



# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Meeting Agenda Board of Aldermen



---

Tuesday, October 17, 2017

7:30 PM

Board Chambers - Room 110

---

### 7:30-7:45

#### A. POETRY READING, RESOLUTIONS, PROCLAMATIONS, AND ACKNOWLEDGEMENTS

1. [17-316](#) Information on West End Poetry Festival - October 18-21, 2017 from Gary Phillips
2. [17-311](#) Proclamation: Domestic Violence Awareness Month
3. [17-307](#) Charge Issued to Recently Appointed Advisory Board Member

### 7:45-7:50

#### B. ANNOUNCEMENT OF UPCOMING MEETINGS

### 7:50-8:05

#### C. REQUESTS FROM VISITORS AND SPEAKERS FROM THE FLOOR

### 8:05-8:10

#### D. CONSENT AGENDA

1. [17-308](#) Approval of Previous Meeting Minutes of October 3, 2017 and October 10, 2017
2. [17-314](#) Request to Make an Appointment to the Carrboro Northern Transition Area Advisory Committee

**PURPOSE:** The Mayor and Board of Aldermen are requested to consider recommending that the Orange County Board of Commissioners confirm an appointment to the NTAAC.

**Attachments:** [Attachment A - A Resolution Making Appointments to the NTAAC](#)  
[Attachment B - Northern Transition Area Advisory Committee Chair Forms and Application](#)

3. [17-312](#) Adoption of a Grant Project Ordinance for Police Body Worn Cameras

**PURPOSE:** The Board is asked to consider approving receipt of a grant from the U.S. Department of Justice in the amount of \$46,371 for implementation of Body Worn Cameras.

**Attachments:** [Attachment A - DOJ Grant Award - Body Worn Cameras Project Ordinance.pdf](#)

4. [17-310](#) Request-to-Set a Public Hearing on Land Use Ordinance Amendments Relating to Tree Protection, Shade Trees, Canopy Coverage and Replacement Standards

**PURPOSE:** Potential text amendments to the Land Use Ordinance relating to the provisions in Article XIX, Screening and Trees, and the associated appendices A and E, were presented to the Board for discussion in May. This agenda item provides the Board with an opportunity to review changes made to the draft ordinance during the summer, and to consider setting a public hearing in January 2018.

**Attachments:** [Attachment A - Resolution](#)  
[Attachment B - Working Draft Ordinance trees-shading and canopies, appendices 10-12-2017](#)  
[Attachment C - ART-XIX with tracking](#)  
[Attachment D - APPEND-A with tracking](#)  
[Attachment E - APPEND-E with tracking](#)

5. [17-306](#) Communications Plan Status Update

**PURPOSE:** The purpose of this item to is provide an update to the Board of Aldermen on implementation initiatives started by the Communications Team since adoption of the Communications Plan in June 2017.

**Attachments:** [Com. Plan Implementation Tracking 10-3-17](#)

## E. OTHER MATTERS

### 8:10-9:00

1. [17-293](#) Draft Solid Waste Study Final Report

**PURPOSE:** The purpose of this item is to have Mitch Kessler of Kessler Consulting, Inc. present a summary of the final solid waste study report to the Board of Aldermen.

**Attachments:** [Attachement A: Draft Carrboro SW Study Final Report](#)

### 9:00-9:20

2. [17-309](#) Update on Traffic Calming Plan for Tallyho Trail

**PURPOSE:** The purpose of this agenda item to report on staff's meeting with Fox Meadow residents regarding the specific placement of traffic calming devices along the western half of Tallyho Trail and to discuss options for installations along the eastern half, including the entrance to the road near Staffield Lane.

**Attachments:** [Attachment A - Resolution Tallyho Trail Traffic Calming](#)  
[Attachment B - Stage2\\_10-10-2017](#)  
[Attachment C - Examples of Landscaped Chokers-Curb Extensions](#)

**9:20-9:45**

3. [17-313](#) Lake Hogan Farms Road Extension - Discussion

**PURPOSE:** The purpose of this item is to provide the Board of Aldermen with an opportunity to review and discuss the history and alignment of Lake Hogan Farm Road, including its planned extension and connection to Eubanks Road.

**Attachments:** [Attachment A - Connector Roads Policy \(1991\)](#)  
[Attachment B - Connector Roads Plan Concept \(1994\)](#)  
[Attachment C -LHF Overall Plan](#)  
[Attachment D - NSA connector roads map](#)  
[Attachment E -Legends at Lake Hogan Plan](#)  
[Attachment F - Morris Grove Elementary School plan](#)  
[Attachment G - Ballentine Subdivision overall plan](#)  
[Attachment H - Master Plan - Twin Creeks Park](#)  
[Attachment I - Ballentine conditional use permit](#)

**9:45-10:00**

4. [17-315](#) Approval of a Development Agreement Regarding South Greensboro Street Property between the Town of Carrboro and Orange County North Carolina

**PURPOSE:** The purpose of this item is to provide the Board of Aldermen with an opportunity to approve a Development Agreement between the Town and Orange County that details terms related to design, permitting, and construction of a building and associated parking at 203 S. Greensboro Street that would provide for new Town office space, the Orange County Southern Branch Library and other possible uses.

**Attachments:** [Attachment A - Resolution 10-17-17](#)

F. MATTERS BY BOARD MEMBERS

G. MATTERS BY TOWN MANAGER

**H. MATTERS BY TOWN ATTORNEY**

**I. CLOSED SESSION - ECONOMIC DEVELOPMENT MATTER - NCGS  
143-318.11(A)(4)**





# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-316

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

Information on West End Poetry Festival - October 18-21, 2017 from Gary Phillips





# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-311

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

Proclamation: Domestic Violence Awareness Month





# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-307

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

### Charge Issued to Recently Appointed Advisory Board Member

The following charge will be issued:

- 1) Tyran Hill - Affordable Housing Advisory Commission





# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-308

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

Approval of Previous Meeting Minutes of October 3, 2017 and October 10, 2017







# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-314

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

### TITLE:

Request to Make an Appointment to the Carrboro Northern Transition Area Advisory Committee

**PURPOSE:** The Mayor and Board of Aldermen are requested to consider recommending that the Orange County Board of Commissioners confirm an appointment to the NTAAC.

**DEPARTMENT:** Town Clerk

**CONTACT INFORMATION:** Cathy Dorando, 918-7309

**INFORMATION:** The Northern Transition Area Advisory Committee currently has one vacant seat that eligible for appointment.

Section 15-27 (a) of the Town Code reads, "There shall be a Northern Transition Area Advisory Committee consisting of five members, three appointed by the Orange County Board of Commissioners and two by the Board of Aldermen. If the Board of Commissioners fails to make these appointments within ninety days after receiving a resolution from the Board of Aldermen requesting that they be made, the Board of Aldermen may make them. All members shall be residents of the Northern Transition Area."

Amy Jeroloman is currently the Chair of the NTAAC and provided the chair forms for the Board's review.

Deborah Eaker-Rich submitted an application for appointment and has been recommended by Amy Jeroloman to fill the vacant Orange County representative seat. The attached resolution makes those appointments.

**FISCAL & STAFF IMPACT:** N/A

**RECOMMENDATION:** It is recommended that the Mayor and Board adopt the attached resolution and that the Town Clerk send the Orange County Board of Commissioners a copy of the resolution requesting that the Orange County seat be filled.

A RESOLUTION MAKING RECOMMENDING THAT THE ORANGE COUNTY  
BOARD OF COMMISSIONERS MAKE AN APPOINTMENT TO THE NORTHERN  
TRANSITION AREA ADVISORY COMMITTEE

Section 1. The Board of Aldermen hereby recommends to the Orange County Board of Commissioners that Deborah Eaker-Rich be appointed as an Orange County Representative to the Northern Transition Area Advisory Committee for a term to expire in February 2020.

Section 2. If the Orange County Board of Commissioners fails to make this appointment within 90 days, the appointment will be automatically made by effect of this resolution.

Section 3. This resolution shall become effective upon adoption.

## Catherine Dorando

---

**From:** noreply@civicplus.com  
**Sent:** Friday, September 01, 2017 12:48 PM  
**To:** Catherine Dorando  
**Subject:** Online Form Submittal: Advisory Board Application

### Advisory Board Application

Name	Deborah Eaker-Rich
Date	9/1/2017
Address1	8125 Old NC 86
Address2	<i>Field not completed.</i>
City	Chapel Hill
State	NC
Zip	27516
Is this address located within the corporate limits of the Town of Carrboro?	No
Telephone	9193021161
Email Address	<a href="mailto:debrich@nc.rr.com">debrich@nc.rr.com</a>
Date of Birth	10/16/1952
Race	caucasian
Sex	female
Occupation	professor/administrator
Are you a registered Orange County Voter?	Yes
Length of Residence in Orange County	25+ yrs (in several locations)
Length of Residence in the Town of Carrboro	12 yrs

I wish to be considered for appointment to the following committee/board(s) (Do Not Select More Than Three):	Northern Transition Area Advisory Committee
Other (advisory board not listed):	<i>Field not completed.</i>
Advisory Board Preference	<i>Field not completed.</i>
*Employer/Self Employed	UNC Chapel Hill
Number of Years Employed	12 yrs
* Provide examples of how you are involved in the promotion of travel and tourism in the Town of Carrboro.	<i>Field not completed.</i>
Community Activities/Organizational Memberships	Because of my roles at UNC--which have until very recently required alot of service to the university and evening events-- I have not officially joined any community organizations to this point. However, being a long time resident of Orange County/Town of Carrboro, I promote and support local businesses. For example, Frank Cole Builders built our current home; we have taken our vehicles to Auto Logic for 15+ years; I frequent Weaver Street Market, Tandem, Glass Half Full, and other restaurants; I purchase many supplies at Southern States; and I spend many mornings drinking coffee at Open Eye.
Experience to Aid You in Working on Advisory Boards	I have been in administration at UNC-CH for over a decade as Senior Associate Dean and then Interim Dean in the School of Education. In those positions, I have served on multiple advisory boards for the university, e.g., Friday Center Advisory Board, Summer School Advisory Board, Athletic Support Programs Advisory Board, etc. as well as working with advisory and foundation boards for the School of Education as part of my administrator's role. In all of these positions, I have often been in the role of negotiator or mediator (and in fact have certification in mediation). I am a good listener, am often able to summarize salient important points, and find common ground among participants.

Reasons You Wish to be  
Appointed

We live in the Northern Transition area and are committed to appropriate growth and development of our rural landscape. I know that our town is changing and I welcome much of what has been done. That said, I wish to be a voice for my neighbors and others whose voices may not have been heard and/or may not be able to dedicate service at this time to planning meetings, hearings, etc. A current job change will enable me to devote the necessary time which I have not heretofore been able to do.

Have you ever served on  
any Town of Carrboro  
Committee or Board?

No

If yes, which one(s)?

*Field not completed.*

Are you currently serving  
on a Town Board or  
Committee?

No

If yes, are you applying  
for a third consecutive  
term?

No

If yes, please describe  
how you meet one, or  
more, of the following  
exceptions noted below.  
\*Members of the Board  
of Adjustment,  
Environmental Advisory  
Board, Human Services  
Advisory Commission,  
and Transportation  
Advisory Board may be  
reappointed to successive  
terms without limitation  
(Sections 15-29(c), 15-  
45(c) 3-7(d), 3-24(c))

I have not answered yes to the above questions so I'm unsure  
what is required here.

Email not displaying correctly? [View it in your browser.](#)



## Advisory Board Chair Recommendation Form

Advisory Board Name	Northern Transitional Area Advisory Committee
Applicant Name	Deborah Eaker-Rich
Outstanding Qualifications	Previous Advisory Board Experience through her position at UNC-CH School of Education. Experience as a negotiator / mediator & certification in mediation
How applicant compliments current board composition:	Fills the last vacancy on the NTAAC which has been vacate for many years.
Other comments:	Has lived in the NTA ~ 12 years
Applicant Name	<i>Field not completed.</i>
Outstanding Qualifications	<i>Field not completed.</i>
Other Comments:	<i>Field not completed.</i>
Applicant Name	<i>Field not completed.</i>
Outstanding Qualifications:	<i>Field not completed.</i>
Other Comments:	<i>Field not completed.</i>
Applicant Name	<i>Field not completed.</i>
Outstanding Qualifications:	<i>Field not completed.</i>
Other Comments:	<i>Field not completed.</i>
Applicant Name	<i>Field not completed.</i>
Outstanding Qualifications:	<i>Field not completed.</i>
Other Comments:	<i>Field not completed.</i>
Applicant Name	<i>Field not completed.</i>
Outstanding Qualifications:	<i>Field not completed.</i>
Other Comments:	<i>Field not completed.</i>

## Advisory Board Chair Applicant Summary and Contact Form

Advisory Board Name:	Northern Transitional Area Advisory Committee
Applicant Name:	Deborah Eaker-Rich
Date of last contact with applicant	9/25/2017
Summary of Qualifications:	Deb is a UNC-Chapel Hill Employee working in Administration for the School of Education. Through the University Deb has extensive Advisory Board and negotiator / mediator experience. These will be useful on the NTAAC. In addition, Deb has lived in the NTA for ~ 12 years and has an understanding of the issues facing our community. She has already attend an NTAAC meeting on 9/7/2017 was an active participate during the joint review process.
Advisory Board Chair reconfirmed applicant's interest in serving by phone or email:	Yes
If no, briefly explain	<i>Field not completed.</i>
Applicant attended advisory board meeting prior to BOA review:	Yes
If yes, date of advisory board meeting:	9/7/2017
Applicant has demonstrated a clear understanding of the time commitment, roles, and responsibilities of serving on the advisory board:	Yes
If no, briefly explain:	<i>Field not completed.</i>
In addition to your comments above, please check other qualities that the applicant offers that	Neighborhood/geographic diversity, Occupation, experience or special skills, Previous public service or community involvement, Other

would help the Advisory Board meet its goals for community representation. Please note that candidates who do not meet any of these qualities are still eligible for appointment. Please communicate any urgent needs and priorities for Advisory Board composition to your Board of Aldermen Liaison.

If other, please explain:      certification in mediation

Email not displaying correctly? [View it in your browser.](#)





# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-312

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

### TITLE:

Adoption of a Grant Project Ordinance for Police Body Worn Cameras

**PURPOSE:** The Board is asked to consider approving receipt of a grant from the U.S. Department of Justice in the amount of \$46,371 for implementation of Body Worn Cameras.

**DEPARTMENT:** Police

**CONTACT INFORMATION:** Chief Walter Horton, 919-918-7397

**INFORMATION:** In February 2017, the Carrboro Police Department submitted a grant application to the U.S. Department of Justice, Office of Justice Programs for funding towards Body Worn Camera Policy and Implementation. On September 29, 2017, the police department received notification of approval of the grant in the amount of \$46,731.

**FISCAL & STAFF IMPACT:** The funding received will be used supplement existing funding toward the cost to acquire 32 body worn Cameras and additional storage.

Federal Grant Funds DOJ Award	46,731.00
Town Funds	35,767.00
<b>Total Revenues</b>	<b>82,498.00</b>
SAN Storage	16,898.00
32 Body Worn Cameras	65,600.00
<b>Total Expenditures</b>	<b>82,498.00</b>

**RECOMMENDATION:** It is recommended that the Board accept the attached project ordinance.

GRANT PROJECT ORDINANCE FOR CARRBORO POLICE BODY-WORN CAMERA POLICY  
AND IMPLEMENTATION PROGRAM  
Ordinance No. \_\_\_\_\_

WHEREAS, the Town of Carrboro (Town) has been awarded a grant in the amount of \$46,731.00 by the U. S. Department of Justice, Bureau of Justice Assistance; and,

WHEREAS, the grant funds are to be used to cover up to 50% of the Town's total cost to acquire 32 body worn cameras; and,

WHEREAS, the total estimated cost to acquire 32 body worn cameras is \$65,600; and,

WHEREAS, the grant requires non-federal matching funds on a 50-50 basis or \$32,800; and,

WHEREAS, the Board of Aldermen have appropriated \$91,000 for the acquisition of body worn cameras and the required data storage; and,

WHEREAS, the required data storage has been acquired at a cost of \$55,208 leaving an uncommitted budget balance of \$35,767; and,

WHEREAS the Board of Aldermen for the Town deems this activity to be a worthy and desirable undertaking; and,

WHEREAS, the Board of Aldermen for the Town accepts this grant award and authorizes the Town Manager to execute a Grant Agreement and any other required documents for the award;

NOW, THEREFORE PURSUANT TO N.C.G.S 159-13.2, BE IT ORDAINED BY THE BOARD OF ALDERMEN OF THE TOWN OF CARRBORO THAT:

1. Grant Award #2017-BC-BX-0075, for the Carrboro Police Department Body Worn Camera Program is hereby accepted by the Town and the Town Manager is authorized to execute a Grant Agreement and any other required documents for the award.
2. This Program is authorized to be undertaken until all project activity is completed.
3. The following revenues are anticipated to be available to the Town of Carrboro to complete this Project:

Federal Grant Funds DOJ Award	46,731.00
Town Funds	35,767.00
<b>Total Revenues</b>	<b>82,498.00</b>

4. The following amount is appropriated for this project to be expended in the following manner:

SAN Storage	16,898.00
32 Body Worn Cameras	65,600.00
<b>Total Expenditures</b>	<b>82,498.00</b>

5. Within five (5) days after this ordinance is adopted, the Town Clerk shall file a copy of this ordinance with the Finance Director.

The foregoing ordinance having been submitted to a vote received the following vote and was duly adopted this \_\_\_\_\_ day of October 2017:

DRAFT





# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-310

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

### **TITLE:**

Request-to-Set a Public Hearing on Land Use Ordinance Amendments Relating to Tree Protection, Shade Trees, Canopy Coverage and Replacement Standards

**PURPOSE:** Potential text amendments to the Land Use Ordinance relating to the provisions in Article XIX, Screening and Trees, and the associated appendices A and E, were presented to the Board for discussion in May. This agenda item provides the Board with an opportunity to review changes made to the draft ordinance during the summer, and to consider setting a public hearing in January 2018.

**DEPARTMENT:** Planning

**CONTACT INFORMATION:** Christina Moon - 919-918-7325, Patricia McGuire - 919-918-7327, Randy Dodd - 919-918-7326, Bob Hornik - 919-929-3905

**INFORMATION:** At the May 16<sup>th</sup> Board of Aldermen meeting, staff presented the Board with a working draft ordinance of potential modifications to the Land Use Ordinance (LUO) as a follow-up to previous amendments relating to canopy coverage, tree protection and tree replacement, adopted on May 27, 2014. At the time of 2014 adoption it was anticipated that certain aspects of the amendments, might need further refinement, particularly the sections relating to canopy cover. Now, almost four years later, staff has heard from and is working with applicants seeking land use permits in the downtown (B-1(C), B-1(G) and B-2 districts) regarding their challenges meeting certain provisions while maintaining their desired building program-often a larger building on an infill lot.

The attached draft ordinance is designed to create an opportunity for minor deviations from the provisions in Article XIX, Screening and Trees, for certain situations while retaining the overall intent to protect trees during construction, and to plant new trees for improved shading and canopy cover (Attachment B). The draft ordinance includes new language to allow a payment in lieu of trees, in certain situations. In the short term, staff could identify a few possible locations on Town-owned property that could be used as receiving areas for trees, but in the long term, such a mitigation program would necessitate the adoption of a tree planting plan to guide the collection of payment for this specific purpose. Other changes-a new calculation worksheet in the appendices, substantially updated plant lists reorganized into a single table, and other minor formatting improvements--are designed for better ease of reading.

While the content of the proposed text amendments is pretty straightforward, the combination of amendments in the main body of the LUO, appendices and tables in the appendices, can make the presentation of the

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

material complicated. Staff has attached the changes as a standard draft ordinance (Attachment B) as well as in tracking to help provide a clear sense of the changes in context (Article XIX - Attachment C, Appendix A - Attachment D, and Appendix E - Attachment E).

The Board must receive public input before considering text amendments to the LUO, and Orange County and Planning Board comments are also required. A resolution has been provided that allows the Board to set a public hearing in January 2018, to facilitate opportunities for input and refinement prior to formal consideration.

**FISCAL & STAFF IMPACT:** None associated with the discussion of this item.

**RECOMMENDATION:** Staff recommends that the Board consider the resolution (Attachment A), setting a public hearing for January 23, 2018, and referring the draft ordinance to Orange County, the Planning Board and other advisory boards.

A RESOLUTION SETTING A PUBLIC HEARING ON AN ORDINANCE AMENDING THE  
CARRBORO LAND USE ORDINANCE PROVISIONS RELATING TO  
TREE PROTECTION, SHADING AND CANOPY REQUIREMENTS

WHEREAS, the Board of Aldermen seeks to provide ample opportunities for the public to comment on proposed amendments to the Land Use Ordinance;

NOW, THEREFORE BE IT RESOLVED that the Board of Aldermen sets a public hearing on January 23, 2018, to consider adopting “An Ordinance Amending the Carrboro Land Use Ordinance Provisions Relating to Tree Protection, Shading and Canopy Requirements.”

BE IT FURTHER RESOLVED that the draft ordinance is referred to Orange County and the Town of Carrboro Planning Board for consideration and recommendation prior to the specified public hearing date.

BE IT FURTHER RESOLVED that the draft ordinance is also referred to the following Town of Carrboro advisory boards and commissions.

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> Appearance Commission        | <input type="checkbox"/> Recreation and Parks Commission             |
| <input type="checkbox"/> Transportation Advisory Board           | <input type="checkbox"/> Northern Transition Area Advisory Committee |
| <input checked="" type="checkbox"/> Environmental Advisory Board | <input type="checkbox"/> _____                                       |
| <input type="checkbox"/> Economic Sustainability Commission      | <input type="checkbox"/> _____                                       |

This is the 17<sup>th</sup> day of October in the year 2017.

**AN ORDINANCE AMENDING TOWN OF CARRBORO LAND USE ORDINANCE  
PROVISIONS RELATING TO TREE PROTECTION, SHADING AND CANOPY  
REQUIREMENTS**

\*Draft 10-12-2017\*

THE BOARD OF ALDERMEN OF THE TOWN OF CARRBORO ORDAINS:

Section 1. Section 15-314 (Board Findings and Declaration of Policy on Protecting Trees and Other Plants), subsection (a)(2) is amended and a new provision (a)(12) is added to read as follows:

(2) Trees, shrubs, and other plants appreciably reduce carbon emissions by shading buildings thereby lowering energy use to cool buildings, and also store carbon as biomass; and

(12) Certain flowering trees, shrubs, and other plants are important sources of pollen and nectar for pollinators.

Section 2: Section 15-314 (Board Findings and Declaration of Policy on Protecting Trees and Other Plants), subsection (b) is amended to read as follows:

(b) Based upon the findings set forth in subsection (a), the Board declares that it is not only desirable but essential to the health, safety, and welfare of all persons living or working within the town's planning jurisdiction, present and future, to protect certain existing trees and tree stands and, under the circumstances set forth in this article, to require the planting of new trees, especially larger trees, in certain types of developments, and to ensure the protection of those trees whether on individual lots or on common space.

Section 3. Section 15-315 of Article XIX, (Definitions) is rewritten as follows:

Section 15-315 Definitions

Unless otherwise specifically provided, or unless the context clearly indicates otherwise, the words and phrases defined below shall have the meaning indicated when used in this Part.

- (1) CANOPY TREE. A healthy evergreen or deciduous tree species that matures at a height of at least thirty (30) feet.
- (2) DRIPLINE. Perimeter formed by the points farthest away from the trunk of a tree where precipitation falling from the branches of that tree lands on the ground.
- (3) CLEARCUTTING. The large-scale, indiscriminate removal of trees, shrubs, and undergrowth with the intention of preparing real property for nonagricultural purposes.
- (4) HABITAT. The natural environment for animals and plants that is made up of physical factors such as soil, moisture, range of temperature, and availability of light as well as biotic factors such as the availability of food, nesting sites, and shelter.
- (5) SPECIMEN OR RARE TREE. Any healthy tree that:



- a. Has a trunk diameter at breast height (dbh) of twenty-four (24) inches or more for pine tree species; or
- b. Has a trunk dbh of eighteen (18) inches or more for any species besides pine tree species; or
- c. Has a trunk dbh of twelve (12) inches or more in the case of any of the species from the following list of North Carolina native canopy tree genera; or

<i>Chamaecyparis</i> (Atlantic White Cedar)	<i>Magnolia</i> (Magnolia)
<i>Carya</i> (Southern Shagbark Hickory)	<i>Pinus</i> (Longleaf pine)
<i>Diospyros</i> (Persimmon)	<i>Taxodium</i> (Bald cypress)
<i>Fagus</i> (Beech)	<i>Tsuga</i> (Hemlock)
<i>Juniperus</i> (Eastern Red Cedar)	<i>Ulmus</i> (American Elm)

- d. has a trunk dbh of six (6) inches or more in the case of the species from the following list of North Carolina native understory tree genera: or

<i>Amelanchier</i> (Serviceberry)	<i>Halesia</i> (Silverbell)
<i>Asimina</i> (Pawpaw)	<i>Hamamelis</i> (Witch-hazel)
<i>Carpinus</i> (Hornbeam)	<i>Ilex</i> (Holly)
<i>Cercis</i> (Redbud)	<i>Ostrya</i> (Hophornbeam)
<i>Chionanthus</i> (Fringetree)	<i>Oxydendrum</i> (Sourwood)
<i>Cornus</i> (Dogwood)	<i>Sassafras</i> (Sassafras)
<i>Crataegus</i> (Hawthorn)	

- e. is listed as a State or National Champion by the North Carolina Forest Service or the American Forestry Association; or
- f. provides unique habitat for any endangered or threatened wildlife species protected by Federal law; or
- g. has been cited by the Board of Aldermen as being historically significant; or
- h. any other tree species listed in the North Carolina Natural Heritage Program as being significantly rare, of special concern, threatened, or endangered.

- (6) TREE. A perennial woody plant, single or multiple trunks, with few if any branches on its lower part, which at maturity will obtain a minimum six (6) inch caliper.
- (7) TREE CANOPY. The combined area encompassing the drip zones of all canopy trees.
- (8) TREE PROTECTION PERIMETER. That area within a circle drawn with the tree's trunk as the center. Radius is dependent upon site conditions and the relative tolerance of tree species to construction damage. Standard accepted radius is 1-1.5 feet per diameter inch of tree to be retained.
- (9) TREE STAND. An aggregation of trees occupying a specific area and generally uniform in species composition, size, age, arrangement, and condition that distinguishes it from vegetation in adjoining areas.

Section 4. Section 15-317 (Retention and Protection of Specimen and Rare Trees), subsections (a) through (c) are rewritten to read as follows:

### Section 15-317 Retention and Protection of Specimen and Rare Trees

(a) Every development shall retain all existing specimen and rare trees. When a site would be so unreasonably burdened by the retention of all such trees that a choice must be made as to which trees will be retained, the following criteria shall be used by the applicant, in consultation with the land use administrator and a landscape or forestry professional, who is a certified arborist, to evaluate the trees for the purpose of deciding which to retain:

- (1) The rareness of the species, relative to the species representation on the site and to the species representation within the region and the state. This shall be the most important criterion in the evaluation;
- (2) Size and age, large old trees being considered more valuable than smaller, younger trees of the same species;
- (3) The expected longevity of the tree, including such factors as the tree's relative health at the time of the evaluation;
- (4) The hardiness of the tree, including wind firmness, climatic requirements, susceptibility to insects and diseases;
- (5) Aesthetic values, including flowers, fruit, form characteristics, potential for autumn coloration;
- (6) Size at maturity; and
- (7) Potential to provide shading.

(b) Flexible approaches such as adjustments to lot layout, placement of buildings and paved surfaces and location of utilities should be pursued in order to save rare and specimen trees.

(c) Subsurface disturbance within the Tree Protection Perimeter around any tree to be retained in accordance with (a) above, shall be limited to the minimum extent practicable as determined by a certified arborist during construction or after completion of the development.

Section 5. Section 15-318 (Shade Trees in Parking Lots), subsections (a) is amended with an additional sentence added to the end of the subsection, and subsection (c) is amended with updated Land Use Ordinance section references and an additional sentence added to the end of the subsection, to read as follows:

(a) Vehicle accommodation areas containing more than four parking spaces that are required by Section 15-296 must be shaded by deciduous trees (either retained or planted by developer) that have or will have when fully mature a trunk at least twelve inches in diameter. When trees are planted by the developer to satisfy the requirements of this subsection, the developer shall choose trees that meet the standards set forth in Appendix E. As part of the redevelopment of an infill lot in the B-1(C), B-1(G) or B-2 districts, up to 25% of the shading

requirement may be from existing or proposed buildings providing shadow as identified in the provisions of Appendix A, A-6 (26).

(c) No paving may be placed within 15 feet (measured from the trunk) of any tree retained to comply with subsection (a), unless such tree is eighteen inches or greater in diameter or a very rare species as described in Section 15-315, in which case no paving may be placed within the Tree Protection Perimeter for such trees as described in 15-315(8). New trees planted to comply with subsection (a) shall be located so that they are surrounded by at least 200 square feet of unpaved area. Notwithstanding the foregoing, new trees planted on infill lots in the B-1(C), B-1(G) or B-2 districts may be surrounded by less than 200 square feet of unpaved area if installed with an urban tree planting system, specified by a professional engineer and landscape architect or certified arborist, that will ensure the survival of the tree for its typical life expectancy.

Section 6. Section 15-319 (Tree Canopy coverage Standards) is rewritten to read as follows:

Section 15-319 Tree Canopy Coverage Standards

(a) Minimum Canopy Coverage Standards. Subject to the remaining provisions of this section, the following minimum tree canopy coverage percentages are required within the boundaries of every lot or tract for which a zoning, special use, or conditional use permit is issued, exclusive of required cleared active recreation areas, water bodies, access easements, public and private right-of-way, stormwater and utility easements.

Table 1: Minimum Tree Canopy Coverage Standards

Land Use	Minimum Canopy Coverage
Residential	40%
Other than residential excluding districts (B-1(C), (B-1(G), (B-2)	30%
Other than residential in districts (B-1(C), (B-1(G), (B-2)	15%

When a tract is subdivided and pursuant to the provisions of Article XIII the developer sets aside open space areas or recreation areas that contain canopy trees (with a minimum caliper of six inches) or when a developer of a subdivision plants canopy trees to comply with the shading requirements of Article XIII, the total tree canopy area so preserved or established shall be credited against the minimum canopy coverage percentages set forth above. The remaining required tree canopy coverage area shall be allocated by the subdivider among the subdivided lots, and this allocation shall be shown on the recorded plat of such subdivision with a disclosure note that such trees, to fulfill the requirements of this section, shall be subject to maintenance and replacement.

(b) Implementation of Standards. Compliance with the tree canopy standards shall be achieved as follows:

- (1) Protection of existing tree canopy. The extent of existing tree canopy coverage retained at the time of permit application may be documented by survey or by using current aerial photographs available on the Town's web

page or similar resource. Protection of the existing tree canopy will be demonstrated by the tree protection plan required by Section 15-320.

- (2) Replacement of canopy. If the existing protected tree canopy is less than the minimum standard as shown in Table 1, the deficit shall be made up by the planting of additional trees as provided herein:
  - a. One (1) or more replacement tree(s) shall be planted in accordance with an approved planting plan. When trees are planted by the developer to satisfy the requirements of this subsection, the developer shall choose trees that meet the standards set forth in Appendix E. Each tree shall be presumed to create a canopy circular area with the trunk of the tree as the center, and there must be sufficient trees so that, using this standard, the canopy requirements in 15-319(a) are met.
  - b. Canopy trees planted to meet the Town's screening and parking lot shading standards can be counted toward the replacement canopy tree calculation.
  - c. Supplemental canopy trees planted to complete the canopy coverage requirements shall be planted no less than twenty (20) feet from any other proposed or existing canopy tree.
  - d. Replacement trees that are planted in an adjacent right-of-way may count toward total tree canopy.
  - e. Replacement tree caliper shall be at least two and one-half (2.5) inches at installation.
  - f. Landscaped areas with shrubs of at least 100 square feet on an infill lot in the B-1(C), B-1(G) or B-2 districts. The developer shall choose shrubs that meet the standards set forth in Appendix E.

(c) Modifications to Canopy Coverage Standards. The permit issuing authority may approve a development application that does not fully comply with the canopy coverage standards when it finds that the application substantially (50 % or more) complies with these standards and that such a deviation:

- (1) Enables the development to better achieve other Town objectives such as: i) the promotion of solar access to encourage active and passive solar technology for water and space heating and renewable energy generation, ii) improved stormwater management, and iii) the preservation of established landscapes professionally designed and installed by an architect or landscape architect, or landscape designer; or
- (2) Is for property enrolled in the present use value taxation program or subject to a forest management plan; or
- (3) Is part of the redevelopment of an infill lot in the B-1(C), B-1(G) or B-2 districts, where the applicant is seeking a reduction of the shading requirement per Section 15-318, has planted trees in the right-of-way to count toward the

canopy coverage, and/or uses a landscaped area with shrubs of at least 100 square feet.

Large expanses of open space, meadowland (excepting a meadow consisting of species native to the Piedmont), or manicured lawn shall not satisfy the canopy coverage standards of this section.

(d) Exemption from Canopy Coverage Standards. Zoning permit applications for structures that are exempt from building permit requirements, or are the lessor of either i) additions to existing permitted structures that do not exceed 25% of an existing building footprint or ii) do not increase the footprint of the existing building by more than 250 square feet, shall be exempt from the tree canopy standards.

Section 7. Section 15-321.1 is amended by creating a new Section 15-321.1 (Payment in Lieu of Providing Shade or Canopy Cover Trees), as follows, and renumbering the existing Section 321.1 (Regulation of Forestry Activities) to 15-321.2.

(a) When the permit issuing authority determines that as part of the redevelopment of an infill lot in the B-1(C), B-1(G) or B-2 districts, it is physically impossible or impracticable for a development to satisfy the requirements of Section 15-318 (shading trees), or Section 15-319 (canopy coverage) of this Article, then the permit-issuing authority may allow the developer to pay a fee to a tree planting fund in accordance to an adopted tree planting master plan.

(b) The amount of the fee authorized by this section shall be determined by estimating the cost of providing the required trees (including the cost of the plant and labor for installation) that meets the requirements of this Article. This determination shall be made annually and the fee shall be included in the Miscellaneous Fees and Charges Schedule adopted by the Board of Aldermen.

(c) Any fees collected in accordance with this section shall be reserved and used exclusively to meet the purposes for which they have been obtained as specified above in subsection (a). The required fee shall be submitted to the Town prior to construction plan approval.

Section 8. Appendix A, Section A-5. (Existing, Natural, Man-Made and Legal Features) (b)(2), is rewritten to read as follows:

(b) Existing natural features:

(1) Tree line of wooded areas.

(2) The location and sizes of all trees which are to be retained in accordance with Section 15-317, and which are to be removed; a written justification for the need to remove any specimen or rare species trees protected by the provisions of Article XIX, along with a description of the extent of the hardship that would occur if such removal were not permitted to occur.

Section 9. Appendix A, Section A-6. (Proposed Changes in Existing Features or New Features), provisions (b)(23) and (b)(24) are rewritten to read as follows:

- (23) Proposed plantings or construction of other devices to comply with the screening requirements of Article XIX, Part I, as well as proposed plantings of trees to comply with the shading, street tree, and canopy requirements of Article XIX, Part II. Plans shall label shrubbery by common and scientific name, show the distance between plants and indicate the height at the time of planting and expected mature height and width. Plans shall label trees by common and scientific name, show the circles of the mature crowns (major trees shall be drawn at diameter = 30 feet; dwarf or decorative trees shall be drawn at their actual mature crown), and indicate the height at the time of planting.
- (24) A Tree Protection Plan, will be completed and stamped by a certified arborist or landscape architect, illustrating the methods proposed to be used to protect, during construction, the trees that are required to be protected under the provisions of Chapter XIX including specifications as to how the grade, drainage, and aeration will be maintained around the trees. The location of all rare and specimen trees to be retained on the site that will not be within the area to be disturbed by construction activities near a building site, or near roads within the development shall also be shown on the plan, along with a note stating that these trees will not be within the area to be disturbed by construction activities. The Administrator may recommend that applicants consult with experts in arboriculture, landscape architecture or forestry about appropriate tree protection methods for the particular conditions and species in question.

Section 10. Appendix E (Screening and Trees – Guide for Landscaping), provision title for E-3) shall be amended to read as follows:

**E-3 Formulas for Calculating Thirty-five Percent Shading of Paved Vehicle Accommodation Areas and Tree Canopy Deficit Replacement.**

Section 11. Appendix E-1 (Guide for Protecting Existing Trees), shall be amended to change the Section number from 15-316 to 15-317 in the first sentence and in subsection (b) to read as follows:

**E-1 Guide for Protecting Existing Trees**

Section 15-317 provides for the retention and protection of large trees when land is developed. In order to better ensure the survival of existing trees, the developer should heed the following guidelines:

- (b) Avoid excavations beneath the crown of the tree as required by Section 15-317(c).

Section 12. Appendix E-2 (Standards for Street and Parking Lot Trees), shall be amended to correct the references to other Sections, as follows:

Trees planted in compliance with the requirements of Sections 15-316, 15-318 and 15-319 should have most or all of the following qualities. The trees recommended in Section E-10 represent the best combinations of these characteristics.

Section 13. Appendix E-3 (Formulas for Calculating 35% Shading of Vehicle Accommodation Areas and Tree Canopy Deficit Replacement) shall be amended to include a new formula for determining the number of replacement trees required to presumptively satisfy the tree canopy requirements of Section 15-319, as follows:

### **Formulas for Calculating the Number of Replacement Trees Required to Satisfy the Tree Canopy Deficit**

Following is an elementary formula for determining the number of replacement trees required to presumptively satisfy the tree canopy requirements of Section 15-319.

- |    |  |                  |
|----|--|------------------|
| 1. | Enter square footage of the site to which canopy standards apply (15-319(a)):                            | _____ sq. ft.    |
| 2. | Multiply (by 40%, 30%, or 15% depending on the Land Use)   | x .4, .3, or .15 |
| 3. | Canopy Required  | _____ sq. ft.    |
|    | *****  |                  |
|    | Add:   |                  |
| 4. | Canopy from existing trees to be retained:*  | _____ sq. ft.    |
| 5. | Canopy area of required screening trees, if any:   | _____ sq. ft.    |
| 6. | Canopy area of required shade trees, if any:   | _____ sq. ft.    |
| 7. | Subtotal (add lines 4-6)   | _____ sq. ft.    |
|    | (if line #7 is greater than line #3, then the canopy requirement has been met. If not, go on to line #8) |                  |
| 8. | Enter the difference between line #7 and line #3   | _____ sq. ft.    |
|    | Divide line #8:  | ÷ 707            |
| 9. | Total number of replacement trees required**:  | _____ trees      |

---

\*Existing trees retained will be credited according to their actual crown radius on the site as determined by survey or aerial photography.

\*\*The actual number of replacement trees to be planted will be determined as described below.

Trees planted that are generally recognized as canopy or overstory trees are credited with shading 707 sq. ft. (based on a crown radius of 15'). New trees planted within 5' of the lot line are credited for having only half a crown (e.g., new perimeter trees will be credited for 354 sq. ft.). When smaller trees generally recognized as understory trees such as Dogwoods are planted, the credited area will be adjusted downward to 314 sq. ft. for interior trees and 157 sq. ft. for perimeter trees (based on a crown radius of 10').

Section 14. Appendix E-9 (Guide for Planning Shrubs) is amended to read as follows:

#### **E-5 Guide for Planting Trees**

After the pit is dug, observe sub surface drainage conditions. Most soils in the Carrboro area are poorly drained. Planting depth where poor drainage exists should be dependent upon the water needs of the tree species. If the species is more sensitive to poor drainage, the tree should be planted higher than existing grade, not to exceed  $\frac{1}{4}$  root of the ball above grade. If a wire cage surrounds the root ball, it should be removed prior to planting. Back fill should then be sloped gradually from top of root ball to existing grade. Gravel placed at the bottom of the hole will not improve drainage.

Section 15. Appendix E-9 (Guide for Planning Shrubs) is amended to read as follows:

#### **E-9 Guide for Planting Shrubs**

Shrubs planted for screening purpose should be given a proper culture and be spaced based on expected size at maturity. Most soils in the Carrboro area are poorly drained. Planting depth where poor drainage exists should be dependent upon the water needs of the tree species. If the species is more sensitive to poor drainage, the shrub should be planted higher than existing grade, not to exceed one quarter of the root ball above grade. If a wire cage surrounds the root ball, it should be removed prior to planting. Back fill should then be sloped gradually from the top of the root ball to the existing grade. Gravel placed at the bottom of the hole, underneath the shrub, will not improve drainage. Many of the guidelines for tree planting listed in Section E-5 also apply to shrubs. However, because specific requirements vary considerably between shrub types, this Appendix does not attempt to generalize the needs of all shrubs.

Section 16. Appendix E-10 (Lists of Recommended Trees and Shrubs) is completely rewritten with the lists of trees and shrubs listed as under subsection E-10(A) through E-10(F) are reorganized into a table, as follows:

#### **E-10 Table of Recommended Trees and Shrubs**

The following table, indicates plants which will meet the screening, shading, and tree canopy replacement requirements of Article XIX of the Land Use Ordinance. Additional desirable aspects of plants are also provided. The lists are not intended to be comprehensive or absolute, but rather are intended as guidance for species that are appropriate.

Plants were selected for inclusion on these lists according to two principal criteria in addition to providing the indicated service: i.) general suitability for the Piedmont of North Carolina and support of Piedmont ecosystems and food webs; and ii.) for a particular site, species native to the Piedmont of North Carolina which are thriving on or near the site should be favored. When trees are planted to replace native tree specimens removed, native tree species should always be selected. Plantings of multiple species are also recommended to increase biodiversity and provide resilience. Further information on recommended native plants is available from the North



Carolina Native Plant Society. The Land Use Administrator has the discretion to not approve of planting plans to comply with Article XIX that substantially deviate from the list provided

Sections E-11 through E-16 contain descriptions of the trees and shrubs listed here.

DRAFT

E-10 TABLE OF RECOMMENDED TREES AND SHRUBS

Common Name ( <i>Latin name</i> )	Human Services							Ecological Services		
	Shading (1)		Screening (2)			Other				
	Parking / VAA	Street	Partial	Evergreen	Broken	Planting Strip	Edible/Medicinal	Rare/specimen (3)	Native (a)	Pollinator (b)
<b>Large Trees (4)</b>										
American Beech ( <i>Fagus grandifolia</i> )								*	*	
American Elm ( <i>Ulmus americana</i> )								*	*	
American Hemlock ( <i>Tsuga canadensis</i> )								*	*	
American Persimmon ( <i>Diospyrus virginiana</i> )			*		*		*	*	*	*
Atlantic White Cedar ( <i>Chamaecyparis thyoides</i> )				*				*	*	
Bald Cypress ( <i>Taxodium distichum</i> )				*				*	*	
Basswood ( <i>Tilia americana</i> )	*								*	
Black Gum ( <i>Nyssa sylvatica</i> )			*						*	
Black Oak ( <i>Quercus velutina</i> )	*	*							*	
Blackjack Oak ( <i>Quercus marilandica</i> )									*	
Chestnut Oak ( <i>Quercus montana</i> ; <i>Q. prinus</i> )	*								*	
Cucumber Tree ( <i>Magnolia acuminata</i> )	*								*	
Eastern Red Cedar ( <i>Juniperus virginiana</i> )				*			*	*	*	
Laurel Oak ( <i>Quercus laurifolia</i> )				*					*	
Loblolly Pine ( <i>Pinus taeda</i> )				*					*	
Longleaf Pine ( <i>Pinus palustris</i> )								*	*	
Mockernut hickory ( <i>Carya tomentosa</i> )									*	*
Ohio Buckeye ( <i>Aesculus glabra</i> )								*	*	
Post Oak ( <i>Quercus stellata</i> )									*	
Red Oak (Eastern) ( <i>Quercus rubra</i> )	*	*							*	
River Birch ( <i>Betula nigra</i> )	*	*				*			*	
Scarlet Oak ( <i>Quercus coccinea</i> )	*	*							*	
Shortleaf Pine ( <i>Pinus echinata</i> )				*					*	
Southern Catalpa ( <i>Catalpa bignonioides</i> )	*								*	
Southern Magnolia ( <i>Magnolia grandiflora</i> )				*				*	*	
Shagbark Hickory ( <i>Carya caroliniana-septentrionalis</i> )								*	*	
Southern Sugar Maple ( <i>Acer saccharum</i> ; <i>A. barbatum</i> )	*								*	
Swamp Chestnut Oak ( <i>Quercus michauxii</i> )	*							*	*	
Swamp White Oak ( <i>Quercus bicolor</i> )	*				*				*	

Sycamore ( <i>Platanus occidentalis</i> )	*								*	
Tulip Poplar ( <i>Liriodendron tulipifera</i> )	*	*							*	*
Virginia Pine ( <i>Pinus virginiana</i> )				*					*	
White Oak ( <i>Quercus alba</i> )	*								*	
Willow Oak ( <i>Quercus phellos</i> )	*	*							*	
<b><u>Small Trees (5)</u></b>										
American Holly ( <i>Ilex opaca</i> )			*	*	*				*	*
American Hop Hornbeam ( <i>Ostrya virginiana</i> )			*						*	
American Hornbeam/Ironwood ( <i>Carpinus carolinia</i> )			*			*			*	
American Smoketree ( <i>Cotinus obovatus</i> )			*		*					
Carolina Cherry Laurel ( <i>Prunus caroliniana</i> )			*	*		*			*	
Crabapple (southern) ( <i>Malus spp.</i> )			*				*		*	
Eastern Redbud ( <i>Cercis canadensis</i> )			*						*	*
Flowering dogwood ( <i>Cornus florida</i> )			*						*	
Fringetree ( <i>Chionanthus virginiana</i> )			*		*				*	*
Loblolly Bay ( <i>Gordonia lasianthus</i> )			*						*	
Mock Orange <i>Philadelphius inodorus</i> (other native cultivars)			*						*	*
Paw Paw ( <i>Asimina triloba</i> )			*				*		*	*
Red Bay ( <i>Persea borbonia</i> )			*						*	
Sassafras ( <i>Sassafras albidum</i> )			*		*		*		*	
Serviceberry ( <i>Amelanchier canadensis/arborea</i> )			*			*	*		*	
Silverbell ( <i>Halesia carolina</i> )									*	
Sourwood ( <i>Oxyndrum arboreum</i> )			*			*			*	
Southern Wax Myrtle ( <i>Myrica cerifera</i> )			*	*					*	
Sumac ( <i>Rhus aromatica</i> (fragrant); <i>copallina</i> (Shining); <i>R. glabra</i> (Smooth); <i>R. typhina</i> (Staghorn))					*		*		*	*
Umbrella Magnolia ( <i>Magnolia tripetala</i> )									*	*
Washington Hawthorn ( <i>Crataegus phaenophyrum</i> )			*							
Witch Hazel (Common) ( <i>Hamamelis virginiana</i> )					*		*		*	
Witch Hazel (Vernal) ( <i>Hamamelis vernalis</i> )					*	*	*			
Yaupon Holly ( <i>Ilex vomitoria</i> )			*	*		*	*		*	
<b><u>Shrubs (6)</u></b>										
Anise Bush ( <i>Illicium anisatum</i> )			*	*		*				
Azaleas ( <i>Rhodendron calendulaceum, canescens, periclymenoides, prunifolium</i> )					*				*	*
Beautyberry ( <i>Callicarpa americana</i> )					*	*			*	
Blueberry ( <i>Vaccinium spp.</i> )					*		*		*	

Buttonbush ( <i>Cephalanthus occidentalis</i> )					*				*	
Carolina Allspice (Sweetshrub) ( <i>Calycanthus floridus</i> )					*				*	
Carolina Rose ( <i>Rosa carolina</i> )					*				*	
Clethra ( <i>Clethra alnifolia</i> )					*				*	
Devil's Walking Stick ( <i>Aralia spinosa</i> )					*				*	*
Flowering dogwood ( <i>Cornus florida</i> )										
Drooping Leucothoe ( <i>Leucothoe fontanesiana</i> )					*				*	
Fortune Tea Olive ( <i>Osmanthus fortunei</i> )			*	*						
Glossy Abelia ( <i>Abelia grandiflora</i> )			*	*						
Hearts-a-burstin ( <i>Eunonymus americanus</i> )					*				*	
Highbush Blueberry ( <i>Vaccinium corymbosum</i> )					*				*	
Inkberry ( <i>Ilex glabra</i> )			*	*					*	
Japanese Yew ( <i>Taxus cuspidata</i> )			*	*						
Magnolia "Little Gem" ( <i>Magnolia grandiflora</i> )		*		*					*	
Mountain Laurel ( <i>Kalmia latifolia</i> )				*					*	
Oakleaf Hydrangea ( <i>Hydrangea quercifolia</i> )					*					*
Poet's Laurel ( <i>Danae racemosa</i> )			*	*						
Possumhaw ( <i>Ilex decidua</i> )									*	
Savannah Holly ( <i>Ilex x attenuata</i> )	*	*		*		*			*	
Silky dogwood ( <i>Cornus amomus</i> )									*	
Spicebush ( <i>Lindera benzoin</i> )					*	*			*	
Viburnum ( <i>acerifolium, dentatum, nudum, rafinesquianum, prunifolium, rufidulum</i> )			*		*				*	
Virginia sweetspire ( <i>Itea virginica</i> )									*	
Winterberry Holly ( <i>Ilex verticillata</i> )			*	*					*	
<b><u>Vines</u></b>										
Carolina Jessamine ( <i>Gelsemium sempervirens</i> )			*	*						
Confederate Jasmine ( <i>Trachelospermum jasminoides</i> )			*	*						
Trumpet Honeysuckle ( <i>Lonicera sempervirens</i> )			*	*						
Virginia Creeper ( <i>Parthenocissus quinquefolia</i> )			*	*						

**Footnotes:** (1) See 15-316 & 15-318. (2) See 15-307. (3) See 15-317. (4,5) Trees that are credited with 707 sf (4) and 314 sf (5) towards canopy requirements per Appendix E (E-3). (6) Shrubs may be credited towards canopy requirements, see 15-319. (a) as defined by NC Cooperative Extension Service and Natural Resources Conservation Service; native plants are preferred for all plantings. (b): as identified by Pollinator Partnership, for southeastern region.

Section 17. Appendix E-11 (Small Trees for Partial Screening) is amended to read as follows:

### **E-11 Small Trees for Partial Screening**

The following trees are recommended for use in all types of screens. Though smaller than the trees listed in planting lists E-12 and E-13, each of these trees will reach a height of at least 20 feet. Selections marked with an (\*) are also recommended as shade trees and may be credited for meeting the 35% shading requirement for paved parking lots.

Section 18. Appendix E-13 (Large Trees for Shading) is rewritten to read as follows:

### **E-13 Large Trees for Shading (Amended 6/22/04)**

The following trees may be used for screening, but they are recommended especially for shading streets and parking lots. Unless otherwise noted, they will grow rapidly. Each species will attain a mature spread of at least thirty feet. The trees on the following list marked with an “\*” are appropriate selections to satisfy Section 15-315, Required Trees Along Dedicated Streets.

#### **\*BLACK OAK (*Quercus velutina*) Height: 50 to 60 feet; Spread: 40 to 50 feet**

A large, deciduous oak of the red oak group with a globular, spreading crown. This tree is primarily native to upland hills, slopes and ridges. It is similar in appearance to red oak with which it may on occasion hybridize. Bark is almost black on mature trunks with deep furrows. Inner bark is yellow to orange. Trunk matures to 3' in diameter. Leathery, shiny, dark green leaves (to 10" long) have 7-9 deeply incised lobes (each with 1-3 bristle tipped teeth). Leaves turn yellow to yellow-brown to dull red in fall. Easily grown in average, acidic, dry to medium moisture, well-drained soils in full sun.

#### **CHESTNUT OAK (*Quercus montana*; *Q. prinus*) Height: 60 to 70 feet; Spread: 50 to 70 feet**

Chestnut oak is a medium-sized, native, deciduous, tree that is suited to dry, infertile, rocky upland sites, yet grows best on rich well-drained soils along streams. At maturity, it is a medium-sized long-lived tree with an irregular dense crown. The sweet acorns are an important food for many wildlife species including deer, turkeys, squirrels, chipmunks, and mice, while small birds, mammals, and bees use chestnut oak cavities for nesting.

