIOR TO EXECUTING THE WORK.
- PRIOR TO BEGINNING WORK WITHIN ANY PUBLIC RIGHT-OF-WAY OR EASEMENT, THE CONTRACTOR SHALL OBTAIN ANY APPLICABLE ENCROACHMENT PERMITS FROM THE OWNER OR ENGINEER AND IS RESPONSIBLE FOR FOLLOWING ALL REQUIREMENTS SPECIFIED IN THESE PERMITS.
- UNLESS OTHERWISE NOTED, REINFORCED CONCRETE PIPE (RCP) SHALL BE IN ACCORDANCE WITH ASTM C76, CLASS III, WALL B WITH SEALANT JOINTS (ASTM C990) PER SCDOT SPECIFICATIONS.
- REFER TO DRAINAGE PROFILE SHEETS FOR ADDITIONAL ELEVATION INFORMATION.
- SEE ROADWAY & DRAINAGE DETAILS FOR UNDERDRAIN DETAIL & REQUIREMENTS.

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NOTE:

ROOF DRAINS NOT INCLUDED IN PLANS. CONTRACTOR TO ACCOUNT FOR NEEDED MATERIAL IN PRELIMINARY PRICING.



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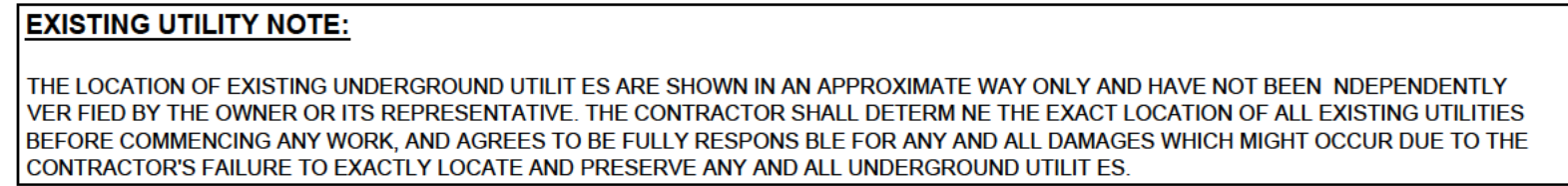
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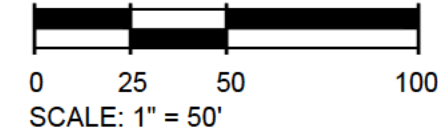
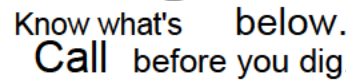
DRAINAGE
PLAN

C6.1

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- STANDARD WATER PLAN NOTES:**
1. FOR PROJECT SURVEY INFORMATION INCLUDING VERTICAL DATUM AND BENCHMARK LOCATIONS, SEE "PROJECT SURVEY" INFORMATION AND CONTRACTOR VERIFICATION REQUIREMENTS" ON SHEET C1.0.
 2. PRIOR TO STARTING NEW CONSTRUCTION, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING CONDITIONS, INCLUDING BUT NOT LIMITED TO TOPOGRAPHIC, TREE, STORM DRAINAGE FACILITIES, AND ALL UTILITIES. EXISTING UTILITIES SHOWN ARE APPROXIMATE AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ENGINEER. THEREFORE, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE EXACT VERTICAL AND HORIZONTAL LOCATIONS OF ALL EXISTING UTILITIES. ANY DISCREPANCIES OR CONFLICTS IDENTIFIED DURING VERIFICATION OF EXISTING CONDITIONS AND UTILITIES SHALL BE REPORTED TO THE OWNER AND ENGINEER. ANY COSTS ASSOCIATED WITH CORRECTIVE WORK OR DAMAGES THAT ARE A RESULT OF THE CONTRACTOR NOT VERIFYING EXISTING CONDITIONS AND THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UTILITIES WILL BE THE CONTRACTOR'S RESPONSIBILITY.
 3. VALVES ARE NOT TO BE LOCATED WITHIN CURB AND GUTTER.
 4. FIRE HYDRANTS, VALVES, WATER SERVICES, AND OTHER SYMBOLS MAY NOT BE TO SCALE FOR CLARITY PURPOSES. REFER TO WATER DETAIL SHEETS AND COORDINATE WITH ENGINEER AND/OR WATER PROVIDER FOR ADDITIONAL INFORMATION AND REQUIREMENTS REGARDING FIRE HYDRANT LOCATIONS AND WATER FITTING SEPARATION DISTANCES.
 5. REFER TO WATER DETAIL SHEETS FOR SPECIFIC INFORMATION REGARDING EXACT PLACEMENT REQUIRED FOR WATER SERVICES, INCLUDING RELATIONSHIP TO PROPERTY LINES, EASEMENTS, AND SIDEWALKS.
 6. REFER TO WATER DETAIL SHEETS AND WATER PROFILE SHEETS (IF APPLICABLE) FOR DETAILS AND ANY ADDITIONAL WATER SYSTEM INFORMATION.
 7. REFER TO THE WATER AUTHORITY'S STANDARD NOTES AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS AND PROCEDURES.