#### **CUCUMBER TREE (*Magnolia acuminata*; *M. Fraserii*) Height: 50 to 80 feet; Spread: 50 to 80 feet**

Cucumber tree is the most widespread and hardiest of the eight native magnolia species. It grows fairly rapidly and well in rich, moist soils of slopes and valleys and matures in 80 to 120 years. This park-like tree is planted as an ornamental for its attractive leaves, flowers, and cucumber-shaped fruit, producing seeds that are eaten by birds and small mammals. Its shape is pyramidal when young, developing a straight trunk and a rounded crown.

**\*EASTERN RED OAK (*Quercus rubra*) Height: 50-70'; Spread: 40'+.**

This tree grows faster than any other Oak, two feet or more per year. It is prized as a street tree because its high branching habit gives it an ideal shape. The Red Oak grows in almost any average soil and presents no special maintenance problems.

**\*LAUREL OAK (*Quercus laurifolia*) Height: 40-60'; Spread: 30'+.**

The Laurel Oak grows more slowly than the other Oaks listed above, but it has the advantage of being nearly evergreen in Piedmont sections of North Carolina. It has proven to be a good street tree and does quite well under city conditions. It presents no special maintenance problems.

**POST OAK (*Quercus stellata*) Height: 40 to 50 feet; Spread: 35 to 50 feet**

Post oak is a small to medium-sized tree with a crown that has snarled and twisted branches and found on upland sites with full sun. This slow-growing drought resistant oak typically occupies rocky or sandy ridges and dry woodlands with a variety of soils. Acorns provide high-energy wildlife food during fall and winter for wild turkey, white-tailed deer, and squirrels, and provide habitat for birds and mammals. Post oak can be a beautiful shade tree for parks and to stabilize soil on dry, sloping, stony sites where few other trees will grow. It develops an attractive crown with strong horizontal branches.

**\*SCARLET OAK (*Quercus Coccinea*) Height: 60-80'; Spread: 40'+.**

This is a third Oak which grows rapidly and is easy to maintain. The Scarlet Oak is more difficult to transplant than the Red or the Willow, but it may be a worthwhile selection for its excellent foliage

**SOUTHERN CATALPA (*Catalpa bignonioides*) Height: 25 to 40 feet; Spread: 20 to 30 feet**

Catalpa is a medium-sized tree with spreading branches, an irregular crown, and generally crooked bole that is suited to moist, well-drained soils with full sun. The flowers and leaves make this an interesting landscape tree but the fruit can be messy.

**SOUTHERN SUGAR MAPLE (*Acer saccharum*; *A. barbatum*) Height: 20 to 25 feet; Spread: 20 to 40 feet**

Sugar maple grows on moist, well-drained soils and is very tolerant of shade. Seeds are eaten by birds and small animals. A popular ornamental for the fall color, Sugar Maple at maturity is a medium to tall tree with very dense elliptical crown.

**SWAMP CHESTNUT OAK (*Quercus michauxii*) Height: 60 to 70 feet; Spread: 50 to 70 feet**

Swamp chestnut oak grows in full sun on moist and wet loamy soils of bottomlands, along streams and borders of swamps, tolerates saturated or flooded soils for a few days to a few weeks. The acorns are sweet and serve as food to wildlife. The crown is round, compacted, and narrow.

**SWAMP WHITE OAK (*Quercus bicolor*) Height: 50 to 60 feet; Spread: 50 to 60 feet**

Swamp white oak is a medium sized tree with an irregular crown suitable to river bottomlands, depressions, swamp borders, and along edges of streams. It is rapid growing and long lived, attaining 300 to 350 years. Many kinds of wildlife eat the acorns, particularly ducks. Swamp white oak is intermediate in shade tolerance but not very drought tolerant.

**SYCAMORE (*Platanus occidentalis*) Height: 70-100'; Spread: 60'+.**

The Sycamore is probably the fastest growing shade tree on this list. Within ten years, it can grow to a height of between thirty and forty feet. It is easily transplanted, but it needs plenty of space. As one of nature's most massive trees, Sycamores have been known to grow to a height of 170 feet with a trunk 10 feet across. The Sycamore is a native tree which typically grows in flood plains, but it thrives in a variety of situations. Its tolerance of severe conditions has long made it a favorite choice as a street tree. Sycamores are susceptible to fungi and leaf blight and their large leaves and seed balls may present a litter problem.

**\*TULIP POPLAR (*Liriodendron tulipifera*) - Height 60'-150'; Spread 30-40'.**

Very common in eastern woodlands, this is a rapidly growing tree with colorful yellow leaves in Fall. Spring flowers, however, are not very noticeable. Difficult to transplant except when young. Excellent street tree.

**WHITE OAK (*Quercus alba*) Height: 60 to 100 feet; Spread: 50 to 90 feet**

White oak is found on fertile, moist, well-drained soils under partial sun. Acorns are eaten by game birds, deer, bear, and many small mammals. Pyramidal in youth, this species matures into a rugged, irregular crown that is wide spreading, with a stocky bole. While this species is potentially valuable for use in reforestation projects, it is not recommended near paved areas.

**\*WILLOW OAK (*Quercus phellos*) Height: 60-80'; Spread: 30'+.**

This is another rapidly growing Oak. It has proven to be quite successful as a street and parking lot tree in the Carrboro area. Its slender leaves give it a finer texture than that of other Oaks, but it still casts excellent shade. The Willow Oak is native to bottomland soils, and thus it needs plenty of moisture. It often spreads majestically as it matures so it should be given ample room to grow. No significant pests or diseases afflict the Willow Oak.

Section 19. Appendix E-14 (Small Shrubs for Evergreen Screening) is rewritten to read as follows:

**E-14 Small Shrubs and Vines for Evergreen Screening (Amended 6/22/04)**

The following shrubs and vines are recommended for informal (unclipped) hedges or screens. These are generally small species and appropriate for Semi-Opaque Screens.

**CAROLINA JESSAMINE\* (*Gelsemium sempervirens*) - Height up to 20'; Spread varies.**

A moderate growing, mostly evergreen vine that grows very well on fences. Fragrant yellow flowers in springtime. Prefers sun or partial shade. All parts of this plant are poisonous.

**CONFEDERATE JASMINE\* (*Trachelospermum jasminoides*) - Height up to 20'; Spread varies.**

Commonly called star jasmine, this is a twining, evergreen, woody vine. Axillary and terminal clusters of salverform, sweetly fragrant, starry, creamy white flowers appear in late spring with sporadic additional bloom in summer. Flowers are attractive to bees.

**GLOSSY ABELIA (*Abelia grandiflora*) Height: 4-6'; Spread: 3-5'.**

Abelia is quite common in local nurseries and tends to be less expensive than other shrubs on this list. It bears pale pink flowers throughout the summer. Although it has proven quite popular for informal hedges, it has several drawbacks. Abelia should be pruned and thinned to maintain its best form. It may drop its leaves due to low temperatures, lack of pruning, or starvation.

**INKBERRY (*Ilex Glabra*) Height: 5-10'; Spread: 4-8'**

Inkberry is an evergreen shrub with alternate leaves with a smooth or toothed margin. The bark is greenish brown and smooth. In early summer, small greenish white flowers mature. The shrub produces a black drupe that matures in the fall. It is a host plant for the Henry's Elfin butterfly. Fruits are eaten by birds and small mammals.

**JAPANESE YEW (*Taxus cuspidata*) Height: 4-6'; Spread: 5-7'.**

The versatile Yew is commonly available from local nurseries in a wide variety of sizes and shapes. The Japanese Yew serves as excellent screening material in either a clipped or unclipped form. It tolerates poor growing conditions and flourishes in almost any kind of soil. (Soggy soil may hamper its growth, however.) It is comparatively pest free and is hardy under trying winter conditions. The Yew's best feature is its rich shiny green needles which grow densely on all varieties.

**MOUNTAIN LAUREL (*Kalmia Latifolia*) Height: 6-10'; Spread: 5-8'**

A shrub that is abundant in the mountains with leaves that are alternate with a smooth margin, raised mid-vein, and yellow underside. The bark is thin, smooth, and dark brown-red in color in young trees. The bark shreds and splits as the plant ages. In late spring to early summer, very showy clusters of white to rose flowers mature.

**POET'S LAUREL (*Danae racemosa*) Height: 2 to 3 feet; Spread: 2 to 3 feet**

Poet's Laurel prefers partial to full shade, moist, well-drained soil enriched with organic matter; but does tolerate clay soils. It has an open growth habit with slender branches that arch up and away from center of crown. It can spread by rhizomes. While foliage discolors in sun; it can be long-lasting for flower arrangements.

**TRUMPET HONEYSUCKLE\* (*Lonicera sempervirens*) - Height up to 50'; Spread varies.**

A rapid growing, mostly evergreen vine with beautiful orange to red to yellow flowers occurring in late spring and throughout the summer. Best in full sun.

**WINTERBERRY HOLLY (*Ilex verticillata*) Height: 6 to 15 feet; Spread: 6 to 10 feet**

With a slow to moderate growth rate, this species is suited to partial to full sun on moist soils, but can tolerate drought. Early summer brings small white flowers that mature into dense clusters of bright red berries.

Note: \* Vines - which if grown on a trellis would make a nice evergreen screen.



Section 20. Appendix E-15 (Small Trees and Large Shrubs for Evergreen Screening is rewritten to read as follows:

### **E-15 Small Trees and Large Shrubs and Trees for Evergreen Screening**

The following shrubs are recommended for high hedges or screens. Each species grows to a height of more than 6 feet and are generally appropriate for Opaque Screens.

#### **ANISE BUSH (*Illicium anisatum*) - Height 8-12'; Spread 8-10'.**

moderate growing, evergreen shrub with an open habit. Small flowers appear in mid-Summer. Prefers a fair amount of moisture, with partial to full sun. Subject to damage during very cold winters.

#### **CAROLINA CHERRY-LAUREL (*Prunus caroliniana*) Height: 20-30'; Spread: 15-20'.**

This tree is prized for its dense evergreen foliage. It may be trimmed as a hedge, but also serves as an excellent screen in its natural form. The Cherry-Laurel grows rapidly and has no pests. However, it may not be as cold hardy as other trees on this list.

#### **FORTUNE TEA OLIVE (*Osmanthus fortunei*) Height: 9-12'; Spread: 5-7'.**

This *Osmanthus* hybrid is a popular, though non-descript, shrub. With its vigorous growth, it will form an excellent screen or border. It is soil tolerant. The Fortune Tea Olive is most notable for its inconspicuous yet highly fragrant flowers.

#### **LOBLOLLY BAY (*Gordonia lasianthus*) Height 30 to 60 feet; Spread 10 to 15 feet**

Loblolly-bay is a small to medium-sized native, evergreen tree that grows on acid soils in flat woodlands or shallow depressions with little or no slope, slow runoff, and poor to very poor drainage. It has a narrow crown and straight trunk.

#### **MAGNOLIA "LITTLE GEM" Height 15 to 30 feet; Spread 15 to 20 feet**

'Little Gem' is a much smaller and slower growing Magnolia cultivar that typically grows as a compact upright multi-stemmed shrub or small tree. It features glossy green leaves (to 5" long) that are bronze-brown underneath. Fragrant white flowers (to 4" diameter) bloom in summer. It is effective as a screen, a small street tree or in containers.

#### **RED BAY (*Persea borbonia*) Height: 15 to 40 feet; Spread 10 to 20 feet**

Redbay is an attractive aromatic evergreen tree suitable for sites with partial to full sun and prefers drier soils. Birds and small mammals eat the fruit.

#### **SAVANNAH HOLLY (*Ilex X Attenuata* 'Savannah') Height: 25 to 40'; Spread 8 to 12 feet**

This holly grows quickly in full sun or partial shade on moist, acid soils. Plants in full sun can grow a dense canopy, those in partial shade are more open. Trees attract cedar waxwings, mockingbirds, robins and many other birds. This holly makes a fairly durable street tree. It is quite drought-tolerant once it becomes well-established. The crown grown with one central trunk is preferred, making it well-suited for urban areas having restricted vertical space. Savannah Holly has also performed well in sidewalk cutouts/small tree pits, in parking lots and median strip plantings and for screens.

**SOUTHERN WAX MYRTLE (*Myrica cerifera*) Height 40 feet; Spread 20 to 25 feet**

Southern wax myrtle is an erect, shade tolerant, ornamental, evergreen, small tree or shrub. Its flat leaves are aromatic when crushed and may repel. Underground runners extend the growth laterally and root nodules are capable of atmospheric nitrogen fixation.

**YAUPON HOLLY (*Ilex vomitoria*) Height: 5-15'; Spread: 6-12'**

This is another versatile Holly, slower growing than the Burford, but equally as adaptable to adverse conditions. It is a native shrub which has proven to be one of the most drought resistant of all Hollies. It may be clipped to maintain any desired height. The Yaupon Holly is very heavily fruited and will attract birds.

Section 21. Appendix E-16 (Assorted Plantings for Broken Screens) is rewritten to read as follows:

**E-16 Assorted Plantings for Broken Screens (Amended 6/22/04)**

The following is a sampling of shrubbery which would be appropriate in a Broken Screen. Because many of these plants are deciduous, they are not suitable for Opaque and Semi-Opaque Screens. (Note: Many of the evergreen shrubs described in planting lists E-14 and E-15 are also suitable for Broken Screens.)

**AZALEAS (*Rhododendron calendulaceum* (Flame); *R. nudiflora* & *R. periclymenoides* (Pinxterbloom); *R. prunifolium* (Plumleaf)) Height 3 to 10 feet; Spread 4 to 8 feet.**

These three azaleas are excellent naturalizing plants that do not require a lot of space. With great orange, pink, and red colors, these species attract hummingbirds and butterflies. Good for sites with full sun to part shade with medium moisture on well-drained soils with a southwest aspect.

**BEAUTYBERRY (*Callicarpa americana*) - Height 6'.**

Very colorful deciduous shrub with springtime flowers, followed by purple fruit which lasts into winter. Prefers full sun.

**\*BLUEBERRY (*Vaccinium ashei*) - Height 4-6'; Spread 3-5'.**

Also known as Rabbiteye blueberry, this is a heat tolerant, native shrub. White flowers in springtime followed by blue fruits that birds enjoy. Has a moderate growth rate. This shrub prefers well drained, acid soil.

**BUTTON BUSH (*Cephalanthus occidentalis*) Height: 6 to 10 feet Spread: 6 to 10 feet**

Buttonbush is a deciduous, warm-season, tall shrub or small tree that grows along swamps, marshes, bogs, ditches, and other riparian areas that are seasonally inundated for at least part of the year. Its base is often swollen, with green branches when young but turns brown at maturity. Tiny, white flowers occur in dense, spherical clusters at branch ends attract bees and butterflies with fruits arranged in a round cluster of brown, cone-shaped nutlets.

**CAROLINA ALLSPICE OR SWEETSHRUB (*Calycanthus floridus*) - Height 6-9'; Spread 5-8'.**

This is a deciduous shrub native to the Southeast. Fragrant, maroon flowers appear in late Spring. Takes sun or shade.

**CAROLINA ROSE (*Rosa carolina*) Height 3 to 6 feet Spread: 5 to 10 feet**

Best grown in average, medium-wet to wet, well-drained soil in full sun. Fragrant, showy flowers attract birds and butterflies, but this plant does have thorns.

**CLETHRA (*Clethra alnifolia*) - Height 10'.**

Another native of the Eastern United States, Clethra has fragrant white flowers in late Summer. Grows well in acid soils. Full sun, however in the Piedmont it would do best with some shade. Varieties are available with pink flowers.

**COMMON WITCH HAZEL (*Hamamelis virginiana*) Height: 8-15'; Spread 7-14'.**

This shrub is a larger version of Vernal Witch Hazel with many of the same qualities. It is another native woodland plant which has adapted well to landscaping uses. The Common Witch Hazel is recommended for shady areas, but when planted in the sun it grows to be a splendid well rounded specimen. It is especially useful in large areas.

**DROOPING LEUCOTHOE (*Leucothoe fontanesiana*) Height: 3-4'; Spread: 4-6'.**

Drooping Leucothoe is a moundlike shrub which is good for planting in front of and between other flora and beneath trees. It is hardy in city conditions and gives a natural effect when planted along borders. This native evergreen is graceful and attractive in all seasons. It is easy to transplant but requires a heavy mulch and should be provided with at least partial shade. Old branches should be pruned occasionally to stimulate new growth.

**EUONYMUS AMERICANA (Hearts-a-Burstin; Strawberry Bush) Height: 3-5'; Spread: 4-6'**

Strawberry Bush is a native deciduous shrub with leaves that are opposite with finely toothed margins. The bark is green, but does split and become darker as the tree ages. In early summer, small, 5-petaled, greenish purple flowers mature. The shrub produces 4-lobed capsules which when opened reveal an orange-red, warty seed.

**FRINGETREE (*Chioanthus virginicus*) Height: 10-30'; Spread: 8-10'.**

The Fringetree is known for its profusion of beautiful flowers. It is considered to be one of the most striking native American shrubs. It is relatively difficult to transplant, but once established it does well in cities as it endures heavy smoke and dust. The mature Fringetree's only drawback is that its leaves appear rather late in the Spring.

**HIGHBUSH BLUEBERRY (*Vaccinium Corymbosum*) Height: 8-15'; Spread: 8-12'**

Highbush Blueberry is a deciduous shrub with alternate leaves with a smooth or toothed margin and fuzzy underside. The bark is gray-brown to reddish brown and very shreddy. In early spring, small, white, bell-shaped flowers mature in clusters. The shrub produces a dark blue berry that matures in mid to late summer. It is a host plant for the Brown Elfin butterfly. Fruits are eaten by a variety of birds and mammals, including humans.

**INKBERRY (*Ilex Glabra*) Height: 5-10'; Spread: 4-8'**

Inkberry is an evergreen shrub with alternate leaves with a smooth or toothed margin. The bark is greenish brown and smooth. In early summer, small greenish white flowers mature. The shrub produces a black drupe that matures in the fall. It is a host plant for the Henry's Elfin butterfly. Fruits are eaten by birds and small mammals.

**OAKLEAF HYDRANGEA (*Hydrangea quercifolia*) - Height 4-6'; Spread 3-5'.**

Deciduous shrub with large, white flower clusters during the Summer. Colorful crimson foliage in Fall. Makes an excellent specimen plant.

**SMOKETREE (*Cotinus coggygia*) - Height 10-15'; Spread 8-14'.**

Large shrub or small deciduous tree with attractive round leaves. Colorful lavender panicles appear in Summer. Prefers well drained soil, but otherwise does well in poor soils. Full sun is best for this shrub.

**SPICEBUSH (*Lindera benzoin*) - Height 6-10'; Spread 4 -8'**

Spicebush is a deciduous shrub alternate leaves with a smooth margin that produce a spicy odor when crushed. The bark is brown to gray-brown and speckled with light colored lenticels. In early spring, small, yellow flowers mature in axillary clusters. The shrub produces a bright red drupe with a peppery taste and scent. The fruit matures in the fall. It is a host plant for the Spicebush Swallowtail butterfly. Fruits are eaten by songbirds, especially during fall migration.

**STAR MAGNOLIA (*Magnolia stellata*) Height: 10-12'; Spread: 8-10'.**

This handsome specimen shrub is considered to be the hardiest of all the Magnolias. It forms a broad, rounded mass. It becomes tree-like with age but continues to branch to the ground. Early in the spring, it produces numerous fragrant white flowers. The Star Magnolia should not be planted adjacent to shallow rooting trees. It should be allowed plenty of sun.

**SUMAC (*Rhus copallina* (Shining); *R. glabra* (Smooth) *R. typhina* (Staghorn)) Height 7 to 40 feet; Spread 9 to 20 feet**

These species are perennial, deciduous, sun-loving, thicket-forming shrubs or small trees with branches that tend to be fairly sparse and stout. Sumac does well on dry to medium moisture sites. The tart fruits are eaten by birds and are very tart in taste. These species provide good fall color.

**\*\*\*\* SWAMP WHITE OAK (*Quercus bicolor*) Height: 50 to 60 feet; Spread: 50 to 60 feet**

Swamp white oak is a medium sized tree with an irregular crown suitable to river bottomlands, depressions, swamp borders, and along edges of streams. It is rapid growing and long lived, reaching 300 to 350 years. Many kinds of wildlife eat the acorns, particularly ducks. Swamp white oak is intermediate in shade tolerance but not very drought tolerant.

**VERNAL WITCH HAZEL (*Hamamelis vernalis*) Height: 4-6'; Spread: 2- 3'.**

This rapidly growing native shrub is excellent for bordering and naturalizing. It assumes a dense, upright form, thriving in even the most polluted air. Other than plenty of watering, the Vernal Witch Hazel requires no special maintenance.

**\*\*\*Viburnum (Viburnum prunifolium; V. dentatum) Height: 12 to 15 feet; Spread: 8 to 12 feet**

Black Haw is a small tree with twisted trunk and arching branches with an overall round crown appearance. Does best on partially sunny sites on moist, well-drained soils.

Section 22. Appendix E-17 (List of Invasive Plant Species) is rewritten to read as follows:

**E-17 Invasive Plant Species**

Invasive plant species identified by the North Carolina Native Plant Society are prohibited from planting for all plantings to comply with Article XIX.

Section 23. All provisions of any Town Ordinance in conflict with this Ordinance are repealed.

Section 24. This Ordinance shall become effective upon adoption.

## **ARTICLE XIX**

### **SCREENING AND TREES**

#### **PART I. SCREENING**

##### **Section 15-304 Board Findings Concerning the Need for Screening Requirements.**

The Board finds that:

- (1) Screening between two lots lessens the transmission from one lot to another of noise, dust, and glare.
- (2) Screening can lessen the visual pollution that may otherwise occur within an urbanized area. Even minimal screening can provide an impression of separation of spaces, and more extensive screening can shield entirely one use from the visual assault of an adjacent use.
- (3) Screening can establish a greater sense of privacy from visual or physical intrusion, the degree of privacy varying with the intensity of the screening.
- (4) The provisions of this part are necessary to safeguard the public health, safety, and welfare.

##### **Section 15-305 General Screening Standards**

Every development shall provide sufficient screening so that:

- (1) Neighboring properties are shielded from any adverse external effects of that development;
- (2) The development is shielded from the negative impacts of adjacent uses such as streets or railroads.

##### **Section 15-306 Compliance with Screening Standards**

(a) The table set forth in Section 15-308, in conjunction with the explanations in Section 15-307 concerning the types of screens, establishes screening requirements that, presumptively, satisfy the general standards established in Section 15-305. However, this table is only intended to establish a presumption and should be flexibly administered, as provided in Section 15-309.

(b) The numerical designations contained in the Table of Screening Requirements (Section 15-308) are keyed to the Table of Permissible Uses (Section 15-146), and the letter designations refer to types of screening as described in Section 15-307. This table indicates the

***Art. XIX - SCREENING AND TREES***

type of screening that may be required between two uses. Where such screening is required, only one of the two adjoining uses is responsible for installing the screening; the use assigned this responsibility is referred to as the “servient” use in Section 15-308, and the other use is the “dominant” use. To determine which of the two adjoining uses is required to install the screening, find the use classification number of one of the adjoining uses in the servient column and follow that column across the page to its intersection with the use classification number in the dominant use column that corresponds to the other adjoining use. If the intersecting square contains a letter, then the use whose classification number is in the servient column is responsible for installing that level of screening. If the intersecting square does not contain a letter, then begin the process again, starting this time in the servient column with the other adjoining use.

(c) If, when the analysis described in subsection (b) is performed, the servient use is an existing use, but the required screening is not in place, then this lack of screening shall constitute a nonconforming situation, subject to all the provisions of Article VIII of this ordinance.

(d) Notwithstanding any other provision of this article, a multi-family development shall be required at the time of construction, to install any screening that is required between it and adjacent existing uses according to the table set forth in Section 15-308, regardless of whether, in relation to such other uses, the multi-family development is the dominant or servient use.

**Section 15-307 Descriptions of Screens.**

The following three basic types of screens are hereby established and are used as the basis for the Table of Screening Requirements set forth in Section 15-308.

- (1) **OPAQUE SCREEN. TYPE “A”.** A screen that is opaque from the ground to a height of at least six feet, with intermittent visual obstructions from the opaque portion to a height of at least twenty feet. An opaque screen is intended to exclude completely all visual contact between uses and to create a strong impression of spatial separation. The opaque screen may be composed of a wall, fence, landscaped earth berm, planted vegetation, or existing vegetation. Compliance of planted vegetation screens or natural vegetation will be judged on the basis of the average mature height and density of foliage of the subject species, or field observation of existing vegetation. The opaque portion of the screen must be opaque in all seasons of the year. At maturity, the portion of intermittent visual obstruction should not contain any completely unobstructed openings more than ten feet wide. The portion of intermittent visual obstructions may contain deciduous plants. Suggested planting patterns that will achieve this standard are included in Appendix E.
- (2) **SEMI-OPAQUE SCREEN. TYPE “B”.** A screen that is opaque from the ground to a height of three feet, with intermittent visual obstruction from above the opaque

*Art. XIX - SCREENING AND TREES*

portion to a height of at least twenty feet. The semi-opaque screen is intended to partially block visual contact between uses and to create a strong impression of the separation of spaces. The semi-opaque screen may be composed of a wall, fence, landscaped earth berm, planted vegetation, or existing vegetation. Compliance of planted vegetation screens or natural vegetation will be judged on the basis of the average mature height and density of foliage of the subject species, or field observation of existing vegetation. At maturity, the portion of intermittent visual obstructions should not contain any completely unobstructed openings more than ten feet wide. The zone for intermittent visual obstruction may contain deciduous plants. Suggested planting patterns which will achieve this standard are included in Appendix E.

- (3) **BROKEN SCREEN. TYPE “C”.** A screen composed of intermittent visual obstructions from the ground to a height of at least twenty feet. The broken screen is intended to create the impression of a separation of spaces without necessarily eliminating visual contact between the spaces. It may be composed of a wall, fence, landscaped earth berm, planted vegetation, or existing vegetation. Compliance of planted vegetative screens or natural vegetation will be judged on the basis of the average mature height and density of foliage of the subject species, or field observation of existing vegetation. The screen may contain deciduous plants. Suggested planting patterns which will achieve this standard are included in Appendix E.

**Section 15-308 Table of Screening Requirements (AMENDED 06/26/07)**

**[PLEASE REFER TO THE NEXT TEN PAGES]**



**Section 15-309 Flexibility in Administration Required.**

(a) The Board recognizes that because of the wide variety of types of developments and the relationships between them, it is neither possible nor prudent to establish inflexible screening requirements. Therefore, as provided in Section 15-306, the permit-issuing authority may permit deviations from the presumptive requirements of Section 15-308 and may require either more intensive or less intensive screening whenever it finds such deviations are more likely to satisfy the standard set forth in Section 15-308 without imposing unnecessary costs on the developer.

(b) Without limiting the generality of subsection (a), the permit-issuing authority may modify the presumptive requirements for:

- (1) Commercial developments located adjacent to residential uses in business zoning districts.
- (2) Commercial uses located adjacent to other commercial uses within the same zoning district.
- (3) Uses located within planned unit developments.

(c) Whenever the permit-issuing authority allows or requires a deviation from the presumptive requirements set forth in Section 15-308, it shall enter on the face of the permit the screening requirement that it imposes to meet the standard set forth in Section 15-308 and the reasons for allowing or requiring the deviation.

(d) If the permit-issuing authority concludes, based upon information it (or the appearance commission) receives in the consideration of a specific development proposal, that a presumption established by Section 15-308 is erroneous, it shall initiate a request for an amendment to the Table of Screening Requirements in accordance with the procedures set forth in Article XX.

**Section 15-310 Combination Uses.**

(a) In determining the screening requirements that apply between a combination use and another use, the permit-issuing authority shall proceed as if the principal uses that comprise the combination use were not combined and reach its determination accordingly, relying on the table set forth in Section 15-308, interpreted in the light of Section 15-309.

(b) When two or more principal uses are combined to create a combination-use, screening shall not be required between the composite principal uses unless they are clearly separated physically and screening is determined to be necessary to satisfy the standard set forth in Section 15-305. (For example, screening may be required in a residential combination use consisting of single-family and multi-family components.)

*Art. XIX - SCREENING AND TREES***Section 15-311 Landscaping Plan.**

Any person who has been issued a permit under this chapter for any development in a non-residential district involving the construction of new buildings or parking areas or additions to or exterior modifications of existing buildings or parking areas, as well as (i) any similar development in a residential district, if such development requires a special or conditional use permit, shall prepare and file a landscaping plan prior to the issuance of a building permit for such development. No building permit shall be issued for such development until the Appearance Commission has had the opportunity, pursuant to regular agenda procedures, to review and comment upon such landscaping plan. (AMENDED 2/4/86)

**Section 15-311.1 Screening of Flag Lots in the Historic District (HD) (AMENDED 11/21/95).**

Notwithstanding the provisions of Section 15-308, every flag lot in the Historic District (HD) shall provide a Type B screen [as described in Section 15-307 (1)] between the flag lot and adjacent property [see Section 15-175.10(c)].

**Section 15-312 Protective Buffer Along Major Roads (AMENDED 05/25/99; 10/23/07)**

Notwithstanding the provisions of Section 15-308, but subject to the remaining provisions of this section, an undisturbed protective buffer shall be maintained along Old N.C. 86, Dairyland Road, Union Grove Church Road, Homestead Road, Eubanks Road and Smith Level Road south of Ray Road that will help preserve the scenic views and elements of this area. With respect to each property that fronts one of the named streets, any development other than use classification 13.200, Fire Station, that occurs after the effective date of this section shall provide an undisturbed buffer (except for necessary crossings) that is a minimum of 50 feet in width and on average is 100 feet in width along such frontage. If the buffer area does not provide the equivalent of a Type 'A' screen, the developer shall provide a Type 'A' screen on the development's side of the buffer (one hundred (100) feet from the right-of-way)

**Section 15-313 Reserved.**

*Art. XIX - SCREENING AND TREES*

**PART II. SHADING AND TREE PROTECTION**

**Section 15-314 Board Findings and Declaration of Policy on Protecting Trees and Other Plants (REWRITTEN 06/24/14)**

- (a) The Board finds that:
- (1) Trees, shrubs, and other plants are proven producers of oxygen, a necessary element for human survival; and
  - (2) Trees, shrubs, and other plants appreciably reduce carbon emissions by shading buildings and thereby lowering energy use to cool buildings, and also store carbon as biomass; and
  - (3) Trees, shrubs, and other plants improve air quality by lowering air temperatures and removing air pollutants; and
  - (4) Trees, shrubs, and other plants transpire considerable amounts of water each day and thereby maintain the natural hydrologic cycle; and
  - (5) Trees, shrubs, and other plants through their canopies and root systems intercept precipitation and encourage rain to infiltrate into the soil and maintain soil water for plants and recharge ground water and play an important and effective part in soil conservation, erosion control, creek protection and flood control; and
  - (6) Trees, especially large, old trees, provide invaluable beneficial physical, aesthetic, historic, and psychological counterpoint to the urban setting, making urban life more comfortable by providing shade and cooling the air and land, and built environment, reducing noise levels and glare, shielding people from high winds, and breaking the monotony of human developments on the land, particularly for parking areas and streets; and
  - (7) Trees, shrubs and other plants help improve soil quality by breaking up heavy soils, mining nutrients and remediating soils at contaminated sites by absorbing, transforming and containing a number of contaminants; and
  - (8) Tree stands create habitats that support a diversity of plants and animals; and
  - (9) Trees, shrubs and other plants make important contributions to the vitality and character of the Town and its neighborhoods and create a more aesthetic, pleasant and emotionally satisfying place in which to live, work and spend leisure time; and

*Art. XIX - SCREENING AND TREES*

- (10) Trees, shrubs and other plants provide numerous human health benefits such as shading ultraviolet radiation, reducing rates of respiratory disease and illness and stress management; and
- (11) Trees, shrubs and other plants have an important impact on the desirability of land and, consequently, on property values, as well as benefitting commercial activity by creating a more enjoyable environment. **(AMENDED 03/21/89)**

(12) Certain flowering trees, shrubs, and other plans are important sources of pollen and nectar for pollinators.

(b) Based upon the findings set forth in subsection (a), the Board declares that it is not only desirable but essential to the health, safety, and welfare of all persons living or working within the town's planning jurisdiction, present and future, to protect certain existing trees and tree stands and, under the circumstances set forth in this article, to require the planting of new trees, especially larger trees, in certain types of developments, and to ensure the protection of those trees whether on individual lots or on common space.

**Section 15-315 Definitions (REWRITTEN 06/24/14)**

Unless otherwise specifically provided, or unless the context clearly indicates otherwise, the words and phrases defined below shall have the meaning indicated when used in this Part.

- (1) Canopy tree: A healthy evergreen or deciduous tree species that matures at a height of at least thirty (30) feet.
- (2) Dripline: Perimeter formed by the points farthest away from the trunk of a tree where precipitation falling from the branches of that tree lands on the ground).
- (3) Clearcutting: The large-scale, indiscriminate removal of trees, shrubs, and undergrowth with the intention of preparing real property for nonagricultural purposes. **(AMENDED 05/25/99)**
- (4) Habitat. The natural environment for animals and - plants that is made up of physical factors such as soil, moisture, range of temperature, and availability of light as well as biotic factors such as the availability of food, nesting sites, and shelter.
- (45) A specimen or rare tree is defined as any healthy tree that:
  - i. has a trunk diameter at breast height (dbh) of thirty-six (36) inches or more for pine tree species; or
  - ii. has a trunk dbh of 18" inches or more for any species; or
  - iii. has a trunk dbh of 12 inches or more in the case of the species from the following list of North Carolina native canopy tree genera; or

*Aesculus* (Ohio Buckeye)

*Art. XIX - SCREENING AND TREES*

*Chamaecyparis* (Atlantic White Cedar)  
*Carya* (Southern Shagbark Hickory)  
*Diospyros* (Persimmon)  
*Fagus* (Beech)  
*Juniperus* (Eastern Red Cedar)  
*Magnolia* (Magnolia)  
*Pinus* (Longleaf pine)  
*Quercus* (Swamp Chestnut Oak)  
*Taxodium* (Bald cypress)  
*Tsuga* (Hemlock)  
*Ulmus* (American Elm)

iv. has a trunk dbh of six inches or more in the case of the species from the following list of North Carolina native understory tree genera: or

*Amelanchier* (Serviceberry)  
*Asimina* (Pawpaw)  
*Carpinus* (Hornbeam)  
*Cercis* (Redbud)  
*Chionanthus* (Fringetree)  
*Cornus* (Dogwood)  
*Crataegus* (Hawthorn)  
*Halesia* (Silverbell)  
*Hamamelis* (Witch-hazel)  
*Ilex* (Holly)  
*Ostrya* (Hophornbeam)  
*Oxydendrum* (Sourwood)  
*Sassafras* (Sassafras)

v. is listed as a State or National Champion by the North Carolina Forest Service or the American Forestry Association; or

vi. provides unique habitat for any endangered or threatened wildlife species protected by Federal law; or

vii. has been cited by the Board of Aldermen as being historically significant; or

viii. any other tree species listed in the North Carolina Natural Heritage Program as being significantly rare, of special concern, threatened, or endangered.

(56) Tree. A perennial woody plant, single or multiple trunks, with few if any branches on its lower part, which at maturity will obtain a minimum six (6) inch caliper.

(67) Tree canopy. The combined area encompassing the drip zones of all canopy trees.

(78) Tree Protection Perimeter: That area within a circle drawn with the tree's trunk as the center. Radius is dependent upon site conditions and the relative tolerance of tree species to

*Art. XIX - SCREENING AND TREES*

construction damage. Standard accepted radius is 1-1.5 feet per diameter inch of tree to be retained.

(9) Tree Stand: An aggregation of trees occupying a specific area and generally uniform in species composition, size, age, arrangement, and condition that distinguishes it from vegetation in adjoining areas.

**Section 15-316 Required Trees Along Dedicated Streets.**

Along both sides of all newly created streets with respect to which an offer of dedication is required to be made by this chapter, the developer shall either plant or retain sufficient trees so that, between the paved portion of the street and a line running parallel to and fifty feet from the center line of the street, there is for every thirty feet of street frontage at least an average of one deciduous tree that has or will have when fully mature a trunk at least twelve inches in diameter. Trees planted to satisfy this section shall not be placed uniformly but in an irregular pattern with a minimum of one twelve inch (12") diameter tree (when fully mature) every one hundred feet (100'). When trees are planted by the developer pursuant to this section, the developer shall choose trees that meet the standards set forth in Appendix E. (AMENDED 11/19/96)

**Section 15-317 Retention and Protection of Specimen and Rare Trees**

(a) Every development shall retain all existing specimen and rare trees ~~unless the retention of such trees would unreasonably burden the development~~. When a site would be so unreasonably burdened by the retention of all such trees that a choice must be made as to which trees will be retained, the following criteria shall be used by the applicant, in consultation with the land use administrator and a landscape or forestry professional, who is a certified arborist, to evaluate the trees for the purpose of deciding which to retain: (AMENDED 06/24/14)

- (1) The rareness of the tree species, both relative to the species representation on the site and relative to the species representation within the region and the state. This shall be the most important criterion in the evaluation;
- (2) ~~The tree's relative~~ size and age, large old trees being considered more valuable than smaller, younger trees of the same species;
- (3) The ~~expected longevity of the tree, trees' relative expected longevities~~, including such factors as the trees' relative health at the time of the evaluation;
- (4) The ~~relative~~ hardness of the trees ~~in question~~, including wind firmness, climatic requirements, susceptibility to insects and diseases;
- (5) ~~The trees' relative~~ aesthetic values, including flowers, fruit, form characteristics, potential for autumn coloration;

*Art. XIX - SCREENING AND TREES*

(6) ~~S~~The trees' relative sizes at maturity; and

(7) ~~P~~The trees' relative contribution to summertime comfort through their potential to provide shading. (AMENDED 03/21/89)

(b) Flexible approaches such as adjustments to lot layout, placement of buildings and paved surfaces and location of utilities should be pursued in order to save rare and specimen trees. (AMENDED 03/21/89; 06/24/14)

(c) ~~S~~No excavation or other subsurface disturbance ~~may be undertaken~~ within the Tree Protection Perimeter around any tree to be retained in accordance with (a) above, shall be limited to the minimum extent practicable as determined by a certified arborist. ~~In addition, no impervious surface (including but not limited to equipment, paving, and structures) may be located within the Tree Protection Perimeter, either~~ during construction or after completion of the development. (AMENDED 03/21/89; 06/24/14)

(d) There shall be no clearcutting in any development within the Transition Area portion of the Carrboro Joint Development Area as identified in the Joint Planning Agreement. The term "clearcutting" shall refer to the large-scale, indiscriminate removal of trees, shrubs, and undergrowth with the intention of preparing real property for nonagricultural purposes. (AMENDED 05/25/99; 06/24/14)

(e) If space that would otherwise be devoted to parking cannot be so used because of the requirements of subsections (a) or (b), and, as a result, the parking requirements set forth in Article XVIII cannot be satisfied, the number of required spaces may be reduced by the number of spaces "lost" because of the provisions of subsections (a) and (b), up to a maximum of fifteen percent of the required spaces. (AMENDED 06/24/14)

**Section 15-318 Shade Trees In Parking Areas.**

(a) Vehicle accommodation areas containing more than four parking spaces that are required by Section 15-296 must be shaded by deciduous trees (either retained or planted by developer) that have or will have when fully mature a trunk at least twelve inches in diameter. When trees are planted by the developer to satisfy the requirements of this subsection, the developer shall choose trees that meet the standards set forth in Appendix E. As part of the redevelopment of an infill lot in the B-1(C), B-1(G), or B-2 districts, up to 25% of the shading requirement may be from existing or proposed buildings providing shadow as identified in the provisions of Appendix A, A-6(26). (AMENDED 11/10/81; 06/24/14)

(b) Each tree of the type described in subsection (a) shall be presumed to shade a circular area having a radius of fifteen feet with the trunk of the tree as the center, and there must be sufficient trees so that, using this standard, thirty-five percent of the vehicle accommodation area will be shaded. (AMENDED 06/24/14)

***Art. XIX - SCREENING AND TREES***

(c) No paving may be placed within 15 feet (measured from the trunk) of any tree retained to comply with subsection (a), unless such tree is eighteen inches or greater in diameter or a very rare species as described in Section 15-315~~6~~, in which case no paving may be placed within the Tree Protection Perimeter for such trees as described in 15-315~~(8)(b)~~(8). New trees planted to comply with subsection (a) shall be located so that they are surrounded by at least 200 square feet of unpaved area. Notwithstanding the foregoing, new trees planted on infill lots in the B-1(C), B-1(G) or B-2 districts may be surrounded by less than 200 square feet of unpaved area if installed with an urban tree planting system, specified by a professional engineer and landscape architect or certified arborist, that will ensure the survival of the tree for its typical life expectancy. (AMENDED 5/10/83; 03/21/89)

(d) Vehicle accommodation areas shall be laid out and detailed to prevent vehicles from striking trees. Vehicles will be presumed to have a body overhang of three feet six inches.

(e) The foregoing requirements shall not apply to 19.100 classification uses where such uses do not involve the construction of a permanent structure and are conducted not more than two days per week on the site of a vehicle accommodation area that is used primarily in connection with another use. Furthermore, when a 19.100 classification use meeting the foregoing requirements is installed on a lot that is nonconforming with respect to the shading requirements of this section, the lot shall not be required to comply with these shading requirements solely because of installation of such use, even though a new permit applicable to the entire lot may be required. (AMENDED 9/2/86)

**Section 15-319 Tree Canopy Coverage Standards (REWRITTEN 06/24/14)**

(a) *Minimum Canopy Coverage Standards.* Subject to the remaining provisions of this section, the following minimum tree canopy coverage percentages are required within the boundaries of every lot or tract for which a zoning, special use, or conditional use permit is issued ~~after June 24<sup>th</sup>, 2014~~, exclusive of required cleared active recreation areas, water bodies, access easements, public and private right-of-way, stormwater and utility easements.

**Table 1: Minimum Tree Canopy Coverage Standards**

Land Use	Minimum Canopy Coverage
Residential	40%
Other than residential excluding districts (B-1(c), (B-1(g), (B-2)	30%
Other than residential in districts (B-1(c), (B-1(g), (B-2)	15%

~~(4)~~ When a tract is subdivided and pursuant to the provisions of Article XIII the developer sets aside open space areas or recreation areas that contain canopy trees (with a minimum caliper of six inches) or when a developer of a subdivision plants canopy trees to comply with the shading requirements of Article XIII, the total tree canopy area so preserved or established shall be



*Art. XIX - SCREENING AND TREES*

credited against the minimum canopy coverage percentages set forth above. The remaining required tree canopy coverage area shall be allocated by the subdivider among the subdivided lots, and this allocation shall be shown on the recorded plat of such subdivision with a disclosure note that such trees, to fulfill the requirements of this section, shall be subject to maintenance and replacement.

~~*(b) Modifications to Canopy Coverage Standards*~~

~~The permit issuing authority may approve a development application that does not fully comply with the canopy coverage standards when it finds that the application substantially complies with these standards and that such a deviation enables the development to better achieve other Town objectives, such as the promotion of solar access to encourage active and passive solar technology for water and space heating and renewable energy generation, improved stormwater management, and the preservation of established managed landscapes, or established streetscapes.~~

*(be) Implementation of Standards.* Compliance with the tree canopy standards shall be achieved as follows:

1) Protection of existing tree canopy. The extent of existing tree canopy coverage retained at the time of permit application may be documented by survey or by using current aerial photographs available on the Town's web page or similar resource. Protection of the existing tree canopy will be demonstrated by the tree protection plan required by Section 15-320;

2) Replacement of canopy. If the existing protected tree canopy is less than the minimum standard as shown in Table 1, the deficit shall be made up by the planting of additional trees as provided herein:

a. One (1) or more replacement tree(s) shall be planted in accordance with an approved planting plan. When trees are planted by the developer to satisfy the requirements of this subsection, the developer shall choose trees that meet the standards set forth in Appendix E. Each tree shall be presumed to create a canopy circular area with the trunk of the tree as the center, and there must be sufficient trees so that, using this standard, the canopy requirements in 15-319(a) are met—per 500 square feet of tree canopy coverage deficit shall be planted in accordance with an approved planting plan.

b. All canopy trees planted to meet the Town's screening and parking lot shading standards can be counted when calculating replacement canopy trees provided.

c. Supplemental canopy trees planted to complete the canopy coverage requirements shall be planted no less than twenty (20) feet from any other proposed or existing canopy tree.

d. Replacement trees that are planted in an adjacent right-of-way may count toward total tree canopy.

e. Replacement tree caliper shall be at least two and one-half (2.5) inches at installation. ~~A replacement tree with a caliper of four (4) inches or greater may count for two replacement trees.~~

*Art. XIX - SCREENING AND TREES*

f. Landscaped areas with shrubs of at least 100 square feet on an infill lot in the B-1(C), B-1(G) or B-2 districts.

(c) Modifications to Canopy Coverage Standards. The permit issuing authority may approve a development application that does not fully comply with the canopy coverage standards when it finds that the application substantially (50% or more) complies with these standards and that such a deviation:

(1) E-enables the development to better achieve other Town objectives, such as: i) the promotion of solar access to encourage active and passive solar technology for water and space heating and renewable energy generation, ii) improved stormwater management, and iii) the preservation of established managed landscapes professionally designed and installed by an architect or landscape architect, or landscape designer; or, or established streetscapes.

(2) Is for property enrolled in the present use value taxation program or subject to a forest management plan; or

(3) Is part of the redevelopment of an infill lot in the B-1(C), B-1(G) or B-2 districts, where the applicant is seeking a reduction of the shading requirement per Section 15-318, has planted trees in the right-of-way to count toward the canopy coverage, and/or uses a landscaped area with shrubs of at least 100 square feet.

Large expanses of open space, meadowland; (excepting a meadow consisting of species native to the Piedmont), or manicured lawn shall not satisfy the canopy coverage standards of this section.

(d) Exemption from Canopy Coverage Standards. Zoning permit applications for structures that are exempt from building permit requirements, or are the lessor of either i) additions to existing permitted structures that do not exceed 25% of an existing building footprint or ii) do not increase the footprint of the existing building by more than 250 square feet, shall be exempt from the tree canopy standards.

**Section 15-320 Protection of Trees During Construction.**

(a) The permit recipient shall be responsible for ensuring that all existing trees specifically shown on approved plans as being retained to comply with this article are protected, during the construction process, from removal, destruction, or injury. As described in Appendix A, a tree protection plan detailing the methods for such protection shall be submitted as part of the land use permit application and construction plan package. Tree protection methods shall meet accepted industry standards in accordance with ANSI A300 and associated Best Practices. (AMENDED 3/12/85; 2/24/87; 03/21/89; 06/24/14)

*Art. XIX - SCREENING AND TREES*

- (1) The permit recipient shall ensure that, before any excavation takes place on the site, a barrier is erected around the Tree Protection Perimeter of all trees to be retained on the site that are within the area to be disturbed by construction activities, and other provisions made such as are necessary and sufficient to put on notice all construction personnel that the area within the Tree Protection Perimeter of all such trees is to be retained is not be disturbed. During the construction process, the permit recipient shall ensure that all activities are kept outside the Tree Protection Perimeter of all such trees. The barrier required by this subsection shall be installed before the issuance of any grading or construction permits for such site. **(AMENDED 06/24/14)**
- (2) The permit recipient shall ensure that all such trees to be retained on the site that are within the area to be disturbed by construction activities, or near roads within the development, shall be further protected from accidental equipment damage by wrapping their trunks with sections of snow fence or boards wired together from the ground to a height six (6) feet above the ground. **(AMENDED 06/24/14)**
- (3) The permit recipient shall ensure that land disturbing activity shall not occur, and that building materials, construction trailers, vehicles, equipment or machinery, dirt, fill, and/or other debris shall not be stored within the Tree Protection Perimeter of such trees as are to be retained.
- (4) The permit recipient shall ensure that all such trees as are to be preserved shall not be used as supports for roping, cable, signs, or fencing, and that nails shall not be driven into the trunks of trees.
- (5) The permit recipient shall ensure that any damage done during construction to the limbs or trunks of such trees as are to be retained shall be properly treated so as to assure the continued health of the trees. The land use administrator shall be consulted, and may suggest that the applicant seek advice from landscape or forestry professionals as to the appropriate method for such treatment. **(AMENDED 06/24/14)**
- (6) Prior to the commencement of any land alteration on a site for which a Tree Protection Plan has been approved, including all clearing or grading activities, the land use administrator shall certify in writing based on an inspection of the site that all tree protection measures required by the approved Tree Protection Plan have been put in place properly and accurately. The land use administrator shall provide this certification in a timely fashion on being notified by the permit recipient that the site is ready for such inspection and certification. **(AMENDED 03/21/89)**

***Art. XIX - SCREENING AND TREES***

(b) If a violation of subsection (a) occurs, and as a result (b) rare or specimen tree(s) specifically shown on approved plans as being retained die or otherwise must be removed within four years after a certificate of occupancy is granted for that portion of a development on which the trees are or were located, then the permit recipient shall be required to replace such trees with trees of the same species, if available, or of a similar species. The choice of the replacement species, where necessary, shall be made subject to approval by the Town. Each replacement tree shall be at least of tree diameter equivalent in size to one (1) inch per every four (4) inches of tree diameter of the tree it replaces, up to a maximum replacement tree diameter of five inches. In cases where the tree to be replaced had a diameter greater than twenty inches, it shall be replaced by more than one tree, such that the ratio of one inch of replacement tree diameter to four inches of original tree diameter is satisfied, and at least one of the replacement trees is of the maximum replacement tree diameter of five inches. In addition, no replacement tree may be smaller than one inch in diameter. For example, a twenty-eight inch diameter tree would be replaced by one five inch diameter tree and one two-inch diameter tree of the same species. Tree replacement shall be performed by either a landscape contractor or forester licensed to practice in the State of North Carolina, or by an arborist certified by the International Society of Arboriculture or National Arborists Association. Such replacement must take place within one year after the death or removal of the trees occur, and this obligation shall be a continuing condition of the validity of the permit. Violators of the tree protection requirements described in subsection (a) shall be subject to the penalties and remedies for all land use ordinance and land use permit condition violations described in Section 15-114. **(AMENDED 03/21/89; 06/24/14)**

**Section 15-321 Performance Security May Be Required (AMENDED 03/21/89; 10/24/06; 06/24/14)**

(a) In cases when the land use administrator has reasonable cause to believe that a Tree Protection Plan has been violated, he or she may require that the developer post a security, for the five year period (four years plus one year in which replacement may occur) described in subsections (b) and (c) of section 15-318, to cover the potential replacement of all such large and rare species trees as are called out in the Tree Protection Plan as being protected. The purpose of this security is to ensure that the financial capability will exist, during the full five year period described in subsections (b) and (c) of section 15-318, to replace any large or rare species trees as are called out on a Tree Protection Plan as being protected during construction, and which have died due to construction damage caused by a violation of the Tree Protection Plan.

(b) It is the intent of this section that the removal and replacement of such trees that die due to construction damage shall be arranged by the Town only when the developer cannot be located at the time when the removal and replacement becomes necessary.

(c) The required security shall be in the form of an interest-bearing account or certificate of deposit payable to the Town, in the amount necessary for the removal of all of the large and rare species trees as are called out in the Tree Protection Plan as being preserved, their replacement as described in subsections (b) and (c) of section 15-318, and the one-time violation penalty described in section 15-114 at the time the security is required. At such time as the four year period described in subsections (b) and (c) of section 15-318 is complete, and no deaths of

*Art. XIX - SCREENING AND TREES*

trees called out in the Tree Protection Plan as being preserved have occurred, the security and all interest accrued on it shall revert to the developer. In the event that some but not all of the security amount is used or needed for tree removal and replacement at the end of the four year period described in subsections (b) and (c) of section 15-318, the remaining security amount and the interest it has accrued shall revert to the developer at the end of that four year period.

**Section 15-321.1 Payment in Lieu of Providing Shade or Canopy Cover Trees**

(a) When the permit issuing authority determines that as part of the redevelopment of an infill lot in the B-1(C), B-1(G) or B-2 districts, it is physically impossible or impracticable for a development to satisfy the requirements of Section 15-318 (shading trees), or Section 15-319 (canopy coverage) of this Article, then the permit-issuing authority may allow the developer to pay a fee to a tree planting fund in accordance to an adopted tree planting master plan.

(b) The amount of the fee authorized by this section shall be determined by estimating the cost of providing the required trees (including the cost of the plant and labor for installation) that meets the requirements of this Article. This determination shall be made annually and the fee shall be included in the Miscellaneous Fees and Charges Schedule adopted by the Board of Aldermen.

(c) Any fees collected in accordance with this section shall be reserved and used exclusively to meet the purposes for which they have been obtained as specified above in subsection (a). The required fee shall be submitted to the Town prior to construction plan approval.

**Section 15-321.21 Regulation of Forestry Activities. (AMENDED 06/24/14)**

(a) The terms “forestry,” “forestry activity,” “forestland,” “forest management plan” and “timber harvest” shall be defined by and used in the same manner as in G.S. 160A-458.5.

(b) Notwithstanding any other provisions of this chapter, this chapter does not regulate either:

(1) Forestry activity on forestland that is taxed on the basis of its present-use value as forestland under G.S. Chpt. 105, Art. 12; or

(2) Forestry activity that is conducted in accordance with a forest management plan that is prepared or approved by a forester registered in accordance with G.S. Chpt. 89B.

(c) Notwithstanding subsection (b) above, the Town may deny a zoning, special use, conditional use, or building permit for a tract of land for a period of up to three years after the completion of a timber harvest if the harvest results in the removal from that tract of all or substantially all of the trees protected by this chapter. If the removal of such trees was in willful

*Art. XIX - SCREENING AND TREES*

violation of the requirements of this chapter, then such permits may be refused for a period of five years.

# **Appendix A**

## **INFORMATION REQUIRED WITH APPLICATIONS**

### **A-1. In General.**

(a) As provided in Section 15-49, it is presumed that all of the information listed in this appendix must be submitted with an application for a zoning, sign, special use, or conditional use permit to enable the permit-issuing authority to determine whether the development, if completed as proposed, will comply with all the requirements of Chapter 15. As set forth in Section 15-92, applications for variances are subject to the same provisions. However, the permit-issuing authority may require more information or accept as sufficient less information according to the circumstances of the particular case. A developer who believes information presumptively required by this appendix is unnecessary shall contact the planning staff for an interpretation.

(b) As also provided in Section 15-49, the administrator shall develop application processes, including standard forms, to simplify and expedite applications for simple development that do not require the full range of information called for in this appendix. In particular, developers seeking only permission to construct single-family houses or duplexes or to construct new or modify existing signs should contact the administrator for standard forms.

### **A-2. Written Applications.**

Every applicant for a variance or a zoning, sign, special use or conditional use permit shall complete a written application containing at least the following information:

- (1) The name, address, and phone number of the applicant.
- (2) If the applicant is not the owner of the property in question, (i) the name, address, and phone number of the owner, and (ii) the legal relationship of the applicant to the owner that entitles the applicant to make application.
- (3) The date of the application.
- (4) Identification of the particular permit sought.
- (5) A succinct statement of the nature of the development proposed under the permit or the nature of the variance.
- (6) Identification of the property in question by street address and tax map reference.
- (7) The zoning district within which the property lies.

- (8) The number of square feet in the lot where the development is to take place.
- (9) The gross floor area of all existing or proposed buildings located on the lot where the development is to take place.
- (10) If the proposed development is a multi-family residential development, the number of one, two, three, or four bedroom dwelling units proposed for consideration.

**A-3. Development Site Plans.**

Subject to Section A-1 of this appendix, every application for a variance or a zoning, sign, special use, or conditional use permit shall contain plans that locate the development site and graphically demonstrate existing and proposed natural, man-made, and legal features on and near the site in question, all in conformity with Section A-4 through A-6 of this appendix.

**A-4 Graphic Materials Required for Plans**

(a) The plans shall include a location map that shows the location of the project in the broad context of the town or planning jurisdiction. This location map may be drawn on the development site plans or it may be furnished separately using reduced copies of maps of the Carrboro planning jurisdiction available at the planning department.

(b) Development site plans shall be drawn to scale, using such a scale that all features required to be shown on the plans are readily discernible. Very large developments may require that plans show the development in sections to accomplish this objective without resort to plans that are so large as to be cumbersome, or the objective may be accomplished by using different plans or plans drawn to different scales to illustrate different features. In all cases, the permit-issuing authority shall make the final determination whether the plans submitted are drawn to the appropriate scale, but the applicant for a conditional or special use permit rely in the first instance on the recommendations of the administration.

(c) Development site plans should show on the first page the following information:

- (1) Name of applicant
- (2) Name of development (if any)
- (3) North arrow
- (4) Legend
- (5) Scale

(d) All of the features required to be shown on plans by Sections A-5 and A-6 may be included on one set of plans, so long as the features are distinctly discernible.



**A-5. Existing Natural, Man-Made and Legal Features.**

(a) Development site plans shall show all existing natural, man-made, and legal features on the lot where the development is to take place, including but not limited to those listed below. In addition, the plans shall also show those features indicated below by an asterisk (\*) that are located within fifty feet in any direction of the lot where the development is to take place, and shall specify (by reference to the Table of Permissible Uses or otherwise) the use made of adjoining properties.

(b) *Existing natural features:*

- (1) Tree line of wooded areas.
- (2) The location and sizes of all trees which are to be retained in accordance with Section 15-~~316~~317, and which are to be removed; ~~along with~~ a written justification for the need to remove any ~~large or rare specimen or rare~~ species trees protected by the provisions of Article XIX, along with ~~and~~ description of the extent of the hardship that would occur if such removal were not permitted to occur. (AMENDED 03/21/89)
- (3) Orchards or other agricultural groves by common or scientific name.
- \*(4) Streams, ponds, drainage ditches, swamps, boundaries of floodways and floodplains.
- (5) (If the proposed development is a subdivision or mobile home park of more than fifty lots or if more than five acres of land are to be developed), base flood elevation data (See Article XVI, Part I). (AMENDED 4/21/87; REPEALED 1/16/07).
- \*(6) Contour lines (shown as dotted lines) with no larger than two foot contour intervals. (As indicated in Subsection A-6(b)(17), proposed contour lines shall be shown as solid lines.)

(c) *Existing man-made features.*

- \*(1) Vehicle accommodation areas (including parking areas, loading areas and circulation areas, see Section 15- 290), all designated by surface material and showing the layout of existing parking spaces and direction of travel lanes, aisles, or driveways.
- (2) Streets, private roads, sidewalks, and other walkways, all designated by surface material.

- (3) Curbs and gutters, curb inlets and curb cuts, and drainage grates.
- (4) Other storm water or drainage facilities, including manholes, pipes, and drainage ditches.
- (5) Underground utility lines, including water, sewer, electric power, telephone, gas, cable television.
- (6) Above ground utility lines and other utility facilities.
- \*(7) Fire hydrants.
- \*(8) Buildings, structures and signs (including dimensions of each).
- (9) Location of exterior light fixtures.
- \*(10) Location of dumpsters.
- (d) *Existing legal features.*
  - (1) The zoning of the property, including zoning district lines where applicable.
  - (2) Property lines (with dimensions identified).
  - (3) Street right-of-way lines.
  - (4) Utility or other easement lines.

**A-6. Proposed Changes in Existing Features or New Features (AMENDED 6/20/06).**

(a) Development site plans shall show proposed changes in (i) existing natural features [see A-5(b)], (ii) existing man-made features [see A-5(c)], and (iii) existing legal features [see A- 5(d)].

(b) Development site plans shall also show proposed new legal features (especially new property lines, street right-of-way lines, and utility and other easements), as well as proposed man-made features, including, but not limited to, the following:

- (1) The number of square feet in every lot created by a new subdivision.
- (2) Lot dimensions, including lot widths measured in accordance with Section 15-183.

- (3) The location and dimensions of all buildings and freestanding signs on the lot, as well as the distances all buildings and freestanding signs are set back from property lines, streets or street right-of-way lines (see Section 15-184).
- (4) Principal side(s) building elevations for typical units of new buildings or exterior remodelings of existing buildings, showing building heights (see Section 15-185) and proposed wall sign or window sign area.
- (5) Elevation in relation to mean sea level of the proposed lowest floor (including basement) of all structures. **(AMENDED 4/21/87; REPEALED 1/16/07)**
- (6) Elevation in relation to mean sea level to which any non-residential structure will be floodproofed. **(AMENDED 4/21/87; REPEALED 1/16/07)**
- (7) Description of the extent to which any watercourse will be altered or relocated as a result of the proposed development. **(AMENDED 4/21/87; REPEALED 1/16/07)**
- (8) The location and dimensions of all recreational areas provided in accordance with Article XIII, with each area designated as to type of use. **(AMENDED 4/21/87)**
- (9) Areas intended to remain as usable open space (Section 15-198) or designated buffer areas (Section 15-265). The plans shall clearly indicate whether such areas are intended to be offered for dedication to public use or shall remain privately owned. **(AMENDED 4/21/87)**
- (10) Streets, labeled by classification (see Section 15-210) and street name showing whether curb and gutter or shoulders and swales are to be provided and indicating street paving widths. Private roads in subdivisions shall also be shown and clearly labeled as such. **(AMENDED 4/21/87)**
- (11) Curb and gutters, curb inlets and curb cuts, drainage grates.
- (12) Other storm water or drainage facilities, including manholes, pipes, drainage ditches, retention ponds, etc.
- (13) Sidewalks and walkways, showing widths and surface material.

- (14) Bridges.
- (15) Outdoor illumination, including the following information:  
**(REWRITTEN 4/20/10)**
  - a. Plans showing the location, type, and height of luminaires including both building and ground fixtures. The plan shall include a point-by-point footcandle array in a printout format indicating the location and aiming of illuminating devices, and indicate compliance with the maximum maintained footcandles required by Section 15-242.4 of this chapter.
  - b. A description of the luminaires, including lamps, supports, reflectors, raised foundations, poles or other supports and shielding devices, which may be provided as electric utility catalogue illustrations, sheets and/or drawings, and product specifications from the manufacturer.
  - c. Photometric data, such as that furnished by the manufacturer, showing the angle of light emission; and
  - d. A demonstration or showing that the applicant has attempted to reduce energy consumption through the selection of energy efficient luminaires, timers, or other methods (such as fixtures that automatically change wattage output). **(AMENDED 05/25/09; REWRITTEN 4/20/10)**
- (16) Underground utility lines, including water, sewer, electric power, telephone, gas, cable television. Water and sewer pipe line signs shall be labeled.
- (17) Above ground utility lines and other facilities.
- (18) Fire hydrants.
- (19) Dumpsters.
- (20) New contour lines resulting from earth movement (shown as solid lines) with no larger than two foot contour intervals (existing lines should be shown as dotted lines).
- (21) Scale drawings of all signs requiring permits pursuant to Article XVII, together with an indication of the location and dimensions of all such signs.

- (22) Vehicle accommodation areas (including parking areas, loading areas, and circulation areas, see Section 15-290), all designated by surface material and showing the dimensions and layout of proposed parking spaces and the dimensions and direction of travel lanes, aisles, and driveways.
- (23) Proposed plantings or construction of other devices to comply with the screening requirements of Article XIX, Part I, as well as proposed plantings of trees to comply with the shading, street tree, and canopy requirements of Article XIX, Part II. Plans shall label shrubbery by common or scientific name, show the distance between plants and indicate the height at the time of planting and expected mature height and width. Plans shall label trees by common or scientific name, show the circles of the mature crowns (major trees shall be drawn at diameter = 30'; dwarf or decorative trees shall be drawn at their actual mature crown), and indicate the height at the time of planting.
- (24) A Tree Protection Plan, will be completed and stamped by a Certified Arborist of Landscape Architect, illustrating the methods proposed to be used to protect, during construction, the trees that are required to be protected under the provisions of Chapter XIX including specifications as to how the grade, drainage, and aeration will be maintained around the trees. The location of all rare and specimen trees to be retained on the site that will not be within the area to be disturbed by construction activities near a building site, or near roads within the development shall also be shown on the plan, along with a note stating that these trees will not be within the area to be disturbed by construction activities. The Administrator may recommend that applicants consult with expertise in arboriculture, landscape architecture or forestry about appropriate tree protection methods for the particular conditions and species in question. ~~and request that their contractors review two videotapes on tree protection during construction developed by the International Society of Arboriculture, entitled "Effect of Building Construction on Trees in Wooded Lots" and "Avoidance of Construction Damage to Trees on Wooded Lots" that are on file in the Public Works Department.~~ (AMENDED 03/21/89; 06/24/14)
- (25) Plan for Downtown Architectural Standards to comply with Section 15-178 and including, but not limited to, elevation drawings/illustrations of existing and neighboring property building facades.

- (26) Plans showing the maximum extent to which all buildings taller than 40 feet will cast a shadow on June 21<sup>st</sup> and December 21<sup>st</sup>.  
**(AMENDED 03/25/14)**

**A-7. Documents and Written Information in Addition to Plans.**

In addition to the written application and the plans, whenever the nature of the proposed development makes information or documents such as the following relevant, such documents or information shall be provided. The following is a representation list of the types of information or documents that may be requested: **(AMENDED 11/23/10).**

- (1) Documentation confirming that the applicant has a legally sufficient interest in the property proposed for development to use it in the manner requested, or is the duly appointed agent of such a person.
- (2) Certifications from the appropriate agencies that proposed utility systems are or will be adequate to handle the proposed development, as set forth in Article XV, and that all necessary easements have been provided.
- (3) Certifications required under Part I of Article XVI.  
**(AMENDED 4/21/87; REPEALED 1/16/07; AMENDED 11/23/10)**
- (4) RESERVED. **(AMENDED 4/21/87; REPEALED 1/16/07; REPEALED 11/23/10)**
- (5) Detailed description of play apparatus to be provided in miniparks.
- (6) Legal documentation establishing homeowners' associations or other legal entities responsible for control over required common areas and facilities.
- (7) Bonds, letters of credit, or other surety devices.
- (8) Stamped envelopes containing the names and addresses of all those to whom notice of a public hearing must be sent to comply with Section 15-102 or Section 15-52.
- (9) Complete documentation justifying any requested deviation from specific requirements established by this chapter as presumptively satisfying design standards.
- (10) Written evidence of permission to use satellite parking spaces under the control of a person other than the developer when such spaces are allowed pursuant to Section 15-298.

- (11) Written evidence of good faith efforts to acquire satellite parking under the circumstances set forth in Section 15-299.
- (12) Verification that 4.000 classification uses will meet the performance standards set forth in Article XI. Such verification shall be made by a licensed engineer or other qualified expert unless it is utterly apparent from the nature of the proposed development that such expert verification is unnecessary.
- (13) Time schedules for the completion of phases in staged development, as required by Section 15-61.
- (14) The environment impact of a development, including its effect on historically significant or ecologically fragile or important areas and its impact on pedestrian or traffic safety or congestion.

**A-8. Number of Copies of Plans and Documents.**

With respect to all plans and other documents required by this appendix, the developer shall submit the number of copies (not to exceed ten) that the administrator deems necessary to expedite the review process and to provide necessary permanent records.

## Appendix E

### SCREENING AND TREES - GUIDE FOR LANDSCAPING (AMENDED 6/22/04)

- E-1 Guide for Protecting Existing Trees
- E-2 Standards for Street and Parking Lot Trees
- E-3 Formula for Calculating ~~Thirty-five~~<sup>Twenty</sup> Per Cent Shading of Paved Vehicle Accommodation Areas
- E-4 Typical Parking Lot Planting Islands
- E-5 Guide for Planting Trees
- E-6 Typical Opaque Screens
- E-7 Typical Semi-Opaque Screens
- E-8 Typical Broken Screens
- E-9 Guide for Planting Shrubs
- E-10 Lists of Recommended Trees and Shrubs
- E-11 Small Trees for Partial Screening
- E-12 Large Trees for Evergreen Screening
- E-13 Large Trees for Shading
- E-14 Small Shrubs for Evergreen Screening
- E-15 Large Shrubs for Evergreen Screening
- E-16 Assorted Shrubs for Broken Screens
- E-17 List of Invasive Plant Species



## E-1 Guide for Protecting Existing Trees

Section 15-~~316~~317 provides for the retention and protection of large trees when land is developed. In order to better ensure the survival of existing trees, the developer should heed the following guidelines:

(a) Protect trees with fencing and armoring (if needed) during the entire construction period. The fence should enclose an area 1-1.5 feet x the diameter inches of the tree to be retained. The area inside the fence should be off limits and no work should take place inside the tree preservation zone. **(REWRITTEN 06/24/14)**

(b) Avoid excavations beneath the crown of the tree as required by Section 15-~~316(b)~~317(c).

(c) Avoid compaction of the soil around existing trees due to heavy equipment. In areas where storage or vehicular access must take place within the tree preservation area outlined above, a drivable mulch pad with ½" plywood on top may be used to protect the tree's root system, maintaining a minimum distance of 8' from the trunk.. Mulch should be maintained at 12" depth. Preservation fencing should still be placed between the work zone and the tree's trunk. Trunk armoring may be needed when equipment will be used in close proximity to the tree. **(REWRITTEN 06/24/14)**

(d) Keep fires or other sources of extreme heat well clear of existing trees.

(e) Damaged roots should be cleanly cut and covered with topsoil to prevent drying. If damage to limbs or branches is anticipated in certain locations, pruning prior to beginning work may be considered. Limbs and branches broken during the construction process but still attached should be pruned to prevent further damage. An assessment should be performed and corrective pruning may be necessary after construction has been completed around the tree. Pruning / restoration work should be performed under the supervision of a Certified Arborist. **(REWRITTEN 06/24/14)**

(f) As is stipulated in Section 15-316(b), no paving or other impermeable ground cover should be placed within the dripline of trees to be retained. **(REWRITTEN 06/24/14)**

## E-2 Standards for Street and Parking Lot Trees

Trees planted in compliance with the requirements of Sections ~~15-316~~~~15-315~~, ~~15-318~~, and ~~15-319~~~~15-317~~ should have most or all of the following qualities. The trees recommended in Section E-10 represent the best combinations of these characteristics.

(a) Hardiness

- (1) Resistance to extreme temperatures.
- (2) Drought resistance.
- (3) Resistance to storm damage.
- (4) Resistance to air pollution.
- (5) Ability to survive physical damage from human activity.

(b) Life Cycle

- (1) Moderate to rapid rate of growth.
- (2) Long life.

(c) Foliage and Branching

- (1) Tendency to branch high above the ground.
- (2) Wide spreading habit.
- (3) Relatively dense foliage for maximum shading.

(d) Maintenance

- (1) Resistance to pests.
- (2) Resistance to plant diseases.
- (3) Little or no pruning requirements.
- (4) No significant litter problems.

(e) Flora Within Planting Strips (**AMENDED 11/19/96**)

- (1) Match foliage size described in Section E-11 through E-16 with planting strip size.

## E-3 Formula for Calculating 35% Shading of Vehicle Accommodation Areas (REWRITTEN 06/24/14)

Following is an elementary formula for determining the number of shade trees required in and around parking lots in order to presumptively satisfy the shading requirements of Section 15-317.

1. Calculate square footage of the vehicle accommodation area. Include parking spaces, driveways, loading areas, sidewalks, and other circulation areas. Do not include building area and any area which will remain completely undeveloped: \_\_\_\_\_ sq. ft.
2. Multiply \_\_\_\_\_ x .35
3. Areas to be shaded: \_\_\_\_\_ sq. ft.
- \*\*\*\*\*
- Add:
4. Area shaded by existing trees to be retained in and around the vehicle accommodation area:\* \_\_\_\_\_ sq. ft.
5. Area shaded by required screening trees, if any:\* \_\_\_\_\_ sq. ft.
6. Area shaded by required street trees, if any:\* \_\_\_\_\_ sq. ft.
7. Subtotal: \_\_\_\_\_ sq. ft.  
(if line #7 is greater than line #3, then the shading requirement has been met. If not, go on to line #8)
8. Enter the difference between line #7 and line #3: \_\_\_\_\_ sq. ft.
9. Divide line #8: ÷ 707
10. Total number of shade trees required within the vehicle accommodation area: \_\_\_\_\_ trees

---

\*Existing trees retained in compliance with Section 15-316 will be credited according to their actual crown radius. Shaded area may be calculated as follows:

$$3.14 \times (\text{crown radius})^2 = \text{shaded area}$$

Trees planted within the vehicle accommodation area are credited with shading 707 sq. ft. (Based on a crown radius of 15) New or existing trees on the perimeter of the parking lot are credited for having only half a crown over the vehicle accommodation area (e.g., new perimeter trees will be credited for shading 354 sq. ft.). Generally, all trees planted in compliance with the screening requirements of Article XIX, Part I and the street tree requirements of Section 15-315 will be considered perimeter trees. When smaller trees such as Dogwoods are planted, the credited shading area will be adjusted downward to 314 sq. ft. for interior trees and 157 sq. ft. for perimeter trees. (Based on a crown radius of 10 ft.) (REWRITTEN 06/24/14)

### Formulas for Calculating the Number of Replacement Trees Required to Satisfy the Tree Canopy Deficit

Following is an elementary formula for determining the number of replacement trees required to presumptively satisfy the tree canopy requirements of Section 15-319.

<u>1.</u>	<u>Enter square footage of the site to which canopy standards apply (15-319(a)):</u>	<u>                    </u> sq. ft.
<u>2.</u>	<u>Multiply (by 40%, 30%, or 15% depending on the Land Use)</u>	<u>                    </u> x .4, .3, or .15
<u>3.</u>	<u>Canopy Required</u>	<u>                    </u> sq. ft.
	<u>*****</u>	
	<u>Add:</u>	
<u>4.</u>	<u>Canopy from existing trees to be retained:*</u>	<u>                    </u> sq. ft.
<u>5.</u>	<u>Canopy area of required screening trees, if any:</u>	<u>                    </u> sq. ft.
<u>6.</u>	<u>Canopy area of required shade trees, if any:</u>	<u>                    </u> sq. ft.
<u>7.</u>	<u>Subtotal (add lines 4-6)</u>	<u>                    </u> sq. ft.
	<u>(if line #7 is greater than line #3, then the canopy requirement has been met. If not, go on to line #8)</u>	
<u>8.</u>	<u>Enter the difference between line #7 and line #3</u>	<u>                    </u> sq. ft.
	<u>Divide line #8:</u>	<u>                    </u> ÷ 707
<u>9.</u>	<u>Total number of replacement trees required**:</u>	<u>                    </u> trees

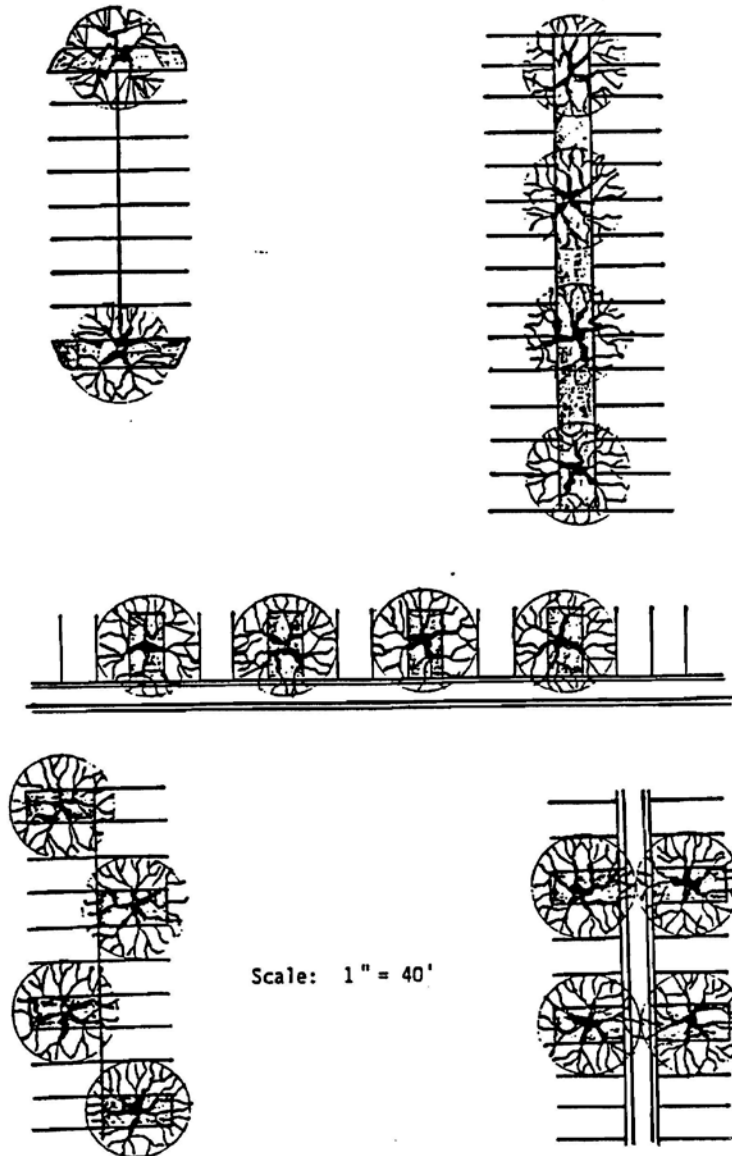
\*Existing trees retained will be credited according to their actual crown radius on the site as determined by survey or aerial photography.

\*\*The actual number of replacement trees to be planted will be determined as described below.

Trees planted that are generally recognized as canopy or overstory trees are credited with shading 707 sq. ft. (based on a crown radius of 15'). New trees planted within 5' of the lot line are credited for having only half a crown (e.g., new perimeter trees will be credited for 354 sq. ft.). When smaller trees generally recognized as understory trees such as Dogwoods are planted, the credited area will be adjusted downward to 314 sq. ft. for interior trees and 157 sq. ft. for perimeter trees (based on a crown radius of 10').

GUIDE FOR LANDSCAPING

E-4 Typical Parking Lot Planting Islands



PAGE E-5

When smaller trees such as Dogwoods are planted, the credited shading area will be adjusted downward to 314 square feet for interior trees and 157 square feet for perimeter trees. (Based on a crown radius of 10 feet.)

## E-5 Guide for Planting Trees (REWRITTEN 06/24/14)

The trees recommended in Section E-10 have minimal maintenance requirements. However, all trees must receive a certain degree of care, especially during and immediately after planting. In order to protect an investment in new trees, the developer and his or her agents should follow these guidelines in accordance with International Society of Arboriculture (ISA) Best Practices, when planting:

(a) All plant material shall conform to the current American Standards for Nursery Stock and must be free from injury, insect infestations and disease. Tree caliper at time of planting should be 2-3”.

(b) The best times for planting are early spring and early fall, but may vary depending upon tree species and site conditions. These factors must be considered when selecting species and planting schedule. Trees planted in the summer run the risk of dehydration and precautions must be taken to ensure establishment.

(c) Plant all trees at least three-and-a-half feet from the end of head-in parking spaces in order to prevent damage from car overhang.

(d) Planting hole should be at least 2x the diameter of the root ball and not deeper than the distance from the bottom of the root ball to the root flair, which may be hidden beneath root ball soil. Excess soil above the root flair should be removed once the tree is in place. The tree should be planted so that its root flair is just above existing grade.

(e) Especially in areas where construction activity has compacted the soil, the sides of the planting hole should be scarified or loosened with a pick ax or shovel.

(f) After the pit is dug, observe sub-surface drainage conditions. Most soils in the Carrboro area are poorly drained. Planting depth where poor drainage exists should be dependent upon the water needs of the tree species. If the species is more sensitive to poor drainage, the tree should be planted higher than existing grade, not to exceed ¼ root of the ball above grade. If a wire cage surrounds the root ball, it should be removed prior to planting. Back fill should then be sloped gradually from top of root ball to existing grade. Gravel placed at the bottom of the hole will not improve drainage.

(g) Backfill should include a proper mix of soil, peat moss and nutrients. All roots must be completely covered. Backfill should be thoroughly watered as it is placed around the roots.

(h) Staking the tree is not recommended unless necessary to stabilize the tree e.g., a loose root ball, unstable bare root transplant, or large evergreen w/higher wind resistance. Staking a tree unnecessarily can reduce the development of structural roots and proper trunk taper. If tree is to be

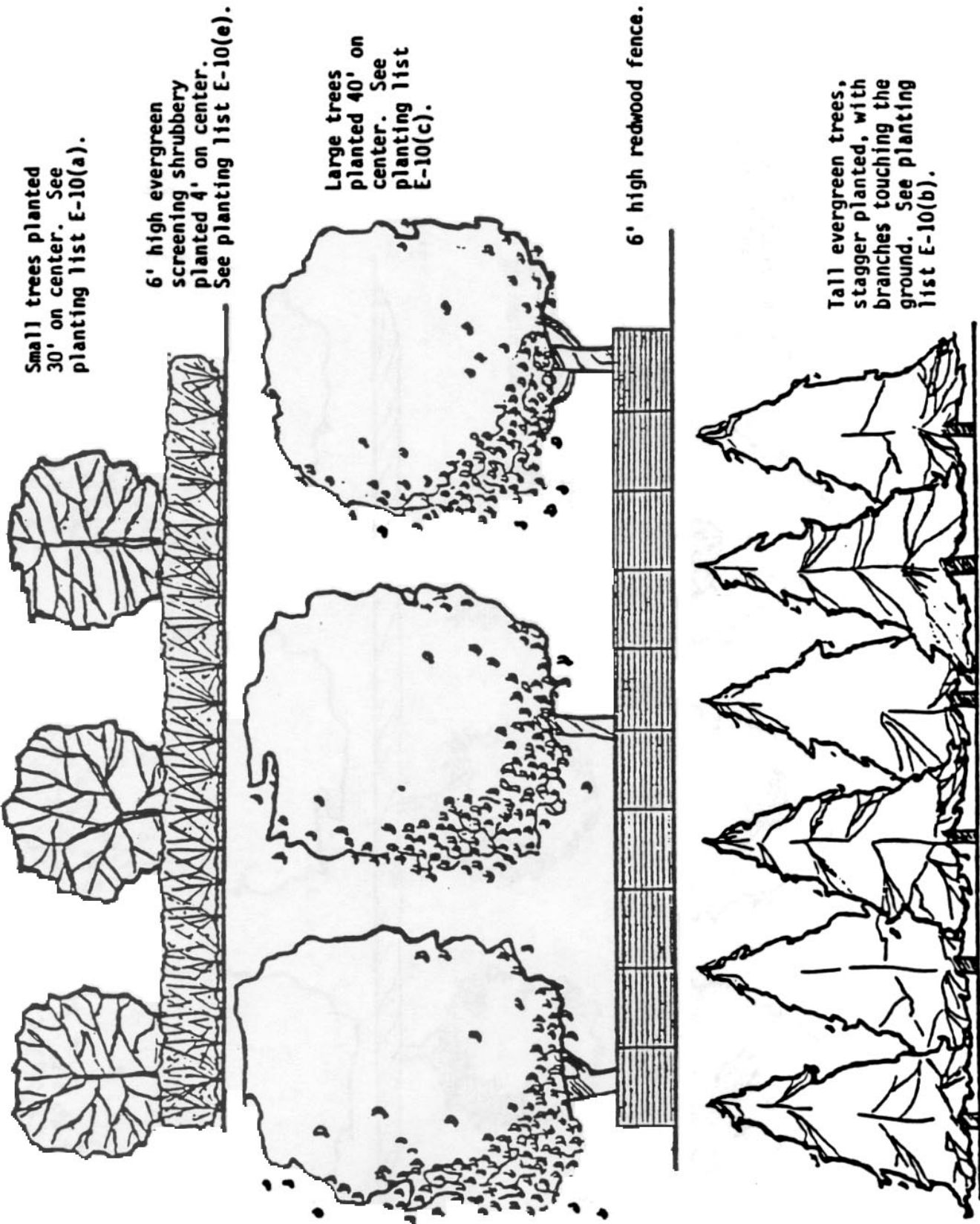
staked, it should be done so loosely and staking should be removed after the first year. Guying materials should not girdle or cut into the bark.

(i) Mulch should be spread at a depth of 2-3 inches maximum, ideally extending to the drip line. At a minimum, it should cover the entire excavation area in order to retain moisture and help to prevent weeds. Mulch should not be allowed to touch the trunk as this will cause moisture build up, increasing the chance of trunk decay. If necessary, on sloped locations, create a raised ring on the downhill side of the slope to catch rain runoff.

(j) Trunk wrapping is not required but may be considered for certain species with thin bark in certain locations. If wrap is to be used it should be light colored, biodegradable (paper) and be wrapped from the bottom up. This will help to prevent moisture build up along the trunk.

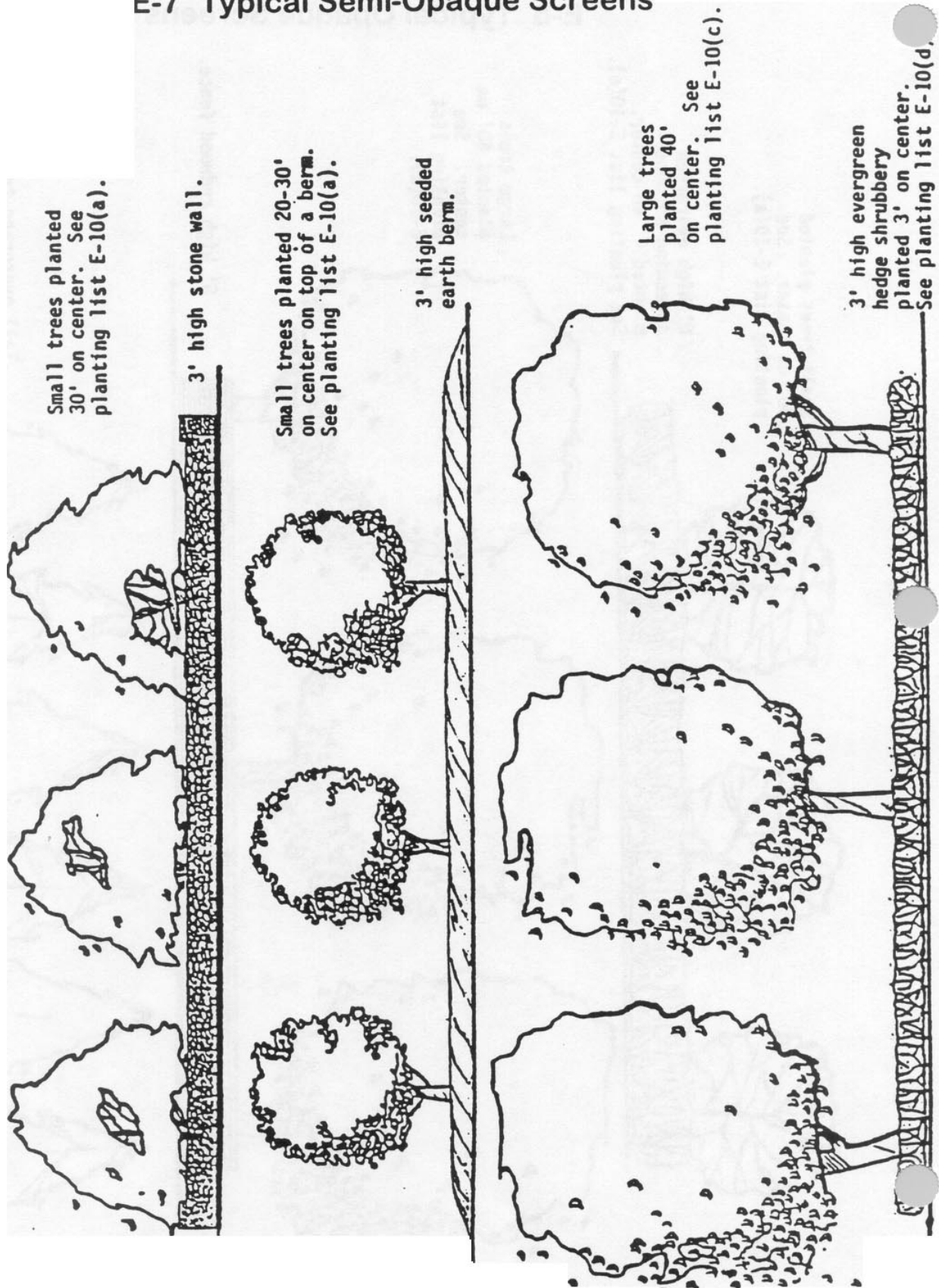
(k) Conscientious post-planting care, especially watering, pruning and fertilizing, is a must for street and parking lot trees. Minimal pruning should be performed during the first year, if at all. Watering and fertilization rates are dependent upon site conditions.

E-6 Typical Opaque Screens

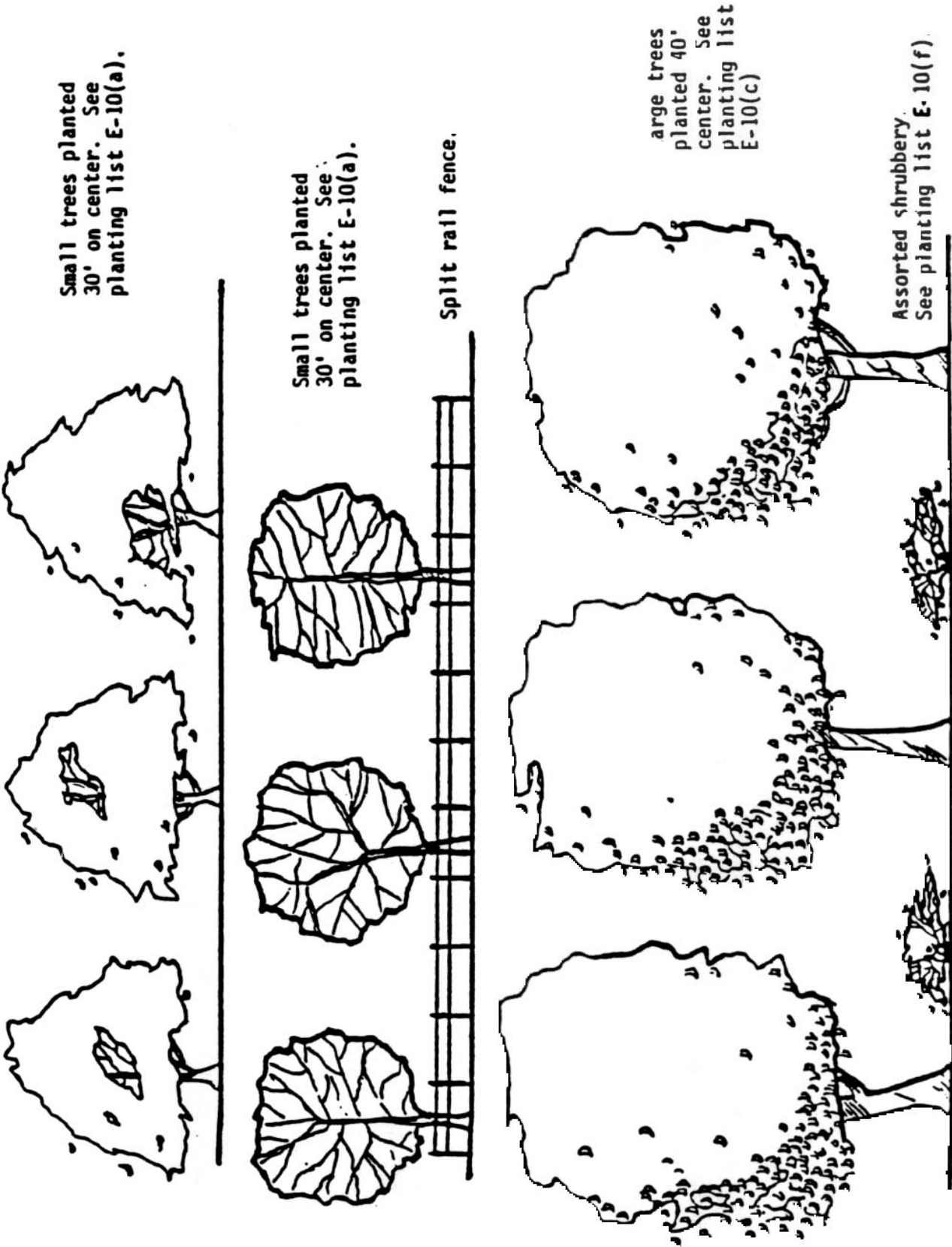




## E-7 Typical Semi-Opaque Screens



E-8 Typical Broken Screens



## E-9 Guide for Planting Shrubs

Shrubs planted for screening purpose should be given a proper culture and be spaced based on expected size at maturity~~sufficient room in which to grow~~. Most soils in the Carrboro area are poorly drained. Planting depth where poor drainage exists should be dependent upon the water needs of the tree species. If the species is more sensitive to poor drainage, the tree should be planted higher than existing grade, not to exceed one quarter of the root ball above grade. If a wire cage surrounds the root ball, it should be removed prior to planting. Back fill should then be sloped gradually from the top of the root ball to the existing grade. Gravel placed at the bottom of the hole, underneath the shrub, will not improve drainage. Many of the guidelines for tree planting listed in Section E-5 also apply to shrubs. However, because specific requirements vary considerably between shrub types, this Appendix does not attempt to generalize the needs of all shrubs. ~~For detailed planting information on individual species, refer to: Landscape Plants of the Southeast by R. Gordon Halfacre and Anne R. Shawcroft. A copy of this book is available in the Carrboro Planning Department or by contacting Sparks Press, P.O. Box 26747, Raleigh, N.C. 27611.~~

## E-10 Lists of Recommended Trees and Shrubs

The following table, indicates plants which will meet the screening, shading, and tree canopy replacement requirements of Article XIX of the Land Use Ordinance. Additional desirable aspects of plants are also provided. The lists are not intended to be comprehensive or absolute, but rather are intended as guidance for species that are appropriate.

Plants were selected for inclusion on these lists according to two principal criteria in addition to providing the indicated service: i.) general suitability for the Piedmont of North Carolina and support of Piedmont ecosystems and food webs; and ii.) for a particular site, species native to the Piedmont of North Carolina which are thriving on or near the site should be favored. When trees are planted to replace native tree specimens removed, native tree species should always be selected. Plantings of multiple species are also recommended to increase biodiversity and provide resilience. Further information on recommended native plants is available from the North Carolina Native Plant Society. The Land Use Administrator has the discretion to not approve of planting plans to comply with Article XIX that substantially deviate from the list provided

~~The following lists indicate plantings which will meet the screening and shading requirements of Article XIX of the Land Use Ordinance. The lists are by no means comprehensive and are intended merely to suggest the types of flora which would be appropriate for screening and shading purposes. Plants were selected for inclusion on these lists according to four principal criteria: i.) general suitability for the Piedmont section of North Carolina; ii.) hardiness/tolerance of city conditions; iii.) ease of maintenance; and iv.) availability from area nurseries. When selecting new plantings for a particular site, a developer should first consider the type of plants which are thriving on or near the site. Accordingly, species native to North Carolina should often be favored. However, if an introduced species has proven highly effective for screening or shading in Piedmont Towns, it too may be a proper selection.~~

---

~~The plantings marked with an (+) on the following lists are appropriate for planting within plantings strips as defined under Section 15-216, Subsection (j).~~

Sections E-11 through E-16 contain descriptions of the trees and shrubs listed here.

**E-10 RECOMMENDED TREES AND SHRUBS**

<b>Common Name (Latin name)</b>	<b>Human Services</b>							<b>Ecological Services</b>		
	<b>Shading (1)</b>		<b>Screening (2)</b>			<b>Other</b>		<b>Services</b>		
	<b>Parking / VAA</b>	<b>Street</b>	<b>Partial</b>	<b>Evergreen</b>	<b>Broken</b>	<b>Planting Strip</b>	<b>Edible/Medicinal</b>			
<b>Large Trees (4)</b>										
<u>American Beech (<i>Fagus grandifolia</i>)</u>								*	*	-
<u>American Elm (<i>Ulmus americana</i>)</u>								*	*	-
<u>American Hemlock (<i>Tsuga canadensis</i>)</u>								*	*	-
<u>American Persimmon (<i>Diospyrus virginiana</i>)</u>			*		*		*	*	*	*
<u>Atlantic White Cedar (<i>Chamaecyparis thyoides</i>)</u>				*				*	*	-
<u>Bald Cypress (<i>Taxodium distichum</i>)</u>				*				*	*	-
<u>Basswood (<i>Tilia americana</i>)</u>	*								*	-
<u>Black Gum (<i>Nyssa sylvatica</i>)</u>			*						*	-
<u>Black Oak (<i>Quercus velutina</i>)</u>	*	*							*	-
<u>Blackjack Oak (<i>Quercus marilandica</i>)</u>									*	-
<u>Chestnut Oak (<i>Quercus montana</i>; <i>Q. prinus</i>)</u>	*								*	-
<u>Cucumber Tree (<i>Magnolia acuminata</i>)</u>	*								*	-
<u>Eastern Red Cedar (<i>Juniperus virginiana</i>)</u>				*			*	*	*	-
<u>Laurel Oak (<i>Quercus laurifolia</i>)</u>				*					*	-
<u>Loblolly Pine (<i>Pinus taeda</i>)</u>				*					*	-
<u>Longleaf Pine (<i>Pinus palustris</i>)</u>								*	*	-
<u>Mockernut hickory (<i>Carya tomentosa</i>)</u>									*	*
<u>Ohio Buckeye (<i>Aesculus glabra</i>)</u>								*	*	-
<u>Post Oak (<i>Quercus stellata</i>)</u>									*	-
<u>Red Oak (Eastern) (<i>Quercus rubra</i>)</u>	*	*							*	-
<u>River Birch (<i>Betula nigra</i>)</u>	*	*				*			*	-
<u>Scarlet Oak (<i>Quercus coccinea</i>)</u>	*	*							*	-
<u>Shortleaf Pine (<i>Pinus echinata</i>)</u>				*					*	-
<u>Southern Catalpa (<i>Catalpa bignonioides</i>)</u>	*								*	-
<u>Southern Magnolia (<i>Magnolia grandiflora</i>)</u>				*				*	*	-
<u>Shagbark Hickory (<i>Carya caroliniana-septentrionalis</i>)</u>								*	*	-
<u>Southern Sugar Maple (<i>Acer saccharum</i>; <i>A. barbatum</i>)</u>	*								*	-
<u>Swamp Chestnut Oak (<i>Quercus michauxii</i>)</u>	*							*	*	-
<u>Swamp White Oak (<i>Quercus bicolor</i>)</u>	*				*				*	-

<u>Sycamore (<i>Platanus occidentalis</i>)</u>	<u>*</u>								<u>*</u>	<u>-</u>
<u>Tulip Poplar (<i>Liriodendron tulipifera</i>)</u>	<u>*</u>	<u>*</u>							<u>*</u>	<u>*</u>
<u>Virginia Pine (<i>Pinus virginiana</i>)</u>				<u>*</u>					<u>*</u>	<u>-</u>
<u>White Oak (<i>Quercus alba</i>)</u>	<u>*</u>								<u>*</u>	<u>-</u>
<u>Willow Oak (<i>Quercus phellos</i>)</u>	<u>*</u>	<u>*</u>							<u>*</u>	<u>-</u>
<b><u>Small Trees (5)</u></b>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
<u>American Holly (<i>Ilex opaca</i>)</u>			<u>*</u>	<u>*</u>	<u>*</u>				<u>*</u>	<u>*</u>
<u>American Hop Hornbeam (<i>Ostrya virginiana</i>)</u>			<u>*</u>						<u>*</u>	<u>-</u>
<u>American Hornbeam/Ironwood (<i>Carpinus carolinia</i>)</u>			<u>*</u>			<u>*</u>			<u>*</u>	<u>-</u>
<u>American Smoketree (<i>Cotinus obovatus</i>)</u>			<u>*</u>		<u>*</u>					<u>-</u>
<u>Carolina Cherry Laurel (<i>Prunus caroliniana</i>)</u>			<u>*</u>	<u>*</u>		<u>*</u>			<u>*</u>	<u>-</u>
<u>Crabapple (southern) (<i>Malus spp.</i>)</u>			<u>*</u>				<u>*</u>		<u>*</u>	<u>-</u>
<u>Eastern Redbud (<i>Cercis canadensis</i>)</u>			<u>*</u>						<u>*</u>	<u>*</u>
<u>Flowering dogwood (<i>Cornus florida</i>)</u>			<u>*</u>						<u>*</u>	<u>-</u>
<u>Fringetree (<i>Chionanthus virginiana</i>)</u>			<u>*</u>		<u>*</u>				<u>*</u>	<u>*</u>
<u>Loblolly Bay (<i>Gordonia lasianthus</i>)</u>			<u>*</u>						<u>*</u>	
<u>Mock Orange <i>Philadelphius inodorus</i> (other native cultivars)</u>			<u>*</u>						<u>*</u>	<u>*</u>
<u>Paw Paw (<i>Asimina triloba</i>)</u>			<u>*</u>				<u>*</u>		<u>*</u>	<u>*</u>
<u>Red Bay (<i>Persea borbonia</i>)</u>			<u>*</u>						<u>*</u>	
<u>Sassafras (<i>Sassafras albidum</i>)</u>			<u>*</u>		<u>*</u>		<u>*</u>		<u>*</u>	<u>-</u>
<u>Serviceberry (<i>Amelanchier canadensis/arborea</i>)</u>			<u>*</u>			<u>*</u>	<u>*</u>		<u>*</u>	<u>-</u>
<u>Silverbell (<i>Halesia carolina</i>)</u>									<u>*</u>	<u>-</u>
<u>Sourwood (<i>Oxyndrum arboreum</i>)</u>			<u>*</u>			<u>*</u>			<u>*</u>	<u>-</u>
<u>Southern Wax Myrtle (<i>Myrica cerifera</i>)</u>			<u>*</u>	<u>*</u>					<u>*</u>	<u>-</u>
<u>Sumac (<i>Rhus aromatica (fragrant); copallina</i> (Shining); <i>R. glabra</i> (Smooth); <i>R. typhina</i> (Staghorn))</u>					<u>*</u>		<u>*</u>		<u>*</u>	<u>*</u>
<u>Umbrella Magnolia (<i>Magnolia tripetala</i>)</u>									<u>*</u>	<u>*</u>
<u>Washington Hawthorn (<i>Crataegus phaenophyrum</i>)</u>			<u>*</u>							<u>-</u>
<u>Witch Hazel (Common) (<i>Hamamelis virginiana</i>)</u>					<u>*</u>		<u>*</u>		<u>*</u>	<u>-</u>
<u>Witch Hazel (Vernal) (<i>Hamamelis vernalis</i>)</u>					<u>*</u>	<u>*</u>	<u>*</u>			<u>-</u>
<u>Yaupon Holly (<i>Ilex vomitoria</i>)</u>	<u>-</u>	<u>-</u>	<u>*</u>	<u>*</u>	<u>-</u>	<u>*</u>	<u>*</u>	<u>-</u>	<u>*</u>	<u>-</u>
<b><u>Shrubs (6)</u></b>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
<u>Anise Bush (<i>Illicium anisatum</i>)</u>			<u>*</u>	<u>*</u>		<u>*</u>				<u>-</u>
<u>Azaleas (<i>Rhodendron calendulaceum, canescens,</i> <i>periclymenoides, prunifolium</i>)</u>					<u>*</u>				<u>*</u>	<u>*</u>
<u>Beautyberry (<i>Callicarpa americana</i>)</u>					<u>*</u>	<u>*</u>			<u>*</u>	<u>-</u>
<u>Blueberry (<i>Vaccinium spp.</i>)</u>					<u>*</u>		<u>*</u>		<u>*</u>	<u>-</u>
<u>Buttonbush (<i>Cephalanthus occidentalis</i>)</u>					<u>*</u>				<u>*</u>	<u>-</u>

<u>Carolina Allspice (Sweetshrub) (<i>Calycanthus floridus</i>)</u>					*				*	-
<u>Carolina Rose (<i>Rosa carolina</i>)</u>					*				*	-
<u>Clethra (<i>Clethra alnifolia</i>)</u>					*				*	-
<u>Devil's Walking Stick (<i>Aralia spinosa</i>)</u>					*				*	*
<u>Flowering dogwood (<i>Cornus florida</i>)</u>										-
<u>Drooping Leucothoe (<i>Leucothoe fontanesiana</i>)</u>					*				*	-
<u>Fortune Tea Olive (<i>Osmanthus fortunei</i>)</u>			*	*						-
<u>Glossy Abelia (<i>Abelia grandiflora</i>)</u>			*	*						-
<u>Hearts-a-burstin (<i>Eunonymus americanus</i>)</u>					*				*	-
<u>Highbush Blueberry (<i>Vaccinium corymbosum</i>)</u>					*				*	-
<u>Inkberry (<i>Ilex glabra</i>)</u>			*	*					*	-
<u>Japanese Yew (<i>Taxus cuspidata</i>)</u>			*	*						-
<u>Magnolia "Little Gem" (<i>Magnolia grandiflora</i>)</u>		*		*					*	-
<u>Mountain Laurel (<i>Kalmia latifolia</i>)</u>				*					*	-
<u>Oakleaf Hydrangea (<i>Hydrangea quercifolia</i>)</u>					*					*
<u>Poet's Laurel (<i>Danae racemosa</i>)</u>			*	*						-
<u>Possumhaw (<i>Ilex decidua</i>)</u>									*	-
<u>Savannah Holly (<i>Ilex x attenuata</i>)</u>	*	*		*		*			*	-
<u>Silky dogwood (<i>Cornus amomus</i>)</u>									*	-
<u>Spicebush (<i>Lindera benzoin</i>)</u>					*	*			*	-
<u>Viburnum (<i>acerifolium, dentatum, nudum, rafinesquianum, prunifolium, rufidulum</i>)</u>			*		*				*	-
<u>Virginia sweetspire (<i>Itea virginica</i>)</u>									*	-
<u>Winterberry Holly (<i>Ilex verticillata</i>)</u>			*	*					*	-
<b><u>Vines</u></b>	-	-	-	-	-	-	-	-	-	-
<u>Carolina Jessamine (<i>Gelsemium sempervirens</i>)</u>			*	*						-
<u>Confederate Jasmine (<i>Trachelospermum jasminoides</i>)</u>			*	*						-
<u>Trumpet Honeysuckle (<i>Lonicera sempervirens</i>)</u>	-	-	*	*	-	-	-	-	-	-

**Footnotes:** (1) See 15-316 & 15-318. (2) See 15-307. (3) See 15-317. (4,5) Trees that are credited with 707 sf (4) and 314 sf (5) towards canopy requirements per Appendix E (E-3). (6) Shrubs may be credited towards canopy requirements, see 15-319. (a) as defined by NC Cooperative Extension Service and Natural Resources Conservation Service; native plants are preferred for all plantings. (b): as identified by Pollinator Partnership, for southeastern region.