MCCALL CAPITAL
ENCLAVE LAURENS



MAIN ENTRANCE CORNER RENDERING

MCCALL CAPITAL - ENCLAVE LAURENS
GREENVILLE, SC
8.7.2025

MCCALL CAPITAL
ENCLAVE LAURENS



TRAFFIC CIRCLE/BOULEVARD CORNER RENDERING

MCCALL CAPITAL - ENCLAVE LAURENS
GREENVILLE, SC
8.7.2025

MCCALL CAPITAL
ENCLAVE LAURENS



OVERALL ELEVATIONS
MCCALL CAPITAL - ENCLAVE LAURENS
GREENVILLE, SC
8.7.2025

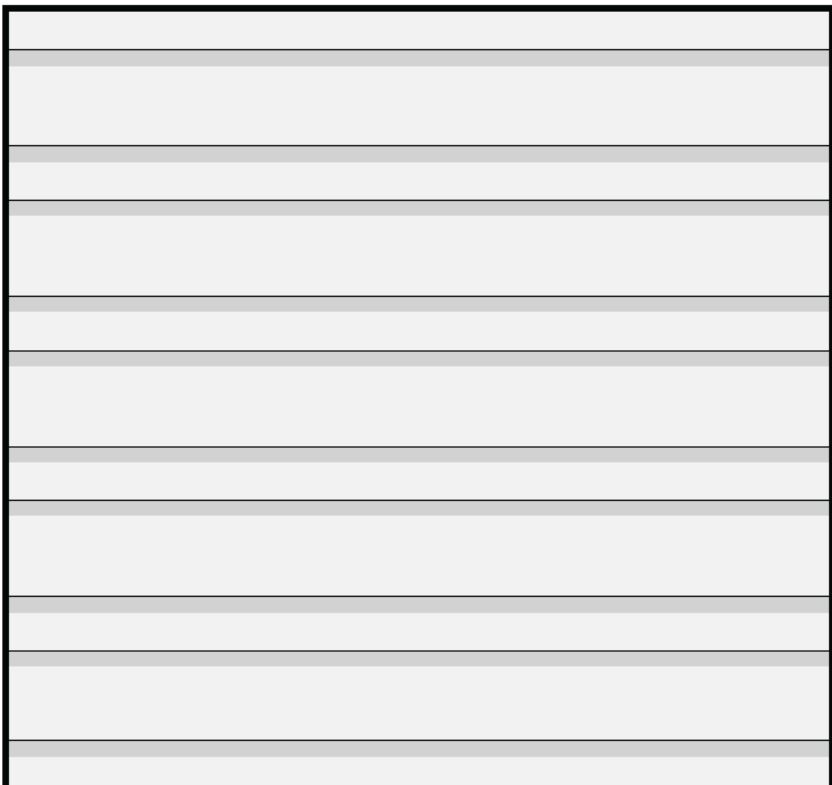
MCCALL CAPITAL
ENCLAVE LAURENS



HISTORIC GREENVILLE DOWNTOWN AIRPORT



A.