~~(A) — E-11 SMALL TREES FOR PARTIAL SCREENING (AMENDED 6/22/04)~~

- |  |   |
|--|---|
| <del>(1) — American Holly</del>                | <del>(10) — Mock Orange</del>                 |
| <del>(2) — American Hop Hornbeam</del>         | <del>(11) — Paw Paw</del>                     |
| <del>(3) — American Hornbeam<sup>±</sup></del> | <del>(12) — Serviceberry<sup>±</sup></del>    |
| <del>(4) — American Smoketree</del>            | <del>(13) — Sourwood<sup>±</sup></del>        |
| <del>(5) — Carolina Cherry Laurel</del>        | <del>(14) — Viburnum (except V. opulus)</del> |
| <del>(6) — Crabapple (southern)</del>          | <del>(15) — Washington Hawthorn</del>         |
| <del>(7) — Eastern Redbud</del>                | <del>(16) — Yaupon</del>                      |
| <del>(8) — Flowering dogwood</del>             |   |
| <del>(9) — Fringetree</del>                    |   |



**~~(B) — E-12 LARGE TREES FOR EVERGREEN SCREENING (AMENDED 6/22/04)~~**

- |  |                                    |
|--|------------------------------------|
| <del>(1) — Atlantic White Cedar</del>        | <del>(5) — Shortleaf Pine</del>    |
| <del>(2) — Eastern Red Cedar</del>           | <del>(6) — Southern Magnolia</del> |
| <del>(3) — Laurel Oak (listed on E-13)</del> | <del>(7) — Virginia Pine</del>     |
| <del>(4) — Loblolly Pine</del>               | <del>(8) — Longleaf Pine</del>     |

**~~(C) — E-13 LARGE TREES FOR SHADING — The trees on the following list marked with an (\*) are appropriate selections to satisfy Section 15-315, Required Trees Along Dedicated Streets (AMENDED 6/22/04)~~**

- |                                       |  |
|---------------------------------------|--|
| <del>(1) — Basswood</del>             | <del>(9) — Southern Catalpa</del>      |
| <del>(2) — Chestnut Oak</del>         | <del>(10) — Southern Sugar Maple</del> |
| <del>(3) — Cucumber Tree</del>        | <del>(11) — Swamp Chestnut Oak</del>   |
| <del>(4) — Ginkgo (male only) *</del> | <del>(12) — Swamp White Oak</del>      |
| <del>(5) — Laurel Oak *</del>         | <del>(13) — Sycamore</del>             |
| <del>(6) — Post Oak</del>             | <del>(14) — Tulip Poplar *</del>       |
| <del>(7) — Red Oak (Eastern) *</del>  | <del>(15) — White Oak</del>            |
| <del>(8) — Scarlet Oak *</del>        | <del>(16) — Willow Oak *</del>         |

**~~(D) — E-14 SMALL SHRUBS FOR EVERGREEN SCREENING (AMENDED 05/25/99, 6/22/04)~~**

- |  |   |
|--|---|
| <del>(1) — Convexa Japanese Holly</del>                | <del>(7) — Otto Lukeyn Laurel<sup>±</sup></del> |
| <del>(2) — Dwarf Horned Holly</del>                    | <del>(8) — Poet's Laurel</del>                  |
| <del>(3) — Glossy Abelia</del>                         | <del>(9) — Warty Blueberry</del>                |
| <del>(4) — Ilex verticillata (Winterberry Holly)</del> | <del>(10) — **Carolina Jessamine</del>          |
| <del>(5) — Indian Hawthorn<sup>±</sup></del>           | <del>(11) — **Trumpet Honeysuckle</del>         |
| <del>(6) — Japanese Yew</del>                          | <del>(12) —</del>                               |

~~\*\*Vines — which if grown on a trellis would make a nice evergreen screen.~~

**~~(E) — E-15 LARGE SHRUBS FOR EVERGREEN SCREENING (AMENDED 6/22/04)~~**

- |   |   |
|---|---|
| <del>(1) — Anise Bush<sup>±</sup></del>             | <del>(6) — Loblolly Bay</del>                         |
| <del>(2) — Carolina Cherry Laurel<sup>±</sup></del> | <del>(7) — Loropetalum<sup>±</sup></del>              |
| <del>(3) — Cleyera<sup>±</sup></del>                | <del>(8) — Red Bay</del>                              |
| <del>(4) — English Laurel</del>                     | <del>(9) — Schipka Laurel</del>                       |
| <del>(5) — Fortune Tea Olive</del>                  | <del>(10) — Southern Wax Myrtle</del>                 |
|   | <del>(11) — Yaupon Holly (standard)<sup>±</sup></del> |

~~(F) — E-16 ASSORTED PLANTINGS FOR BROKEN SCREENS (AMENDED 5/25/99, 6/22/04)~~

- |   |  |
|---|--|
| <del>(1) — Beautyberry<sup>±</sup></del>            | <del>(11) — Judd Viburnum</del>                    |
| <del>(2) — Blueberry</del>                          | <del>(12) — Oakleaf Hydrangea</del>                |
| <del>(3) — Button Bush</del>                        | <del>(13) — Rhododendron</del>                     |
| <del>(4) — Carolina Allspice (Sweetshrub)</del>     | <del>(14) — Smoketree</del>                        |
| <del>(5) — Carolina Rose</del>                      | <del>(15) — Star Magnolia (tree)</del>             |
| <del>(6) — Clethra</del>                            | <del>(16) — Sumac</del>                            |
| <del>(7) — Devil's Walking Stick</del>              | <del>(17) — Viburnum (except V. opulus)</del>      |
| <del>(8) — Drooping Leucothoe</del>                 | <del>(18) — Witch Hazel (Common)</del>             |
| <del>(9) — Fringetree</del>                         | <del>(19) — Witch Hazel (Vernal)<sup>±</sup></del> |
| <del>(10) — Japanese Flowering Apricot (tree)</del> |  |

~~— The following plant species shall be prohibited when complying with the shading and landscaping provisions of this chapter. (AMENDED 6/22/04).~~

<b>Species (Latin)</b>	<b>Common Name</b>
<del>Akebia quinata</del>	<del>Chocolate vine</del>
<del>Acer ginnala</del>	<del>Amur Maple</del>
<del>Acer platanoides</del>	<del>Norway Maple</del>
<del>Ailanthus altissima</del>	<del>Tree of Heaven</del>
<del>Albizia julibrissin</del>	<del>Mimosa</del>
<del>Ampelopsis brevipedunculata</del>	<del>Porecelainberry</del>
<del>Baccharia halimifolia</del>	<del>Baccharus spp</del>
<del>All Berberis species including</del>	
<del>Berberis julianae</del>	<del>Wintergreen Barberry</del>
<del>Berberis thunbergii</del>	<del>Japanese Barberry</del>
<del>Broussonetia papyrifera</del>	<del>Paper Mulberry</del>
<del>Celastrus orbiculatus</del>	<del>Bittersweet</del>
<del>All Cotoneaster species including</del>	
<del>Cotoneaster microphyllus</del>	<del>Littleleaf Cotoneaster</del>
<del>Cotoneaster horizontalis</del>	<del>Rockspray Cotoneaster</del>
<del>Crataegus monogyna</del>	<del>Singleseed Hawthorn</del>
<del>Crataegus laevigata</del>	<del>English Hawthorn</del>
<del>All Cytisus scoparius</del>	<del>Scotch Broom</del>
<del>Eleagnus angustifolia</del>	<del>Russian Olive</del>
<del>Eleagnus umbellata</del>	<del>Autumn Olive</del>
<del>Euonymus alatus</del>	<del>Winged Euonymus, Burning Bush</del>
<del>Euonymus japonicus</del>	<del>Japanese Euonymus</del>
<del>Firmiana simplex</del>	<del>Chinese Parasol Tree</del>

Species (Latin)	Common Name
<del>Hedera helix</del>	<del>English Ivy</del>
<del>All Ligustrum species including</del>	
<del>Ligustrum japonicum</del>	<del>Japanese Privet</del>
<del>Ligustrum lucidum</del>	<del>Waxleaf Privet</del>
<b>Ligustrum obtusifolium</b>	<b>Border Privet</b>
<del>Ligustrum vulgare</del>	<del>European Privet</del>
<del>Ligustrum sinense</del>	<del>Chinese Privet</del>
<del>Ligustrum x vicari</del>	<del>Golden Vicary Privet</del>
<del>Lonicera japonica</del>	<del>Japanese Honeysuckle</del>
<del>Lonicera maaackii</del>	<del>Bush Honeysuckle</del>
<del>Lonicera nitida</del>	<del>Boxleaf Honeysuckle</del>
<del>Lonicera tatarica</del>	<del>Tatarian Honeysuckle</del>
<del>Miscanthus sinensis</del>	<del>Eulalia, Maiden Grass</del>
<del>Mahonia repens</del>	<del>Oregon Grape</del>
<b>Morus alba</b>	<b>White Mulberry</b>
<del>Paulownia tomentosa</del>	<del>Princess Tree</del>
<b>Phyllostachys aurea</b>	<b>Golden Bamboo</b>
<b>Populus alba</b>	<b>White Poplar</b>
<b>Spirea Japonica</b>	<b>Japanese Meadowsweet</b>
<del>Taxus cuspidata</del>	<del>Japanese Yew</del>
<del>Viburnum opulus</del>	<del>European Cranberrybush Viburnum</del>
<del>Vinca major</del>	<del>Large Periwinkle</del>
<del>Vinca minor</del>	<del>Common Periwinkle</del>
<del>Wisteria sinensis</del>	<del>Chinese Wisteria</del>
<del>Wisteria japonica</del>	<del>Japanese Wisteria</del>

## **E-11 Small Trees for Partial Screening (Amended 6/22/04)**

The following trees are recommended for use in all types of screens. Though smaller than the trees listed in planting lists E-12 and E-13, each of these trees will reach a height of at least 20 feet. Selections marked with an (\*) are also recommended as shade trees and may be credited for meeting the ~~35~~20% shading requirement for paved parking lots.

### **AMERICAN HOLLY (*Ilex opaca*) Height: 15-30'; Spread: 10-20'.**

This familiar native tree possesses a pyramidal evergreen crown with abundant red berries in the winter. It grows best in full sun and prefers moist yet well drained soils. If the lower limbs are allowed to grow naturally, they will branch to the ground. Hollies should be protected from high winds. The American Holly is a relatively slow grower.

### **AMERICAN HOP HORNBEAM (*Ostrya virginiana*) Height: 40 to 50 feet; Spread: 20 to 30 feet**

Hophornbeam is a small short-lived understory tree in moist, well-drained forests. It has a slow to medium growth rate on a great variety of soils. It develops a finely branched round crown and is an attractive landscape tree that provides wildlife with a limited amount of seed. Fruit

### **\*AMERICAN HORNBEAM (*Carpinus carolinia*) Height: 20-30'; Spread: 15-20'.**

This native tree has a natural yet refined appearance. It is slow growing, but at maturity it serves as an excellent small shade tree. Its fluted, “muscular” trunk is an interesting feature. In the wild, the American Hornbeam is common in moist rich soil, yet, when used in landscape design, it is soil tolerant and does not require an unusual amount of water. It has no pests and no special maintenance problems.

### **AMERICAN SMOKETREE (*Cotinus obovatus*) Height: 15 feet; Spread: 15 feet**

Smoketree is a small tree found on upland sites. This tree is planted as an ornamental for the attractive fruit that are presented on a feathery, hairy stalk, which gives a smoke-like appearance.

### **BLACK HAW (*Viburnum prunifolium*; *V. dentatum*) Height: 12 to 15 feet; Spread: 8 to 12 feet**

Black Haw is a small tree with twisted trunk and arching branches with an overall round crown appearance. Does best on partially sunny sites on moist, well-drained soils.

### **CAROLINA CHERRY-LAUREL (*Prunus caroliniana*) Height: 20-30'; Spread: 15-20'.**

This tree is prized for its dense evergreen foliage. It may be trimmed as a hedge, but also serves as an excellent screen in its natural form. The Cherry-Laurel grows rapidly and has no pests. However, it may not be as cold hardy as other trees on this list.

### **CRABAPPLE, SOUTHERN (*Malus*) Height: 15'-30'; Spread 10-20'**

Slow to moderate growers, with springtime flowers in colors ranging from pink to red to white. Birds are fond of fruit. Care should be taken when choosing a specific variety to make certain that it is disease resistant. Some disease resistant varieties include ‘Adams’, ‘Callaway’, and ‘Sentinel’.

**EASTERN REDBUD (*Cercis canadensis*) Height: 20-30'; Spread: 12-25'.**

This native tree is covered by beautiful pink flowers in the Spring and develops a dense round crown when allowed to grow in direct sunlight. The Redbud has some pests, and its fruit pods may present a litter problems, but it recommends itself by being drought resistant and tolerant of polluted city air.

**\*FLOWERING DOGWOOD (*Cornus florida*) height: 15-30'; Spread: 15-20'.**

The Dogwood is a native woodland tree which is very popular for landscape planting. It is considered to be a fairly hardy tree, but, when planted in direct sun, it must be frequently watered. A healthy Dogwood will develop attractive horizontal branches and bushy crown. Dogwoods look best when planted in groups or when used as an accent in borders. These trees should be guarded against borers and other pests.

**FRINGE TREE (*Chionanthus virginiana*) Height: 12 to 20 feet; Spread: 12 to 20 feet**

Fringe-tree is a short trunk tree with a narrow, oblong crown found on moist soils. It is a popular ornamental because of the white fringe-like drooping white flower clusters in May and June that mature into inch-long blue-black fruit in September and October.

**MOCK ORANGE (*Philadelphus inodorus* or other native cultivars) Height: 3 to 6 feet; Spread: 3 to 9 feet**

Mock Orange is a deciduous short shrub, suitable on a range of soil conditions along streams and bluffs, cliffs, and rocky banks, with full sun to partial shade. Best used as part of a shrub border or an edge to natural areas. Fragrant white flowers in spring on spreading branches that twist around each other and arch to the ground.

**PAW PAW (*Asimina triloba*) Height: 15 to 40 feet; Spread: 15 to 30 feet**

Pawpaw is an understory species found on moist, well-drained sites that has a tropical appearance in the landscape. Purplish-brown, broad bell shape flowers appear with or slightly before the leaves. Fall ripening fruit resemble a short, fat banana, that is very fleshy, tastes like a banana, and eaten by squirrel, fox, raccoon and small animals.

**SERVICEBERRY (*Amelanchier canadensis*) Height: 10'-20'; Spread 8-15'**

An upright shaped tree with a moderate growth rate. Serviceberry will thrive in sun or partial shade. White springtime flowers. Tolerant of most soil types, Serviceberry looks good planted along the edge of woods.

**SOURWOOD (*Oxyndrum arboreum*) Height: 20-30'; Spread: 10-15'.**

Sourwoods are handsome native trees which are most effective in landscape design when planted in groups. They are easy to transplant and as each tree matures it assumes a slender form with upright branches. Sourwood prefers relatively dry acid soils. Its only special maintenance problems may be infestations of webworms.

**WASHINGTON HAWTHORN (*Crataegus phaenophyrum*) Height: 25-30'; Spread: 25-30'.**

Hawthorns generally require spraying to prevent disease and insect infestation. However, they are an excellent choice for screening because of their extremely dense and thorny branches. They have proven to be excellent as a headlight screen on highway medians and, when planted close together, they form an

impenetrable living fence. They prefer sun and are tolerant to most types of soil. The Washington Hawthorn is generally considered to be the best of the Hawthorns.

**YAUPON (*Ilex vomitoria*) Height: 15 to 20 feet; Spread: 10 to 20 feet**

Yaupon is an upright evergreen shrub that forms thickets with numerous stems and branches. It grows well in full to partial shade and adapted to wet and dry sites. Small white flowers in spring yield to small shiny red berry clusters on the stems in the fall. Deer browse the foliage and fruit are eaten by birds and small mammals.

## **E-12      Large Trees for Evergreen Screening (Amended 6/22/04)**

The following trees are ideal for screening large scale areas such as shopping centers and industrial sites. They are also effective in combination with other, smaller screening plants. All three are moderate to fast growers. They are not considered to be shade trees.

### **ATLANTIC WHITE CEDAR (*Chamaecyparis thyoides*) Height: 40 to 50; Spread 10 to 20 feet**

Atlantic White Cedar is a tall, slender columnar tree; that loses lower branches with age. It grows best in wet sites with full sun. Bluish green needles appear flattened and arranged in irregular sprays with pointed tips. Bluish purple cones are quarter-inch long.

### **EASTERN RED CEDAR (*Juniperus virginiana*) - Height 60'; Spread 15-20'**

This is a native evergreen tree that is very hardy in the area. Mature specimens have interesting bark. Has waxy fruit that birds enjoy. Slow growth.

### **LAUREL OAK (*Quercus laurifolia*) Height: 40-60'; Spread: 30'+.**

The Laurel Oak grows more slowly than the other Oaks listed above, but it has the advantage of being nearly evergreen in Piedmont sections of North Carolina. It has proven to be a good street tree and does quite well under city conditions. It presents no special maintenance problems.

### **LOBLOLLY PINE (*Pinus taeda*) - Height 50 to 90; Spread 30 to 40 feet**

Loblolly pine grows well on moderately acid soils with poor surface drainage and full sun. It is initially pyramidal until the crown becomes rounded with horizontal branches following the loss of lower branches. Excellent fast growing species for rapid vegetative screening.

### **LONGLEAF PINE (*Pinus palustris*) - Height 80 to 100; Spread 30 to 40 feet**

~~Longleaf pine is found on well drained sandy soils and on swamp edges and requires full sun. In the Piedmont, it rarely attains mature height due to susceptibility to ice storm damage, wind, lightning, high winds, and drought. It is also a nesting tree for red-cockaded woodpecker. It is slow to establish and grows in "grass-like" stage for first 5 years.~~

### **SHORTLEAF PINE (*Pinus echinata*) Height 80 to 100; Spread 30 feet**

Shortleaf pine is a medium-sized, native, evergreen conifer with relatively short needles and thin, flaky, black bark that becomes reddish brown with age. Shortleaf pine is suitable to sunny sites and a variety of soils. It is a medium to large tree with an initial small, open, pyramidal crown that becomes a small narrow crown with age.

### **SOUTHERN MAGNOLIA (*Magnolia grandiflora*) Height: 40-60'; Spread: 25'+.**

Magnolias are striking trees which serve well as screens when their branches are allowed to grow to the ground. Generally, the tree does well in city conditions, but it should be planted in quite rich acidic soils

and it requires a lot of moisture. Furthermore, Magnolias require ample space for growth. If planted in full sunlight, they will grow rapidly. Because it drops large waxy leaves, seed pods, and flowers, the Magnolia may present a litter problem.

**VIRGINIA PINE (*Pinus virginiana*) - Height 60'; Spread 25-35'.**

A native of the area, Virginia Pine is a short needled tree that is very tolerant of clay soils. More resistant to winter weather conditions than Loblolly Pine.



## E-13 Large Trees for Shading (Amended 6/22/04)

The following trees may be used for screening, but they are recommended especially for shading streets and parking lots. Unless otherwise noted, they will grow rapidly. Each species will attain a mature spread of at least thirty feet. The trees on the following list marked with an “\*” are appropriate selections to satisfy Section 15-315, Required Trees Along Dedicated Streets.

### **\*BLACK OAK (*Quercus velutina*) Height: 50 to 60 feet; Spread: 40 to 50 feet**

A large, deciduous oak of the red oak group with a globular, spreading crown. This tree is primarily native to upland hills, slopes and ridges. It is similar in appearance to red oak with which it may on occasion hybridize. Bark is almost black on mature trunks with deep furrows. Inner bark is yellow to orange. Trunk matures to 3' in diameter. Leathery, shiny, dark green leaves (to 10" long) have 7-9 deeply incised lobes (each with 1-3 bristle tipped teeth). Leaves turn yellow to yellow-brown to dull red in fall. Easily grown in average, acidic, dry to medium moisture, well-drained soils in full sun.

### **CHESTNUT OAK (*Quercus montana*; *Q. prinus*) Height: 60 to 70 feet; Spread: 50 to 70 feet**

Chestnut oak is a medium-sized, native, deciduous, tree that is suited to dry, infertile, rocky upland sites, yet grows best on rich well-drained soils along streams. At maturity, it is a medium-sized long-lived tree with an irregular dense crown. The sweet acorns are an important food for many wildlife species including deer, turkeys, squirrels, chipmunks, and mice, while small birds, mammals, and bees use chestnut oak cavities for nesting.

### **CUCUMBER TREE (*Magnolia acuminata*; *M. fraserii*) Height: 50 to 80 feet; Spread: 50 to 80 feet**

Cucumber tree is the most widespread and hardiest of the eight native magnolia species. It grows fairly rapidly and well in rich, moist soils of slopes and valleys and matures in 80 to 120 years. This park-like tree is planted as an ornamental for its attractive leaves, flowers, and cucumber-shaped fruit, producing seeds that are eaten by birds and small mammals. Its shape is pyramidal when young, developing a straight trunk and a rounded crown.

### **\*EASTERN RED OAK (*Quercus rubra*) Height: 50-70'; Spread: 40'+.**

This tree grows faster than any other Oak, two feet or more per year. It is prized as a street tree because its high branching habit gives it an ideal shape. The Red Oak grows in almost any average soil and presents no special maintenance problems.

### **\*GINKGO OR MAIDENHAIR TREE (*Ginkgo biloba*) Height: 40-80'; Spread: 30'+.**

~~The Ginkgo is a tree which is recommended for several outstanding reasons. It is one of the oldest surviving species of trees. It is adaptable to any soil, climate, or degree of exposure to the sun. It does quite well in the city. It has no pests, no diseases, and no pruning requirements. In sum, it is a tree of exceptional vitality. The N.C. Department of Forest Resources calls the Ginkgo, probably the best all around street tree. Two reservations are worth stating, however. First, only male trees should be planted because female Ginkgos bear a messy, malodorous fruit. Second, the Ginkgo is a slow grower. When young, it has a rather gangly appearance. It takes 20 to 30 years to assume its mature, symmetrically spreading form.~~

**\*LAUREL OAK (*Quercus laurifolia*) Height: 40-60'; Spread: 30'+.**

The Laurel Oak grows more slowly than the other Oaks listed above, but it has the advantage of being nearly evergreen in Piedmont sections of North Carolina. It has proven to be a good street tree and does quite well under city conditions. It presents no special maintenance problems.

**POST OAK (*Quercus stellata*) Height: 40 to 50 feet; Spread: 35 to 50 feet**

Post oak is a small to medium-sized tree with a crown that has snarled and twisted branches and found on upland sites with full sun. This slow-growing drought resistant oak typically occupies rocky or sandy ridges and dry woodlands with a variety of soils. Acorns provide high-energy wildlife food during fall and winter for wild turkey, white-tailed deer, and squirrels, and provide habitat for birds and mammals. Post oak can be a beautiful shade tree for parks and to stabilize soil on dry, sloping, stony sites where few other trees will grow. It develops an attractive crown with strong horizontal branches.

**\*SCARLET OAK (*Quercus Coccinea*) Height: 60-80'; Spread: 40'+.**

This is a third Oak which grows rapidly and is easy to maintain. The Scarlet Oak is more difficult to transplant than the Red or the Willow, but it may be a worthwhile selection for its excellent foliage

**SOUTHERN CATALPA (*Catalpa bignonioides*) Height: 25 to 40 feet; Spread: 20 to 30 feet**

Catalpa is a medium-sized tree with spreading branches, an irregular crown, and generally crooked bole that is suited to moist, well-drained soils with full sun. The flowers and leaves make this an interesting landscape tree but the fruit can be messy.

**SOUTHERN SUGAR MAPLE (*Acer saccharum*; *A. barbatum*) Height: 20 to 25 feet; Spread: 20 to 40 feet**

Sugar maple grows on moist, well-drained soils and is very tolerant of shade. Seeds are eaten by birds and small animals. A popular ornamental for the fall color, Sugar Maple at maturity is a medium to tall tree with very dense elliptical crown.

**SWAMP CHESTNUT OAK (*Quercus michauxii*) Height: 60 to 70 feet; Spread: 50 to 70 feet**

Swamp chestnut oak grows in full sun on moist and wet loamy soils of bottomlands, along streams and borders of swamps, tolerates saturated or flooded soils for a few days to a few weeks. The acorns are sweet and serve as food to wildlife. The crown is round, compacted, and narrow.

**SWAMP WHITE OAK (*Quercus bicolor*) Height: 50 to 60 feet; Spread: 50 to 60 feet**

Swamp white oak is a medium sized tree with an irregular crown suitable to river bottomlands, depressions, swamp borders, and along edges of streams. It is rapid growing and long lived, attaining 300 to 350 years. Many kinds of wildlife eat the acorns, particularly ducks. Swamp white oak is intermediate in shade tolerance but not very drought tolerant.

**SYCAMORE (*Platanus occidentalis*) Height: 70-100'; Spread: 60'+.**

The Sycamore is probably the fastest growing shade tree on this list. Within ten years, it can grow to a height of between thirty and forty feet. It is easily transplanted, but it needs plenty of space. As one of

nature's most massive trees, Sycamores have been known to grow to a height of 170 feet with a trunk 10 feet across. The Sycamore is a native tree which typically grows in flood plains, but it thrives in a variety of situations. Its tolerance of severe conditions has long made it a favorite choice as a street tree. Sycamores are susceptible to fungi and leaf blight and their large leaves and seed balls may present a litter problem.

**\*TULIP POPLAR (*Liriodendron tulipifera*) - Height 60'-150'; Spread 30-40'.**

Very common in eastern woodlands, this is a rapidly growing tree with colorful yellow leaves in Fall. Spring flowers, however, are not very noticeable. Difficult to transplant except when young. Excellent street tree.

**WHITE OAK (*Quercus alba*) Height: 60 to 100 feet; Spread: 50 to 90 feet**

White oak is found on fertile, moist, well-drained soils under partial sun. Acorns are eaten by game birds, deer, bear, and many small mammals. Pyramidal in youth, this species matures into a rugged, irregular crown that is wide spreading, with a stocky bole. While this species is potentially valuable for use in reforestation projects, it is not recommended near paved areas.

**\*WILLOW OAK (*Quercus phellos*) Height: 60-80'; Spread: 30'+.**

This is another rapidly growing Oak. It has proven to be quite successful as a street and parking lot tree in the Carrboro area. Its slender leaves give it a finer texture than that of other Oaks, but it still casts excellent shade. The Willow Oak is native to bottomland soils, and thus it needs plenty of moisture. It often spreads majestically as it matures so it should be given ample room to grow. No significant pests or diseases afflict the Willow Oak.

## E-14 Small Shrubs for Evergreen Screening (Amended 6/22/04)

The following shrubs are recommended for informal (unclipped) hedges or screens. Each species grows to a height of less than six feet; therefore, these shrubs are appropriate for Semi-Opaque Screens.

### **CAROLINA JESSAMINE\* (*Gelsemium sempervirens*) - Height up to 20'; Spread varies.**

A moderate growing, mostly evergreen vine that grows very well on fences. Fragrant yellow flowers in springtime. Prefers sun or partial shade. All parts of this plant are poisonous.

### **CONFEDERATE JASMINE\* (*Trachelospermum jasminoides*) - Height up to 20'; Spread varies.**

Commonly called star jasmine, this is a twining, evergreen, woody vine. Axillary and terminal clusters of salverform, sweetly fragrant, starry, creamy white flowers appear in late spring with sporadic additional bloom in summer. Flowers are attractive to bees.

### **CONVEXA JAPANESE HOLLY (*Ilex crenata* 'convexa') Height: 4-6'; Spread: 3-5'.**

~~The Convexa Japanese Holly is another good Boxwood substitute. This shrub is considered to be one of the most attractive, hardy and serviceable Hollies for landscape use. It is attractive in either a clipped or unclipped form. It grows faster than the Littleleaf Japanese Holly.~~

### **DWARF HORNED HOLLY (*Ilex cornuta* 'rotunda') Height: 3'; Spread: 3-4'.**

~~This shrub is an excellent selection for a low hedge. It is soil tolerant and requires no pruning or other special care once established. With its spiny leaves, this plant appears to be and is in fact rugged. Like all Hollies, it grows best in full sun, but unlike others of its species, it produces bright red berries without both sexes being present.~~

### **GLOSSY ABELIA (*Abelia grandiflora*) Height: 4-6'; Spread: 3-5'.**

Abelia is quite common in local nurseries and tends to be less expensive than other shrubs on this list. It bears pale pink flowers throughout the summer. Although it has proven quite popular for informal hedges, it has several drawbacks. Abelia should be pruned and thinned to maintain its best form. It may drop its leaves due to low temperatures, lack of pruning, or starvation.

### **INDIAN HAWTHORN (*Raphiolepis indica*) Height: 3-4'; Spread: 4-5'.**

~~With its spreading, irregular branching, the India Hawthorn makes an excellent informal hedge. It is tolerant of a variety of soils and is fairly drought resistant. However, it may not be as cold tolerant and pest resistant as other shrubs on this list.~~

### **INKBERRY (*Ilex Glabra*) Height: 5-10'; Spread: 4-8'**

Inkberry is an evergreen shrub with alternate leaves with a smooth or toothed margin. The bark is greenish brown and smooth. In early summer, small greenish white flowers mature. The shrub produces a black drupe that matures in the fall. It is a host plant for the Henry's Elfin butterfly. Fruits are eaten by birds and small mammals.

**JAPANESE YEW (*Taxus cuspidata*) Height: 4-6'; Spread: 5-7'.**

The versatile Yew is commonly available from local nurseries in a wide variety of sizes and shapes. The Japanese Yew serves as excellent screening material in either a clipped or unclipped form. It tolerates poor growing conditions and flourishes in almost any kind of soil. (Soggy soil may hamper its growth, however.) It is comparatively pest free and is hardy under trying winter conditions. The Yew's best feature is its rich shiny green needles which grow densely on all varieties.

**OTTO LUKEYN LAUREL (*Prunus laurocerasus* var. 'Otto Lukeyn') - Height 4'; Spread 4-7'.**

~~A cold hardy, broad leaved evergreen shrub. Prefers sun, but will grow in fairly shady conditions. Good green color even in winter. This is a shorter growing variety of the Schipka Laurel.~~

**MOUNTAIN LAUREL (*Kalmia Latifolia*) Height: 6-10'; Spread: 5-8'**

A shrub that is abundant in the mountains with leaves that are alternate with a smooth margin, raised mid-vein, and yellow underside. The bark is thin, smooth, and dark brown-red in color in young trees. The bark shreds and splits as the plant ages. In late spring to early summer, very showy clusters of white to rose flowers mature.

**POET'S LAUREL (*Danae racemosa*) Height: 2 to 3 feet; Spread: 2 to 3 feet**

Poet's Laurel prefers partial to full shade, moist, well-drained soil enriched with organic matter; but does tolerate clay soils. It has an open growth habit with slender branches that arch up and away from center of crown. It can spread by rhizomes. While foliage discolors in sun; it can be long-lasting for flower arrangements.

**TRUMPET HONEYSUCKLE\* (*Lonicera sempervirens*) - Height up to 50'; Spread varies.**

A rapid growing, mostly evergreen vine with beautiful orange to red to yellow flowers occurring in late spring and throughout the summer. Best in full sun.

**WARTY BARBERRY (*Berberis verruculosa*) Height: 3-4'; Spread: 3-4'.**

~~Barberrys as a group have proven to be excellent as hedge plants. With their dense, spiny limbs, they are effective barriers in public places. The Warty Barberry is a shrub with a neat, compact habit. It is soil tolerant and has no special maintenance requirements. It grows slowly, but it will reach a height of 3 to 4 feet within five years.~~

**WINTERBERRY HOLLY (*Ilex verticillata*) Height: 6 to 15 feet; Spread: 6 to 10 feet**

With a slow to moderate growth rate, this species is suited to partial to full sun on moist soils, but can tolerate drought. Early summer brings small white flowers that mature into dense clusters of bright red berries.

**WINTERGREEN BARBERRY (*Berberis julianae*) Height: 4-6'; Spread: 2-5'.**

~~This is another Barberry which forms an impenetrable thorny hedge. In fact, it grows even more densely than the Warty Barberry. It is pest resistant and is very hardy. No pruning is required. Because it is fairly slow growing, it will take eight to ten years to reach a height of 5 to 6 feet.~~

Note: \* Vines - which if grown on a trellis would make a nice evergreen screen.

## E-15 Large Shrubs for Evergreen Screening (Amended 6/22/04)

The following shrubs are recommended for high hedges or screens. Each species grows to a height of more than 6 feet ~~and are generally; therefore, these shrubs are~~ appropriate for Opaque Screens.

### **ANISE BUSH (*Illicium anisatum*) - Height 8-12'; Spread 8-10'.**

moderate growing, evergreen shrub with an open habit. Small flowers appear in mid-Summer. Prefers a fair amount of moisture, with partial to full sun. Subject to damage during very cold winters.

### **CAROLINA CHERRY-LAUREL (*Prunus caroliniana*) Height: 20-30'; Spread: 15-20'.**

This tree is prized for its dense evergreen foliage. It may be trimmed as a hedge, but also serves as an excellent screen in its natural form. The Cherry-Laurel grows rapidly and has no pests. However, it may not be as cold hardy as other trees on this list.

### **CLEYERA (*Cleyera japonica*) - Height 8-10'; Spread 5-6'.**

~~A slow-moderate growing evergreen shrub. Its new foliage is reddish in color, like the Photinia. However, unlike the Photinia, Cleyera is much more disease resistant and thus a better option. Prefers shade or partial shade, with moist, but well drained soil.~~

### **ENGLISH LAUREL (*Prunus laurocerasus*) - Height 10-12'; Spread 8-11'.**

~~A large leaved, evergreen shrub with moderate growth. Prefers well drained soils. Grows best in sun or partial shade, but will survive in shade. Cold hardy. Makes an excellent evergreen screen.~~

### **FORTUNE TEA OLIVE (*Osmanthus fortunei*) Height: 9-12'; Spread: 5-7'.**

This Osmanthus hybrid is a popular, though non-descript, shrub. With its vigorous growth, it will form an excellent screen or border. It is soil tolerant. The Fortune Tea Olive is most notable for its inconspicuous yet highly fragrant flowers.

### **LOBLOLLY BAY (*Gordonia lasianthus*) Height 30 to 60 feet; Spread 10 to 15 feet**

Loblolly-bay is a small to medium-sized native, evergreen tree that grows on acid soils in flat woodlands or shallow depressions with little or no slope, slow runoff, and poor to very poor drainage. It has a narrow crown and straight trunk.

### **MAGNOLIA "LITTLE GEM" Height 15 to 30 feet; Spread 15 to 20 feet**

'Little Gem' is a much smaller and slower growing Magnolia cultivar that typically grows as a compact upright multi-stemmed shrub or small tree. It features glossy green leaves (to 5" long) that are bronze-brown underneath. Fragrant white flowers (to 4" diameter) bloom in summer. It is effective as a screen, a small street tree or in containers.

### **RED BAY (*Persea borbonia*) Height: 15 to 40 feet; Spread 10 to 20 feet**

Redbay is an attractive aromatic evergreen tree suitable for sites with partial to full sun and prefers drier soils. Birds and small mammals eat the fruit.

**SAVANNAH HOLLY (*Ilex X Attenuata* ‘Savannah’) Height: 25 to 40’; Spread 8 to 12 feet**

This holly grows quickly in full sun or partial shade on moist, acid soils. Plants in full sun can grow a dense canopy, those in partial shade are more open. Trees attract cedar waxwings, mockingbirds, robins and many other birds. This holly makes a fairly durable street tree. It is quite drought-tolerant once it becomes well-established. The crown grown with one central trunk is preferred, making it well-suited for urban areas having restricted vertical space. Savannah Holly has also performed well in sidewalk cutouts/small tree pits, in parking lots and median strip plantings and for screens.

**SCHIPKA LAUREL (*Prunus laurocerasus* ‘schipkaensis’) - height 6-8’; spread 3-5’.**

~~A cold hardy, broad leaved evergreen shrub. Prefers sun, but will grow in fairly shady conditions. Good winter color.~~

**SOUTHERN WAX MYRTLE (*Myrica cerifera*) Height 40 feet; Spread 20 to 25 feet**

Southern wax myrtle is an erect, shade tolerant, ornamental, evergreen, small tree or shrub. Its flat leaves are aromatic when crushed and may repel. Underground runners extend the growth laterally and root nodules are capable of atmospheric nitrogen fixation.

**YAUPON HOLLY (*Ilex vomitoria*) Height: 5-15’; Spread: 6-12’.**

This is another versatile Holly, slower growing than the Burford, but equally as adaptable to adverse conditions. It is a native shrub which has proven to be one of the most drought resistant of all Hollies. It may be clipped to maintain any desired height. The Yaupon Holly is very heavily fruited and will attract birds.



## **E-16 Assorted Plantings for Broken Screens (Amended 6/22/04)**

The following is a sampling of shrubbery which would be appropriate in a Broken Screen. Because many of these plants are deciduous, they are not suitable for Opaque and Semi-Opaque Screens. (Note: Many of the evergreen shrubs described in planting lists E-14 and E-15 are also suitable for Broken Screens.)

### **AZALEAS (*Rhododendron calendulaceum* (Flame); *R. nudiflora* & *R. periclymenoides* (Pinxterbloom); *R. prunifolium* (Plumleaf)) Height 3 to 10 feet; Spread 4 to 8 feet.**

These three azaleas are excellent naturalizing plants that do not require a lot of space. With great orange, pink, and red colors, these species attract hummingbirds and butterflies. Good for sites with full sun to part shade with medium moisture on well-drained soils with a southwest aspect.

### **BEAUTYBERRY (*Callicarpa americana*) - Height 6'.**

Very colorful deciduous shrub with springtime flowers, followed by purple fruit which lasts into winter. Prefers full sun.

### **\*BLUEBERRY (*Vaccinium ashei*) - Height 4-6'; Spread 3-5'.**

Also known as Rabbiteye blueberry, this is a heat tolerant, native shrub. White flowers in springtime followed by blue fruits that birds enjoy. Has a moderate growth rate. This shrub prefers well drained, acid soil.

### **~~\*BORDER FORSYTHIA (*Forsythia intermedia*) Height: 8-10'; Spread: 7-10'.~~**

~~Forsythias are well known shrubs which bloom bright yellow quite early in the Spring. There are two commonly available forms of this shrubs: the weeping *Forsythia suspensa* and the more upright *Forsythia intermedia*. The latter is preferred for screening purposes. With its graceful branches, the Border Forsythia presents a good deciduous foliage mass and should be given plenty of room to grow. It transplants easily and withstands poor growing conditions. It should be thinned occasionally to ensure vigorous growth.~~

### **BUTTON BUSH (*Cephalanthus occidentalis*) Height: 6 to 10 feet Spread: 6 to 10 feet**

Buttonbush is a deciduous, warm-season, tall shrub or small tree that grows along swamps, marshes, bogs, ditches, and other riparian areas that are seasonally inundated for at least part of the year. Its base is often swollen, with green branches when young but turns brown at maturity. Tiny, white flowers occur in dense, spherical clusters at branch ends attract bees and butterflies with fruits arranged in a round cluster of brown, cone-shaped nutlets.

### **CAROLINA ALLSPICE OR SWEETSHRUB (*Calycanthus floridus*) - Height 6-9'; Spread 5-8'.**

This is a deciduous shrub native to the Southeast. Fragrant, maroon flowers appear in late Spring. Takes sun or shade.

### **CAROLINA ROSE (*Rosa carolina*) Height 3 to 6 feet Spread: 5 to 10 feet**

Best grown in average, medium-wet to wet, well-drained soil in full sun. Fragrant, showy flowers attract birds and butterflies, but this plant does have thorns.

**CLETHRA (Clethra alnifolia) - Height 10'.**

Another native of the Eastern United States, Clethra has fragrant white flowers in late Summer. Grows well in acid soils. Full sun, however in the Piedmont it would do best with some shade. Varieties are available with pink flowers.

**COMMON WITCH HAZEL (Hamamelis virginiana) Height: 8-15'; Spread 7-14'.**

This shrub is a larger version of Vernal Witch Hazel with many of the same qualities. It is another native woodland plant which has adapted well to landscaping uses. The Common Witch Hazel is recommended for shady areas, but when planted in the sun it grows to be a splendid well rounded specimen. It is especially useful in large areas.

**DROOPING LEUCOTHOE (Leucothoe fontanesiana) Height: 3-4'; Spread: 4-6'.**

Drooping Leucothoe is a moundlike shrub which is good for planting in front of and between other flora and beneath trees. It is hardy in city conditions and gives a natural effect when planted along borders. This native evergreen is graceful and attractive in all seasons. It is easy to transplant but requires a heavy mulch and should be provided with at least partial shade. Old branches should be pruned occasionally to stimulate new growth.

**EUONYMUS AMERICANA (Hearts-a-Burstin; Strawberry Bush) Height: 3-5'; Spread: 4-6'**

Strawberry Bush is a native deciduous shrub with leaves that are opposite with finely toothed margins. The bark is green, but does split and become darker as the tree ages. In early summer, small, 5-petaled, greenish purple flowers mature. The shrub produces 4-lobed capsules which when opened reveal an orange-red, warty seed.

**FRINGETREE (Chioanthus virginicus) Height: 10-30'; Spread: 8-10'.**

The Fringetree is known for its profusion of beautiful flowers. It is considered to be one of the most striking native American shrubs. It is relatively difficult to transplant, but once established it does well in cities as it endures heavy smoke and dust. The mature Fringetree's only drawback is that its leaves appear rather late in the Spring.

**HIGHBUSH BLUEBERRY (Vaccinium Corymbosum) Height: 8-15'; Spread: 8-12'**

Highbush Blueberry is a deciduous shrub with alternate leaves with a smooth or toothed margin and fuzzy underside. The bark is gray-brown to reddish brown and very shreddy. In early spring, small, white, bell-shaped flowers mature in clusters. The shrub produces a dark blue berry that matures in mid to late summer. It is a host plant for the Brown Elfin butterfly. Fruits are eaten by a variety of birds and mammals, including humans.

**INKBERRY (Ilex Glabra) Height: 5-10'; Spread: 4-8'**

Inkberry is an evergreen shrub with alternate leaves with a smooth or toothed margin. The bark is greenish brown and smooth. In early summer, small greenish white flowers mature. The shrub produces a black drupe that matures in the fall. It is a host plant for the Henry's Elfin butterfly. Fruits are eaten by birds and small mammals.

**JAPANESE BARBERRY (*Berberis thunbergii*) Height: 3-5'; Spread: 3-5'.**

~~This extremely common deciduous shrub is considered to be one of the toughest members of the Barberry family. It survives drought, poor soils, exposures, and the worst city conditions. With its many thorns, the Japanese Barberry is often used as an impenetrable barrier, but it is attractive enough to stand alone as a specimen plant. It requires no special maintenance and, when planted singularly, needs no pruning.~~

**JAPANESE FLOWERING APRICOT (*Prunus mume*) - Height 15' (tree).**

~~Deciduous tree with small, but profuse flowers that have a spicy fragrance. Blooms in February or March. Varieties are available with pink, red, or white flowers. Prefers full sun or partial shade.~~

**OAKLEAF HYDRANGEA (*Hydrangea quercifolia*) - Height 4-6'; Spread 3-5'.**

Deciduous shrub with large, white flower clusters during the Summer. Colorful crimson foliage in Fall. Makes an excellent specimen plant.

**SMOKETREE (*Cotinus coggygria*) - Height 10-15'; Spread 8-14'.**

Large shrub or small deciduous tree with attractive round leaves. Colorful lavender panicles appear in Summer. Prefers well drained soil, but otherwise does well in poor soils. Full sun is best for this shrub.

**SPICEBUSH (*Lindera benzoin*) - Height 6-10'; Spread 4-8'.**

Spicebush is a deciduous shrub with alternate leaves with a smooth margin that produce a spicy odor when crushed. The bark is brown to gray-brown and speckled with light colored lenticels. In early spring, small, yellow flowers mature in axillary clusters. The shrub produces a bright red drupe with a peppery taste and scent. The fruit matures in the fall. It is a host plant for the Spicebush Swallowtail butterfly. Fruits are eaten by songbirds, especially during fall migration.

**STAR MAGNOLIA (*Magnolia stellata*) Height: 10-12'; Spread: 8-10'.**

This handsome specimen shrub is considered to be the hardiest of all the Magnolias. It forms a broad, rounded mass. It becomes tree-like with age but continues to branch to the ground. Early in the spring, it produces numerous fragrant white flowers. The Star Magnolia should not be planted adjacent to shallow rooting trees. It should be allowed plenty of sun.

**SUMAC (*Rhus copallina* (Shining); *R. glabra* (Smooth) *R. typhina* (Staghorn)) Height 7 to 40 feet; Spread 9 to 20 feet**

These species are perennial, deciduous, sun-loving, thicket-forming shrubs or small trees with branches that tend to be fairly sparse and stout. Sumac does well on dry to medium moisture sites. The tart fruits are eaten by birds and are very tart in taste. These species provide good fall color.

**\*\*\*\* SWAMP WHITE OAK (*Quercus bicolor*) Height: 50 to 60 feet; Spread: 50 to 60 feet**

Swamp white oak is a medium sized tree with an irregular crown suitable to river bottomlands, depressions, swamp borders, and along edges of streams. It is rapid growing and long lived, reaching 300 to 350 years. Many kinds of wildlife eat the acorns, particularly ducks. Swamp white oak is intermediate in shade tolerance but not very drought tolerant.

**VERNAL WITCH HAZEL (*Hamamelis vernalis*) Height: 4-6'; Spread: 2- 3'.**

This rapidly growing native shrub is excellent for bordering and naturalizing. It assumes a dense, upright form, thriving in even the most polluted air. Other than plenty of watering, the Vernal Witch Hazel requires no special maintenance.

**\*\*\*\*Viburnum (*Viburnum prunifolium*; *V. dentatum*) Height: 12 to 15 feet; Spread: 8 to 12 feet**

Black Haw is a small tree with twisted trunk and arching branches with an overall round crown appearance. Does best on partially sunny sites on moist, well-drained soils.

## E-17 List of Invasive Plant Species (AMENDED 6/22/04; 6/22/10)

Invasive plant species identified by the North Carolina Native Plant Society are prohibited from planting for all plantings to comply with Article XIX.

~~—The following plant species shall be prohibited when complying with the shading and screening provisions of this chapter and shall not be shown on any plans submitted in support of a Land Use Permit application. Further information on invasive pest plants that applicants may wish to avoid may be found on the website for the North Carolina Native Plant Society.—~~

Plant Type: A=Aquatic, H=Herbaceous, W=Woody Plant

<b>Species (Latin)</b>	<b>Common Name</b>	<b>Type</b>
<del>Ailanthus altissima</del>	<del>Tree of Heaven</del>	<del>W</del>
<del>Albizia julibrissin</del>	<del>Mimosa</del>	<del>W</del>
<del>Alliaria petiolata</del>	<del>Garlic Mustard</del>	<del>W</del>
<del>Celastris orbiculatus</del>	<del>Asian Bittersweet</del>	<del>W</del>
<del>Eleagnus angustifolia</del>	<del>Russian Olive</del>	<del>W</del>
<del>Eleagnus umbellata</del>	<del>Autumn Olive</del>	<del>W</del>
<del>Hedera helix</del>	<del>English Ivy</del>	<del>W</del>
<del>Hydrilla verticillata</del>	<del>Hydrilla</del>	<del>A</del>
<del>Lespedeza bicolor</del>	<del>Bicolor Lespedeza</del>	<del>W</del>
<del>Lespedeza cuneata</del>	<del>Sericea Lespedeza</del>	<del>H</del>
<del>Ligustrum sinense</del>	<del>Chinese privet</del>	<del>W</del>
<del>Lonicera fragrantissima</del>	<del>Bush Honeysuckle</del>	<del>W</del>
<del>Lonicera japonica</del>	<del>Japanese Honeysuckle</del>	<del>W</del>
<del>Microstegium vimineum</del>	<del>Japanese Stilt grass</del>	<del>H</del>
<del>Murdannia keisak</del>	<del>Asian Spiderwort</del>	<del>H</del>
<del>Myriophyllum aquaticum</del>	<del>Parrotfeather</del>	<del>A</del>
<del>Paulownia tomentosa</del>	<del>Princesstree</del>	<del>W</del>
<del>Phragmites australis</del>	<del>Common Reed</del>	<del>H</del>
<del>Polygonum cuspidatum</del>	<del>Japanese Knotweed</del>	<del>H</del>
<del>Pueraria montana</del>	<del>Kudzu</del>	<del>H</del>
<del>Rosa multiflora</del>	<del>Multiflora Rose</del>	<del>W</del>
<del>Salvinia molesta</del>	<del>Aquarium water moss</del>	<del>A</del>
<del>Wisteria sinensis</del>	<del>Chinese wisteria</del>	<del>W</del>





# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-306

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 2

---

### **TITLE:**

Communications Plan Status Update

**PURPOSE:** The purpose of this item is to provide an update to the Board of Aldermen on implementation initiatives started by the Communications Team since adoption of the Communications Plan in June 2017.

**DEPARTMENT:** Town Manager's Office

**CONTACT INFORMATION:** Julie Eckenrode 919-918-7308

**INFORMATION:** A staff Communications Team formed as directed by the Communications Plan and meets once a month to work on implementation of the Communications Plan. The Team has taken on five initiatives to complete this fiscal year based on need, fiscal ability, and time sensitivity. Those initiatives and status updates are available in Attachment A.

The Team will continue to meet monthly to work to implement the Communications Plan, implement sound communications practices across all departments, and work with organizations throughout the county to help get our messaging out.

**FISCAL & STAFF IMPACT:** The Communications Team meets once a month for 90 minutes. There is no current fiscal impact.

**RECOMMENDATION:** It is recommended that the Board of Aldermen accept the report.

Communications Plan Implementation Tracking

Oct. 2017

Item		Start Date	Target Finish Date	Staff	Status/Comments
4.1.3	Create external and internal newsletters to communicate Town news and information citizens and employees	8/9/2017	6/30/2018	Julie Eckenrode, Will Potter	Team reviewed internal newsletter survey feedback and recommends launching the internal newsletter in January in correlation with website relaunch. Julie will present sample external newsletter to Management Team. Will will work on a header for newsletter and everyone will brainstorm newsletter names.
2.2.1	Centralize Town event information via Community Events Calendar	8/9/2017	6/30/2018	Julie Eckenrode	The Team will investigate this as part of the internal newsletter research.
2.1.4	Investigate ability to create video content for use in various places (i.e. website, local channels)	8/9/2017	6/30/2018	Julie Eckenrode, Chris Attack	Some team members visited CH Lib Media Lab to learn about video equipment. Team will work on a sample PSA using equipment at library to better understand potential financial and time costs of creating video more regularly. Chris is investigating equipment options for PD and will share findings with Team.
5.5.2	Require department heads to participate in NIMS/ICS training to awareness and understanding of emergency communication. Offer all town personnel option of attending same training	8/9/2017	6/30/2018	Will Potter	Management Team will be surveyed to determine needs of ICS training per feedback from Kirby Saunders, OC EM.
4.2.2	Establish a process to periodically monitor and evaluate Town communications activities.	9/5/2017	6/30/2018	All Comm. Team	Communications Team received a demo from ArchiveSocial to gain understanding about municipalities archiving social media. Team recommends proceeding with the free trial from ArchiveSocial. Julie will investigate purchase process and follow-up with ArchiveSocial to get answers on questions from the Team.





# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-293

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

### **TITLE:**

Draft Solid Waste Study Final Report

**PURPOSE:** The purpose of this item is to have Mitch Kessler of Kessler Consulting, Inc. present a summary of the final solid waste study report to the Board of Aldermen.

**DEPARTMENT:** Town Manager's Office, Public Works

**CONTACT INFORMATION:** David Andrews 918-7315; Anita Jones-McNair 918-7427

**INFORMATION:** The Town contracted Kessler Consulting, Inc. in 2016 to complete a solid waste study. This study has 5 components which have been completed over the past year.

This evening Mitch Kessler is here to provide an overview of the of the draft final report for the Board's acceptance. All details of the study and its findings and recommendations from the consultant can be found in the attached draft final report.

**FISCAL & STAFF IMPACT:** Staff and fiscal impact will be determined by next steps.

**RECOMMENDATION:** It is recommended that the Board of Aldermen accept the final report and provide feedback on next steps.



## TECHNICAL MEMORANDUM

**DATE:** September 1, 2017

**TO:** David Andrews, Town Manager

**FROM:** Lisa Lamppert, Senior Consultant

**SUBJ:** **Residential Solid Waste Study – Executive Summary**

**PROJ #:** 192-00.00

---

The Town of Carrboro, NC (Town) requested Kessler Consulting, Inc. (KCI) to conduct a Residential Solid Waste Study (Study). The Study includes an assessment of the Town's Solid Waste Management Division (Division) and its existing system. The purpose and intent for the Study was to progress toward a long-term goal of Zero Waste, evaluate options to reduce residential solid waste disposal, and assess collection methods and schedules to reduce the Town's carbon footprint.

KCI conducted several tasks that resulted in individual technical memorandums presenting the observations, findings, and recommendations by task. This memorandum is designed to summarize and integrate the tasks into an executive summary of the Study.

The following tasks were requested in the Town's Request for Proposals (RFP) scope of work:

- Task 1 – Public Participation
- Task 2 – Assessment of Current Waste Programs
- Task 3 – Waste Characterization Study
- Task 4 – Waste Collection Route Study
- Task 5 – Organics Collection Options Assessment
- Task 6 – Preliminary Plan for Residential Source Separated Pilot Program
- Task 7 – Final Product
- Task 8 – Pay-As-You-Throw Assessment

Five technical memorandums (TMs) were developed addressing these tasks. For cohesiveness, Task 2 and Task 4 were combined into a single TM as was Task 5 and Task 6. The five TM's are attached to this executive summary for convenience.

### **Current Residential Solid Waste Collection Program**

The Town currently provides collection services for garbage, yard waste, and bulk waste via the Public Works Department. Services are paid for through the General Fund. Orange County (County) provides recyclables collection services, which is paid for through property taxes.

The Town's current residential solid waste collection program is as follows:

- Garbage – automated curbside service once per week in 95-gallon carts
- Yard Waste – automated and manual curbside service twice per month; seasonal loose leaf collection every-other-week (EOW) (November – February)<sup>1</sup>
- Bulk Waste – once per week service on the same day as garbage collection and on-call service; limited items at no charge, others for a fee
- Recycling – automated curbside service once per week in 95-gallon carts collected by the County

The County does not collect the Town's recyclables separately from non-Town recyclables. As a result the Town's recycling rate cannot be determined.

### **Residential Waste Composition**

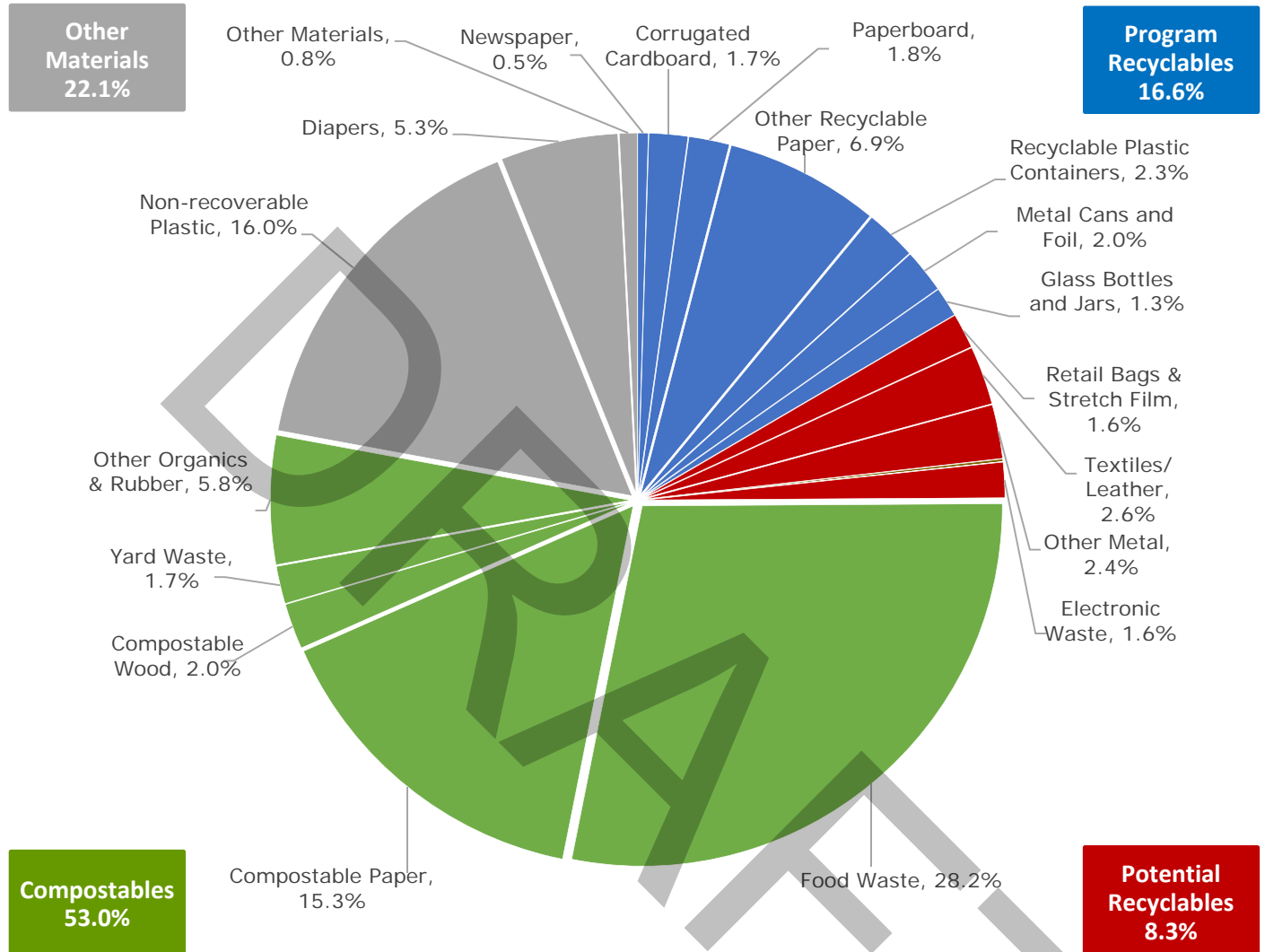
KCI conducted a residential waste composition study (WCS) October 24-28, 2016. We developed a methodology that modeled after the County's previous waste composition studies in order to maintain continuity with the previous study results.

The results of the WCS identified that the Town's residents are actively diverting recyclables, yard waste, and textiles as those categories are much smaller than typical. As a result, the Town has a much higher percentage of organics, which is comprised of food waste, compostable paper, and small amounts of compostable wood, yard waste, and other organics and rubber. Figure 1 provides the detailed results of the Town's residential WCS.

This Section Intentionally Left Blank

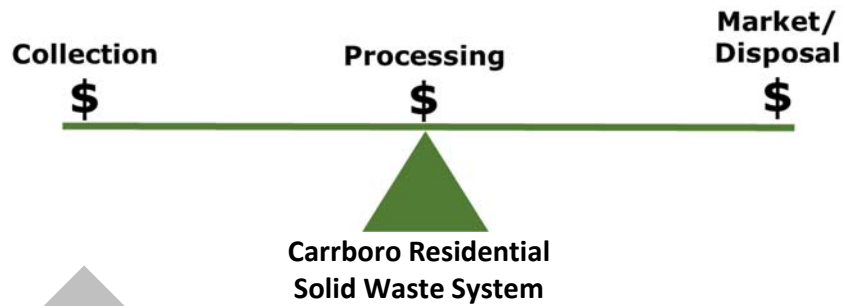
---

<sup>1</sup> Seasonal loose leaf collection is conducted by the Landscaping Division and is not included in this Study.

**Figure 1: Composition of Single-Family Residential Waste Disposed (% by weight)**

### Residential Cost of Services

Collection, processing, and marketing/disposal are interrelated elements of a materials management system (see Figure 2). All three elements have a cost and are critical to maintaining a balanced, sustainable management system. Changes to one of these elements will impact the others; therefore, the model links all three elements to ensure implications to the overall materials management system are factored in.

**Figure 2: Balancing the Business Components of Materials Management**

KCI conducted a cost of services analysis of the Town's current residential collection program. The Division's expenses were allocated across residential and commercial lines of business. Residential expenses were further allocated into three residential collection services provided by the Division: Garbage, yard waste, and bulk waste. KCI worked with Division and Finance staff to identify direct expenses and develop an appropriate methodology for allocating indirect expenses. The assignment of collection routes, fleet, and full-time employees to the three collection services was used for allocation. Disposal costs were calculated based on actual disposal log reports and totals by Division truck type. A summary of the cost of service follows.

**Table 1: Residential Cost of Services**

<b>FY2016</b>	<b>Collection Cost per Ton</b>	<b>Disposal Cost per Ton</b>	<b>Annual Tons</b>	<b>Est. Annual Cost per Household</b>
Garbage	\$100.93	\$41.00	2,547.22	\$82.41
Yard Waste	\$289.41	\$18.00	859.59	\$60.23
Bulk Waste	\$220.47	\$41.00	224.86	\$13.40
Average/Total	\$188.50		3,631.67	\$156.05

The estimated cost per household per month for solid waste collection services is \$13.00, which is a relatively reasonable cost for the services that the Town provides. However, the Town's cost for services for collection comprises 81 percent of total solid waste expenditures with disposal making up the remaining 19 percent. Typically collection costs range from 50-70 percent of a materials management system, which is primarily dependent on the cost of disposal that can vary widely. The Town's disposal costs are moderate, reflecting a higher than average cost for collection.

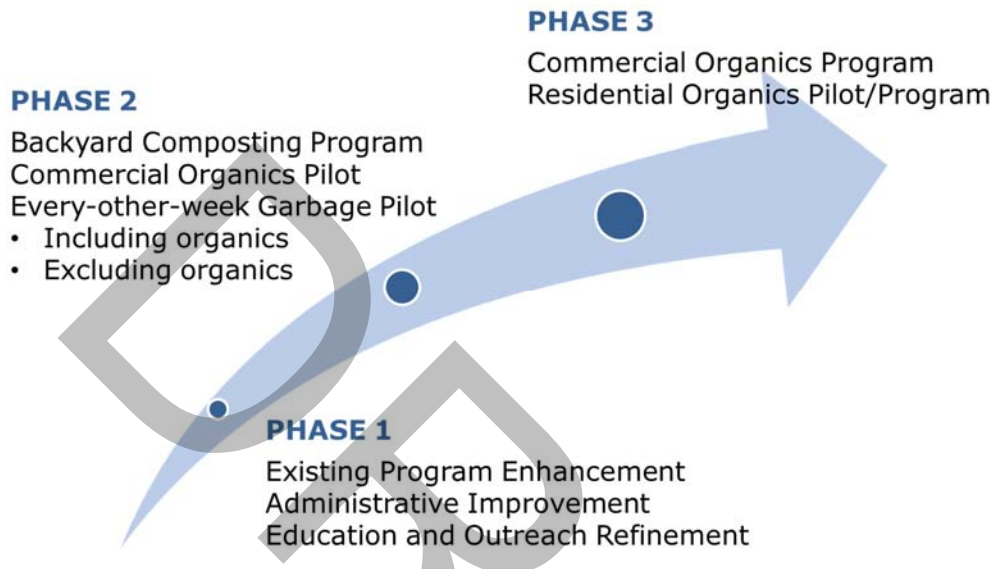
### **Findings and Recommendations**

KCI presented a variety of recommendations within the TMs to help the Town achieve its goals and objectives based on the purposes and intent of the Study. A summary of findings and recommendations are presented in this executive summary, more details can be found in the individual TMs.

The recommendations are provided in a phased-in approach (see Figure 3), identifying enhancements that could be implemented immediately and others that may require building upon

previous activities. Depending on the Town's desire and resources available, Phase 1 and some of Phase 2 recommendations could be implemented together.

**Figure 3: Recommendations for Improved Solid Waste Management**



### Phase 1 Recommendations

#### ➤ Garbage Collection

Garbage collection is a uniform program with a clear schedule and low collection cost. Residents surveyed were overwhelmingly pleased and described the Town's garbage services as "great" or "good" (92 percent).

KCI recommends that the Town enhance its garbage program to encourage diversion and lower collection costs by incorporating:

- Increased rate for customers utilizing more than one roll cart for garbage
- Alternative setout requirements, such as artery or one-sided collection, for hard-to-service areas to streamline collection, alleviate collection congestion, and provide a safer environment for staff and residents

#### ➤ Yard Waste Collection

Yard waste collection is a non-uniform program with multiple options and multiple collection vehicles, and collection vehicles are not aligned with the collection method employed. Residents surveyed were less pleased with the Town's yard waste services with only 66 percent describing them as "great" or "good." One area of frustration was that the schedule was confusing and reported missed services. Yard waste is the most expensive collection service.

KCI recommends that the Town enhance its yard waste program to lower collection costs, reduce Greenhouse Gas (GHG) emissions with streamlined routes, and increase quality of service as follows:

- Cart yard waste
- Use the hybrid vehicle
- Route yard waste outside of the cart, as needed
- Charge for all yard waste collected outside of the cart

The Town could purchase brand new garbage carts for all residents and repurpose the existing garbage carts as yard waste carts. A fully carted program would allow the Division to utilize the hybrid collection vehicle, which is currently underutilized and remains parked two days per week. A carted program will also eliminate the need for collection staff to exit the vehicle to debag yard waste. Piles of yard waste outside of the cart could be routed for the claw truck and collected the following day. Of the six injuries reported between 2013 and 2016, all but one occurred while the driver was outside of the vehicle to manually collect yard waste.

By enhancing the yard waste program to an on-call program for piles of yard waste, collections could be routed to reduce time driving streets looking for large setouts. The reduced time on route will not only reduce collection costs but will reduce GHG emissions.

#### ➤ **Bulk Waste Collection**

Similar to yard waste, bulk waste collection is a non-uniform program with an unclear fee structure and inefficient routing. While some customers may place bulk waste out on their trash collection day, others may place items at the curb for on-call collection. Division staff might bypass one pile of bulk waste because it requires a fee to stop next door because that pile of bulk waste is comprised of “free” items. Bulk waste is the second most expensive collection program.

KCI recommends that the Town enhance its bulk waste program to help lower collection costs and reduce GHG emissions with streamlined routes by incorporating:

- On-call service only
- Route collection, as needed
- Charge for all bulk waste

Similar to the on-call yard waste recommendations, by enhancing the bulk waste program to an on-call program, collections could be routed to reduce time driving streets looking for setouts. The reduced time on route will not only reduce collection costs but will reduce GHG emissions.

#### ➤ **Operation Administration**

KCI observed an experienced staff of eight full-time employees with an average of 14.5 years with the Town. The Division appears to foster a culture of happiness and cooperative work ethics among its employees. The Division demonstrated effective communication and cooperation among the front line staff and the supervisor. Drivers are cross-trained, which is an industry best practice but, despite the best efforts in many organizations, is never actually implemented.



KCI reviewed the fleet replacement schedule and found it inconsistent with industry standards. The best replacement policies evaluate utilization and mitigate the increased maintenance, repair, and fuel costs incurred by older vehicles. Several of the administrative processes and procedures were manual and/or inefficient. Utilizing technology, where appropriate, will improve efficiency and mitigate human error. Although the Division does promote safety, solid waste safety meetings are not regularly scheduled.

KCI recommends the following enhancements to assist staff in conducting effective and efficient work.

- Revamp education and outreach
- Promote a collection reminder app for customers that find schedules confusing
- Revisit the fleet vehicle replacement policy
- Revise back office processes and procedures
- Schedule weekly safety meetings

#### ➤ **Education and Outreach Refinement**

The education and outreach (E&O) on the Town website should inform residents of the existing collection program, encourage diversion, and provide resources as appropriate. E&O should include multiple touchpoints using multiple methods for the widest reach. Appropriate E&O is critical to the successful implementation of program enhancements, pilot programs, or new programs.

### **Phase 2 Recommendations**

#### ➤ **Backyard Composting Program**

In an effort to build upon existing diversion efforts and encourage more, KCI recommends the Town promote a residential backyard composting program. Of the residents surveyed, 42 percent already do some form of backyard composting consisting of food scraps and/or leaves and small yard debris. The Town may want to consider conducting workshops to teach residents about composting and provide kitchen pails/bins and/or backyard composters for a fee.

#### ➤ **Commercial Organics Pilot**

Commercial organics programs address the largest generators. Although the Town's commercial collection program was not part of the scope, a commercial organics program could provide significant diversion opportunity. The County WCS indicated that 23 percent of the Town's commercial waste is food waste. The town has four organics processors in the local area for delivery of the feedstock. A pilot study with a select group of generators would provide the Town with important information for the development of a full-scale commercial organics program.

#### ➤ **EOW Garbage Pilot**

Removing organics from the residential waste stream will mitigate one of the major concerns regarding EOW garbage collection. A pilot study could be conducted in tandem



with the residential organics pilot, or once a full-scale residential organics program has been implemented. The EOW garbage collection pilot could also include curbside organics. Should the Town decide to implement a carted yard waste program, the infrastructure will already be in place and require minimal additional resources.

### **Phase 3 Recommendations**

#### **➤ Commercial Organics Program**

Based on the results of the commercial organics pilot study, the Town may want to implement a full-scale commercial organics program.

#### **➤ Residential Organics Pilot/Program**

Should a residential organics pilot not be conducted in tandem with the EOW garbage collection pilot, a stand-alone residential curbside organics pilot study could be conducted with a select group of residents. Based on the results of a residential organics pilot study, the Town may want to implement a full-scale residential organics program.

### **Next Steps**

On September 19, 2017, Mitch Kessler, President of KCI, will make a presentation of the Study to the Board of Aldermen in the Board Chambers. The presentation will align with this executive summary and encourage further discussion regarding the Town's goals and objectives as they pertain to residential solid waste collection. At that time, Town staff will seek to obtain board approval to accept the Study and obtain board direction in prioritizing the next steps for implementation. It has been a pleasure assisting the Town in this important project and KCI would be happy for the opportunity to assist the Town with the implementation of any, or all, of the recommended program enhancements, pilot studies, and new programs.



## TECHNICAL MEMORANDUM

**TO:** David Andrews, Town Manager  
Town of Carrboro

**FROM:** Shane Barrett, Consultant

**SUBJ:** **Technical Memorandum #1: Residential Waste Composition Study Results**

**PROJ #:** 192-00.00

---

### Purpose and Background

This technical memorandum provides the results of the Residential Waste Composition Study (WCS) conducted by Kessler Consulting, Inc. (KCI) for the Town of Carrboro (Town). The objective of the WCS is to provide the Town with reliable information regarding the types and percentages of materials, including potentially recyclable materials, currently disposed of by its single-family residents. This information will assist the Town in developing future programs, including more focused and cost-effective resource management and recycling systems.

Fieldwork for the WCS was conducted concurrently with a similar study KCI was conducting for Orange County (County), thereby leveraging the resources already mobilized by KCI. Fieldwork took place at the City of Durham (City) Transfer Station during the week of October 24-28, 2016.

### Methodology

KCI developed a methodology that was modelled after the County's previous waste composition studies in order to maintain continuity with the previous study results. KCI provided a Study Supervisor, Sorting Supervisor, additional labor to assist with sorting activities, all sorting equipment, and safety gear. The City provided the services of a loader and operator to pull samples at the direction of the Study Supervisor and remove waste upon completion of sorting activities.

During the week of October 24-28, 2016, KCI pulled a representative sample of at least 200 pounds from each of the Town's six weekly single-family residential routes (noted as automated side loader routes #1-#6). All samples were manually sorted into 40 material categories, which are defined in Attachment A. This list of material categories was developed taking into consideration the types of recyclables included in the Town's recycling program, as well as the County's previous studies.

Recyclables accepted by the Town include the following:

- Cardboard
- Newspaper
- Mixed paper
- Narrow-neck plastic containers
- Plastic tubs #2, #4, and #5
- Glass bottles and jars
- Aseptic and gable-top containers
- Aluminum cans and foil
- Steel cans and containers

Following the field work, data was analyzed as outlined in the *ASTM Standard Test Method for Determination of the Composition of Unprocessed Municipal Solid Waste (D5231-92; reapproved 2008)* to determine the percentage, by weight, of each material category. In addition to the weighted average, the 90 percent confidence interval was calculated for each material category. The confidence interval indicates that, with a 90 percent level of confidence, the actual arithmetic mean (the arithmetic mean obtained if an infinite number of samples were sorted) is within the upper and lower limits shown. This provides an understanding of how much variation occurred in the quantity of that material category in the samples sorted. Generally, the more homogeneous the waste stream and the greater the number of samples sorted, the higher the level of accuracy achieved and the narrower the margin between the upper and lower bounds of the confidence interval.

## WCS Results

Unless otherwise stated, all results presented in this section are expressed in percentage by weight. The percentages included in the tables and figures are the mean values for each material category.

The tables and figures provided at the end of this memorandum present the results of the Winter 2016 sorting event as listed below.

- Single-family residential waste results are provided in Figure 1 and Table 1. Table 1 summarizes the materials in the Town's single-family residential waste stream that offer the greatest potential for diversion through increased recycling or composting. Individual sample results provided in Attachment B.
- Table 2 provides a comparison of the Town's single-family residential waste stream to the countywide single-family residential results from the County's current and previous studies.

Comparisons with the previous studies demonstrate changes in the waste stream over time. For example, the percentage of newspapers and magazines has declined, reflecting the trend toward electronic news media and the commensurate downsizing of printed newspapers. It likely also reflects recycling efforts within the County. The percentage of glass containers has also declined, reflecting the trend toward replacing some types of glass with plastic packaging.

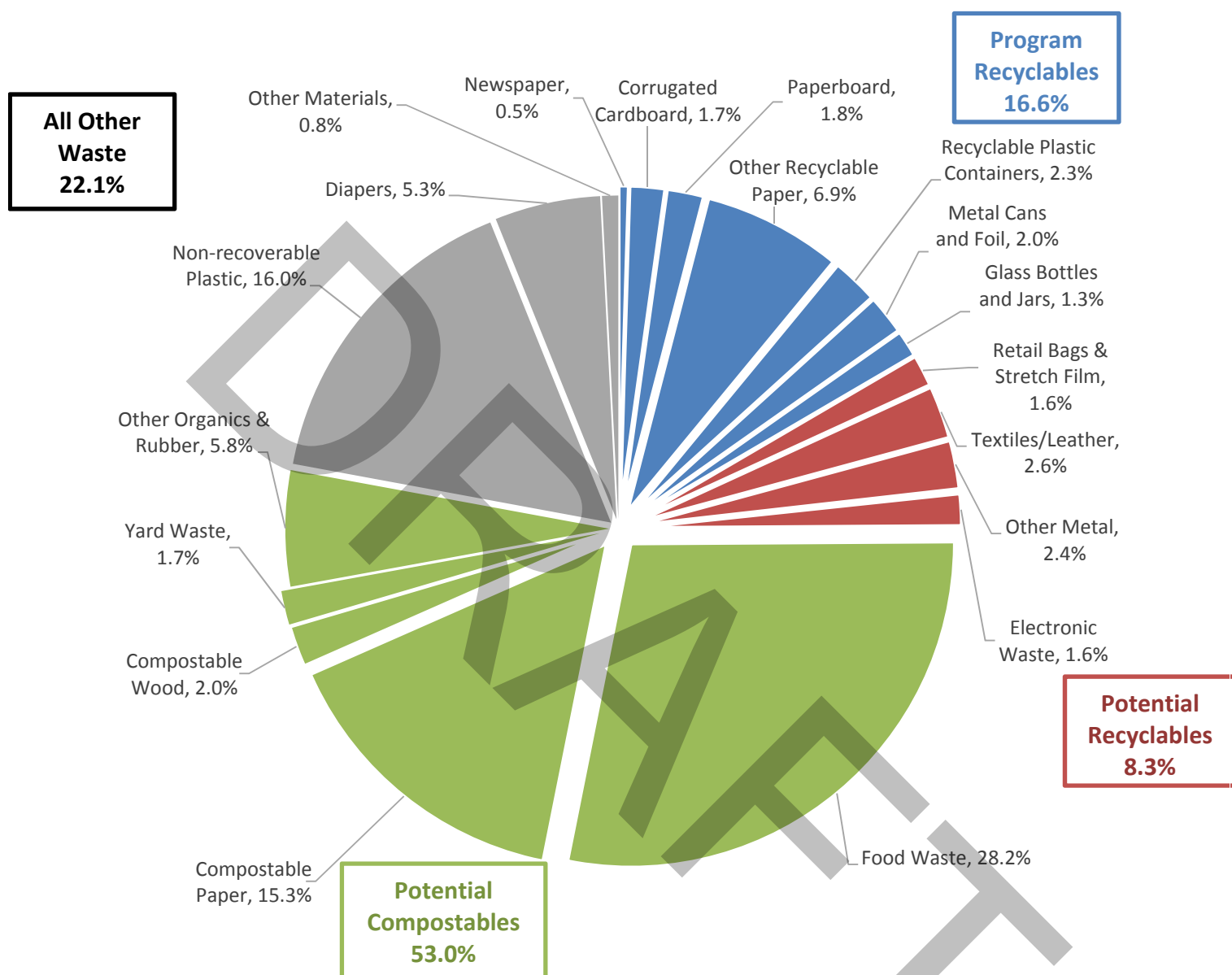
Results of the Town's residential waste composition revealed opportunities to increase waste diversion. Some of the key opportunities are as follows:

- Nearly 17 percent of the single-family residential waste stream consists of recyclables that are currently accepted in the Town's single stream recycling program (10.9% recyclable paper and 5.6% recyclable containers).
- Organic waste is the largest component of the single-family waste stream at over 53 percent of all materials disposed. Food waste makes up the largest component at 28.2 percent, followed by low-grade (compostable) paper at 15.3 percent.
- Just over 8 percent of the Town's single-family waste stream is comprised of materials that have the potential to be recycled or reused. These materials include textiles, other metals, electronic waste, and retail bags, all of which are accepted at the County's waste and recycling centers.

In all, nearly 78 percent of the Town's waste stream consists of recyclable or compostable materials. While it is unrealistic to believe that all of these materials can be diverted from disposal, results of this study demonstrate the existence of substantial opportunities for increased diversion through enhanced recycling and composting programs. Results of this study will assist the Town in benchmarking its current waste diversion programs, as well as in designing and implementing future programs or program enhancements that target materials offering the greatest waste diversion opportunities.

KCI appreciates the opportunity to assist the Town with this project and to provide current and accurate composition data for use in future planning decisions. We look forward to assisting the Town with the remaining items of our scope to enhance the overall performance of its solid waste management system.

DRAFT

**FIGURE 1: Composition of Single-Family Residential Waste Disposed (% by weight)**

Note: For the purpose of this figure, the following categories have been combined:

- Other Recyclable Paper includes the categories of Magazines, Phone Books, Other Books, White Ledger, Mixed Recyclable Paper, and Aseptic Containers.
- Recyclable Plastic Containers includes the categories of All Plastic Bottles and Dairy Plastic Containers.
- Metal Cans and Foil includes the categories of Steel/Tin Cans, Aluminum Cans, Aerosol Cans, and Aluminum Foil.
- Other Metals includes the categories of Other Ferrous Metals and Other Non-Ferrous Metals.
- Recoverable Hazardous Waste includes the categories of Lead Acid Batteries, Dry Cell Batteries, Oil Filters, and Other Hazardous Wastes.
- Compostable Paper includes the categories of Waxy Cardboard and Low Grade Paper.
- Compostable Wood includes the categories of Wood Pallets, Wood Lumber, and Stumps/Branches.
- Non-recoverable Plastic includes the categories of Plastic Film, Mixed Plastic Containers, and All Other Plastics.
- Other Materials includes the categories of Other Glass, Painted/Treated Wood, Brick/Concrete/Dirt, and Infectious Waste.

**Table 1: Composition of Single-Family Residential Waste (% by weight)**

Material Categories		Weighted Average	Standard Deviation	90% Confidence Interval	
				Lower	Upper
1	Newspaper	0.5%	0.5%	0.1%	0.9%
2	Glossy Magazines	0.6%	0.8%	0.0%	1.3%
3	Corrugated Cardboard	1.7%	1.3%	0.7%	2.8%
5	Phone Books	0.0%	0.0%	0.0%	0.0%
6	Paperboard	1.8%	0.7%	1.3%	2.4%
7	Other Books	0.0%	0.1%	0.0%	0.1%
8	White Ledger	0.7%	0.6%	0.2%	1.2%
9	Mixed Recyclable Paper	5.4%	2.9%	3.1%	7.8%
40	Aseptic Containers	0.2%	0.1%	0.1%	0.3%
11	All Plastic Bottles	1.5%	1.2%	0.5%	2.4%
13A	Dairy Plastic Containers	0.8%	0.4%	0.5%	1.2%
19	Tin/Steel Cans	0.4%	0.3%	0.1%	0.7%
20	Aerosol Cans	0.4%	0.4%	0.1%	0.7%
22	Aluminum Cans	0.4%	0.2%	0.3%	0.6%
23	Aluminum Foil	0.7%	0.3%	0.4%	1.0%
25	Glass Bottles and Jars	1.3%	0.8%	0.7%	2.0%
<b>Total Program Recyclables</b>		<b>16.6%</b>			
12B	Retail Bags & Stretch Film	1.6%	0.5%	1.2%	2.0%
16	Textiles/Leather	2.6%	1.3%	1.5%	3.7%
21	Other Ferrous	1.9%	2.6%	-0.2%	4.0%
24	Other Non-Ferrous	0.5%	0.8%	-0.1%	1.2%
33	Lead Acid Batteries	0.0%	0.0%	0.0%	0.0%
34	Dry Cell Batteries	0.1%	0.1%	0.0%	0.2%
35	Oil Filters	0.0%	0.0%	0.0%	0.0%
36	Other Hazardous Waste	0.0%	0.0%	0.0%	0.0%
38	Reusable Waste	0.0%	0.0%	0.0%	0.0%
39	Electronic Waste	1.6%	1.9%	0.0%	3.2%
<b>Total Potential Recyclables</b>		<b>8.3%</b>			
4	Waxy Cardboard	0.0%	0.0%	0.0%	0.0%
15	Food Waste	28.2%	4.8%	24.3%	32.2%
10	Low-Grade Paper	15.3%	6.1%	10.3%	20.2%
18	Other Organics & Rubber	5.8%	6.8%	0.2%	11.4%
27	Wood Pallets	0.0%	0.0%	0.0%	0.0%
28	Wood Lumber	1.1%	0.7%	0.5%	1.6%
30	Stumps/Branches	1.0%	2.5%	-1.1%	3.0%
32	Yard Waste	1.7%	3.3%	-1.0%	4.4%
<b>Total Potential Compostables</b>		<b>53.0%</b>			
12A	Plastic Film	8.8%	3.2%	6.2%	11.4%
13B	Mixed Plastic Containers	0.6%	0.5%	0.2%	1.0%
14	All Other Plastics	6.6%	2.8%	4.3%	9.0%
17	Diapers	5.3%	1.8%	3.8%	6.8%
26	Other Glass	0.3%	0.3%	0.0%	0.5%
29	Painted/Treated Wood	0.5%	0.7%	0.0%	1.1%
31	Brick/Concrete/Dirt	0.0%	0.0%	0.0%	0.0%
37	Infectious Waste	0.0%	0.0%	0.0%	0.0%
<b>Total All Other Waste</b>		<b>22.1%</b>			
<b>TOTALS</b>		<b>100.0%</b>			

Note: Columns may not appear to calculate correctly due to rounding.

**Table 2: Comparison of Single-Family Residential Waste Results (% by weight)**

Material Categories		2016 Carrboro	2016 Countywide	2010 Countywide	2005 Countywide	2000 Countywide	1995 Countywide
1	Newspaper	0.5%	1.1%	1.4%	4.9%	4.8%	5.3%
2	Glossy Magazines	0.6%	1.3%	1.7%	4.7%	4.4%	6.1%
3	Corrugated Cardboard	1.7%	1.8%	1.8%	2.4%	4.7%	4.5%
5	Phone Books	0.0%	0.0%	0.2%	0.2%	0.3%	n/a
6	Paperboard	1.8%	2.9%	2.8%	3.6%	5.1%	n/a
7	Other Books	0.0%	0.2%	0.3%	<0.1%	0.4%	n/a
8	White Ledger	0.7%	1.5%	0.8%	1.9%	2.0%	n/a
9	Mixed Recyclable Paper	5.4%	4.3%	4.0%	3.3%	4.5%	1.7%
40	Aseptic Containers	0.2%	0.3%	* included with Low Grade Paper			
11	All Plastic Bottles	1.5%	2.7%	2.2%	2.4%	2.9%	2.6%
13A	Dairy Plastic Containers	0.8%	1.5%	2.6%	1.0%	2.7%	0.7%
19	Tin/Steel Cans	0.4%	1.0%	1.1%	1.4%	1.8%	2.7%
20	Aerosol Cans	0.4%	0.5%	0.7%	0.7%	0.9%	n/a
22	Aluminum Cans	0.4%	0.5%	0.7%	0.7%	1.0%	0.8%
23	Aluminum Foil	0.7%	0.5%	0.7%	0.7%	0.9%	n/a
25	Glass Bottles and Jars	1.3%	2.7%	3.4%	4.3%	4.3%	5.8%
<b>Total Program Recyclables</b>		<b>16.6%</b>	<b>22.7%</b>	<b>24.4%</b>	<b>32.2%</b>	<b>40.7%</b>	<b>30.2%</b>
12B	Retail Bags & Stretch Film	1.6%	1.7%	* included with Plastic Film			
16	Textiles/Leather	2.6%	5.4%	6.3%	5.1%	5.4%	3.3%
21	Other Ferrous	1.9%	1.0%	2.0%	1.3%	2.0%	2.9%
24	Other Non-Ferrous	0.5%	0.4%	0.7%	<0.1%	0.2%	n/a
33	Lead Acid Batteries	0.0%	0.0%	<0.1%	<0.1%	<0.1%	n/a
34	Dry Cell Batteries	0.1%	0.1%	<0.1%	0.2%	0.2%	n/a
35	Oil Filters	0.0%	0.0%	<0.1%	<0.1%	<0.1%	n/a
36	Other Hazardous Waste	0.0%	0.1%	<0.1%	0.4%	0.6%	0.3%
38	Reusable Waste	0.0%	0.4%	<0.1%	<0.1%	<0.1%	n/a
39	Electronic Waste	1.6%	0.6%	1.4%	1.4%	0.9%	n/a
<b>Total Potential Recyclables</b>		<b>8.3%</b>	<b>9.8%</b>	<b>10.4%</b>	<b>8.4%</b>	<b>9.3%</b>	<b>6.5%</b>
4	Waxy Cardboard	0.0%	0.0%	0.3%	0.7%	1.2%	n/a
15	Food Waste	28.2%	25.1%	20.9%	22.2%	17.8%	11.2%
10	Low-Grade Paper	15.3%	13.8%	9.2%	13.1%	9.0%	24.6%
18	Other Organics & Rubber	5.8%	3.2%	4.7%	1.3%	4.6%	8.3%
27	Wood Pallets	0.0%	0.2%	<0.1%	<0.1%	0.2%	n/a
28	Wood Lumber	1.1%	0.8%	2.8%	2.3%	1.3%	1.9%
30	Stumps/Branches	1.0%	0.1%	<0.1%	<0.1%	<0.1%	n/a
32	Yard Waste	1.7%	2.7%	2.6%	1.8%	0.9%	1.0%
<b>Total Potential Compostables</b>		<b>53.0%</b>	<b>46.0%</b>	<b>40.5%</b>	<b>41.4%</b>	<b>35.0%</b>	<b>47.0%</b>
12A	Plastic Film	8.8%	6.0%	7.9%	5.6%	5.7%	4.3%
13B	Mixed Plastic Containers	0.6%	0.5%	* included with All Other Plastics			
14	All Other Plastics	6.6%	6.9%	5.6%	5.9%	4.6%	4.4%
17	Diapers	5.3%	6.3%	5.2%	4.4%	3.5%	3.5%
26	Other Glass	0.3%	0.4%	0.2%	0.2%	0.8%	0.5%
29	Painted/Treated Wood	0.5%	0.6%	2.7%	<0.1%	<0.1%	1.1%
31	Brick/Concrete/Dirt	0.0%	0.6%	3.0%	2.2%	0.7%	2.6%
37	Infectious Waste	0.0%	0.2%	0.4%	<0.1%	n/a	<0.1%
<b>Total All Other Waste</b>		<b>22.1%</b>	<b>21.4%</b>	<b>25.0%</b>	<b>18.3%</b>	<b>15.3%</b>	<b>16.4%</b>
<b>TOTALS</b>		<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Note: Columns may not appear to calculate correctly due to rounding.

**ATTACHMENT A - MATERIAL CATEGORIES**

#	Material Categories	Definitions
1	Newspaper	Newspaper (loose or tied) including other paper normally distributed inside newspaper such as ads, flyers, etc. Newspaper found inside plastic sleeve will be removed from plastic and sorted accordingly.
2	Glossy Magazines	Periodicals and journals.
3	Corrugated Cardboard	Brown "cardboard" boxes with a wavy core (no plastic liners or packaging Styrofoam®). Does not include small pieces of Cardboard within shrink-wrap plastic such as that from a case of bottled water.
4	Waxy Cardboard	Wax-coated cardboard.
5	Phone Books	Phone books
6	Paperboard	Paperboard and chipboard such as cereal boxes, shoeboxes, and 12-pack carrier stock.
7	Other Books	Paperback novels and manuals.
8	White Ledger	Copy paper and computer printouts.
9	Mixed Recyclable Paper	Recyclable paper not identified above such as junk mail, colored paper, etc.
10	Low-Grade Paper	Non-recyclable paper such as tissues, paper towels, hardback books, paper cups, plates, and containers, cigarette packs, and heavily soiled paper.
11	All Plastic Bottles	All narrow-neck bottles irrespective of resin code (meaning neck smaller than base).
12A	Plastic Film	Loose and bagged plastic bags, garbage bags, re-sealable bags, floral wrap (generally), potato chip bags and other multi-laminates. Includes mylar bags and balloons.
12B	Retail Bags & Stretch Film	Retail and grocery bags, point-of-sale bags, newspaper bags, toilet paper overwrap, dry cleaning bags, air pillows, and bubble wrap, Ziploc® bags, and plastic stretch film.
13A	Dairy Plastic Containers (SPI #2, 4, and 5)	Also includes wide-mouthed tubs and containers labeled HDPE #2, LDPE #4 or PP #5, including lids. Examples include yogurt cups, margarine tubs, Cool Whip® tubs, and other non-bottle HDPE items. ALL DAIRY PRODUCTS.
13B	Mixed Plastic Containers	Clear and colored plastic items labeled PET #1 such as clamshell containers, frozen food trays, and disposable cups. All other plastic cups and containers, irrespective of resin type, not categorized above.
14	All Other Plastic	Consists of non-container rigid plastic items such as plastic drums, crates, buckets, baskets, toys, refuse totes, lawn furniture, laundry baskets, and other large plastic items. Does not include electronic toys. Container and non-container Styrofoam® such as clamshell containers, packaging peanuts, foam sheeting, and other packaging. Any plastic materials not categorized above, such as straws, utensils, deodorant cases, toothpaste tubes, tooth brushes, broom heads, etc.
15	Food Waste	Meat, vegetable, and bread waste. Includes coffee grinds and tea bags.
16	Textiles/Leather	Clothing apparel, rags, leather, blankets, curtains, shoes, wallets, purses, belts, and scrap leather.
17	Diapers	All child and adult diapers and incontinence aids. Feminine hygiene products.



**ATTACHMENT A - MATERIAL CATEGORIES (cont.)**

#	Material Categories	Definitions
18	<b>Other Organics &amp; Rubber</b>	Organics such as hair, pet waste, and rubber.
19	<b>Tin/Steel Cans</b>	Tin and steel cans such as canned food and pet food cans.
20	<b>Aerosol Cans</b>	Aerosol spray cans such as cooking spray, paint cans, and air fresheners.
21	<b>Other Ferrous</b>	Household appliances such as refrigerators, stoves, and salvageable items such as machinery. Steel, clothes hangers, sheet metal products, pipes, miscellaneous metal scraps, and other magnetic metal items.
22	<b>Aluminum Cans</b>	Aluminum soft drink, beer, and some pet food cans (i.e., cat food).
23	<b>Aluminum Foil</b>	Aluminum foil and catering trays.
24	<b>Other Non-Ferrous</b>	Scrap aluminum, aluminum foil and catering trays, and other non-magnetic metal, copper wiring and tubing, and brass fixtures.
25	<b>Glass Bottles and Jars</b>	Clear, brown, and green glass bottles and containers.
26	<b>Other Glass</b>	Windowpanes, mirrors, ceramics, and drinking glasses.
27	<b>Wood Pallets</b>	Forklift pallets.
28	<b>Wood Lumber</b>	Dimensional lumber such as plywood sections, 2x4s, particleboard, and other clean wood waste.
29	<b>Painted/Treated Wood</b>	Treated and/or painted lumber, pallets, and dimensional lumber. Also includes treated/painted wood furniture including chairs, cabinets, dressers, etc.
30	<b>Stumps/Branches</b>	Large yard waste such as tree stumps and large limbs/branches.
31	<b>Brick/Concrete/Dirt</b>	Construction and demolition debris that includes concrete, carpet, drywall, insulation, and roofing materials.
32	<b>Yard Waste</b>	Shrub and brush prunings, household bedding plants, weeds, leaves, grass clippings, and other landscaping and gardening wastes.
33	<b>Lead Acid Batteries</b>	Car, motorcycle, boat, and other deep cell batteries.
34	<b>Dry Cell Batteries</b>	Household batteries including AA, AAA, C, D, 9-volt, and button types.
35	<b>Oil Filters</b>	Motor oil filters.
36	<b>Other Hazardous Waste</b>	Paint, solvent, pesticides, motor oil, and fluorescent lights
37	<b>Infectious Waste</b>	Un-sterilized medical waste, including needles, syringes, and medical tubing.
38	<b>Reusable Waste</b>	Reusable items such as binders, toys, and other such durable products.
39	<b>Electronic Waste</b>	Electronic devices such as televisions, computers, cell phones, cordless telephones, PDA, handheld devices, rechargeable batteries, etc.
40	<b>Aseptic Containers</b>	Gable-top cartons, aseptic juice boxes, and other similar containers made of coated paperboard.

**ATTACHMENT B – INDIVIDUAL SAMPLE RESULTS**

Load information		Wednesday Truck 808	Wednesday Truck 807	Thursday Truck 807	Thursday Truck 808	Friday Truck 808	Friday Truck 807	Weighted Average
	Material Categories	1	2	3	4	5	6	
1	Newspaper	0.0%	1.1%	0.0%	0.3%	0.6%	0.8%	0.5%
2	Glossy Magazines	0.0%	1.4%	0.0%	0.0%	0.6%	1.8%	0.6%
3	Corrugated Cardboard	0.3%	2.3%	1.4%	3.0%	0.4%	3.3%	1.7%
4	Waxy Cardboard	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5	Phone Books	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6	Paperboard	2.2%	1.5%	2.8%	1.2%	1.1%	2.1%	1.8%
7	Other Books	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
8	White Ledger	0.0%	1.5%	0.0%	0.6%	0.8%	1.2%	0.7%
9	Mixed Recyclable Paper	3.4%	7.3%	9.2%	7.2%	2.1%	3.3%	5.4%
10	Low-Grade Paper	18.7%	11.9%	14.5%	10.7%	25.6%	9.6%	15.3%
11	All Plastic Bottles	1.0%	3.2%	0.0%	1.7%	0.8%	2.3%	1.5%
12A	Plastic Film	8.3%	5.0%	13.6%	9.0%	10.5%	5.7%	8.8%
12B	Retail Bags & Stretch Film	1.5%	1.5%	1.3%	1.4%	2.6%	1.1%	1.6%
13A	Dairy Plastic Containers	0.3%	1.4%	1.1%	0.9%	0.7%	0.7%	0.8%
13B	Mixed Plastic Containers	0.0%	0.7%	0.2%	1.5%	0.6%	0.6%	0.6%
14	All Other Plastics	10.0%	7.8%	4.6%	7.2%	7.9%	2.0%	6.6%
15	Food Waste	27.8%	33.0%	23.4%	31.4%	21.8%	32.4%	28.2%
16	Textiles/Leather	4.4%	3.3%	2.9%	2.0%	2.4%	0.5%	2.6%
17	Diapers	4.8%	5.8%	3.6%	4.8%	4.1%	8.8%	5.3%
18	Other Organics/Rubber	2.2%	2.2%	18.6%	1.3%	8.2%	1.6%	5.8%
19	Tin/Steel Cans	0.4%	0.8%	0.0%	0.5%	0.1%	0.7%	0.4%
20	Aerosol Cans	0.2%	1.0%	0.1%	0.9%	0.2%	0.2%	0.4%
21	Other Ferrous	7.0%	0.8%	0.0%	1.1%	1.5%	0.6%	1.9%
22	Aluminum Cans	0.3%	0.5%	0.3%	0.4%	0.3%	0.7%	0.4%
23	Aluminum Foil	0.5%	0.3%	1.1%	0.8%	1.0%	0.6%	0.7%
24	Other Non-Ferrous	0.0%	0.7%	0.0%	0.0%	2.0%	0.4%	0.5%
25	Glass Bottles and Jars	2.4%	0.7%	0.2%	1.7%	1.2%	1.8%	1.3%
26	Other Glass	0.1%	0.4%	0.0%	0.8%	0.0%	0.2%	0.3%
27	Wood Pallets	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
28	Wood Lumber	1.1%	0.6%	1.1%	1.7%	0.0%	1.7%	1.1%
29	Painted/Treated Wood	1.6%	0.0%	0.0%	0.4%	0.0%	1.2%	0.5%
30	Stumps/Branches	0.0%	0.0%	0.0%	6.1%	0.0%	0.0%	1.0%
31	Brick/Concrete/Dirt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
32	Yard Waste	0.7%	1.1%	0.0%	0.3%	0.0%	8.3%	1.7%
33	Lead Acid Batteries	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
34	Dry Cell Batteries	0.0%	0.2%	0.0%	0.2%	0.0%	0.3%	0.1%
35	Oil Filters	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
36	Other Hazardous Waste	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
37	Infectious Waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
38	Reusable Waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
39	Electronic Waste	0.1%	1.4%	0.0%	0.6%	2.7%	5.0%	1.6%
40	Aseptic Containers	0.3%	0.3%	0.0%	0.2%	0.2%	0.3%	0.2%
TOTALS		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK FOR PRINTING PURPOSES



## TECHNICAL MEMORANDUM

**TO:** David Andrews, Town Manager  
Town of Carrboro

**FROM:** Jeux Brown, Consultant

**SUBJ:** **Technical Memorandum #2: Assessment of Current Waste Programs and Waste Collection Route Study**

**PROJ #:** 192-00.00

---

The Town of Carrboro, NC (Town) requested Kessler Consulting, Inc. (KCI) to conduct a Residential Solid Waste Study. Task 2 of this study is an assessment of the Town's Solid Waste Management Division (Division) and its existing system. The purpose of this technical memorandum is to provide the results and findings of this assessment.

### 1. Introduction

The operational assessment was conducted in three parts: 1) advance data request and review, 2) physical site visit, and 3) follow-up analysis of data and observations.

In advance of the site visit, KCI developed a request for information from Division staff. The information was used to conduct various preliminary analyses and stress tests in order for KCI to better understand the breadth and width of the Division's scope of services. A portion of the data was received prior to site visits. However, a large portion of data could not be obtained until KCI was on site, working directly with staff. Data requested was typical of other assessments KCI has conducted and the Division's cooperation in its completion was greatly appreciated.

### 2. Organization

Division front line staff consists of eight full-time equivalent (FTE) employees, which are detailed in Table 1. The average years of service for current Division employees is fourteen and a half years. This level of tenure is a valuable asset as employees have Town-specific experience and knowledge. The Division appears to foster a culture of happiness and cooperative work ethics among its employees. High morale and job satisfaction have had a large payoff for the organization; positive employees are more dedicated, safer, and produce better results. The Division demonstrated effective communication and cooperation among the front line staff and the Supervisor.

The administration staff includes the Public Works Director as well as an Administrative Assistant (AA). Both positions are involved in the day-to-day activities of the entire Public Works Department. The AA spends approximately 70 percent of her day on Division tasks. All incoming calls from residents and businesses are answered by the AA, who works with the Solid Waste Supervisor (SWS) to ensure that requests and concerns are addressed in a timely manner. The SWS coordinates all daily activities performed by collection staff (Drivers).

The Town has a unique situation in that most Drivers are cross trained in commercial, residential, and bulky collection. This is considered an industry best practice that, despite the best efforts in many organizations, is never actually implemented. Having a team of drivers who have route knowledge beyond that of their assigned route is invaluable and the Division has managed to ensure that Drivers learn other routes and remain motivated despite the repetitive nature of waste and recyclables collection. It is highly recommended that this practice continues and is expanded as needed.

**Table 1: Division of Labor**

Department	FTEs	Average Service Years
Administrative Assistant	1	11
Supervisor	1	22
Commercial	1	11
Residential	5*	13
<b>Totals</b>	<b>8</b>	<b>14.25</b>

\*1 FTE is under Landscaping Department but works full time in Solid Waste; 1 position is open.

### 3. Residential Collection Services

The Division provides a comprehensive collection service for its residents. Materials are collected Monday through Friday. Curbside carted service is provided to residential customers for garbage once a week. A selection of acceptable bulky items can also be collected each week when placed curbside. Yard waste service is available approximately every two weeks. Residents can place their yard waste at the curb for pickup, or they can purchase a 95 gallon cart at town hall. Recycling collection is provided by Orange County. Loose leaf collection is performed for residents November through February by the Landscaping Division and will not be addressed in this memo.