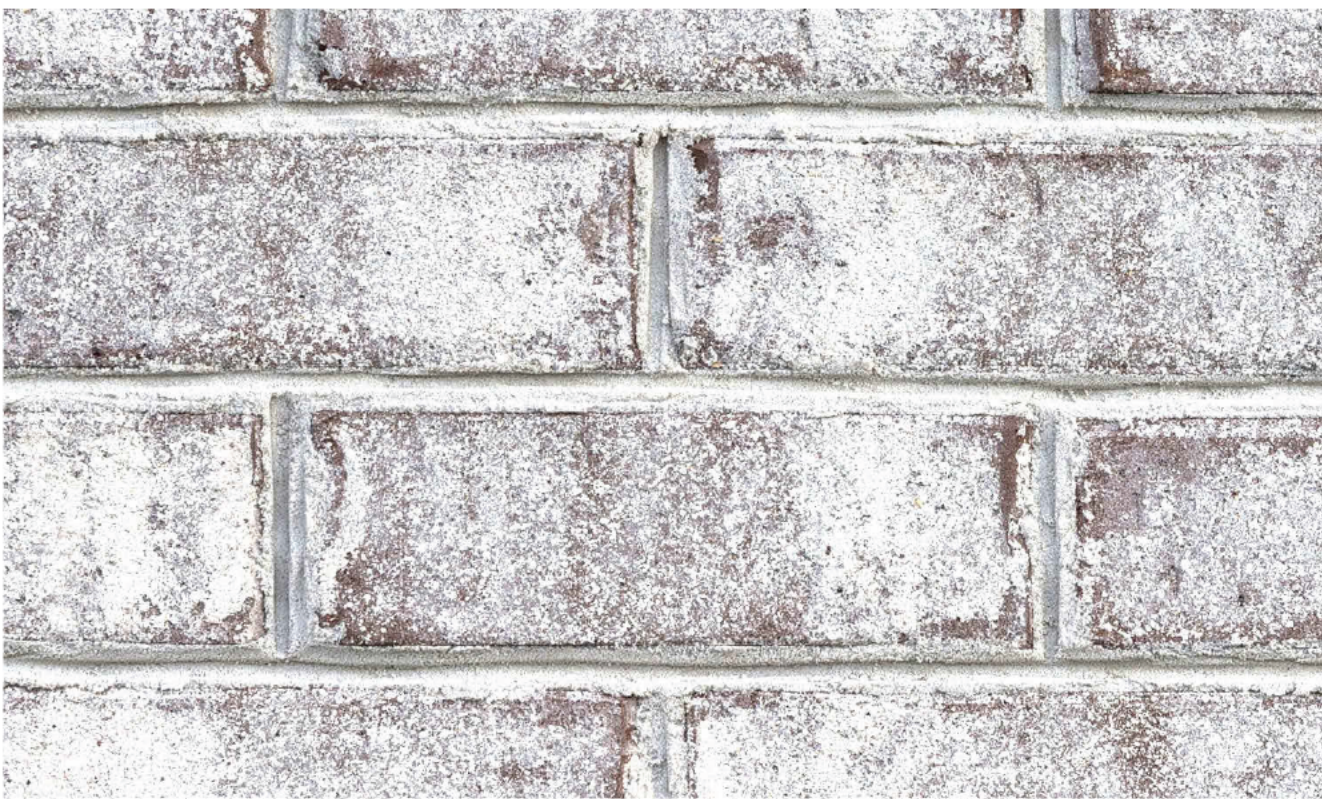
D.