The Division staff is engaged with the community in a positive manner and provides excellent customer service from administration down to the Drivers. Staff appears to go above and beyond to provide the best possible service to the residents and businesses in Town. If there is a reason materials are not collected, Drivers are proactive in addressing the customer either verbally or by leaving a door hanger or cart tag indicating the reason why collection did not occur. In addition, if the reason for non-collection is due to the resident setting out an item or pile of debris that must be paid for in advance, Drivers inform the SWS. The SWS will then call the resident to discuss the price of collection. Table 2 summarizes the Town's types and number of routes operating daily to better visualize the distribution of assets across the collection days.

**Table 2: Residential Route Matrix**

Route Type	Number of Operating Routes							Weekly Routes
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	
Residential Garbage	0	0	2	2	2	n/a	n/a	6
Residential Yard Waste <sup>1</sup>	2	2	0	0	0	n/a	n/a	4
Residential Bulk Yard Waste <sup>2</sup>	.80	.80	.80	.80	.80	n/a	n/a	4
Residential Bulk Trash <sup>3</sup>	.20	.20	.20	.20	.20	n/a	n/a	1

<sup>1</sup>Consists of two routes, however in the busy months 4-5 vehicles are utilized.

<sup>2 & 3</sup>Vehicle/Driver routed to collect bulk yard waste 80 percent of each day and bulk trash 20 percent of each day.

### 3.1. Residential Garbage

Residential garbage collection is provided to approximately 4,400 homes on Wednesday, Thursday, and Friday each week. The Town divides each service day into two routes. Garbage is fully automated and collected in Town issued roll carts. Carts are available for residents to purchase at Town Hall for \$48.18 per cart, and there is not a limit to the number of carts a resident can purchase. There is no additional collection charge associated with having more than one cart per household.

KCI conducted route audits in February 2017. Table 3 illustrates the information gathered during ride along audits of two routes. Set out rates between 68 and 70 percent were lower than expected since the Town only offers once a week service. However, the tonnage is comparable to the historical February average tonnage provided in disposal reports. The average for February tonnage over the past three years is 7.80 on

Wednesdays and 8.20 on Thursdays. Town recycling data was gathered from Orange County. The average recycling set out rate during fiscal year (FY) 2015-2016 was 43 percent with approximately 77 percent of the population participating throughout the year. This indicates that residents are not filling their cart to capacity each week. Setout rates also declined by 7 percent from the previous fiscal year, and participation dropped by 12 percent. As indicated in KCI's Waste Composition Study technical memo, nearly 17 percent of the waste stream consisted of recyclables that are accepted by Orange County. Despite the Town not being involved in the collection of recycling, it can choose to enhance education and outreach in order to reduce the tonnage generated by residents.

In conjunction with ride along route audits, a Cart Capacity Study (Study) was also conducted. The Study found that approximately 81 percent of all carts surveyed were either not at the curb or were less than 50 percent full. The details of this study will be addressed in the next section.

**Figure 1: Proper Residential Cart Placement**



**Table 3: Residential Route Audit Metrics\***

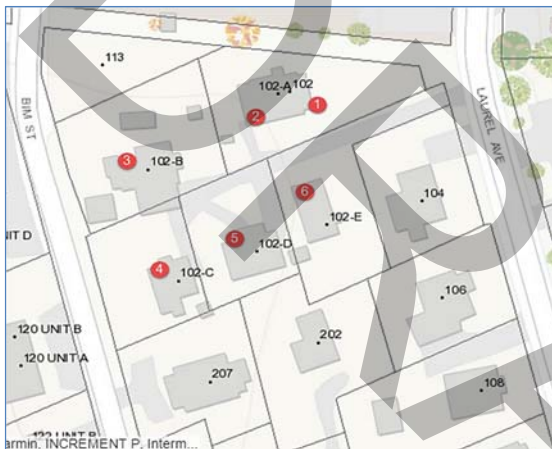
Route	Scheduled Homes	Set Out	Not Out	Total Collection Time	Disposal Time	Disposal Weight	Set Out Rate	Pounds per Household
Wednesday	860	586	274	5.25	1.50	8.06	68%	27.51
Thursday	868	611	257	5.25	1.5	8.46	70%	27.69

\*Routes include an unspecified number of commercial carts as these are not recorded on route sheets.



Many of the neighborhoods serviced contain tight cul-de-sacs, dead ends, and narrow roads which have several homes. On several streets, such as private ones, Drivers needed to pull down the street to service homes on the right side of the street, then exit the street and return to service the remaining homes on the opposite side due to lack of room to turn around. As noted in Figures 2 and 3, 102 Laurel Avenue has six homes. This is a one lane road which can only be serviced by entering twice or requiring the Driver to get out to move carts to one side of the street. During route audits several residents needed to wait for the Driver to complete servicing the street before they could exit as the Division vehicle blocks the road. Streets such as this would be safer for the residents as well as the Drivers if carts were brought to the curb at the entrance of Laurel Avenue. Several similar situations were observed where one-sided street collection would be beneficial for safety and productivity.

**Figure 3: 102 Laurel Avenue**



**Figure 2: 102 Laurel Ave. Street View**



The Town expressed interest in decreasing the number of collection days. Possibilities include collection every-other-week (EOW) and every ten days (ETD). Servicing ETD collection would be difficult to manage and keep residents apprised of their service days. Adding in non-collection holidays, schedule shifts due to snow and ice, and heavy yard waste pickup during certain times of year, we feel this would be a difficult schedule to manage. It would also require an annual calendar to be maintained and supplied to residents each year. Due to these issues we will not be analyzing or recommending ETD collection.

This Section Intentionally Left Blank

Utilizing FY 2015-2016 actual tonnage KCI determined average per route tonnage, illustrated in Table 4, for the current routes as well as EOW service. The potential tonnage for EOW service would need to be divided into two disposal trips if the Town continued service with only two vehicles per day. However, there is a one and a half hour turn around to drive to and from the disposal facility and dispose of garbage, which would require the Drivers to work additional hours to complete routes if only utilizing two collection vehicles. Further analysis will be needed to determine the feasibility of EOW service. Increased diversion could alleviate some of the tonnage in the garbage. There are a number of possibilities to pilot EOW collection which will be explored as part of Task 6.

**Table 4: Fiscal Year 2015-2016 Residential Garbage Tonnage**

Month	Current Average Tons/Route	Estimated Average Tons/Route EOW
July	9.39	18.78
August	7.26	14.53
September	7.96	15.92
October	7.84	15.68
November	7.38	14.77
December	9.79	19.58
January	7.82	15.65
February	7.02	14.03
March	8.26	16.53
April	8.11	16.22
May	7.80	15.60
June	9.41	18.82

### Recommendations

- Through the public participation surveys that will be created:
  - Ask residents about their willingness to move their carts to one side of the street for expedited, safer collection which would reduce emissions and vehicle time on their streets, reduce collection costs, and improve service.
  - Ask residents if they are interested in participating in a pilot for EOW service.
  - Explore option for residents to move carts to curbside on the main street for service on roads that are difficult to service, such as 102 Laurel Avenue, shown in Figures 2 and 3.

### 3.2. Residential Yard Waste

Residents receive yard waste service approximately twice per month per household. The Town is divided into four quadrants and Division staff rotates through two quadrants on Mondays and two quadrants on Tuesdays to collect yard waste. Two automated side load (ASL) collection vehicles and two Drivers are regularly scheduled to collect curbside yard waste. An additional Driver is scheduled in a bulk claw load (BCL) vehicle to service large piles of yard waste Monday through Friday. Throughout the months when yard waste is more abundant additional Drivers within the Division, and at times from other Public Works divisions are utilized to complete service on Wednesdays, and sometimes Thursdays as well. The Division has enough vehicles



that are not in daily use to cover the additional service.

Despite ASLs being utilized for the curbside collection the majority of debris is manually loaded into the trucks because it is not required by the Town to be containerized. Residents can choose to dispose of their yard waste in the following ways:

- A Town issued, resident purchased, 95 gallon roll-out yard waste cart.
- Up to eight plastic bags per collection day.
- Unlimited paper yard waste bags.
- A container of the residents' choice, filled with uncontaminated yard waste.
- Limbs up to three feet long and four inches in diameter in piles.

Drivers are also instructed to pick up any piles of yard debris and limbs that will take less than ten minutes for one Driver to collect. While on route, Drivers were stopping to service piles that were small enough to fit into a shoebox.

The variety of options available to residents to set out yard waste proves difficult for collection. Approximately 700 homes use Town carts, or approximately 15% of the population serviced<sup>1</sup>. All other collection options require Drivers to get out of the vehicle in order to service the residence. When residents use plastic bags these are emptied by the collection staff and left at the curb as they are not acceptable at the disposal facility; paper bags can become wet if there is rain or excessive moisture in the air; personal yard waste containers are difficult to identify as yard waste only. Most importantly, the Town's hybrid vehicle is not utilized for yard waste collection because the hopper is too high for a Driver to manually load materials. This leaves the Town's most energy efficient vehicle dormant for two days a week.

Large set outs that would require more than ten minutes time for one person to collect have a fee assessed prior to collection. The SWS determines the fee, notifies the resident, and a Driver is dispatched in the claw truck within two business days after the resident makes the payment at Town Hall.

**Figure 4: Manual Yard Waste Collection**



<sup>1</sup> Solid Waste Containers- Town of Carrboro December 2016 file provided by Town.

Curbside yard waste routes follow approximately the same routes as residential garbage. However, the route audit revealed that the majority of homeowners did not set out yard waste, as summarized in Table 5.

**Table 5: Yard Waste Route Audit**

Route Hours	Count of Homes <sup>1</sup>	Bagged Yards <sup>2</sup>	Loose Yards	Carted Yards	Christmas Trees <sup>3</sup>	Total Yards	Miles Driven	Avg. yards/ Hour	Avg. yards/ Set Out	Avg. yards/ Mile
4	26	3.50	4.88	4.50	4.00	16.88	14.00	0.24	0.65	0.83

<sup>1</sup>Homes with yard waste set out

<sup>2</sup>Bag = .25 yards

<sup>3</sup>Christmas trees = 1 yard each

Time is spent each day driving up and down streets looking for yard waste. During the route audit KCI found that 96 percent of homes on the route did not place out yard waste, of the 4 percent that did, 69 percent set out a half yard or less. The yard waste carts offered by the Town are approximately half a yard. Tonnage was not determined during the audit because the truck was not filled and therefore not emptied. Historical disposal reports indicate much higher yard waste collection than witnessed while on audits. However, ASL vehicles traditionally do not make disposal trips on Mondays<sup>2</sup>. The majority of debris collected and disposed of is in the claw truck, indicating that current ASL utilization could be reduced.

While on route the Driver was required to get out of the truck for all but eight homes to manually load loose yard waste into the hopper of the vehicle. Large limbs that were not cut down to the required 3 foot allowance required the Driver to manually break down limbs or leave them behind with a tag indicating why debris was not collected. Despite Drivers wearing proper Personal Protective Equipment (PPE) such as gloves, safety glasses, and ear plugs at times, injuries can still occur. The risk of injuries increases with manual collection and decreases with automation. Injury reports received from the Town for the past four years show a total of six injuries, five of which occurred while the Driver was outside of the vehicle collecting yard waste.

Carted yard waste would allow the town to utilize its fully automated vehicles, including the hybrid vehicle, to reduce time on route, keep Drivers safe and in the vehicle, and eliminate unsightly debris curbside. Yard waste contained in carts would also eliminate the need for Drivers to empty plastic bags as well as keep the debris free from snow and water which can add weight. In addition, requiring yard waste to be carted would allow the Division to route only those homes that utilize the service, increasing route efficiency.

<sup>2</sup>Town supplied disposal data for 36 months indicates ASL vehicles made Monday disposal trips 4 percent of the time, or 7 total trips. The BCL vehicle made Monday disposal trips 66 percent of the time, or 104 total trips.

Table 6 illustrates the actual tonnage from three fiscal years. February is traditionally the lightest month for yard waste, which correlates to the low set out during the route audit. The number of residents placing out yard waste is not tracked on a daily basis; therefore the household count was used to determine the average pounds per household in the historical data.

**Table 6: Fiscal Year Yard Waste Tonnages\***

Month	FY 2013-14	FY 2014-15	FY 2015-16
July	140.07	72.21	119.82
August	95.12	28.1	88.56
September	77.93	81.55	64.36
October	81.55	75.97	77.79
November	32.21	58.97	48.52
December	44.9	61.53	52.45
January	53.89	48.96	38.61
February	46.92	28.68	35.07
March	102.19	130.04	92.84
April	122.49	100.58	68.69
May	112.92	100.72	95.65
June	91.09	96.08	77.23
<b>Annual Totals</b>	<b>1,001.28</b>	<b>883.39</b>	<b>859.59</b>

\*Combined yard waste from automated side load home collection and bulky large pile collection.

### Recommendations

- Require yard waste to be carted for regular collection.
- Pilot carted yard waste service with every other week collection.
- Create a route for carted yard waste collection.
- Require all non-carted yard waste to be called-in for service with a fee attached.
- Begin utilization of Town's hybrid vehicle for yard waste collection.

### 3.3. Residential Bulky Waste

The Town offers the collection of bulky materials as part of its residential service. Table 7 details the monthly tonnage collected over the past three FYs. A limited list of acceptable materials is picked up for free, with a disposal cost to the Town of \$41 dollars per ton. Items are placed curbside on the same day the resident receives garbage service. As residents do not need to call for the service of these items, the bulky route follows the same route as the garbage route, looking for bulky items. It was difficult to determine average hours spent on route due to data entry errors in the Town's reporting system, PubWorks®. For example, there were duplicate data entries for the same day which doubled tonnage and hours worked. Additional information will be discussed on this topic in section 3.5 Work Orders.

Large items that are not acceptable as part of the included service can still be picked up for a fee. Residents make a payment at Town Hall, per item. The Division collects the items within two business days after payment is received.

Proactive measures are taken by Drivers on garbage and yard waste routes by calling the SWS in order to report bulky materials that may not have been called in by residents. Examples of items called-in were:

- Couches discarded along the side of the road instead of curbside in front of a home
- Unacceptable items such as large televisions
- Small piles of bulky material next to garbage carts
- A pile of mattresses curbside

Bulky collection service would be more efficient and cost effective if residents were required to call in for the collection of all items. This would allow the Division to plan a route for collection, which would better utilize the Driver and vehicle time. Education and Outreach would need to be updated in order to convey new rules to all residents. While data collection for bulky trash is challenging because the location and the material may not be consistent, there are a variety of options to collect the data. Some jurisdictions utilize their 311 systems both telephonically and via the Internet while others utilize on board computer (OBC) systems for solid waste drivers to record bulky trash set outs in order to schedule future pickups. An administrative person in the office tracks the incoming data and produces a sequenced route for future collection.

**Table 7: Bulky Waste Disposal Tonnage**

Month	FY 2013-14	FY 2014-15	FY 2015-16
July	15.43	10.71	20.76
August	17.82	n/a	24.99
September	10.8	21.55	20.51
October	9.25	19.06	26.32
November	3.08	9.47	22.28
December	23.91	6.76	17.36
January	8.72	7.87	6.50
February	4.90	5.92	9.71
March	12.39	10.87	15.66
April	12.65	20.02	13.91
May	19.83	22.38	25.89
June	13.69	27.49	20.97
<b>TOTALS</b>	<b>152.47</b>	<b>162.1</b>	<b>224.86</b>

#### Recommendations

- Convert bulky collection service to on-call service and require residents to request service. Residents could be directed to utilize the Town's online request tracker form, which allows photos to be attached, and allows administrative staff to schedule pickups. Residents without online access could call-in requests to administrative staff.
- Utilize OBC to log bulky set outs via driver input. This would allow office staff to route bulky collection for the same day or the following day.

- Create work orders for all bulky collection and route Drivers to collect in one area per day per week.

### **3.4. Daily Reporting**

Currently Drivers fill out two forms detailing their daily activities: Daily Worksheet and Roll-Out Container Route Report. Much of the information contained on these different forms is repetitive and could be combined. The data is entered into PubWorks® for reporting purposes. Due to the heavy workload in administration, reports have been backlogged for several months. In an effort to improve the process, Drivers are currently being trained to enter this information directly into PubWorks® at the end of each shift.

The Town has a powerful reporting tool in PubWorks®, if utilized properly. Reports from PubWorks® could provide the Town with standard industry reporting metrics such as hours of service, equipment hours, disposal trends, and tonnage. Reports can be viewed easily on a daily basis. However, KCI found inconsistencies in the historical tonnage and hours in the PubWorks® system and would not recommend using the data for future comparisons unless data is cleansed.

#### **Recommendations**

- Combine current Driver paperwork into one form that mirrors the PubWorks® data entry screens to facilitate more accurate data entry.
- Conduct daily or weekly quality control reviews of reports for accuracy as the data is compiled in the annual report to the state.

### **3.5. Work Orders**

Currently work orders are hand written and kept on file. There is currently not an easy way to report on the amount of work orders completed by Division staff for a given time period. PubWorks® has the capability for entering and tracking work orders. Entering all work orders into an electronic system would allow for better tracking of how much the bulky and large yard waste services are being utilized by residents.

#### **Recommendations**

- Investigate the cost of adding the work order module to the current system for enhanced tracking and reporting capabilities.

## **4. Safety**

The Division has impressive safety statistics, reporting very low accident and injury rates. The Division reported only two vehicle accidents between 2013 and 2016, both resulting in minor damage to equipment. Six injuries were reported during the same timeframe. All but one injury occurred while the Driver was out of the vehicle to manually collect yard waste.

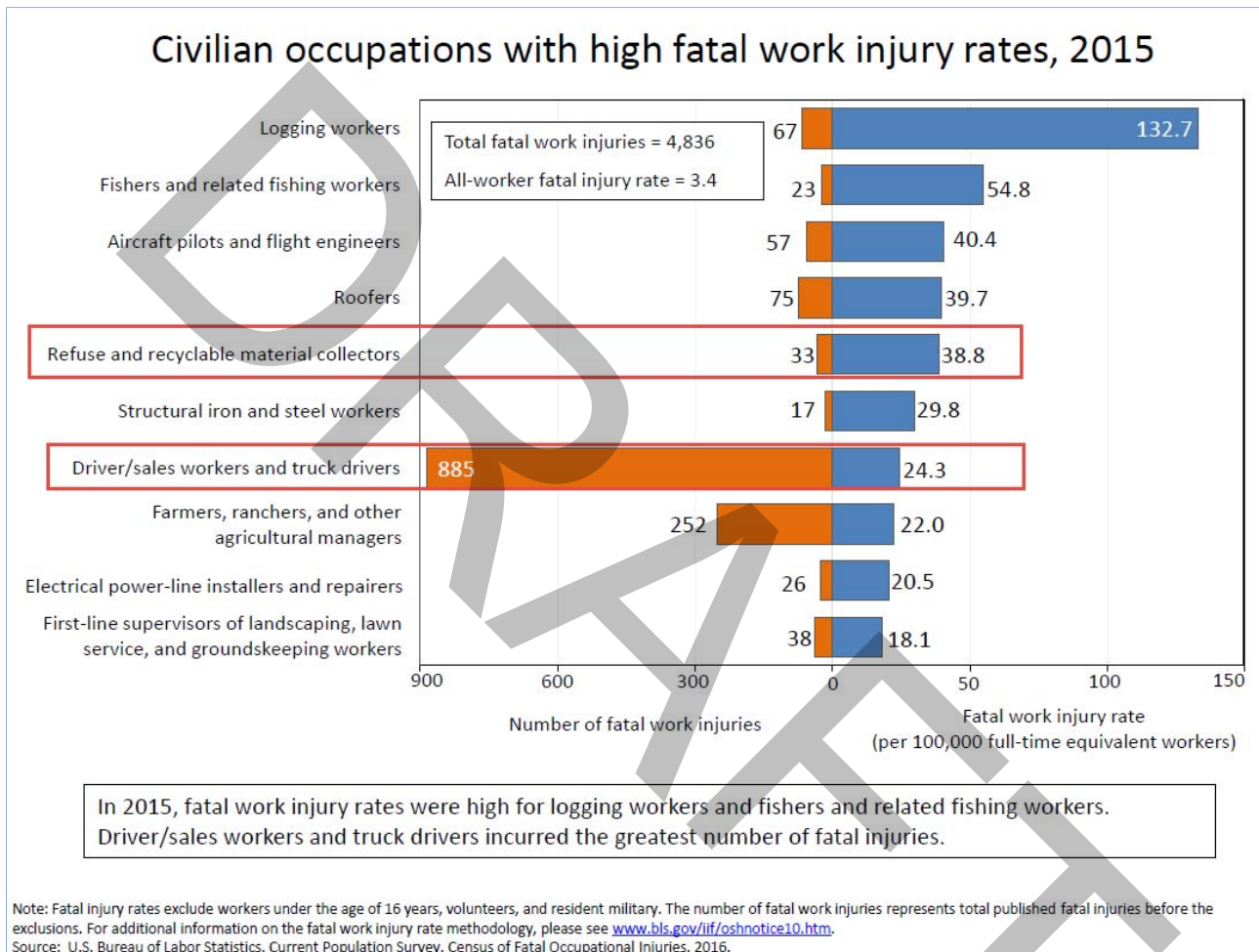
Drivers have a clean, safe environment in which to begin and end their days, as well as take breaks, attend safety meetings, and fill out their daily paperwork.

Formal safety meetings are not scheduled or run by the Division. Human Resources plans safety meetings for all Town employees, but they are not directly related to solid waste. However, the SWS meets with each Driver daily to discuss any safety or route issues that occurred during service. In addition, the SWS periodically covers important safety topics with all collection staff.



The Solid Waste Association of North America as well as the Bureau of Labor Statistics (BLS) has continually identified solid waste industry employees to be in one of the top ten most dangerous occupations in the country. The BLS lists refuse and recyclable collectors as the fifth most dangerous job in the country. Drivers are listed as seventh, as illustrated in Figure 5: Bureau of Labor Statistics 2015 Data. Due to the inherent danger of the Division tasks, safety should be a daily focus.

**Figure 5: Bureau of Labor Statistics 2015 Data**



Despite the lack of an organized safety program, a high level of adherence to safety was observed while on site and during ride-alongs with staff. All field employees were wearing and/or carried PPE such as hi-visibility vests or jackets, steel toed boots, work gloves, safety glasses, and hard hats. Unlike industry trends to work as quickly as possible to complete the assigned daily tasks, observations proved Town staff took their time, adhered to common safety measures when driving and collecting, and utilized proper PPE when handling debris and manually loading yard waste into the vehicles.

Even with the evident safety culture and low number of accidents and injuries a focus on safety that is solid waste driven is recommended. The importance of safety should be communicated frequently and consistently, with scheduled meetings focused on safety associated specifically to solid waste collection. Posters, signs, and videos also assist as constant reminders throughout the day. A variety of topics, specific to solid waste collection, should be covered throughout the year such as backing, lifting, awareness of surroundings, disposal facility precautions, cleaning behind the blade, and weather related collection safety.

## Recommendations

- Conduct weekly safety meetings covering solid waste focused topics.

## 5. Fleet Services

The Division has a well maintained fleet comprised of eleven pieces of equipment including one administration and ten collection vehicles. During staff interviews it was found that vehicles receive maintenance in a timely manner and the Division maintains a good working relationship with Fleet Maintenance. Of the Division's collection vehicles, seven are considered frontline units, one is considered a spare, and two are out of service rotation. The types of vehicles the Town uses are ASL, BCL, and Front End Loaders (FEL). Table 8 provides key metrics of the vehicle fleet. There are spare vehicles, which can be utilized if an ASL or FEL is out of service. However, there is not a spare Division vehicle if the BCL is out of service.

**Table 8: In-Service Collection Vehicle Fleet Metrics**

Vehicle Type & Number	Vehicle Manufacturer	Use	Purchase Price	Lifecycle Operating Cost	Lifecycle Costs-Repairs (to date)	Age	Useful Life (Years) Industry Standard	Useful Life (Years) Town Standard	Total Cost Per Mile	Fuel Cost Per Mile
<b>Residential Vehicles</b>										
ASL-800	Freightliner	Spare	\$204,250	\$215,596	\$136,329	10	7-9	12	\$3.22	\$1.19
ASL-801	Freightliner	Front Line	\$209,014	\$195,728	\$111,536	10	7-9	12	\$3.24	\$1.39
ASL-802	Freightliner	Front Line	\$249,371	\$170,920	\$97,764	8	7-9	12	\$3.06	\$1.31
ASL-807*	Autocar	Front Line	\$401,898	\$8,313	\$3,739	2	7-9	12	\$0.87	\$0.48
ASL-808	Autocar	Front Line	\$298,957	\$9,671	\$2,942	2	7-9	12	\$0.85	\$0.59
BCL-805	Freightliner	Front Line	\$103,058	\$61,113	\$31,106	5	10-12	12	\$1.25	\$0.61
<b>Commercial Vehicles</b>										
FEL-804	Autocar	Front Line	\$218,453	\$169,387	\$101,214	7	8-10	12	\$2.52	\$1.01
FEL-806	Autocar	Front Line	\$231,000	\$93,183	\$42,920	4	8-10	12	\$1.67	\$0.90

*\*Hydraulic Diesel Hybrid vehicle; partially funded by a grant*

This Section Intentionally Left Blank

In April of 2015 the Town received the Clean Fuel Advanced Technology Grant to fund the purchase of a hybrid collection vehicle which combines the use of diesel and hydrostatic drive technology. This new collection vehicle consumes an average of 48 percent less fuel than normal diesel vehicles.

Currently the average age of the Division's fleet is 6.4 years. Two residential vehicles are ten years old and operate at an average cost of \$3.23 per mile<sup>3</sup>, as opposed to the other vehicles which operate at an average cost of approximately \$1.59 per mile<sup>4</sup>.

The Town has a vehicle replacement policy that schedules the replacement of all solid waste vehicles at 12 years. This policy does not take engine hours into account, which is a more accurate measure of vehicle activity. The additional evaluation criteria for replacement are as follows:

1. Year of Vehicle: One (1) point is assigned for each year of chronological age past life expectancy, based on "in-service date" of the vehicle.
2. Mileage: One (1) point is assigned for each 5,000 miles of operation over 125,000 miles.
3. General Overall Condition: This category takes into consideration the condition of the body, rust, interior condition, vehicular accident status, anticipated repairs, etc. A scale from one (1) to five (5) is used, with five (5) being extremely poor condition.
4. Maintenance Cost: Points are assigned on a scale of one (1) to five (5) based on the total cost factor. The maintenance cost figure includes all repair and maintenance costs minus any costs associated with accident repairs. A five (5) would be equal to 100% or more of the original purchase price, while a one (1) would be equal to 20% of the original purchase price.

In general, KCI recommends a replacement schedule of 8-10 years for FEL vehicles and 7-9 years for ASL vehicles. Prior to replacing any vehicle, the unit should be reviewed to determine if maintenance expenses are tracking as planned. If a unit falls below the average spending for similar vehicle types, the useful life might be extended. On the other hand, high maintenance expenses are an indicator that a unit might need to be replaced sooner than planned. Should the situation of early replacement arise, an examination of vehicle procurement specifications, warranty, and driver misuse and abuse should be conducted to prevent a reoccurrence.

Solid waste drivers are required by the U.S. Department of Transportation to complete a Daily Vehicle Inspection Report for every vehicle driven each shift. This document indicates that the driver has conducted both a pre- and post-trip safety inspection of the vehicle and authorizes that the vehicle is safe to operate. KCI reviewed the Town's Daily Truck/Equipment Check Out Sheet which Drivers are required to fill out and hand in daily. While the Town does have a form in place, a more robust policy could assist the Division in heading off small problems before they manifest into larger issues. One key function missing in the process is a post-trip inspection. Issues are often found during this end of day inspection.

**Figure 6: Hybrid Vehicle**



<sup>3</sup> Includes ASL-800 and ASL-801 which are ten years old.

<sup>4</sup> Includes ASL-802 which is eight years old and ASL-807 and ASL-808 which are two years old.



## Recommendations

- Revise the Vehicle Replacement Policy with input from the Fleet Maintenance Supervisor.
- Expand driver inspections to include post-trip inspections.

## 6. Cost of Service (COS) Analysis

KCI compiled and reviewed Town provided data pertinent to the development of a cost of service (COS) analysis. The Division's financial and operational data, discussions with Division and Finance staff, and actual expenses for the past three fiscal years were used in allocating expenses across the residential and commercial lines of business (LOB). The scope of this project focused the COS analysis on residential services and therefore further allocated residential expenses into the three residential collection services provided by the Division: garbage, yard waste and bulky waste. Because only one year of residential customer counts were available, the current residential customer count was used for all three years.

In order to allocate residential services, KCI utilized the percentage of weekly routes, fleet, and full time employees assigned to the three different residential services. Table 9 illustrates these allocations.

**Table 9: Collection Allocation\***

Line of Business	Weekly Routes		Fleet		Full Time Employees (FTE)	
Residential Garbage	6	30%	2	29%	2.2	32%
Residential Yard Waste	8	40%	2	29%	2.6	37%
Residential Bulky	1	5%	1	14%	0.8	11%
Commercial Garbage	5	25%	2	29%	1.3	19%
<b>Totals</b>	<b>20</b>	<b>100%</b>	<b>7</b>	<b>100%</b>	<b>6.9</b>	<b>100%</b>

*\*Employees are allocated by percentage of time spent on each service. Public Works Director and Administrative assistance only spend a portion of time allocated to solid waste.*

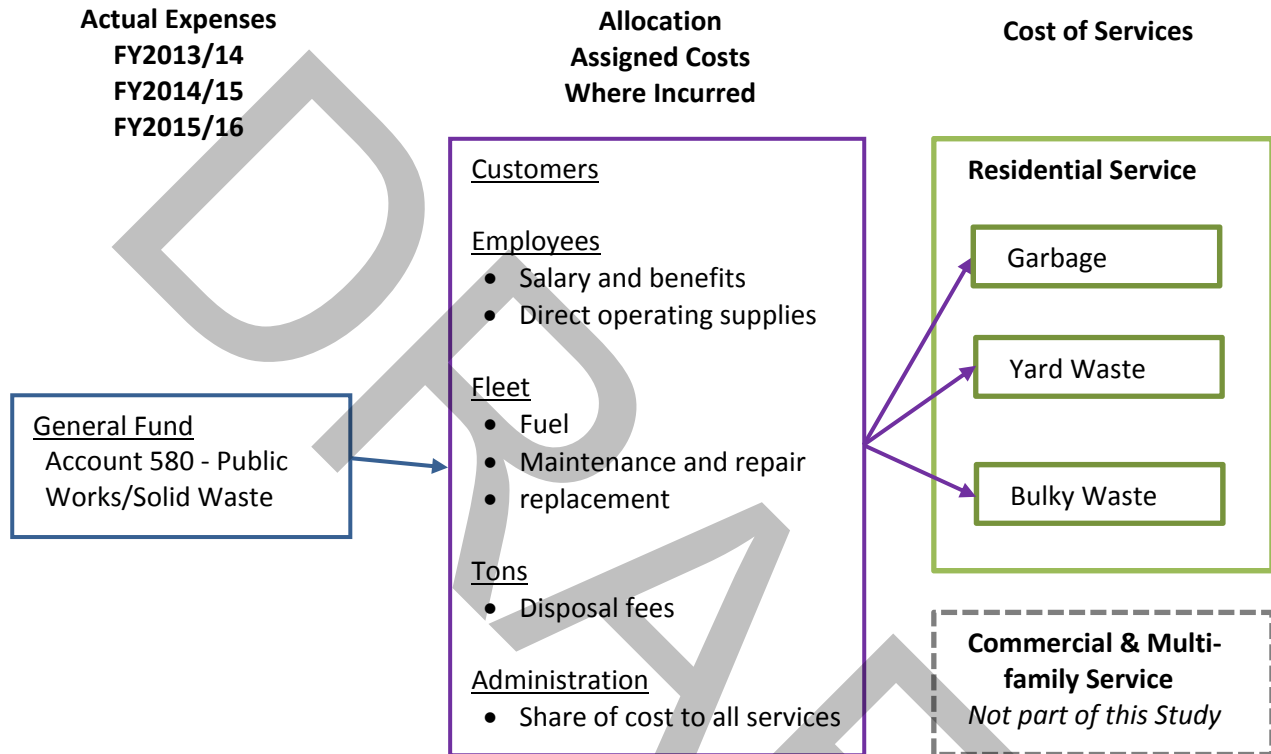
- Line items within the general fund were allocated using the percentages in Table 9 in the following manner:
  - Salaries, benefits, and direct operating supplies were allocated based on FTE.
  - Vehicle maintenance & repairs were allocated based on fleet.
  - Fuel was allocated based on weekly routes.
  - Yard waste cart expenses were assigned to residential yard waste.
  - Garbage carts that were purchased for resale were assigned to residential garbage.
  - Remaining accounts, which were indirect expenses spanning all services were considered administrative and were allocated based on the total service costs.
- Disposal cost totals are not an allocation. Annual disposal fees were calculated based on actual disposal log reports and totals by division truck type. Any difference between total calculated disposal costs and actual expenses are related to non-Division disposal costs such as Landscaping and Streets Division activities.

The Division does not have a designated fund for planned purchases of replacement vehicles. Fleet vehicles are purchased outright and reflected in expenditures rather than being depreciated over the life of the unit. To determine an average fleet replacement cost for the COS model, KCI estimated the total replacement cost of the entire fleet to account for purchase anomalies and straight-lined the total value by twelve years (current programmed average life expectancy of fleet vehicles) to determine an

estimated capital replacement cost. The estimated annual replacement cost was then allocated based on the use of the vehicle.

The estimated cost of service was compiled by adding the estimated collection and disposal cost for each service. A graphic representation of the allocation methodology used is presented in Figure 7.

**Figure 7: Cost Allocation Methodology**



The annual cost per household per service was determined by the estimated cost of service divided by the number of households serviced. The cost per household is illustrated in Table 10.

**Table 10: Residential Annual Average Cost per Household**

Allocation Category	Residential Garbage	Residential Yard Waste	Residential Bulky Waste	Average Annual Cost
FY 2015-16 Collection	\$58.60	\$56.71	\$11.30	\$126.61
FY 2015-16 Disposal	\$23.81	\$3.53	\$2.10	\$29.43
<b>FY 2015-16 Total</b>	<b>\$82.41</b>	<b>\$60.23</b>	<b>\$13.40</b>	<b>\$156.05</b>
FY 2014-15 Collection	\$61.54	\$60.90	\$11.80	\$134.24
FY 2014-15 Disposal	\$22.85	\$3.62	\$1.51	\$27.99
<b>FY 2014-15 Total</b>	<b>\$84.39</b>	<b>\$64.52</b>	<b>\$13.32</b>	<b>\$162.23</b>
FY 2013-14 Collection	\$58.13	\$56.84	\$11.00	\$125.96
FY 2013-14 Disposal	\$23.57	\$4.11	\$1.42	\$29.11
<b>FY 2013-14 Total</b>	<b>\$81.70</b>	<b>\$60.95</b>	<b>\$12.42</b>	<b>\$155.07</b>

Note: Columns may not appear to calculate correctly due to rounding.

In addition, the Town requested a cost per ton for each residential service. The average cost per ton is illustrated in Table 11.

**Table 11: Residential Average Cost per Ton**

Allocation Category Per Ton	Residential Garbage	Residential Yard Waste	Residential Bulky Waste
FY 2015-16 Collection	\$100.93	\$289.41	\$220.48
FY 2015-16 Disposal	\$41.00	\$18.00	\$41.00
<b>FY 2015-16 Total</b>	<b>\$141.93</b>	<b>\$307.41</b>	<b>\$261.48</b>
FY 2014-15 Collection	\$110.44	\$302.41	\$319.43
FY 2014-15 Disposal	\$41.00	\$18.00	\$41.00
<b>FY 2014-15 Total</b>	<b>\$151.44</b>	<b>\$320.41</b>	<b>\$360.43</b>
FY 2013-14 Collection	\$101.09	\$249.04	\$316.38
FY 2013-14 Disposal	\$41.00	\$18.00	\$41.00
<b>FY 2013-14 Total</b>	<b>\$142.09</b>	<b>\$267.04</b>	<b>\$357.38</b>

### Findings

The COS analysis calculates an estimate for the annual cost for each residential service offered by the Division. Because COS is affected by either operational costs or disposal costs, the COS model is an effective tool to help make financial-based decisions when improving operational efficiency in order to reduce expenditures, as well as identifying disposal market opportunities and/or limitations. Due to the fact that there is not a stand-alone residential fee for solid waste service and disposal, KCI cannot compare the COS to current rates. Following are the key findings:

- Almost 19 percent of the Town's costs are associated with disposal, and 81 percent is attributed to collection.
- The average annual cost per household \$156.05, or \$13.00 per month, which is based on anecdotal data and our industry experience, is reasonable.

### 7. Conclusion

The Division's solid waste operation is a well-run, cohesive operation. Employee morale is high as demonstrated through the longevity of the current staff. A mutual respect among the community and the Division was witnessed while on site. The Division has developed and implemented a number of best practices such as cross-training, detailed driver paperwork, data entry of metrics into PubWorks®, and encouraging Drivers to be safe. The Division's equipment is in good working order, and there are enough vehicles to complete each day's tasks. Route optimization, scheduled bulky waste collection, and carted, subscription yard waste could all increase efficiencies in the Town's program. As noted throughout the memo, there are areas where KCI believes the Division could improve, which could be achieved incrementally. A list of these recommendations is attached in Appendix A. KCI is available to assist with any of these items or any additional technical assistance the Division may require.

## **APPENDIX A**

### **Recommendations**

Compilation of Recommendations from Solid Waste Assessment-Current System.

#### **Residential Garbage**

- Through the public participation surveys that will be created:
  - Ask residents about their willingness to move their carts to one side of the street for expedited, safer collection, which would reduce emissions and vehicle time on their streets, reduce collection costs, and improve service.
  - Ask residents if they are interested in participating in a pilot for every other week service.
  - Explore option for residents to move carts curbside for service on roads that are difficult to service, such as 102 Laurel Avenue, shown in Figures 2 and 3.

#### **Residential Yard Waste**

- Require yard waste to be carted for regular collection.
- Pilot carted yard waste service with every other week collection.
- Create a route for carted yard waste collection.
- Require all non-carted yard waste to be called in for service with a fee attached.
- Begin utilization of Town's hybrid vehicle for yard waste collection.

#### **Residential Bulky Waste**

- Convert bulky collection service to on-call service requiring residents to request service. Residents could be directed to utilize the Town's online request tracker forms, which allows photos to be attached, and allows administrative staff to schedule pickups. Residents without online access could call in requests to administrative staff.
- Utilize OBC to log bulky set outs via driver input. This would allow office staff to route bulky collection for the same day or the following day.
- Create work orders for all bulky collection and route Driver to collect in one area per day per week.

#### **Daily Reporting**

- Combine current Driver paperwork into one form that mirrors the PubWorks® data entry screens to facilitate more accurate data entry.
- Conduct daily or weekly quality control reviews of reports for accuracy as the data is compiled in the annual report to the state.

### **Work Orders**

- Investigate the cost of adding the work order module to its current system for enhanced tracking and reporting capabilities.

### **Safety**

- Conduct weekly safety meetings covering solid waste focused topics.

### **Fleet Services**

- Revise the Vehicle Replacement Policy with input from the Fleet Maintenance Supervisor.
- Expand driver inspections to include post-trip inspections.

DRAFT

Town of Carrboro

Cost of Service Detail

Background detail for Tables 10 and 11

DISPOSAL COSTS						
Data and Equations	Actual	Town Residential Home Count	ASL <sup>1</sup> & BCL <sup>2</sup> Vehicles only	(Disposal x Tons)	(Tons/HH)	(Disposal Fees/HH)
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Disposal Fees FY 2015-16	Average Annual Tons per HH	Average Annual Disposal Cost Per HH
Residential Garbage	\$ 41.00	4387	2547.22	\$104,436.02	0.58	\$23.81
Residential Yard Waste	\$ 18.00	4387	859.59	\$15,472.62	0.20	\$3.53
Residential Bulky	\$ 41.00	4387	224.86	\$9,219.26	0.05	\$2.10
<b>Totals</b>			<b>3631.67</b>	<b>\$129,127.90</b>	<b>0.83</b>	<b>\$29.43</b>
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Disposal Fees FY 2014-15	Average Annual Tons per HH	Average Annual Cost per household
Residential Garbage	\$ 41.00	4387	2444.74	\$100,234.34	0.56	\$22.85
Residential Yard Waste	\$ 18.00	4387	883.39	\$15,901.02	0.20	\$3.62
Residential Bulky	\$ 41.00	4387	162.10	\$6,646.10	0.04	\$1.51
<b>Totals</b>			<b>3490.23</b>	<b>\$122,781.46</b>	<b>0.80</b>	<b>\$27.99</b>
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Disposal Fees FY 2013-14	Average Annual Tons per HH	Average Annual Cost per household
Residential Garbage	\$ 41.00	4387	2522.43	\$103,419.63	0.57	\$23.57
Residential Yard Waste	\$ 18.00	4387	1001.28	\$18,023.04	0.23	\$4.11
Residential Bulky	\$ 41.00	4387	152.47	\$6,251.27	0.03	\$1.42
<b>Totals</b>			<b>3676.18</b>	<b>\$127,693.94</b>	<b>0.84</b>	<b>\$29.11</b>

<sup>1</sup>ASL=Automatic Side Loader

<sup>2</sup>BCL=Bulk Claw Loader

COLLECTION COSTS						
Data and Equations	Actual	Town Residential Home Count	ASL <sup>1</sup> & BCL <sup>2</sup> Vehicles only	Allocated Expenditures	(Allocated Expenditures/Tons)	(Allocated Expenditures/HH)
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Collection Costs FY 2015-16	Average Collection Cost per Ton	Average Annual Cost per HH
Residential Garbage	\$ 41.00	4387	2547.22	\$257,095.69	\$100.93	\$58.60
Residential Yard Waste	\$ 18.00	4387	859.59	\$248,771.90	\$289.41	\$56.71
Residential Bulky Waste	\$ 41.00	4387	224.86	\$49,577.35	\$220.48	\$11.30
<b>Totals</b>			<b>3631.67</b>	<b>\$555,444.94</b>		<b>\$126.61</b>
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Collection Costs FY 2014-15	Average Collection Cost per Ton	Average Annual Cost per HH
Residential Garbage	\$ 41.00	4387	2444.74	\$269,987.34	\$110.44	\$61.54
Residential Yard Waste	\$ 18.00	4387	883.39	\$267,148.25	\$302.41	\$60.90
Residential Bulky Waste	\$ 41.00	4387	162.10	\$51,779.44	\$319.43	\$11.80
<b>Totals</b>			<b>3490.23</b>	<b>\$588,915.03</b>		<b>\$134.24</b>
	Disposal Per Ton	Households (HH)	Annual Actual Tons	Annual Collection Costs FY 2013-14	Average Collection Cost per Ton	Average Annual Cost per HH
Residential Garbage	\$ 41.00	4387	2522.43	\$255,004.19	\$101.09	\$58.13
Residential Yard Waste	\$ 18.00	4387	1001.28	\$249,354.14	\$249.04	\$56.84
Residential Bulky Waste	\$ 41.00	4387	152.47	\$48,238.08	\$316.38	\$11.00
<b>Totals</b>			<b>3676.18</b>	<b>\$552,596.41</b>		<b>\$125.96</b>

<sup>1</sup>ASL=Automatic Side Loader

<sup>2</sup>BCL=Bulk Claw Loader

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK FOR PRINTING PURPOSES



## TECHNICAL MEMORANDUM

**TO:** David Andrews, Town Manager  
Town of Carrboro

**FROM:** Shane Barrett, Consultant

**SUBJ:** **Technical Memorandum #3: Organics Collection Options Assessment and Preliminary Plan for Residential Source Separated Organics Pilot Program**

**PROJ #:** 192-00.00

---

### Introduction

The Town of Carrboro, NC (Town) contracted Kessler Consulting, Inc. (KCI) to conduct a Residential Solid Waste Study. Task 5 of this study is an assessment of organic collection options for developing a framework for the city to collect residential curbside organics. Task 6 of this study is the development of a preliminary plan for piloting residential curbside organics. This technical memorandum summarizes the results of these two tasks.

### Profiles of Existing Residential Organics Collection Programs

In order to develop the curbside organics pilot for the Town, KCI reviewed six on-point municipalities with residential curbside organics collection. Unfortunately, no communities were found in the Southeast that currently collect residential food waste; therefore, cities across the country are profiled. All of these municipalities collect organics and yard waste together in roll carts. While some municipalities, especially in the Northeast, collect organics only in small roll carts or bins, they were not included in these profiles because Carrboro collects some of its residential yard waste in carts and these programs would not be comparable, as they often do not have carted yard waste collection.

- **Portland, Oregon:** Portland collects curbside organic materials from single-family and small multi-family (2-4 units) residential properties on a weekly basis using 60-gallon roll carts. Accepted organic materials include all food waste, food-soiled or compostable paper (e.g., napkins and paper towels), and yard waste. Certified compostable bags are allowed to line carts or in-home collection containers; however, other compostable plastics are not allowed. The city also collects food waste from multi-family and commercial properties, but not compostable paper or yard waste. Organic materials collected in the residential program are sent to a compost facility that can handle the non-food materials, while commercial food waste is sent to





either an anaerobic digestion facility or another compost facility that processes only food waste. By implementing organics collection, the city was able to transition to every-other-week or every-four-week collection of garbage. In addition, Portland has a pay-as-you-throw (PAYT) rate schedule to incentivize recycling and composting. The city uses franchised haulers to provide residential collection services. Residents do not have a separate fee for composting and recycling, but the cost is included in a single rate based on the container size and collection frequency of the garbage service. Portland Metro reported a 59.8 percent diversion rate in 2014, which includes waste-to-energy incineration.<sup>1</sup> The residential curbside program collected an average of 1,089 pounds of organics per household in 2015, compared to 815 pounds of garbage and 776 pounds of recyclables per household in the same year.<sup>2</sup>

- Austin, TX:** In December 2012, Austin implemented a residential curbside organics collection pilot at 7,500 households as part of its Master Plan to reach zero waste (90 percent diversion) by 2040. The pilot currently encompasses approximately 14,000 households after adding 6,500 households in February 2014. Organics, including all types of food waste, compostable paper, and yard waste, are collected weekly in 96-gallon roll carts. The city does not accept any compostable plastics, including compostable bags, but encourages participants to line kitchen collection bins with paper and layer food waste with paper and yard waste in the cart to keep the containers clean. Austin also has a PAYT rate schedule, which incentivizes organics diversion. In FY 2015, the pilot collected 4,219 tons of organics,<sup>3</sup> which equates to approximately 600 pounds per household per year.
- Seattle, Washington:** In 2014, Seattle banned food waste and food-soiled paper from residential and commercial garbage, in addition to a 1989 ban on yard waste. All residential properties in the city are required to have weekly curbside collection of organic waste, with an exception for approved backyard composting. Collection service is provided by its two franchise haulers. The haulers offer 13-, 32-, and 96-gallon organics collection carts for \$5.65, \$8.50, and \$10.85 per month, respectively. Accepted materials include all food waste, food-soiled paper, yard waste, compostable bags, and other certified compostable plastics. Initially, the city was to impose a \$1 fine on single-family residential households that were found to have more than 10% food waste in their garbage containers upon visual inspection; however, the fine was suspended in early 2015. In 2015, the city reported a recycling rate of 58.0 percent overall and 74.3 percent for the single family residential sector.<sup>4</sup> Over 162,000 tons of organic material was composted in 2016, 91,375 tons of which were collected from single family and multi-family properties.<sup>5</sup> The city had 146,204 single family and 5,010 multi-family properties signed up for the program as of December 2016. This equates to 1,208 pounds of organics per property per year.

<sup>1</sup> Oregon Department of Environmental Quality, *2015 Oregon Material Recovery and Waste Generation Rates Report*, 2015 (<http://www.deq.state.or.us/lq/pubs/docs/sw/2015MRWGratesReport.pdf>).

<sup>2</sup> City of Portland, *Residential Curbside Collection Service Rate Study for Rates Effective July 1, 2015*, 2015 (<https://www.portlandoregon.gov/bps/article/404493>).

<sup>3</sup> Beniot, Erin, Records Analyst, Austin Resource Recovery, email communication.

<sup>4</sup> Seattle Public Utilities, *2015 Recycling Rate Report*, 2015 ([http://www.seattle.gov/Util/cs/groups/public/@spu/@garbage/documents/webcontent/1\\_052510.pdf](http://www.seattle.gov/Util/cs/groups/public/@spu/@garbage/documents/webcontent/1_052510.pdf)).

<sup>5</sup> Seattle Public Utilities, *Organics Report, 4<sup>th</sup> Quarter 2016*, 2016 ([http://www.seattle.gov/Util/cs/groups/public/@spu/@garbage/documents/webcontent/1\\_051719.pdf](http://www.seattle.gov/Util/cs/groups/public/@spu/@garbage/documents/webcontent/1_051719.pdf)).

- San Francisco, CA** – At 80 percent, San Francisco claims one of the highest diversion rates in the country. The city mandates recycling and composting for all residential and commercial properties. While mandatory composting has been required since 2009, the city has been collecting food waste for composting since a 1997 pilot, through its franchise hauler, Recology. For single-family residences, organics, including food waste, food-soiled paper, yard waste, and certified compostable bags and other plastics, are collected weekly in 32-gallon roll carts at a cost of \$2.06 per month. The city has a PAYT rate structure, but is currently piloting a pay-per-set out pilot for garbage carts to further encourage recycling and composting.
- Princeton, NJ** – In 2011, Princeton started a three-month residential curbside organics collection pilot that has since become permanent. The program is voluntary and participants pay an annual fee of \$65 to receive weekly collection of organic waste in either 20- or 32-gallon rolls carts. All food waste, compostable paper, and yard waste are accepted in the carts, as are certified compostable bags. The city provides all participants with kitchen collection bins and bags to line these bins. As of January 2016, approximately 1,200 customers participate in this voluntary program,<sup>6</sup> which represents approximately 12 percent of Princeton's households. In 2015, the program collected 483 tons of organics,<sup>6</sup> which equates to approximately 800 pounds per participating household.
- Denver, CO** – Denver began curbside collection of organics in 2008 as a pilot program in select areas of the city. In 2010, the program became fee based and has been expanding its service area since. In 2016, the city provided service to 9,545 households along five collection routes<sup>7</sup>. In 2017, the City plans to expand to 11 routes, doubling eligible households to 160,000; the city anticipates about 20,000 additional subscriptions with the expansion<sup>8</sup>. The city charges subscribers \$29.25 per quarter (\$9.75 per month) for organics collection service. However, the city also does not have Pay-as-you-throw for trash collection. This could explain the low participation rate, where less than 20 percent of eligible households are anticipated to be subscribed after the 2017 expansion. Organic material (including food waste, yard waste, compostable paper products, and other Biodegradable Products Institute (BPI) certified compostable bags and products) is collected weekly in 65- or 95-gallon carts. In 2016, the city estimates 5,567 tons of organics were collected or approximately 1,166 pounds per household<sup>7</sup>.



### Existing Organics Infrastructure in Orange County

Currently a number of organics collection and processing activities are occurring in Carrboro and the surrounding area.

<sup>6</sup> Pellichero, Janet, Recycling Coordinator, City of Princeton, NJ, telephone interview.

<sup>7</sup> Denver Recycles, *2016 Annual Report*, 2016.

([https://www.denvergov.org/content/dam/denvergov/Portals/709/documents/DR\\_AnnualReport\\_2016\\_Final.pdf](https://www.denvergov.org/content/dam/denvergov/Portals/709/documents/DR_AnnualReport_2016_Final.pdf)).

<sup>8</sup> Murray, Jon. *Denver Post*, "See where Denver is expanding curbside composting pickup and finishing trash cart conversions", March 16, 2017. (<http://www.denverpost.com/2017/03/16/denver-curbside-compost-pickup-trash/>).

### Collection Services

- **Orange County drop-offs** – Orange County Solid Waste Management maintains two food waste drop off locations. One is located at the Carrboro Farmer’s Market on Saturdays and one at the Walnut Grove Convenience Center. The drop offs accept all food waste (including meat, bones and dairy) and compostable paper products. Approximately 1,000 and 1,500 pounds of food waste are collected each month from the Farmers’ Market and Walnut Grove, respectively. All food waste is collected by Brooks Contractor and transported to their composting facility in Goldston.
- **CompostNOW** – CompostNOW is a private organics collection service provider based out of Raleigh. They provide subscription-based service to home and businesses in the Research Triangle area, including Carrboro. The service provides residential subscribers with up to two 5-gallon buckets for collecting food waste and other compostable materials (including compostable paper and BPI-certified compostable products). The buckets are collected weekly at the door and replaced with a clean one. They will also provide subscribers with finished compost should they wish. The cost for residential subscription is \$25 per month for up to two buckets and \$5 more per month for each additional bucket. CompostNOW also provides weekly service for offices and restaurants/cafes. All material is delivered to Brooks Contractor’s facility.
- **FoodFWD** – FoodFWD is a private organics collection service provider based in Durham. They primarily collect organics from commercial properties and special events using roll carts. Starting in April 2017, the company began a subscription-based residential drop off facility. The first facility is at Durham’s Central Park, but they plan to expand into Orange County. The cost to subscribe to the program is \$15 per month. For this cost, FoodFWD will provide a four-gallon collection bucket, compostable liners, and access to the drop-off containers. Collected material is delivered to Brooks Contractor’s facility.

### Organics Processing

- **Brooks Contractor** – As stated above, Brooks Contractor is the primary composting partner for organics collection services in the research triangle area, including Orange County. The company owns a Class 3 permitted composting facility in Goldston. The site is approximately 38 miles from Carrboro (measured from the Public Works Department). Class 3 facilities are permitted to accept yard waste, manures, agricultural waste, and pre- and post-consumer food waste. They also accept certified compostable products. According to reports to the North Carolina Department of Environmental Quality (DEQ), the facility processed 57,231 tons of material in FY 2014-15, 9,342 tons of which were food waste<sup>9</sup>. This was 76 percent of its permitted capacity. In addition to composting, Brooks Contractor also collects organics from large food waste generators (grocery stores, schools, restaurants, etc.) using dumpsters and roll carts, including several locations in Orange County. Brooks also accepts food waste, food-soiled paper, and certified compostable bags from North Carolina State University.
- **McGill Regional Composting Facility** – McGill Regional Composting Facility, located in New Hill, is a large Class 4 commercial composting facility. The site is approximately 23 miles from Carrboro (measured from the Public Works Department). The facility is currently composting yard waste, food waste, biosolids, manures, and other organic materials. They also accept certified compostable products. In FY 2014-15, the facility composted 82,131 tons of material,

<sup>9</sup>Jorge Montezuma, “Organics Recycling in North Carolina,” *BioCycle* (September 2016): 36. (<https://www.biocycle.net/2016/09/15/organics-recycling-north-carolina/>).

including 1,231 tons of food waste.<sup>9</sup> This was 54% of its permitted capacity. McGill has collection service using tractor-trailer trucks, but commercial haulers can self-haul to the facility.

- **Full Circle Recycling** – Full Circle Recycling is an anaerobic digestion facility in Zebulon. They receive food waste; however, because of the process used (i.e. yard waste would not be able to be digested with this type of digester), the food waste could not receive yard waste and food waste mixed together. This would not be an option for Carrboro’s curbside organics program.
- **Orange County Water and Sewer Authority (OWASA)** – OWASA has an anaerobic digester for treatment of its biosolids. Food waste could be incorporated into this type of anaerobic digester, but could not be included with yard waste. This option would not be appropriate for Carrboro’s curbside organics program.

### Residential Curbside Organics Collection Framework and Overview

Based on the above research, KCI proposes a general framework for the collection of organics. This framework is based on evaluating other curbside programs, existing organics infrastructure in the region, and the Best Management Practices in Food Scraps Programs<sup>10</sup>.

- The Town would collect organics, which would include yard waste, food waste, non-recyclable compostable paper, and certified compostable products (if accepted by chosen processor), in a single 64- or 95-gallon roll cart. Smaller carts may be offered to households that do not generate a significant amount of yard waste, such as townhomes. The yard waste carts that are currently offered to residents would be acceptable. Implementation of full-scale organics collection would need to occur after full conversion to yard waste carts, as recommended by KCI in the Operations Assessment Technical Memorandum.
- The Town would use its existing automated side loader (ASL) trucks to collect the material weekly. The two current routes, two days per week may be sufficient, but will depend largely on participation and material collected. Additional routes may be needed depending on participation rates. Since only carts would be collected on these routes, the Town’s hybrid ASL could be used for one of these routes each day.
- The potential diversion rate achievable by curbside collection, depends on three main factors: 1) amount of municipal solid waste (MSW) that is compostable (waste composition), 2) the number of residents that use a cart for organics (participation rate), and 3) the amount of organics collected from each participant (capture rate).
  - The waste composition study conducted by KCI in 2016, indicated about 47 percent of the MSW stream is potentially compostable (this is excluding other organics & rubber, which was predominantly pet waste, a material not accepted in most curbside programs). According to the city’s tonnage reports, 2,547 tons of MSW were generated from the single-family residents in FY 2015-16. This means that about 1,200 tons of this material is potentially compostable or 546 pounds per household per year.
  - Participation is difficult to estimate, but currently about 15 percent of households (about 700 households) participate in the carted yard waste service. Should the Town require carted yard waste as the universal yard waste collection method, the number of households with yard waste carts would increase substantially. However, this does not equate to the participation rate in food waste and compostable paper collection. Not all households may

<sup>10</sup>Freeman, Juri and Skumatz, Lisa, Econservation Institute, *Best Management Practices in Food Scraps Programs*. ([http://www.foodscrapsrecovery.com/EPA\\_FoodWasteReport\\_EI\\_Region5\\_v11\\_Final.pdf](http://www.foodscrapsrecovery.com/EPA_FoodWasteReport_EI_Region5_v11_Final.pdf))

- place these materials in the yard waste cart. A number of factors impact participation rate, including outreach and education and residential rate structure. Materials outlining the benefits of the organics program and proper participation (i.e., what can be placed in the cart) must be provided to residents. In addition, most programs offer residents an economic incentive to participate. Municipalities with the most successful programs have a PAYT rate structure. This creates incentive for diverting material from the MSW cart into the organics cart because the household may be able to downgrade to a smaller and less expensive cart. Given that Carrboro does not have a PAYT system the participation rate may possibly be around 60 percent, dependent on whether a transition to yard waste carts is carried out. A discussion of PAYT programs will be provided in Technical Memorandum #4.
- The third factor that affects diversion is the capture rate. Even if a household participates in the program, they will not be diverting all compostable material to the organics collection. Informing the household of all possible compostable materials is critical in achieving high capture rates, especially for compostable paper or other less commonly composted materials. Convenience and “yuck” factors also play a role in the capture rate. The resident may be willing to put cornhusks or banana peels in the cart, but not raw meat trimmings or spoiled food. Providing effective kitchen containers with compostable liners can make it more convenient and cleaner for the household. Educating about ways to reduce the “yuck” factor, such as chilling or freezing food waste, especially during the summer, can help as well. Conservatively, a 60 percent capture rate from participants could be assumed.
  - Based on these gross assumptions, an estimated 430 tons or 17 percent of MSW could be diverted to organics collection. This assumes a citywide residential program with 60 percent participation and a 60 percent capture rate. This does not include any yard waste that is currently collected.
  - Organics collection will have additional costs associated with it, as outlined below. These costs are discussed in further detail later in this memo in relation to pilot costs.
    - Additional time and mileage to transport the material to the composting facility.
    - Potentially higher tip fee compared to the current yard waste tip fee. However, this will reduce the tip fee paid for MSW.
    - Purchase of additional yard waste carts (unless the city maintains the current practice of residents purchasing their own carts)
    - Purchase of any kitchen containers or compostable bags for use by residents.
    - Development of outreach and education materials.

### **Preliminary Plan for Residential Organics Collection**

This section outlines a preliminary plan for a curbside residential organics collection pilot based on the general framework outlined above.

- Hold discussions with both Brooks Contractor and McGill Compost to develop an agreement for processing the collected organics. Both facilities have capacity and accept materials that would be collected in the pilot: yard waste, post-consumer food waste, compostable paper products, and certified compostable products. Brooks Contractor has an existing relationship with Orange County, which may facilitate working with them. However, McGill Compost is approximately 20 minutes closer to Carrboro. The Town would need to negotiate a tip fee with each facility, which could help in making a determination. The facility would need to understand that this is only a pilot, material may have higher contamination due



to first time participants. The Town and the facility should agree upon an acceptable level of contamination prior to the pilot.

- Develop a route to collect organics only from existing yard waste carts. These would need to be separate from loose, bagged, or canned yard waste collection. This would also allow the Town to use the hybrid automated side loader (ASL) truck since the driver would not need to manually load any material. Currently, the city has approximately 700 residents that have yard waste carts. These residents would be ideal participants for an organics collection pilot because 1) they already have carts that could be used for organics and 2) they have shown a commitment to yard waste collection, giving them buy-in to a pilot program.
- Prior to informing participants about the pilot, implement the new route for collecting from the carted yard waste residents and collect tonnage data from this route. This would allow the Town to establish baseline data for carted yard waste.
- Distribute outreach and education materials to each of the participants clearly describing the purpose of the pilot, what materials can and cannot be placed in their carts, kitchen collection procedures, and set out and cleaning procedures. KCI can provide assistance to the Town in developing this material should the Town move forward with this pilot. A strong outreach and education program is vital to a successful organics program. It will increase the amount of material collected in the program and decrease contamination or unacceptable materials.
  - Materials accepted: All yard waste the participants are currently placing in their yard waste carts, cooked and raw food (fruits, vegetables, bread, meat, bones, trimmings, spoiled or rotted food), compostable paper products (paper towels, napkins, tissues, uncoated paper plates, food-soiled paper, pizza boxes), certified compost products (paper and plastic products certified by BPI or meeting ASTM D6400 or D6868 standards).
  - Materials not accepted: plastic bags/film, pet waste/cat litter, any non-certified plastics or lined paper, expanded polystyrene, aluminum foil, and other inorganic materials. The list of acceptable and unacceptable materials should be verified with the composting facility before distributing to participants.
  - The Town may decide to provide kitchen containers, as some municipalities currently do. This would be an additional cost to the Town, but may encourage higher participation and recovery. Alternatively, participants could be encouraged to use their own containers, examples include a coffee can, large yogurt tub or cat litter bucket.
  - Set-out instructions would be identical to current procedures, but all carts would be collected on a single day.
  - To keep carts clean, paper bags or certified compostable plastic bags could be used to line kitchen containers. These liners could be provided by the Town or participants could be told examples of which brands to use based on the list of certified compostable products. However, these bags would be an added cost to either the Town or participant. Participants should be encouraged to layer food waste with yard waste as an additional cleanliness measure. Instructions for clean carts (soap and water) should also be provided to participants.
- Collect carts weekly curbside using one of the Town's ASL trucks. The hybrid ASL would be an ideal solution because manual loading would not be required and the compost facility is a further distance than the current yard waste disposal site.

- The expected tonnage will depend on how active the participants are in diverting additional organics in their yard waste carts. The quality of the education and outreach material provided to the participants will play a critical role in this. Below, are calculated rough estimates of expected tonnage for the pilot:
  - Based on the examples of other municipal curbside organics programs given above, the tons of organics annually collected ranged from 600 to 1200 pounds per household or about 11.5 to 23.1 pounds per household per week. Using these numbers as an assumption, this would equate to about 4 to 8 tons of organics per week during the pilot. The amount collected during the Town's pilot may be less than other established programs.
  - As discussed above, the WCS conducted by KCI in 2016 indicated that about 47 percent of the Town's residential waste is compostable. This equates to approximately 11.8 pounds per household per week, using the FY 2015-16 average of 22.4 pounds of MSW per household per week. The pilot will likely have a high participation and capture rate because the participants have already made the commitment to buy the yard waste cart. Assuming an 85 percent participation rate among the 700 households and a 75 percent capture rate from the participating residents, the pilot would collect about 6.7 pounds of additional organics per household per week. This is in addition to the yard waste currently collected. Based on FY 2015-16 data, an average of 2.8 pounds of yard waste per household per week were collected by the ASL truck. However, this number may not be representative of residents with yard waste carts as the ASL currently collects material from all residents (carted and loose). Nevertheless, this would mean that an estimated 9.5 pounds of total organics per household per week would be collected, averaged across all 700 households. This equates to 3.3 tons of organics per week.
  - One unknown factor is backyard composting. If the 700 residents practice backyard composting to a greater extent than the average household, the amount of organics that would be in the MSW stream and potentially collected in the pilot would be lower, assuming they continue to compost at home.
- Based on this tonnage estimate, the ASL would have sufficient capacity to collect material from all 700 households in a single load. The ASL would drive to the compost facility and tip its load at the completion of the weekly pilot route.
- We recommend the duration of the pilot to be at least 6 months to obtain reliable data and measure any seasonal changes in collection tonnage.

#### **Preliminary Cost Estimates for the Pilot.**

- Because the pilot would be using currently available collection equipment and staff, the additional cost to collect is minimal. Additional time and fuel costs would be needed to drive the extra distance to the compost facility rather than the Orange County Solid Waste Facility for yard waste disposal, approximately 7 miles (measured from the Public Works Department). However, by being able to use the Town's hybrid truck for the collection, the fuel usage would be partially offset. Furthermore by diverting organics from MSW, the amount of MSW that must be delivered to Waste Industries Transfer Station in Durham would be reduced. This could potentially reduce the number of trips the Town's trucks make to dispose of MSW, especially once the program is full scale.

- The compost facility would charge a tip fee for the organics. This could be negotiated during the planning phase of the pilot. DEQ reported an average tip fee of \$24.33 for private composting facilities<sup>11</sup>. This is slightly higher than the \$18 per ton tip fee the Town is paying to yard waste processing at the Orange County Landfill and significantly less than the \$44 per ton MSW tip fee. Assuming the tonnage numbers calculated above for the pilot (1 ton of yard waste per week and 2 tons of additional organics per week), the total tip fee could be around \$35 per week less for the pilot.
- Development and production of outreach and education materials would be another cost to the pilot. As with any outreach program, budgets range and depend largely on the funds available. At a minimum, each home should receive an information packet mailed or delivered to each pilot home.
- An optional cost would be for providing kitchen containers and compostable liners. The containers could range from \$10-\$20, and liners could be around \$0.20 each or \$10 for a 6-month supply (2 per week). This would be an estimated \$20-\$30 per household for the pilot or \$14,000 - \$21,000 total. However, lower costs may be able to be negotiated with a supplier, especially for a pilot project. While these costs are optional, providing the supplies could significantly improve participation. The Town should also consider whether they would be able to provide these supplies in a full-scale program, as providing them for the pilot may set the expectation of the same for a full-scale program. If they are not provided in a full-scale program, the diversion rates measured in the pilot may not be able to be achieved once full scale.

### Data Tracking and Monitoring

Collecting data throughout the pilot will be critical in evaluating its success and making a determination as to whether to move to full-scale. Some of the important metrics to measure include:

- The Town will need to record the weekly tonnage of material collected. This will simply be a matter of recording the scale tickets at the composting facility.
- Tonnage of yard waste and MSW streams will also need to be tracked to see the impact the pilot has on these.
- Throughout the pilot, the Town will need to measure the set-out rates for the participants. This will help to measure the true participation rate in the pilot.
- Town staff or drivers would need to monitor contamination in the organics carts. This will help the Town to evaluate their education material. If contamination becomes particularly problematic (i.e. exceeds the agreed upon level of contamination) the material may be rejected from the compost facility. Refinement to the education materials may be required during the pilot.
- A waste composition study should be conducted at least once during the pilot targeting the participants. This will measure the amount and types of organics that remain in the MSW stream.

<sup>11</sup>North Carolina Department of Environmental Quality, *NC Organics Recycling Study: Materials Managed 2011-2015 & Food Recovered 2015, 2016*. (<https://ncdenr.s3.amazonaws.com/s3fs-public/Environmental%20Assistance%20and%20Customer%20Service/Composting/NC%20Organics%20Recycling%20Study%202016.pdf>)



- A survey of participants should also be conducted towards the end of the pilot for the Town to receive their feedback and make any changes to facilitate collection on the residents' side.

### **Next Steps**

Upon the Town's review of this Technical Memorandum, KCI will discuss these recommendations with the Town. Should the Town decide to move forward with a pilot and wish to contract with KCI to provide assistance throughout the pilot, KCI will develop a scope for preparing a more detailed pilot implementation plan.

DRAFT



## TECHNICAL MEMORANDUM

**TO:** David Andrews, Town Manager  
Town of Carrboro

**FROM:** Shane Barrett, Consultant

**SUBJ:** **Technical Memorandum #4: Pay-as-You-Throw Assessment and Pilot Discussion**

**PROJ #:** 192-00.00

---

### Introduction

The Town of Carrboro, NC (Town) requested Kessler Consulting, Inc. (KCI) to conduct a Residential Solid Waste Study that included several tasks. Task 8 of this study is an assessment of pay-as-you-throw programs. The purpose of this technical memorandum is to provide the findings of this assessment and discuss the pilot program option(s) identified for the Town as a result of the recent cart audit, route study, and organics assessment that were also included in the Residential Solid Waste Study.

### Pay-As-You-Throw

In a variable rate, or pay-as-you-throw (PAYT) program, customers are charged for waste collection and disposal based on how much – or how little – waste they generate. PAYT breaks with the traditional fixed or flat fee for waste collection services by treating trash services like other utilities – customers pay only for what they use. In many instances, the cost of waste collection is hidden; therefore, residential users do not have an apparent reason to limit their disposal habits. If a customer's action directly affects the cost of their service, they are more likely to limit their usage, and take advantage of available waste reduction opportunities including source reduction, reuse, recycling, and composting.

There are two systems for determining how much waste is generated by residents in a PAYT program: weight-based systems and volume-based systems.

- Weight-based systems are more common for drop-off locations where incoming waste can be weighed on permanent scales. Curbside weight-based systems require on-vehicle scales to weigh materials as they are collected at each residential household. These systems are much less common for curbside collection due to the difficulty and expense of maintaining and certifying the accuracy of the on-board scales, which must comply with governmental standards<sup>1</sup>. While there are weight-based PAYT programs in existence, most are found within the European Union. As on-vehicle scale technologies advance, weight-based PAYT programs may grow in popularity.
- Volume-based systems are based on a given container size and are much more common in the

---

<sup>1</sup> The Weights and Measures Division, within the National Institute of Standards and Technology promotes uniformity in U.S. weights and measures laws, regulations, and standards to achieve equity between buyers and sellers in the marketplace.

United States. Volume-based systems include a variety of methods to determine how much (i.e., volume) waste a residential user generates. These systems include:

- **Pre-paid Bags** – Residents purchase specific bags at government offices and/or local stores, which are priced by the jurisdiction to fund collection and disposal operations. In these systems, only garbage placed within these bags is collected by sanitation workers or accepted at local disposal locations. Bags are typically no larger than 20 or 30 gallons in capacity to ensure that residents who generate less waste pay less.
- **Pre-paid Tags/Stickers** – A variation of the pre-paid bag system, in which tags or stickers are purchased by residents and placed on their personal bins or loose trash bags for collections.
- **Containers** – Container systems typically include government issued containers, where the rate is based on the size of the container chosen and/or the number of times a can is serviced.
  - In a single can system, residents are provided with one container and are charged only when that container is serviced. Single can systems have grown in popularity with the use of Radio Frequency Identification (RFID), which automates the billing process.
  - In a variable can system, governments offer different sized containers and residents choose the size and number of containers needed for their household. Carts are typically offered in 35, 64, and 96-gallon sizes, which correlate to most automated cart options. Each container is offered at an increasing rate structure to incentivize waste diversion and the use of smaller containers. The frequency of service is set by the jurisdiction and residents pay the monthly fee regardless of the number of times the cart is serviced during the month.

Regardless of the approach chosen, research has shown that PAYT programs encourage residents to pay closer attention to the amount of waste they generate.

**Advantages to PAYT systems include:**

- Raises residential awareness of solid waste issues
- Provides residents with control over waste expenses
- Incentivizes recycling and composting programs
- Successful in encouraging waste diversion

**Potential barriers to PAYT systems include:**

- Litter and illegal dumping worries
- Low income households
- System accounting
- New and expanded education and outreach
- Language barrier issues

**Profiles of Existing PAYT Programs**

- **Bloomington, Indiana:** The City of Bloomington (City) is unique among the jurisdictions reviewed, in that they are currently transitioning from a sticker system to variable cart sizes. The City provides waste services to roughly 15,000 households from Monday through Thursday. Under the old system, a solid waste sticker was required for each regular trash bin (that meets city code standards) placed out for pickup at the cost of \$2 per bin. Two solid waste stickers were required for bulky items and appliances. Yard waste bags required a yard waste sticker to be placed on them at the cost of \$1 each. Recycling services were provided free of charge.

On average, the City's annual Sanitation Department budget, generated through sticker sales, was unable to cover the cost of services. The City's general fund was needed to supplement the Department with approximately \$1 million per year.

Under the new system, each resident will receive their choice of three solid waste cart sizes, 96, 64, or 35 gallon and their similar choice of a recycling cart. Recycling services will switch to weekly collection. New monthly fees<sup>2</sup> will be determined based on the size of the solid waste cart chosen. Actual prices will be known once cart selections are made; however, estimates range from:

- 35-gallon: \$4.82-\$6.51
- 64-gallon: \$8.60-\$11.61
- 96-gallon: \$13.72-\$18.52

Additional fees will be assessed for bulky item pick-up, additional cart service request, cart exchanges, late fees, and yard waste collection.

- Gainesville, Florida: The City of Gainesville (Gainesville) has one of the most mature programs in the Southeast having had a successful PAYT program since 1994. In their first year, garbage collection decreased by 18 percent and recyclables recovery increased by 25 percent, resulting in a savings of \$186,000 to the residential sector. When residents move into a new home in (Gainesville), they have a 30-day window to exchange the current cart for their chosen size. After the grace period, a resident can move to a smaller cart at no charge or pay a \$12.75 exchange fee to move to a larger cart. Solid waste collection is once-per-week and four cart sizes are offered:

- Mini Cart: \$16.75 (approximately 15-gallon)
- 35-gallon: \$21.75
- 64-gallon: \$27.00
- 96-gallon: \$33.50

Weekly recycling service (dual stream bin program), bulk item, and yard waste (that is free of plastic bags) collection is also included in the above rates. Yard waste that is bagged requires a special request and associated fee. The City also sells "official" yellow bags for excess waste that will not fit inside the cart.

- Highland Park, Illinois: The City of Highland Park contracts with Lakeshore Recycling Systems (Lakeshore) to offer collections services. Lakeshore offers weekly and bi-weekly collection; however, residents are only charged when they actually put their carts to the curb for collection service. In this RFID program that started August 1, 2016, volume-based customers no longer have to buy stickers for curbside pickup. RFID technology allows Lakeshore to track the number of times a garbage cart is collected each month and bill customers accordingly.
  - Base Fee: \$5.68/month (paid by all households) with the following options:
    - 35 or 65-gallon Twice Weekly Curbside Subscription: \$40.29
    - 35 or 65-gallon Once Weekly Curbside Subscription: \$22.29
    - 35-gallon Curbside Volume-Based: \$2.50 per service (35-gallon only)
  - Refuse Sticker: \$2.50 utilized for excess waste
  - 95 -Gallon Container: extra \$5 per month to above subscription fees

<sup>2</sup> New rates reflect the City's wishes to continue to supplement the Sanitation Department with approximately \$1 million per year from the General Fund.

The above fees also include once weekly single stream recycling; however, only the subscription options include weekly curbside recycling of mixed organic waste (food scrap/landscape/low grade paper), which is available from April 1 to December 15. Volume-based customers must purchase refuse stickers for the collection of organics. All options include weekly bulk waste collection.

- Hendersonville, North Carolina: The City of Hendersonville (City) offers weekly solid waste and recycling collection using variable sized collection containers. To encourage recycling, the City charges more for those residents that do not choose to request a free recycling cart. Current rates for solid waste:
  - 96-gallon container (non-recycler): \$22.00
  - 96-gallon container (actively recycles): \$18.50
  - 32-gallon container (non-recycler): \$20.00
  - 32-gallon container (actively recycles): \$16.25

The City also offers weekly curbside yard waste, bulky waste and appliance collection; however, the City requests that residents call ahead to notify collection crews. In addition, the City offers loose leaf collection between October and December.

- Aberdeen, Maryland: The City of Aberdeen (Aberdeen) is in its 15<sup>th</sup> year of a PAYT sticker program. In 1992, before the program, Aberdeen averaged 314 tons of waste and 37 tons of recyclables per month. In 2006, the Aberdeen averaged 264 tons of waste and 85 tons of recyclables, despite a growth from 3,520 homes to 4,182 homes. Aberdeen sells pre-paid stickers at six local retailers and City Hall.

Aberdeen provides weekly waste and recycling collection service and twice per month yard waste and bulky collection. Pre-paid stickers are required on all resident-owned waste collection containers. Stickers can also be placed on electronics and will be collected curbside. Aberdeen is unique in that collection costs are included in its tax base, and the stickers are used to fund disposal tipping fees, which are currently \$50 per ton. Stickers currently cost \$1.00 and cover up to 32-gallons or 40 pounds.

## **Advantages and Disadvantages of Each PAYT Systems**

### Weight Based System

#### Advantages:

- True PAYT, residents are only charged for what they actually dispose.
- Residents realize immediate savings from waste diversion.

#### Disadvantages:

- High equipment demands to maintain and calibrate on-vehicle scales.
- Higher initial costs.

### Pre-paid Bags and Stickers

#### Advantages:

- Easy for residents to understand
- Low implementation costs

#### Disadvantages:

- Uncertain revenues as residents purchase on an as-needed basis.

- Bags can rip and/or stickers can fall off.
- Maintaining bag/sticker inventories and controlling flow of funds from resellers.
- Not compatible with automated collection systems.

#### Variable Can System

##### Advantages:

- Constant revenue stream
- Can be integrated with automated collection

##### Disadvantages:

- Need method to deal with excess waste.
- Higher initial costs.
- Higher administrative costs for distribution of carts and billing.

#### Single Can System

##### Advantages:

- Can be integrated with automated collection.

##### Disadvantages:

- Higher initial costs for RFID equipment
- Need method to deal with excess waste.
- Higher administrative costs and need for ongoing RFID technology subscriptions.

Applicability to Carrboro: Currently, the Town's Solid Waste Management Division is funded by the Town's General Fund, via Account 580 for Public Works/Solid Waste. Because solid waste is not billed directly to residents, and residents do not see a monthly bill, it will be difficult to implement a PAYT program requiring residents to pay for a service they had not actively paid for in the past. A solution could be to offer a basic level service (e.g., every-other-week collection) paid for by the general fund and offer a PAYT option for additional services at an additional rate. The applicability of each system to Carrboro is as follows:

- **Weight-Based System:** As on-vehicle scale technology advances, a weight-based program may be implementable in Carrboro. The Town currently has the infrastructure in place (i.e., automated carts and collection) and would only need on-vehicle scales and the corresponding billing system to implement a weight-based PAYT program. While initial expenses may be higher than other options, the Town should monitor industry advances with on-vehicle scales.
- **Pre-paid stickers or bags:** Not a viable option for the Town due to the use of automated collection vehicles and cart-based collection of solid waste.
- **Variable Can System:** With the use of automated vehicles and carts in place, Carrboro could offer its residents additional container sizes and develop a rate schedule that incentivizes waste diversion.
- **Single Can System:** With the addition of RFID technology, the Town could implement PAYT with current containers outfitted with low-cost RFID tags. On-vehicle RFID readers require initial capital and technology subscriptions must be maintained, but with only two to four vehicles to retrofit with RFID technology; the overall cost may not be considered excessive.

## Program Recommendations for the Town of Carrboro

Utilizing the results of the Town's Route Audit, Cart Study, Source Segregated Organics Assessment and the PAYT research summarized herein, KCI offers the following pilot program recommendation.

### Every Other Week Collection with Carted Source Separated Organics and PAYT Options

A residential cart study was conducted in February to measure the volume of waste in carts placed curbside for collection. The study revealed that 71.8 percent of all carts placed at the curb for service were less than 50 percent full. Nearly half of those carts (34.3 percent of all carts audited) contained less than 25 percent waste by volume. This means that just 28.2 percent of residents generate more waste than could be contained in their waste cart for a two-week period. This number drops to just 19.2 percent when assuming that those residents who did not have their carts placed curbside for service, had the capacity available to wait until the next collection cycle. Full results of the residential cart study can be found in Attachment A.

In Technical Memorandum #2, KCI reviewed average per route tonnage for the current residential routes and calculated the tonnage in an every other week (EOW) service scenario. It was determined, at the time that the estimated tonnage for EOW service would need to be divided into two disposal trips due to truck capacity, if the Town continued to service all residents with the same six weekly routes (i.e., two vehicles, three days per week). However, due to the 1-1/2-hour turn around to drive to and from the disposal facility and dispose of garbage, drivers would be required to work additional hours to complete routes at the current waste generation rate. PAYT incentivizes waste diversion over disposal, which may alleviate the need for second trips.

In Technical Memorandum #3, KCI estimated that an established source separated organics (SSO) program could recover an additional 6.7 pounds of SSO per household per week. This equates to approximately five tons per route over a two-week period, which lowers the average tons per route EOW to a level that can be feasibly collected in a single load; therefore, eliminating the need for a second trip to the disposal facility and saving at least 12 staff hours each week. Table 1 depicts the following:

- The current average tons per route for the Town's residential ASL routes.
- The estimated tons per route if the Town went to EOW collection with no other changes. In this scenario, a second trip to the disposal facility is needed due to the high volume of waste.
- The estimated average tons per route, with EOW collection and weekly SSO collection. In this scenario, a single trip to the disposal facility is feasible.
- The estimated average tonnage of yard waste and SSO tonnage to be collected along the weekly SSO route.

**Table 1: Residential Route Tonnage**

Month	Current Average Tons/Route	Estimated Average Tons/Route EOW (Current Avg. x 2)	Estimated Average Tons/Route EOW with Weekly SSO Route	Current Average ASL Yard Waste Tons/Route Plus Estimated SSO Tonnage
July	9.39	18.78	13.76	12.84
August	7.26	14.53	9.51	5.56
September	7.96	15.92	10.90	5.57
October	7.84	15.68	10.66	6.35
November	7.38	14.77	9.75	4.75
December	9.79	19.58	14.56	5.22
January	7.82	15.65	10.63	5.61
February	7.02	14.03	9.01	2.79
March	8.26	16.53	11.51	9.31
April	8.11	16.22	11.20	9.81
May	7.80	15.60	10.58	8.98
June	9.41	18.82	13.80	7.55

In the proposed collection system:

- The Town would collect SSO, which would include yard waste, food waste, non-recyclable compostable paper, and certified compostable products (if accepted by chosen processor), in a single 64- or 95-gallon roll cart. Smaller carts may be offered to households that do not generate a significant amount of yard waste, such as townhomes. The yard waste carts that are currently offered to residents would be acceptable. Implementation of full-scale organics collection would need to occur after full conversion to yard waste carts, as recommended by KCI in the Operations Assessment Technical Memorandum #2.
- The Town would use its existing automated side loader (ASL) trucks to collect the SSO material weekly, which would offer greatly increased efficiencies over the current yard waste collection operations. The two current routes, two days per week may be sufficient, but will depend largely on participation and material collected. KCI envisions adding two additional routes as needed depending on participation rates. Because only carts would be collected on these routes, the Town's hybrid ASL could be used for one of these routes each day, maximizing the use of this vehicle.
- The Town would move solid waste pickup to every other week collection. This shift in frequency would reduce the number of garbage routes from six routes per week to three routes per week. All of which could be serviced by the Town's hybrid collection vehicle. SSO routes would increase from the four current yard waste routes to six so that each home would receive weekly SSO collection.

Table 2 depicts the current number of garbage and yard waste routes as well as the number of routes needed in the proposed collection system.



**Table 2: Residential Route Matrix**

Route Type	Current Number of Operating Routes							Weekly Routes
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	
Residential Garbage	0	0	2	2	2	n/a	n/a	6
Residential Yard Waste <sup>1</sup>	2	2	0	0	0	n/a	n/a	4

<sup>1</sup>Consists of two routes, however in the busy months 4-5 vehicles are utilized.

Route Type	Proposed Number of Operating Routes							Weekly Routes
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	
Residential Garbage <sup>1</sup>	0	0	1	1	1	n/a	n/a	3
Residential SSO	3	3	0	0	0	n/a	n/a	4

<sup>1</sup>Every other week collection cycle allows the hybrid vehicle to service all garbage routes.

### Greenhouse Gas Reductions

With the reduction of three garbage routes per week and the availability of the Town's hybrid vehicle to work five days per week, the total greenhouse gas (GHG) emissions of the Town's collection service is expected to be reduced. Table 3, below, shows the calculated weekly and annual GHG emissions, represented as carbon dioxide equivalent (CO<sub>2</sub>e) for the current and proposed collection programs. GHG emissions are calculated using the methodology recommended by the EPA's Center for Corporate Climate Leadership's *GHG Inventory Guidance: Direct Emissions from Mobile Sources*<sup>3</sup> for diesel medium- and heavy-duty trucks.

Please note: these are rough estimates using current route data, average fuel economies of the current fleet, and default emission factors. They do not account for gains or losses in fuel economy in collecting more or less weight on each route, nor do they account for any mileage savings through route efficiency that could be accomplished through carted SSO collection (i.e. driving fewer miles to collect only from locations with carts).

**Table 3: Greenhouse Gas Emission Estimates**

Route Type	Weekly Routes	Weekly miles <sup>1</sup>	Weekly fuel consumption (gal) <sup>2</sup>	Weekly GHG emissions (tons CO <sub>2</sub> e)	Annual GHG emissions (tons CO <sub>2</sub> e)	Percent Reduction
<b>Current Collection</b>						
Residential Garbage	6	420	162.2	1.8	95.0	
Residential Yard Waste	4	300	134.3	1.5	78.6	
<b>Totals</b>				<b>3.3</b>	<b>173.6</b>	
<b>Proposed Collection</b>						
Residential Garbage	3	210	68.2	0.8	39.9	37%
Residential SSO	6	420	170.8	1.9	100.0	3%
<b>Totals</b>				<b>2.7</b>	<b>139.9</b>	<b>19.4%</b>

<sup>1</sup> Weekly miles are assuming a round-trip route distance for collection and disposal of 70 miles for garbage and 75 miles for yard waste/SSO.

<sup>2</sup> Weekly fuel consumption is based on the average lifetime fuel economy of the Town's four ASL trucks and the lifetime fuel economy of the Town's hybrid ASL, as reported on December 13, 2016.

<sup>3</sup> Available from: [https://www.epa.gov/sites/production/files/2016-03/documents/mobileemissions\\_3\\_2016.pdf](https://www.epa.gov/sites/production/files/2016-03/documents/mobileemissions_3_2016.pdf)

Converting the collection of yard waste to carts, which will allow the use of the hybrid truck on one of the routes and adding two diesel routes to offer weekly SSO collection, will increase GHG emissions; however these increases are offset by the reduction of weekly garbage routes. Collecting SSO in addition to yard waste with these trucks will allow every other week garbage collection with the hybrid truck, and could reduce GHG emissions by 58 percent for collection of garbage, and a total of 19 percent for both services.

### PAYT Options

Municipalities with the most successful SSO programs have a PAYT rate structure. This creates incentives for diverting material from the garbage cart into the organics cart because the household may be able to downgrade to a smaller and less expensive garbage cart. The Town could switch to EOW collection and implement a variable or single container PAYT rate structure. A variable can system would require the Town to offer carts of various sizes, while a single can system would require the initiation of RFID technology. Both systems would provide an economic incentive to increase SSO diversion.

After a switch to EOW garbage collection, another PAYT option would be to charge residents an additional fee for additional trips per week. Offering twice-weekly collection at an added expense would also incentivize waste diversion while simultaneously providing a high level of service should certain residents elect to participate.

### Pilot Program Discussion

Approximately 700 residents have already elected to participate in the carted yard waste collection program. These volunteers would be a likely group to participate in the pilot because of their willingness to engage in segregated, carted yard waste collection. The advantage of piloting the program with current yard waste cart subscriptions is the elimination of the purchase and distribution of carts for SSO. The disadvantage is that pilot participants will be spread across the Town and collection efficiencies will not be fully realized due to the excess route travel. Conversely, the selection of a new pilot will require initial cart expenses, but collection efficiencies will match those expected in a Town-wide program. The following list outlines the initial steps to pilot program implementation.

- Identify a Processor: Hold discussions with both Brooks Contractor and McGill Compost to development an agreement for processing the collected organics. Both facilities have capacity and accept materials that will be collected in the pilot: yard waste, post-consumer food waste, compostable paper products, and certified compostable products.
- Develop a Pilot Route: Route existing yard waste carts for maximum ASL efficiency. Currently, the Town has approximately 700 residents who have yard waste carts. These residents would be ideal participants for an organics collection pilot because 1) they already have carts that could be used for organics and 2) they have shown a commitment to yard waste collection.
- Establish a Baseline: Prior to informing participants about the pilot implement the new route for collecting garbage and yard waste from the carted yard waste residents and collect tonnage data from this route. This will allow the Town to establish baseline data for carted yard waste.
- Educate Pilot Participants: Distribute outreach and education materials to each of the participants clearly describing the purpose of the pilot, what materials can and cannot be placed in their carts, kitchen collection procedures, and setout and cleaning procedures. KCI can provide assistance to the Town in developing this material should the Town move forward with this pilot. A strong outreach and education program is vital to a successful organics program. It

will increase the amount of material collected in the program and decrease contamination or unacceptable materials.

At a minimum, outreach materials should include the following:

- Materials accepted
  - Materials not accepted
  - Set-out instructions
  - Program contact information
- **Initiate Pilot:** Collect garbage carts EOW and SSO carts weekly curbside using one of the Town's ASL trucks. The hybrid ASL would be an ideal solution because manual loading would not be required and the compost facility is a further distance than the current yard waste disposal site. Fuel consumption should also be tracked to identify the GHG savings of the new route with the hybrid.
- **Track Tonnage and Setout Rates:** The expected tonnage will depend on how active the participants are in diverting additional organics in their yard waste carts. The quality of the education and outreach materials provided to the participants will play a critical role in driving program participation and material diversion tonnage. Throughout the pilot, the Town will need to measure the setout rates for the participants to understand who is and is not utilizing the new program. Education and outreach materials can be directed to those residents not participating.

We recommend the duration of the pilot to be at least six months to obtain reliable data and measure any seasonal changes in collection tonnage.

### **Next Steps**

Upon the Town's review of this Technical Memorandum, KCI will discuss these recommendations with the Town. A public input survey is currently being developed to gather resident feedback in an SSO pilot program. The results of this survey, along with a full summary of the Residential Solid Waste Study will be compiled into a Final Report, which will be completed once the survey is finalized. KCI has experience designing, implementing, and monitoring many pilot programs and is available to provide assistance should the Town decide to move forward with its own SSO pilot program.

## ATTACHMENT A

### RESULT OF THE TOWN'S CART STUDY

#### Purpose:

The Town of Carrboro requested a cart audit to evaluate the fullness or capacity of municipal trashcans on pickup day. Understanding how much waste was present in the average trashcan on service day provides the town with valuable information on which future program decisions can be made.

#### Methodology:

To determine the average volume of waste present in trashcans on collection day, KCI worked with Town staff to conduct the cart audit to determine the actual volume of waste placed curbside for collection. While onsite for the residential route audit, KCI rode with Town staff through representative neighborhoods and streets quickly looking in each trashcan placed curbside for service that day. During the audit, KCI recorded the address, whether a trashcan was placed curbside for collection, and if so, how much garbage was present. The audit included 756 homes and 515 visual trashcan observations. The following capacity levels were recorded during the audit:

- No cart placed curbside.
- Less than 10 percent, i.e., one small bag of garbage.
- 25 percent, approximately one quarter full.
- 50 percent, approximately half full.
- 75 percent, approximately three quarters full.
- 100 percent, at or near cart capacity.
- More than 100 percent overflowing cart or two cans totaling more than 100 percent.

#### Results:

The table below presents the raw data from the cart audit. Overall, 32 percent of the homes included did not have carts placed curbside for collection, meaning these residents either forgot to place their carts curbside or they felt service was unnecessary on the day of the audit. To understand how these homes affect the data, the results were analyzed to include and exclude the number of homes that did not have carts placed curbside.

**Table 1: Cart Audit Data**

Trashcan Fullness	All Homes Audited		Only Audited Trashcans	
	Count	Percent	Count	Percent
Not set out	241	31.9%		
Less than 10%	46	6.1%	46	8.9%
Approximately 25%	131	17.3%	131	25.4%
Approximately 50%	193	25.5%	193	37.5%
Approximately 75%	62	8.2%	62	12.0%
At or near capacity (100%)	77	10.2%	77	15.0%
More than 100%	6	0.8%	6	1.2%
Totals	756	100.0%	515	100.0%

Results of the cart audit reveal:

- Approximately 32 percent of homes audited did not place carts curbside, although the reasons for this are unknown.

- Approximately 23 to 34 percent of the Town's trashcans were one quarter full or less.
- Approximately 25 to 37 percent of the Town's trashcans are approximately half-full on collection day.
- Approximately 8 to 12 percent of the Town's trashcans are approximately three quarters-full on collection day.
- Only 11 to 16 percent of the Town's trashcans are at or over capacity on collection day.

**Findings:**

- When assuming that carts that were not set-out also contained very little waste, it is estimated that 80.8 percent of homes' audited set-out carts that were less than half full. Of the carts actually audited, 71.8 percent were less than half full.
- Overall, only 28.2 percent of carts audited would not have the capacity for every other week collection.

DRAFT



## TECHNICAL MEMORANDUM

**TO:** David Andrews, Town Manager  
Town of Carrboro

**FROM:** Shane Barrett, Consultant

**SUBJ:** Technical Memorandum #5: Public Participation Survey Results

**PROJ #:** 192-00.00

---

### Introduction

The Town of Carrboro, NC (Town) contracted Kessler Consulting, Inc. (KCI) to conduct a Residential Solid Waste Study. Task 1 of this study was to garner feedback from residents regarding current waste services and potential changes to the Town's programs. During the initial stages of this study, it was decided to move the survey to the end of the project to allow the project team to identify which pilot options should be included in the survey.

### Survey Methodology

KCI developed the survey instrument for review by Town staff. Once finalized, staff uploaded the survey onto an online survey website and disseminated the survey to Town residents via social media and the Town's email distribution list. Survey details were also provided to local media. The survey was open for three weeks between June 30 and July 23, 2017, during which time 137 responses were received. Four responses were removed from the survey analysis. Two respondents stated that they did not receive waste services from the Town of Carrboro and two respondents stated that they had commercial waste services. The responses received represent a three percent return rate for households receiving waste services provided by the Town.

### Survey Results

#### 1. Do you receive garbage collection services provided by the Town of Carrboro?

Yes	97.08%	133
No*	2.92%	4
Answered		137
Skipped		0

*\* The four respondents that do not receive garbage services provided by the Town were removed from the following survey results.*

**2. Please choose the answer that best represents your home:**

Single family standalone home	82.71%	110
Single family town home	8.27%	11
Multi-family duplex, triplex, etc.	9.02%	12
<b>Answered</b>		<b>133</b>
<b>Skipped</b>		<b>0</b>

**3. How many persons occupy your home on average:**

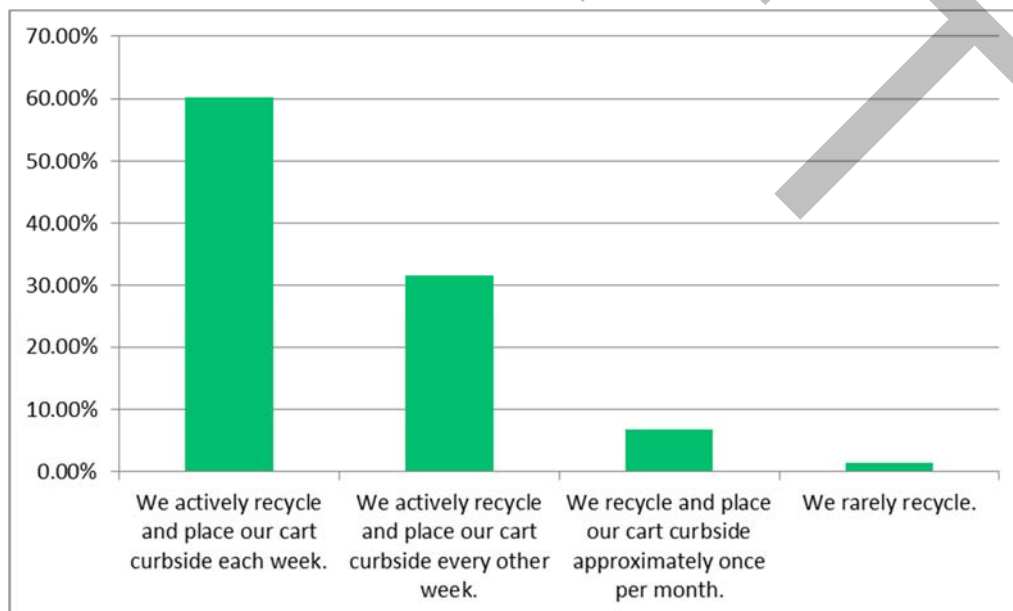
1-2 persons	51.88%	69
3-4 persons	41.35%	55
More than 4 persons	6.77%	9
<b>Answered</b>		<b>133</b>
<b>Skipped</b>		<b>0</b>

**4. Do you have a recycling cart (provided by Orange County) for your home?**

Yes	96.99%	129
No	3.01%	4
<b>Answered</b>		<b>133</b>
<b>Skipped</b>		<b>0</b>

**5. Which of the following best describes your recycling practices?**

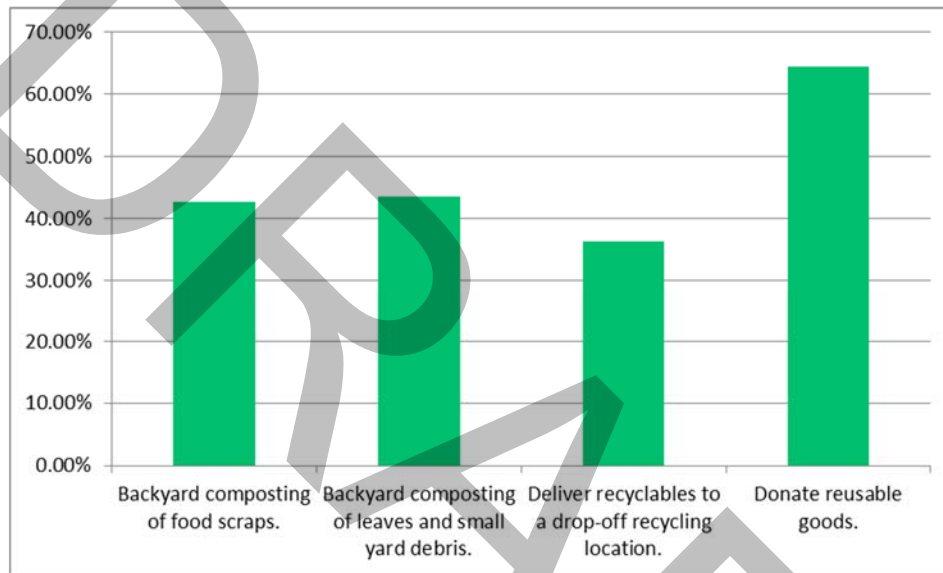
We actively recycle and place our cart curbside each week.	60.15%	80
We actively recycle and place our cart curbside every other week.	31.58%	42
We recycle and place our cart curbside approximately once per month.	6.77%	9
We rarely recycle.	1.50%	2
<b>Answered</b>		<b>133</b>
<b>Skipped</b>		<b>0</b>



**6. Do you actively participate in any of the following waste diversion practices? If you complete more than one, please use the other box to express that.**

Backyard composting of food scraps.	42.74%	53
Backyard composting of leaves and small yard debris.	43.55%	54
Deliver recyclables to a drop-off recycling location.	36.29%	45
Donate reusable goods.	64.52%	80
Other (please specify)	incorporated into above	
<b>Answered</b>		<b>124</b>
<b>Skipped</b>		<b>9</b>

*Note: All "Other" responses contained more than one of the above choices; therefore, responses were analyzed and collated as appropriate.*



**7. How would you rate the garbage services provided by the Town of Carrboro?**

Great, excellent service and excellent customer service.	60.63%	77
Good, quality service and quality customer service.	31.50%	40
Okay, neither good nor poor service.	3.15%	4
Needs improvement, service and customer service could be better.	4.72%	6
<b>Answered</b>		<b>127</b>
<b>Skipped</b>		<b>6</b>

**Of the six respondents that stated the Town's services needed improvement:**

- Three respondents expressed issues with cart placement following service, such as open lids, tipped over carts, and being left in bike lanes.
- Three respondents mentioned missed collections, though one respondent stated their cart was blocked by a neighbor's car and another respondent stated that they are in a commercial district and received service following a call to the Town.
- Two respondents mentioned litter being left in the neighborhood following collection.



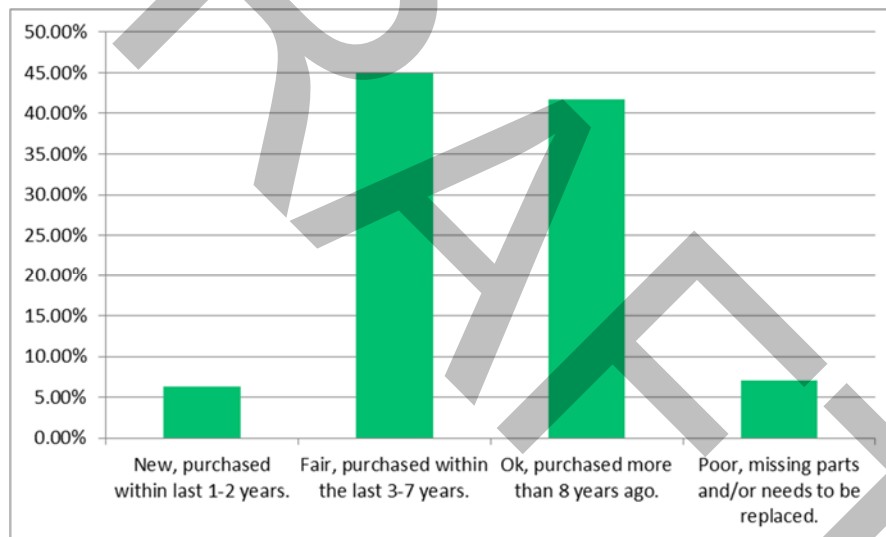
**8. How many garbage carts (not including yard waste or recycling carts) do you have for your home?**

1	88.98%	113
2	8.66%	11
More than 2	2.36%	3
<b>Answered</b>		<b>127</b>
<b>Skipped</b>		<b>6</b>

**9. How would rate the condition of your garbage cart? (If you have more than one cart, please rate the oldest cart.)**

New, purchased within last 1-2 years.	6.30%	8
Fair, purchased within the last 3-7 years.	44.88%	57
Ok, purchased more than 8 years ago.	41.73%	53
Poor, missing parts and/or needs to be replaced.	7.09%	9
<b>Answered</b>		<b>127</b>
<b>Skipped</b>		<b>6</b>

*Note: Responses were limited to the 127 residents stating that they have at least one garbage cart.*



**10. How often do you place your garbage cart curbside for collection?**

Every week (this includes carts that are left at the curb).	77.17%	98
Every other week.	14.96%	19
Once per month.	7.87%	10
<b>Answered</b>		<b>127</b>
<b>Skipped</b>		<b>6</b>

*Note: Responses were limited to the 127 residents stating that they have at least one garbage cart.*

**11. Please choose the statement that best reflects your garbage collection habits:**

I place my cart curbside every week, and it is usually full.	14.96%	19
I place my cart curbside every week, regardless of fullness.	54.33%	69
I place my cart curbside, only when it is more than half full.	25.20%	32
I place my cart curbside, only when it is completely full.	5.51%	7
<i>Note: Responses were limited to the 127 residents stating that they have at least one garbage cart.</i>		
<b>Answered</b>		<b>127</b>
<b>Skipped</b>		<b>6</b>

**12. Would you consider a switch to every other week collection service for garbage?**

Yes	44.09%	56
No, please explain:	55.91%	71
<b>Answered</b>		<b>127</b>
<b>Skipped</b>		<b>6</b>

**Of the 71 respondents that stated they would not consider a switch to every other week collection service for garbage:**

- Forty-two percent (30 respondents) expressed concerns over odors resulting from every other week collection.
- Forty-one percent (28 respondents) expressed concerns over whether they would have the cart capacity for every other week collection.
- Ten percent (7 respondents) stated that they did not want every other week collection without further explanation.
- Seven percent (5 respondents) stated that they might be open to the possibility of every other week collection.