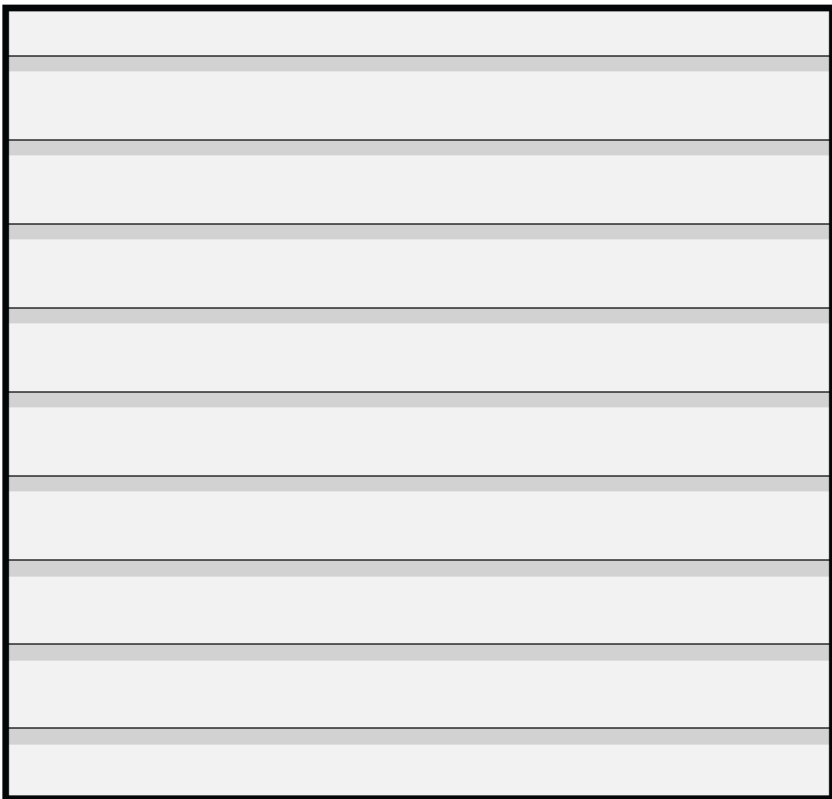
G.



J.



B.



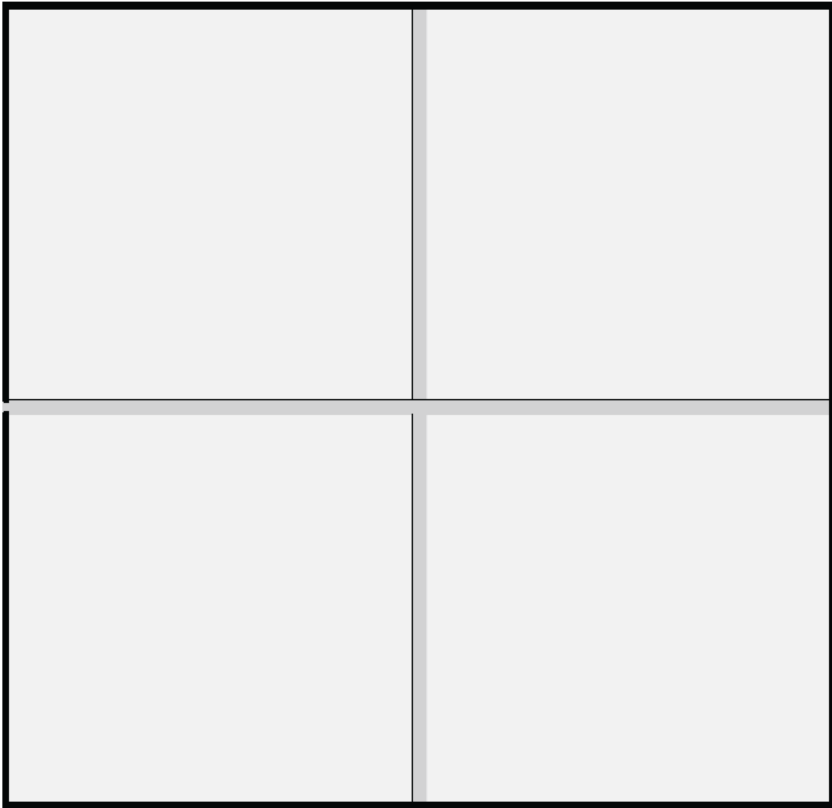
E.



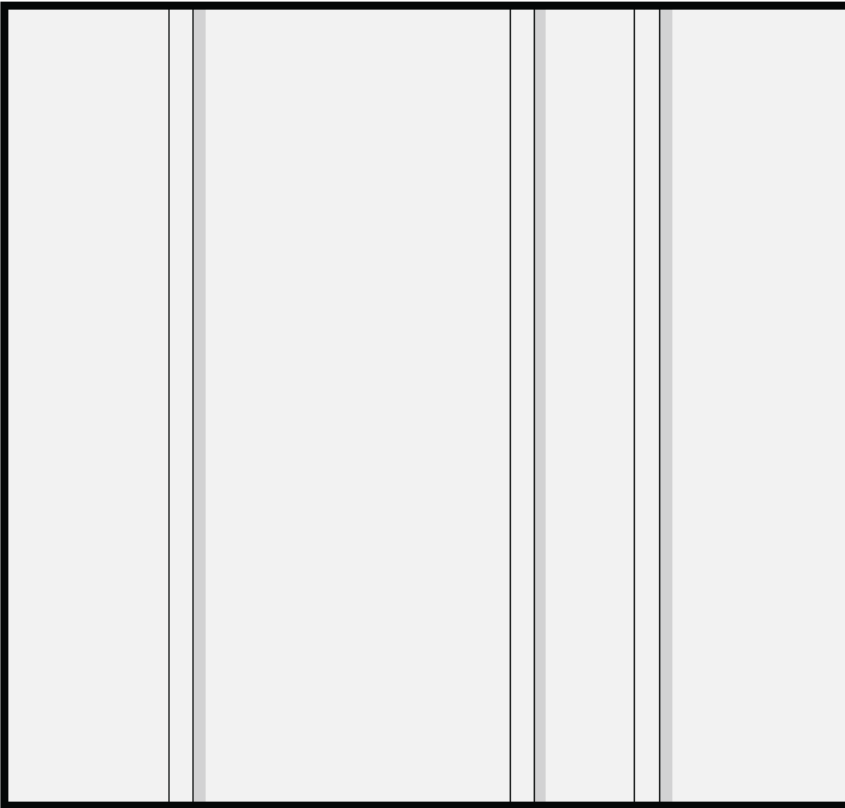
H.



K.



C.



F.



I.



1 2 3

**POTENTIAL* COLOR PALETTE*

- SOME OPTIONS INCLUDE:
1. SW 7035 - AESTHETIC WHITE
2. SW 7069 - IRON ORE
3. SW 7015 - REPOSE GRAY

*** OPTIONS ARE PROVIDED TO GENERATE FEEDBACK IN EARLY STAGES OF DESIGN, FINAL COLORS WILL BE REVIEWED ON PHYSICAL MOCK-UP ON SITE BEFORE APPROVAL***

PROPOSED EXTERIOR MATERIALS

- A, B, O, D. = OLD LYNCHBURG - PALMETTO BRICK
B, B, O, D. = MYRTLE SAND - PALMETTO BRICK
C, FIBER CEMENT W/ REVEAL TRIM
D, ALTERNATING EXPOSURE FIBER CEMENT LAP SIDING
E, FIBER CEMENT LAP SIDING
F, FIBER CEMENT BOARD AND BATTEN, STAGGERED
G, PREFABRICATED METAL BALCONY
H, PREFABRICATED METAL CANOPIES
I, VINYL WINDOWS AT ALL RESIDENTIAL UNITS
J, ALUMINUM STOREFRONT AT LEASING/ AMENITIES/ RETAIL
K, POWDERCOATED ALUMINUM RAILINGS AT ALL BALCONIES



PROPOSED MATERIAL BUILDING PALETTE

MCCALL CAPITAL - ENCLAVE LAURENS
GREENVILLE, SC
8.7.2025



McCall Capital – Enclave Laurens Phase 1
13 Airport Rd. Greenville, SC 29607
PPM Meeting Comments and Responses
24 June 2025 / 4:00 - 6:00

- Comment - Recommended bikes/bike storage for connection to the Swamp Rabbit Trail.
 - Response – Bike storage/parking included on site and incorporated into the building.
- Comment – Great connection to the Swamp Rabbit Trail.
 - Response – 15' or greater walk connection from Airport Rd to Swamp Rabbit Trail
- Comment – Is there affordable housing included?
 - Response – Yes, per PD zoning agreement.
- Comment – This site and surrounding area seems very walkable.
 - Response – Yes, design incorporates strong connection to Swamp Rabbit Trail and hardscape at retail areas.
- Comment – The design connection to the historic downtown Greenville airport is very interesting.
 - Response – Yes, the art-deco style of the original downtown Greenville has been the primary inspiration of the main elevations of the building.
- Comment – The architecture of the retail corner being treated differently is very strong.
 - Response – The corner has a different massing to distinguish it as the primary corner.
- Comment – There is concern about the use of corrugated metal.
 - Response – The corrugated metal ties back to the aviation theme, specifically from the Ford tri-motor airplane. We are studying alternatives.
- Comment - Recommendations to use the corrugated metal in smaller fields, serving more as an intentional accent.