**13. How would you describe garbage collection day on your street?**

Collection vehicles can easily service my home and my neighbors' homes travelling up one side of the street and down the other side.	77.95%	99
Collection vehicles have a little difficulty servicing my home, because I live on a cul-de-sac that has a tight turning radius for the vehicle.	14.96%	19
Collection vehicles have difficulty servicing my street and I routinely see vehicles driving in reverse.	7.09%	9
<b>Answered</b>		<b>127</b>
<b>Skipped</b>		<b>6</b>

**14. How would you rate the yard waste services (i.e., carts, loose piles, bulk piles, and leaf collection) provided by the Town of Carrboro?**

Great, excellent service and excellent customer service.	37.40%	46
Good, quality service and quality customer service.	28.46%	35
Okay, neither good nor poor service.	16.26%	20
Needs improvement, service and customer service could be better.	17.89%	22
<b>Answered</b>		<b>123</b>
<b>Skipped</b>		<b>10</b>

**Of the 22 respondents that stated the Town's yard waste services needs improvement:**

- Fifty-nine percent (13 respondents) expressed confusion over the yard waste collection schedule and difficulty in knowing when services are scheduled.
- Thirty-two percent (7 respondents) expressed concerns over missed collections and piles of loose material remaining at the curb.
- Four percent (1 respondent) stated that a cart was damaged by Town collection staff.
- Four percent (1 respondent) stated a complaint with customer service.

**15. How many yard waste carts (not including garbage or recycling carts) do you have for your home?**

0	65.85%	81
1	30.08%	37
2 or more	4.07%	5
<b>Answered</b>		<b>123</b>
<b>Skipped</b>		<b>10</b>

**16. How would rate the condition of your yard waste cart? (If you have more than one cart, please rate the oldest cart.)**

New, purchased within last 1-2 years.	28.57%	12
Fair, purchased within the last 3-7 years.	47.62%	20
Ok, purchased more than 8 years ago.	19.05%	8
Poor, missing parts and/or needs to be replaced.	4.76%	2
<b>Answered</b>		<b>42</b>
<b>Skipped</b>		<b>91</b>

*Note: Responses were limited to the 42 residents stating that they have at least one yard waste cart.*

**17. How often do you place your yard waste cart curbside for collection?**

Every week (this includes carts that are left at the curb).	4.76%	2
Every other week.	33.33%	14
Once per month.	61.90%	26
<i>Note: Responses were limited to the 42 residents stating that they have at least one yard waste cart.</i>		<b>Answered 42</b>
		<b>Skipped 91</b>

**18. Please choose the statement that best reflects your yard waste cart collection habits:**

I place my cart curbside every week, and it is usually full.	5.13%	2
I place my cart curbside every week, regardless of fullness.	2.56%	1
I place my cart curbside, only when it is more than half full.	43.59%	17
I place my cart curbside, only when it is completely full.	48.72%	19
<i>Note: Responses were limited to the 42 residents stating that they have at least one yard waste cart.</i>		<b>Answered 39</b>
		<b>Skipped 94</b>

**19. How often do you put loose yard waste at the curb for collection?**

Never, all of my yard waste goes into my yard waste cart.	15.31%	15
Only when my yard waste cart is full.	23.47%	23
Every week, I do not have a yard waste cart.	7.14%	7
Every other week, I do not have a yard waste cart.	7.14%	7
Once per month, I do not have a yard waste cart.	46.94%	46
<b>Answered 98</b>		
<b>Skipped 35</b>		

**20. Pay-as-you-Throw – Many communities have implemented pay-as-you-throw programs that utilize a variety of methods to calculate solid waste fees based on the amount of waste disposed, for example, some communities utilize different sized carts, where the larger carts cost more than the smaller carts. Please choose the statement that best reflects your thoughts on pay-as-you-throw waste collection:**

Very interested	14.41%	17
Interested	37.29%	44
Hesitant	24.58%	29
Against	23.73%	28
<b>Answered 118</b>		
<b>Skipped 15</b>		

## Survey Findings

- Of the 133 respondents that receive solid waste services provided by the Town of Carrboro, the majority (83 percent) live in single-family standalone homes.
- A majority of the Town's residents actively recycle. Ninety-two percent of respondents place their recycling carts curbside at least every other week. Fewer than 2 percent of respondents rarely recycle.
- There is an interest in waste reduction beyond curbside recycling. Respondents also utilize the following waste diversion options:
  - Donate reusable goods (65 percent)
  - Backyard composting of food scraps (43 percent)
  - Backyard composting of leaves and small yard debris (44 percent)
  - Deliver recyclables to drop-off recycling locations (36 percent)
- Overall, Town residents are happy with the services provided by the Town.
  - Ninety-two percent of respondents rated the Town's garbage services as good or great. Explanations for low ratings included issues with:
    - Cart placement after service, such as open lids, tipped over carts, and carts being left in bike lanes.
    - Missed collections.
    - Litter left in neighborhood following collection service.
  - Sixty-six percent of respondents rated the Town's yard waste services as good or great. Explanations for low ratings included issues with:
    - Confusion over the yard waste collection schedule.
    - Missed collections and loose materials remaining at curb.
- Most respondents have purchased at least one garbage cart (98 percent), but only 34 percent have purchased a yard waste cart.
  - Of the garbage carts in use, only half (51 percent) are considered in new or fair condition, the remaining carts are more than 8 years old.
  - Of the yard waste carts in use, 76 percent are considered in new or fair condition.
- The majority of respondents (77 percent) place their garbage carts at the curb for service every week. Twenty-three percent place their carts curbside only once or twice per month.
  - Of those residents that place their garbage carts curbside every week, half (54 percent) place it curbside regardless of how full their cart is.
  - Only thirty percent of respondents place their garbage carts curbside only when the cart is more than half full.
- The majority of respondents (62 percent) place their yard waste carts curbside only once per month. A third of respondents place their carts curbside every other week.
  - Ninety-three percent of respondents only place their yard waste carts curbside when they are more than half full.

- Only 3 percent of respondents place their yard waste carts curbside regardless of how full they are.
- When asked about collection services on their streets, 78 percent of respondents stated that collection vehicles can easily service their street, 15 percent stated that collection vehicles have difficulty serving their street due to living on a cul-de-sacs, and 7 percent stated they routinely see collection vehicles driving in reverse on their street.
- When asked to consider a switch to every other week garbage service, 44 percent of respondents were open to the idea of every other week collection service. Of those that were not open to the idea, the following issues were expressed:
  - Forty-two percent (30 respondents) expressed concerns over odors resulting from every other week collection.
  - Forty-one percent (28 respondents) expressed concerns over whether they would have the cart capacity for every other week collection.
  - Ten percent (7 respondents) stated that they did not want every other week collection without further explanation.
  - Seven percent (5 respondents) stated that they might be open to the possibility of every other week collection.
- When asked about pay-as-you-throw as an option to increase waste diversion, 51 percent of respondents were interested or very interested and 49 percent of respondents were hesitant or against the idea.

Garnering public sentiment is important when evaluating changes to public programs. The results of this survey, along with the results of the Residential Solid Waste Study will aid the Town in the evaluation and implementation of potential waste diversion programs and policies. The survey provides the Town with public sentiment regarding the services provided by the Town as well as feelings toward every other week collection and pay-as-you-throw.



# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-309

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

### TITLE:

Update on Traffic Calming Plan for Tallyho Trail

**PURPOSE:** The purpose of this agenda item to report on staff's meeting with Fox Meadow residents regarding the specific placement of traffic calming devices along the western half of Tallyho Trail and to discuss options for installations along the eastern half, including the entrance to the road near Staffield Lane.

**DEPARTMENT:** Planning

**CONTACT INFORMATION:** Christina Moon - 919-918-7325, Patricia McGuire - 919-918-7327

**INFORMATION:** The Board of Aldermen received presentations regarding traffic calming on Tallyho Trail on September 27, 2016 and more recently on March 21, 2017. The September meeting focused on recommendations for Stage 1 traffic calming--education and outreach, while the March 21<sup>st</sup> meeting included a design for Stage 2-physical improvements in the form of speed tables and mini-roundabouts. Neighbors expressed concern with the two proposed mini-roundabouts at the Transportation Advisory Board meeting and again at the Board meeting, but supported the use of speed tables. (Materials from the March meeting may be found here:

<https://carrboro.legistar.com/LegislationDetail.aspx?ID=2986761&GUID=1053B498-AB53-4992-912F-51DAFE10B640&Options=&Search=>=.>)

As part of the resolution for March 21<sup>st</sup>, the Board approved the overall Stage 2 traffic calming plan allowing for adjustments based on comments from the neighbors and Town Engineer, and requested that staff meet with the neighbors to inform those adjustments. Planning staff met with a group of residents in late July, and walked much of the western end of Tallyho Trail with a focus on the areas identified for speed tables; the locations for three speed tables were confirmed. The group agreed that it made sense to postpone the installation of traffic calming devices along the eastern half of the road until the completion of the Rogers Road sewer project, since the line extends through the Fox Meadows neighborhood and underneath Tallyho Trail. Residents noted, however, the importance of locating at least one more speed table east of the sewer line, near the overhead utility lines, in the vicinity of 1509 and 1515 Tallyho Trail.

Subsequent to the field visit, planning staff reviewed the proposal with the Town engineer and Fire Department to consider the possibility of designing a mid-block choker between Rogers Road and Staffield Lane that would slow traffic and potentially serve as an attractive stormwater device. Images showing examples of different types of choker/neck-down/ and curb extension designs including landscaping and/or stormwater features are provided (Attachment C). It is important to note, that Fire department staff expressed concern with the

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

potential for traffic calming devices, in general, to delay EMS response time, and particularly for residents at the end of the road.

An updated Stage 2 design has been provided, showing the location of the three confirmed speed tables, the approximate location of the fourth table along with a shaded area over the entrance to Tallyho Trail in the vicinity of Staffield Lane, representing the potential landscaped choker. Speed tables are shown in the locations confirmed during the summer walkabout-with notations regarding the anticipated Rogers Road sewer installation, and phasing of the work. A copy of the earlier design, from the March 21<sup>st</sup> meeting is attached for information only; the mini-roundabouts have been omitted from the proposal (Attachment B). Additional design work is needed on the entrance segment before that section of the plan is finalized and neighbors in Fox Meadow, Highlands North and Highlands Meadow will need to be alerted about that aspect of the proposal so that their input can be incorporated. Another potential element of the overall design, and one that also has not yet been discussed with the neighbors, is the possibility of installing sharrows on Tallyho Trail. A visual cue to remind drivers to be alert of bike-ped users, sharrows can serve as a traffic calming measure as well as encourage cyclists to feel more comfortable on the road.

Public Works staff can begin the installation of the first three tables along with educational signage this fall. Staff can also begin to trim vegetation within the right-of-way, particularly in the areas where the road curves, to improve sight lines. It is worth noting, that the right-of-way for Tallyho Trail is quite a bit wider than the paved travelway, allowing for considerable trimming. Staff will seek to balance the need for improved visibility while retaining the overall character of the road.

**FISCAL & STAFF IMPACT:** Staff is work with Sungate Design and Public Works to finalize costs estimates relating to the different traffic calming devices, but based on the recent installation of speed tables on Blue Ridge Road, the anticipated cost for the three speed tables in the first phase would be approximately \$5,000.

**RECOMMENDATION:** Staff recommends that the Board of Aldermen consider the resolution (Attachment A) authorizing staff to install the first three speed tables and signage along the western half of Tallyho Trail, to trim vegetation, and to bring back a plan for the eastern half of Tallyho Trail showing a fourth speed table and an entrance design incorporating a landscaped neck down or curb extension and/or other stormwater features.



**A RESOLUTION RECEIVING THE UPDATE ON THE TRAFFIC CALMING PLAN  
FOR TALLYHO TRAIL AND DIRECTING STAFF TO BEGIN THE  
INSTALLATION OF STAGE 2 TRAFFIC CALMING MEASURES**

WHEREAS, the Board of Aldermen adopted the Residential Traffic Management Plan (RTMP) in June of 1996 to provide “a process for identifying and addressing existing problems related to speeding, excessive volumes, and safety on town-maintained residential streets;” and,

WHEREAS, a valid traffic calming petition, in accordance with the RTMP, was received from residents of Tallyho Trail; and,

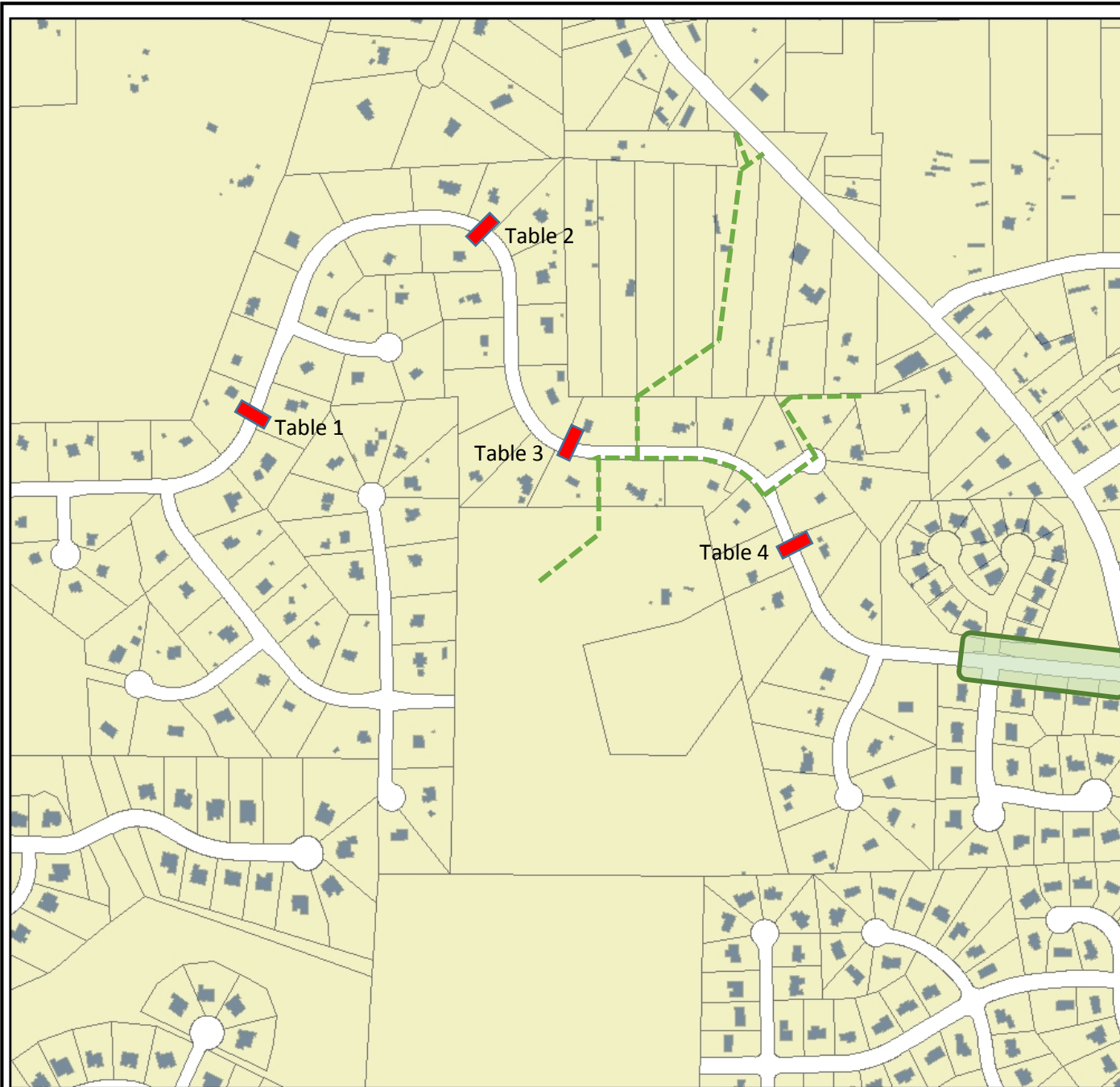
WHEREAS, two evaluations of Tallyho Trail, following the criteria outlined in the RTMP, were completed and the findings support implementation of Stage 1 and 2 measures; and

WHEREAS, the Board of Aldermen received a design for Stage 2 Traffic Calming measures on March 21, 2017;

NOW, THEREFORE BE IT RESOLVED by the Carrboro Board of Aldermen that:

1. The Board receives the update on traffic calming on Tallyho Trail.
2. The Board directs staff to install three speed tables along the western half of Tallyho Trail.
3. Finalize the location for a fourth speed table and a design for the entrance way to Tallyho Trail for traffic calming and stormwater management for a future meeting.

This is the 19<sup>th</sup> day of October in the year 2017.



Tallyho Trail Stage 2 Traffic Calming - October 2017

Signage

Install 'walk on left facing traffic' signs in appropriate places along the road

Speed tables:

## Phase I

- 1010/1015 Tallyho Trail
- 1204/1203 Tallyho Trail
- 1322/1319 Tallyho Trail

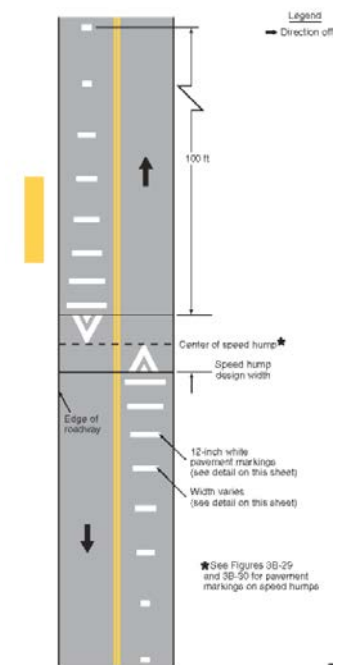
## Phase II

- 1509/1512 Tallyho Trail

Neck-down/Choker w/BMP

## Phase II

- Rogers Rd to Staffield Ln

Proposed Sewer Line



Install 'walk on left facing traffic' signs in appropriate places along the road

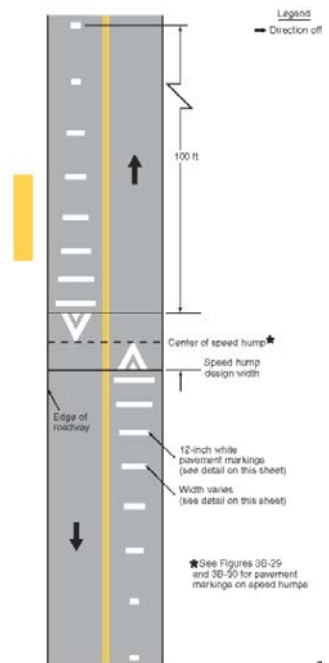


Mini traffic circles:

- Tallyho and Reynard
- Tallyho and Huntsman

Speed tables:

- 1010/1015 Tallyho Trail
- 1204/1203 Tallyho Trail
- 1322/1319 Tallyho Trail



Tallyho Trail Stage 2 Traffic Calming - March 2017



## Examples of Landscaped Chokers/Neck-Downs/Curb Extensions





# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-313

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

### **TITLE:**

Lake Hogan Farms Road Extension - Discussion

**PURPOSE:** The purpose of this item is to provide the Board of Aldermen with an opportunity to review and discuss the history and alignment of Lake Hogan Farm Road, including its planned extension and connection to Eubanks Road.

**DEPARTMENT:** Planning

**CONTACT INFORMATION:** Trish McGuire, [pmcguire@townofcarrboro.org](mailto:pmcguire@townofcarrboro.org)  
<<mailto:pmcguire@townofcarrboro.org>>, 919-918-7327;

**INFORMATION:** Street and road interconnectivity has been a focus of the Town in relation to service provision, safety, and development management for decades. An extension of Lake Hogan Farms Road from Homestead Rd. to Eubanks Rd. is included in the Town's Connector Roads Policy, Facilitated Small Area Plan for Carrboro's Northern Study Area (NSA Plan), and the DCHC MPO long-range transportation plans.

An administrative plan for street interconnectivity was developed and put into use starting in 1979. In June of 1984, a formal Connector Roads Policy encompassing the Town limits and extraterritorial areas was presented to the Board of Aldermen and adopted in 1986 (see version with 1991 amendment, *Attachment A*). The purpose of the Connector Roads Policy is to

ensure that old and new developments and businesses in our town connect to each other, both to disperse newly generated traffic and to give a sense of connectivity and unity to the town as it grew. It indicates a commitment by the town to work toward this connectivity. The roads shown on the Connector Roads Plan are intended to provide a backbone for a more intricate grid of smaller connector roads. The Connector Roads Policy is designed to guide an ever-changing Board of Aldermen as new projects and developments come before them for approval. As Carrboro's boundaries for development expand, additional areas and "backbone" collector roads will need to be added to these maps to ensure that all of Carrboro connects in ways that are both safe and efficient.

With the addition of Transition Areas in the wake of the Joint Planning Area Land Use Plan effort, planning for

interconnecting street networks north of Homestead Road occurred and the Connector Roads Plan was amended to include “Connector Road Plan Concepts” in February 1994 (*Attachment B*). The Lake Hogan Farms subdivision was approved in September of 1984 and a plan for connector roads was incorporated in the NSA Plan (quoted above), adopted by the Board of Aldermen in May 1998 (*Attachments C and D*). The NSA plan states that a connected, grid-like network

connects new and existing developments with one another, disperses automobile traffic among multiple routes, and allows efficient access for public transit and Town service vehicles. The presence of multiple routes would reduce the pressure on any one roadway, thereby eliminating the need for multi-lane facilities which would fracture the Study Area. (p. 35)

Two additional sections were constructed as part of the Legends at Lake Hogan Farms subdivision and Morris Grove Elementary School (*Attachments E and F*). An additional section is included in the approved conditional use permit for the Ballentine subdivision and a conceptual alignment is part of the Master Plan for Twin Creeks Park (*Attachments G and H*). It may be noted that the alignment selected by the County to include in the Twin Creeks Master Plan differs from the straight line shown in the Connector Roads Policy in order to protect the historic homestead and natural areas and to maximize usable areas for park facilities and also in recognition that properties on the east side of the creek would require a street network - formal discussion and approval of an alignment for this section has not taken place. The question of where the street might appropriately cross the creek has not been decided and concerns about the cost of a crossing have been expressed in association with the Ballentine subdivision. Conditions 5, 6, and 7 of the Ballentine permit relate to street interconnectivity, with condition 5 addressing a connection to the east (*Attachment I*).

The Town’s Northern Transition Area Advisory Committee has emphasized the importance of the street’s completion related to development in the Town’s northern area. See meeting notes from March 20, April 15, and October 22 (2012), December 5 (2013), January 27, February 17, and May 1 (2014, and March 20, 2017 (<http://www.townofcarrboro.org/AgendaCenter>)).

The Comprehensive Transportation Plan incorporates a Collector Streets Plan to enhance connectivity, and the Lake Hogan Farm Road alignment is included in its list and map of long-range transportation improvements.

Street interconnectivity described in referenced plans may be required in association with developments subject to several Land Use Ordinance provisions, including 15-211, 15-214, 15-217, and Fire Access Code Section 503.1.2.

**FISCAL & STAFF IMPACT:** Fiscal and staff impacts associated with considering this information are minimal.

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

**RECOMMENDATION:** It is recommended that the Board of Aldermen receive the information and discuss.



**CARRBORO CONNECTOR ROADS POLICY  
ADOPTED BY THE BOARD OF ALDERMEN  
MARCH 18, 1986**

**I INTRODUCTION**

On March 18, 1986 the Board of Aldermen adopted a Connector Road Plan for the Town of Carrboro. In recent years Carrboro has experienced rapid growth, especially to the north. The success of this growth plus future growth is ultimately dependent upon the effectiveness and continued efficiency of its transportation system. The transportation system, like any other public facility, must keep pace with the increased demands that new development places upon it. Roadway systems that once provided adequate service must be regularly reevaluated and upgraded to meet future traffic demands.

**II PURPOSE**

Connector roads have several purposes:

1. They are intended to provide access by linking new development with existing areas of Town.
2. They are intended to relieve congestion on already existing roads which will soon meet capacity.
3. They are intended to integrate those areas in Orange County's and Chapel Hill's planning jurisdiction with the Town's jurisdiction.

A well designed connector roads system will benefit the existing road system by dispersing increased traffic resulting from new development over a more extensive and integrated system.

**III NORTHERN CONNECTOR ROAD PLAN**

The Connector Roads Plan proposes to meet the demands from full development of the northern development area by construction a series of connector roads that will link this area with the arterial system to the north and to Estes Drive in the east. The construction of a connector road that





## TOWN OF CARRBORO NORTHERN CONNECTOR ROADS

Approved Thoroughfares — — — — —  
Approved Connector Roads . . . . .

Adopted by the Board of Alderman  
March 8, 1986



**Approved Connector Roads .....**

**Adopted by the Board of Alderman**  
**April 2, 1991**



minor modifications to adjust the road to a developers overall site plan.

Because connectors are intended to provide access by linking new development with existing areas of Town, construction standards should address the following capacity factors:

- \* alignment
- \* grade
- \* site distance
- \* lane width
- \* interruptions

Connectors must have sufficient right-of-way to allow for the construction of two 12-foot travel lanes, a bikeway on either side, a sidewalk and an adequate drainage system. Under Carrboro's Land Use Ordinance these roads are required to be built to a 34 foot cross-section with curb and gutter.

Connectors should maintain a minimum site distance of 200 feet on a vertical curve, have a slope of less than 8% and intersect with other roads and streets at right angles. Some flexibility may be appropriate in difficult situations. Fire trucks can negotiate a grade of as much as 9% and an intersection with interior angles of 60% can be negotiated safely.

Construction standards for the travel lanes specify that they shall have a foundation of 8" ABC stone and 2" of bituminous asphalt. Those portions of the roads that cross mucky clay soils with high shrink/swell potential will need to employ additional construction techniques (stronger compaction, oil-plastic film base, additional gravel and/or asphalt) to make the road suitable for the anticipated load.

To the extent that any of these roads by virtue of being placed on the Thoroughfare Plan would have more specific and restrictive demands, the criteria imposed by such a plan would govern.

The following resolution was introduced by Alderman Shetley and duly seconded by Alderman Anderson.

**A RESOLUTION ADOPTING THE CONNECTOR ROADS PLAN CONCEPT FOR  
THE CARRBORO NORTHERN TRANSITION AREA.**

Resolution No. 39/93-94

WHEREAS, the TAB was charged by the Board of Aldermen to study and make recommendations regarding transportation planning in general, and connector roads in particular, for the Carrboro Northern Transition Area; and,

WHEREAS, the Small Area Planning Work Group was charged by the Board of Aldermen to study and make recommendations regarding land-use planning for the Carrboro Northern Transition Area; and,

WHEREAS, land-use and transportation planning are necessarily interconnected in the development of any comprehensive planning strategy; and,

WHEREAS, the TAB has formulated a concept for a roadway network within the Carrboro Northern Transition Area that utilizes connector and arterial roads in a grid-like pattern; and,

WHEREAS, an effective connector roads plan facilitates the implementation of mass transit; and,

WHEREAS, the TAB has analyzed the Carrboro Northern Transition Area and routed the major roads to avoid environmentally sensitive areas, historical sites, and existing homesites and subdivisions; and,

WHEREAS, preliminary site plans currently being submitted by developers for the Carrboro Northern Transition Area are encouraged to be consistent with the goals and objectives for development in the Carrboro Northern Transition Area, and will be reviewed by the Town; and,

WHEREAS, the aforementioned circumstances have demonstrated a need to provide guidance for development in the Carrboro Northern Transition Area while the Work Group's study is taking place.

**NOW THEREFORE, BE IT RESOLVED THAT THE CARRBORO BOARD OF ALDERMEN ADOPTS THE NORTHERN TRANSITION AREA CONNECTOR ROADS PLAN AS THE RECOMMENDED CONCEPT.**

Section 1. This resolution shall become effective upon adoption.

The foregoing resolution having been submitted to a vote, received the following vote and was duly adopted this 8th day of February, 1994:

Ayes: Michael Nelson, Randy Marshall, Eleanor Kinnaird, Frances Shetley,  
Hank Anderson

Noes: Jay Bryan, Jacquelyn Gist

Absent or Excused: None

# Connector Roads Plan Concepts



## LEGEND

CONNECTOR ROADS STUDY  
NORTHERN TRANSITION AREA

University Lake Watershed Boundary

Carrboro Planning Jurisdiction

Carrboro City Limits

Existing Arterial & Connector Routes

ADOPTED: February 8, 1994



PLANNING  
ENGINEERING  
LANDSCAPE ARCHITECTURE  
111 West Main Street  
Durham, North Carolina 27701  
Ph 919 682 0368  
Fax 919 688 5646

OWNER / DEVELOPER  
FIRST AMERICAN LAND  
2521 SCHIEFFELIN ROAD  
APEX, NC 27502  
Ph 919 303-8525  
Fax 919 303-8524

Drawn	KBW, MJD
Checked	KBW
Date	12/17/99
Revisions	
REVISED 2-29-00 AS PER	
TOWN OF CARRBORO COMMENTS	

**OVERALL  
PLAN/PHASING  
PLAN**

NOTE: LOT 150 MAY BE LOST. THIS LOT IS NOT LISTED IN THE LOT PHASING TABLE ON THE COVER SHEET.

NOTE: THE EDGE OF LAKE ELEVATION AND THE TOP OF THE SPILLWAY ELEVATION ARE THE SAME ACCORDING TO THE SPILLWAY CONSTRUCTION OF FEB. 2, 1990.

NOTE: ALL STORMWATER EASEMENTS, RECREATION FACILITIES AND OPEN SPACE AREAS LABELED AS "PRIVATE" ARE TO BE MAINTAINED BY THE LAKE HOGAN FARMS HOMEOWNERS ASSOCIATION.

NOTE: LOTS 12H AND 13H HAVE BEEN COMBINED AND ARE BEING USED AS A TOWER SITE. THESE LOTS ARE NOT LISTED ON THE LOT PHASING TABLE ON THE COVER SHEET.

NOTE: SEE AMENITIES CENTER PHASE 3 BY KIMLEY-HORN AND ASSOCIATES FOR DETAILED INFORMATION CONCERNING THE AMENITIES CENTER.

ORIGINAL PLAN BY YOUNG-JEWELL & ASSOC., PA

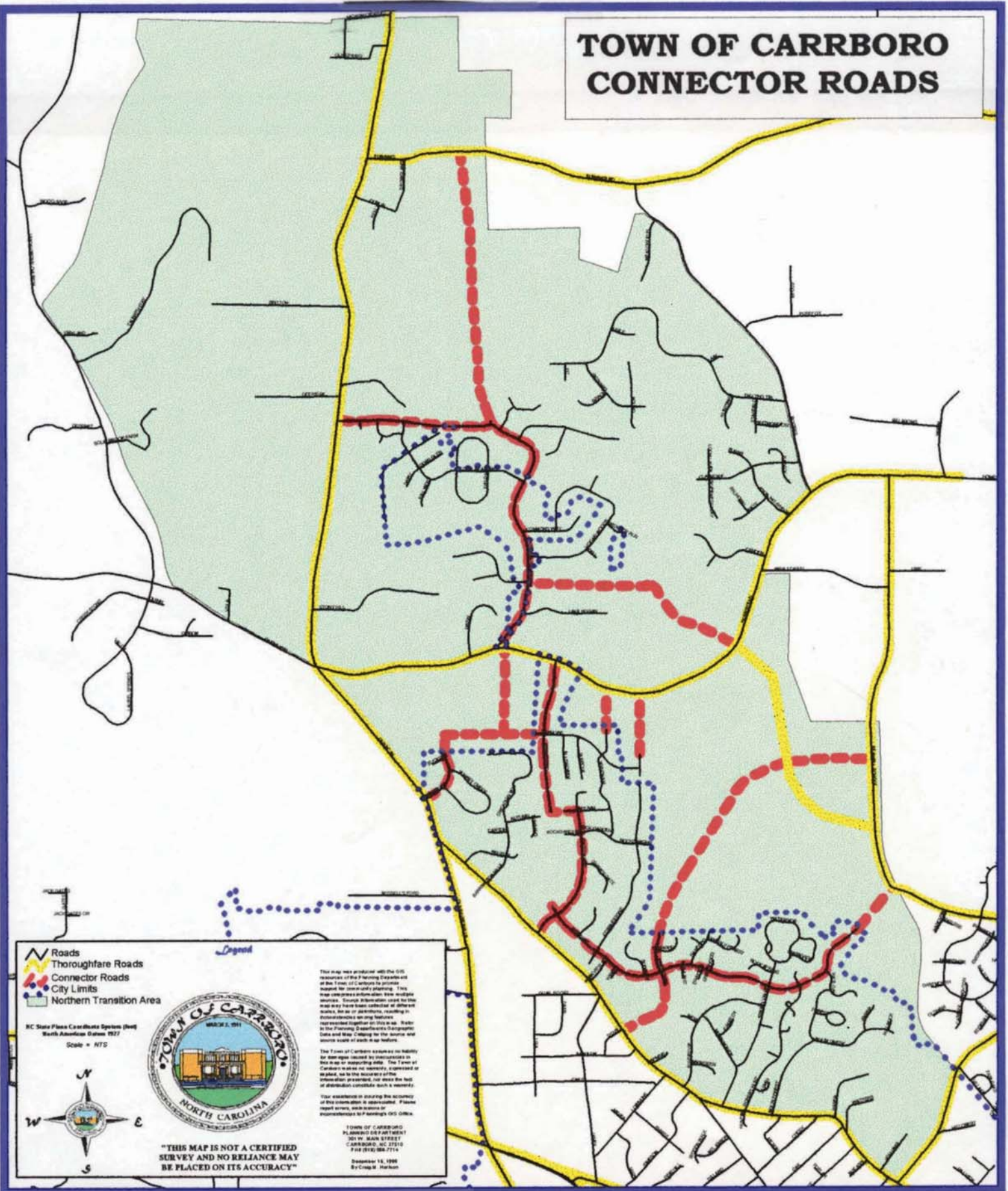
North

OVERALL/PHASING PLAN

Scale 1" = 200'



# TOWN OF CARRBORO CONNECTOR ROADS





NOTE: EACH SINGLE FAMILY LOT MUST ALLOW ROOM FOR PARKING TWO CARS WITHOUT BLOCKING SIDEWALK.

1. A HARD SURFACE IS REQUIRED PRIOR TO BUILDING CONSTRUCTION.
2. FIRE LANE STRIPING WILL BE COORDINATED WITH THE CARBORO FIRE MARSHALL PRIOR TO THE ISSUANCE OF A CO PER CHAPTER 12 OF THE CARBORO TOWN CODE.

[illegible]

COMPACTED TO 100% AASHTO  
T99 & PROOF ROLLED)

## NTS (199 &amp; PROOF ROLLED)

1100	1100 SF MAX UNIT, NO PRICE RESTRICTIONS
1100	1100 SF MAX UNIT, AFFORDABLE REQUIREMENTS
1350	1350 SF MAX UNIT, NO PRICE RESTRICTIONS

## NTS

## NTS

## N15

SP2









THE JOHN R. McADAMS  
COMPANY, INC.

ENGINEERS/PLANNERS/SURVEYORS  
RESEARCH TRIANGLE PARK, NC  
P.O. BOX 14005 ZIP 27709-4005  
PHONE (919) 361-5000, FAX (919) 361-2269



REVISIONS:

03/29/2006 PER TOWN OF CARBORO COMMENTS

07/23/2007 PER TOWN OF CARBORO COMMENTS

05/14/2007 PER TOWN OF CARBORO COMMENTS

M/I HOMES, LLC.  
1511 SUNDAY DRIVE, SUITE 100  
PHONE: 252-728-1728, FAX: 252-728-6663  
RALEIGH, NORTH CAROLINA 27607

OWNER:

**BALLENTINE**  
**CONDITIONAL USE PERMIT**  
CARBORO, NORTH CAROLINA  
LANDSCAPE PLAN

PROJECT NO. MH-02010

FILENAME: MH02010-S7

DESIGNED BY: KAH

DRAWN BY: HFR

SCALE: 1"=100'

DATE: 04-14-2006

SHEET NO. S-7

McADAMS





Orange County  
Environment and Resource  
Conservation Department

# Twin Creeks\* Park and Campus

Adopted Master Plan - May 3, 2005\*\*

(\*Moniese Nomp)

(\*\* Revised School Campus 5-15-07

\*\*\* Revised Greenway 3-21-09)



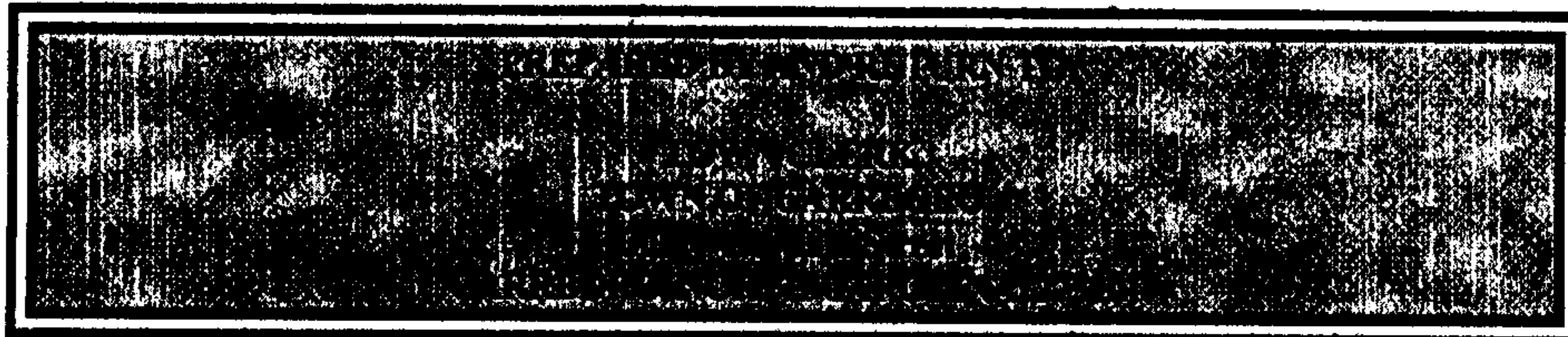
0 50 100 200  
M. CARR



20071109000325200 PRMIT  
Bk:RB4407 Pg:340  
11/09/2007 03:23:11 PM 1/6

FILED Joyce H. Pearson  
Register of Deeds, Orange Co., NC  
Recording Fee: \$29.00  
NC Real Estate TX: \$.00

DB



Return to: TOWN OF CARRBORO  
301 WEST MAIN STREET  
CARRBORO, NC 27510



**ORANGE COUNTY  
NORTH CAROLINA**

**TOWN OF CARRBORO  
CONDITIONAL USE PERMIT GRANTED  
Ballentine Property AIS**

On the date(s) listed below, the Board of Aldermen of the Town of Carrboro met and held a public hearing to consider the following application:

APPLICANT: M/I Homes
OWNERS: M/I Homes
PROPERTY LOCATION (Street Address): 8110 Old NC 86
TAX MAP, BLOCK, LOT(S): 7.23.C.31 9860-93-2325 JW.
PROPOSED USE OF PROPERTY: Major subdivision consisting of the following uses: 1.111 (single-family detached), 1.321 (multi-family, townhomes (no greater than 20% of the units may have more than three (3) bedrooms))
CARRBORO LAND USE ORDINANCE USE CATEGORY: 26.100, 1.111, 1.321
MEETING DATES: June 26, 2007 and August 28, 2007

Having heard all the evidence and arguments presented at the hearing, the Board finds that the application is complete, that the application complies with all of the applicable requirements of the Carrboro Land Use Ordinance for the development proposed, and that therefore the application to make use of the above-described property for the purpose indicated is hereby approved, subject to all applicable provisions of the Land Use Ordinance and the following conditions:

1. The applicant shall complete the development strictly in accordance with the plans submitted to and approved by this Board, a copy of which is filed in the Carrboro Town Hall. Any deviations from or changes in these plans must be submitted to the





- Development Review Administrator in writing and specific written approval obtained as provided in Section 15-64 of the Land Use Ordinance.
2. If any of the conditions affixed hereto or any part thereof shall be held invalid or void, then is permit shall be void and of no effect.
  3. Certificates of Occupancy for seventeen (17) "market-rate" units will be withheld until such time as the corresponding affordable units (units 1, 2, 3, 4, 5, 6, 7, 25, 26, 27, 28, 29, 30, 31, 32, 33, & 34) are granted COs and are offered for sale or rent for an amount consistent with the language found in Section 15-182.4 of the Town of Carrboro Land Use Ordinance. Each affordable unit that meets this qualification may reduce the number of withheld market rate COs by one.
  4. If the Land Trust is unable to sell any affordable unit within one year of the date it receives a certificate of occupancy, M/I Homes will be released from its obligation to sell that unit to the Land Trust and may sell the unit in accordance with the affordable housing provisions of the Carrboro Land Use Ordinance in existence prior to June 26, 2007 (the date of their amendment). Per the requirements of Section 15-128 of the Land Use Ordinance, the Board authorizes use of the referenced, pre-June 26, 2007 provisions based the findings of "substantial expenditures". Should this scenario transpire, in accordance with Section 15-182.4, the developer shall include in the restrictive covenants applicable to the subdivision, and in the deeds for the affordable units, covenants and restrictions that are sufficient to ensure that the affordable units will remain affordable as described in that section. Those covenants and restrictions shall include provisions that will allow the Town of Carrboro to enforce the commitment that the housing units remain affordable. These documents shall be subject to the approval of the Town Attorney.
  5. That, prior to final plat approval, the applicant provides to the Town, in accordance with applicable LUO provisions, a financial security sufficient to construct their portion of the remaining, uncompleted road and stream crossing, from the eastern terminus of Street A, as shown on plans, to the property line directly to the east. The value of said security shall be determined by the Consulting Engineer with approval by the Town Engineer and shall be retained until the road segment and stream crossing is constructed or until an alternate stream crossing is constructed. Furthermore, the estimate shall be renewed annually and adjusted for inflation via the Consumer Price Index. The security shall be returned to the applicant if (1), the Town determines that the road and crossing will not be constructed, or (2), a period of ten years has passed from the date of initial posting of the financial security with the Town.
  6. That prior to construction plan approval the applicant provide to the Town evidence of a shared-access easement (or equivalent) agreed upon by Orange County so as to allow for the construction of Street A, as shown on the approved CUP plans.
  7. That prior to construction plan approval the applicant provide to the Town evidence that the portion of property owned by the Lake Hogan Farms Homeowner's Association necessary to allow Street B2 to connect to the Hogan Hills Road R/W has been substantially secured.
  8. That prior to construction plan approval, the applicant receive a driveway permit from NCDOT in accordance with any conditions imposed by such agency including but not limited to encroachment/maintenance agreements for lighting and sidewalks.
  9. That the applicant provide on the property, a 10' paved trail (meeting the Town of Carrboro's greenway standard) within a public access easement along the entirety of the Old NC 86 road frontage. The alignment may meander to avoid trees and other obstacles as needed.
  10. That written authorization is provided from the Town of Carrboro Public Works Director prior to allowing the use of asphalt for the proposed mixed-use trail that fronts Old NC 86.
  11. That an offer of dedication of the open space areas on east side of Lake Hogan Farm road extension be made to the Town.
  12. That the 10' greenway trails demonstrate compliance on the construction plans with the greenway facilities specifications identified in the AASHTO Guide for the Development of Bicycle Facilities.
  13. That the single family home lots, when developed have sufficient room to conveniently park two cars, off of the street, without blocking the sidewalk. Garages may not be counted toward this requirement. This parking will be shown on individual plot plans during the building permit stage.
  14. That, for the townhome parking lots, the Board hereby allows a deviation from the parking requirements of 15-291(g), finding that 57 spaces are sufficient to serve the 34





- townhomes. Per 15-292(a), the board makes this finding based on evidence submitted by the applicant as referenced in Attachment E of the staff report.
15. That the proposed street tree planting layout be revised to meet the spacing requirements of Section 15-315 of the LUO.
  16. That an “alternate” stormwater management facility be constructed as part of Phase 1 (West Side of Buckhorn Branch) of the development if, 10 months after Phase 1 final plat approval, either a) the Buckhorn Branch CLOMR is not received or, b) an approval for a bond extension to cover the construction of the stormwater management facility to treat Street ‘A’, is not obtained.
  17. That the Buckhorn Branch CLOMR be received prior to Phase 2 (East Side of Buckhorn Branch) final plat approval.
  18. That a LOMR be received prior to granting building permits for the final 50% of Phase 2 lots (9 Lots) unless a bond is posted covering a LOMR approval and any potential infrastructure modifications deemed necessary as a result of the LOMR approval process for Buckhorn Branch.
  19. That the applicant shall provide to the Zoning Division, prior to the recordation of the final plat for the project or before the release of a bond if some features are not yet in place at the time of the recording of the final plat, Mylar and digital as-builts for the stormwater features of the project. Digital as-builts shall be in DXF format and shall include a base map of the whole project and all separate plan sheets. As-built DXF files shall include all layers or tables containing storm drainage features. Storm drainage features will be clearly delineated in a data table. The data will be tied to horizontal controls.
  20. That the developer shall include a detailed stormwater system maintenance plan, specifying responsible entity and schedule. The plan shall include scheduled maintenance activities for each unit in the development, (including cisterns, bioretention areas, swales, check dams, and irrigation pond), performance evaluation protocol, and frequency of self-reporting requirements (including a proposed self-reporting form) on maintenance and performance. The plan and supporting documentation shall be submitted to Town engineer and Environmental Planner for approval prior to construction plan approval. Upon approval, the plans shall be included in the homeowners’ association documentation.
  21. That the developer provide a written statement from the electrical utility stating that electric service can be provided to all locations shown on the construction plans prior to the approval of the construction plans.
  22. That fire flow calculations and building-sprinkler design (as required) must be submitted and approved by the Town Engineer and Town Fire Department prior to construction plan approval.
  23. That the plans be revised such that the dumpsters and recycling facilities located between units 11 and 12 allow a clear 35’ turning radius for efficient collection-vehicle access.
  24. That the Board authorizes the receipt of funds-in-lieu of 142.06 recreation points valued at \$26,022.55 to be used on proposed greenway improvements for Jones Creek. These funds are to be paid prior to final plat approval.
  25. That the subdivision must comply with the requirements of Section 15-177(d)-3a which specifies that developments of greater than 14 units provide a minimum of nine (9) significantly different house plans (i.e. elevations sets).
  26. That the applicant receive(s) CAPs from the Chapel Hill Carrboro City Schools District pursuant to Article IV, Part 4 of the Land Use Ordinance, prior to construction plan approval.
  27. That prior to construction plan approval, the applicant either meet the requirements through proof of compliance of, enhance or, find an alternate-to, the proposed hydrodynamic separators, such that they satisfy the Town’s stormwater requirements with regards to water quality.
  28. That prior to Construction Drawing approval Town staff and the Consulting Engineer meets with NCDOT District Engineer to pursue the reduction in speed along Old NC 86. If NCDOT reduces the speed limit, the intersection could be moved to the original access easement location (subject to NCDOT approval). If not, the intersection would remain as shown on the CUP plans.
  29. That the homeowner’s association document should contain language encouraging landscaping design and flora requiring no irrigation or water usage, and that the homeowner’s association documents contain no language requiring or encouraging lawn and landscaping techniques or species which encourage regular water usage.
  30. All street construction on those streets proposed for acceptance by the Town of Carrboro shall be certified by an engineer. Engineering certification is the inspection by the





developer's engineer of the street's subgrade, base material, asphalt paving, sidewalks and curb and gutter, when used. The developer's engineer shall be responsible for reviewing all compaction tests that are required for streets to be dedicated to the town. The developer's engineer shall certify that all work has been constructed to the town's construction specifications.

This permit shall automatically expire within two years of the date of issuance if the use has not commenced or less than 10 percent (10%) of total cost of construction has been completed or there has been non-compliance with any other requirements of Section 15-62 of the Carrboro Land Use Ordinance.

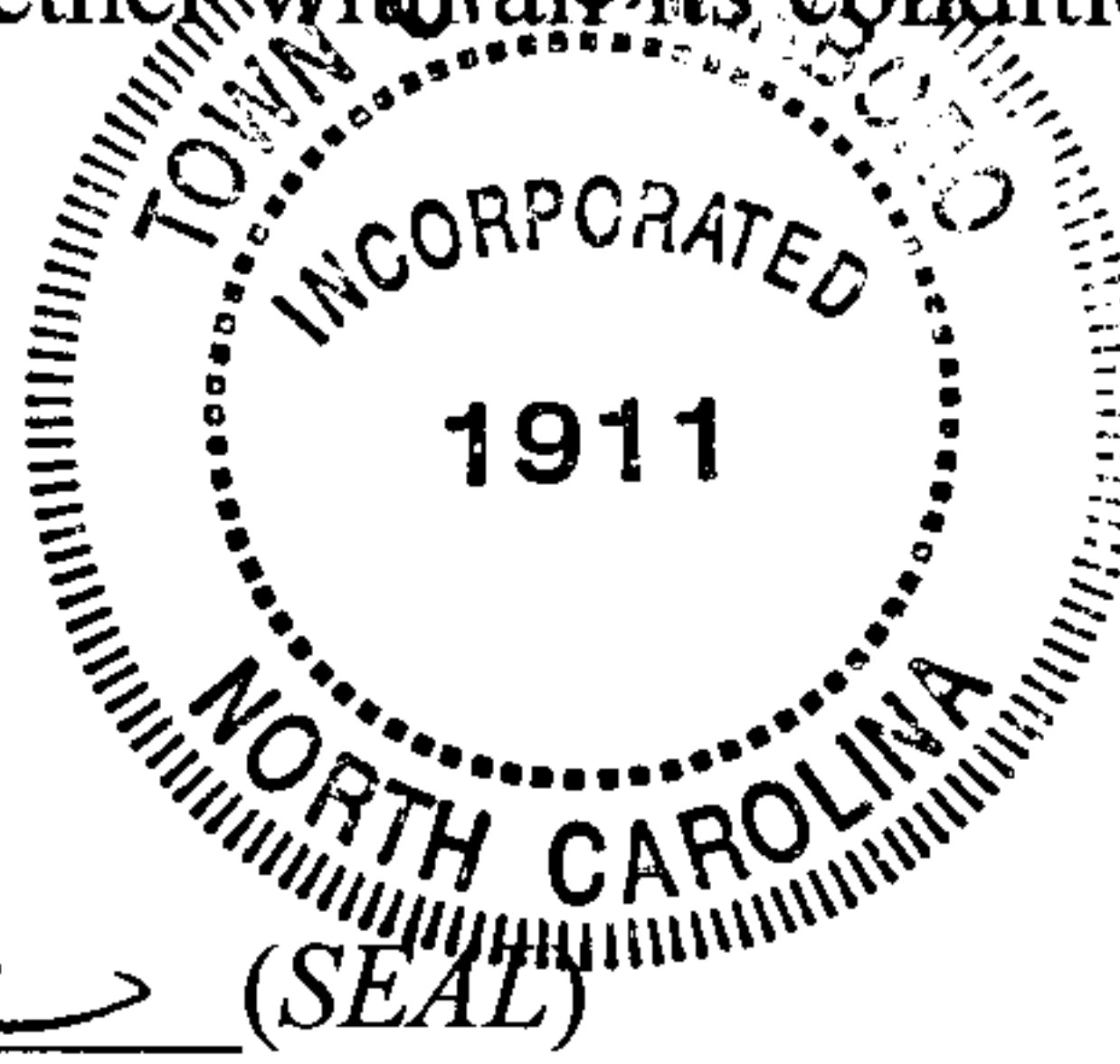
If this permit authorizes development on a tract of land in excess of one acre, nothing authorized by the permit may be done until the property owner properly executes and returns to the Town of Carrboro the attached acknowledgment of the issuance of this permit so that the town may have it recorded in the Orange County Registry.



NORTH CAROLINA

ORANGE COUNTY

IN WITNESS WHEREOF, the Town of Carrboro has caused this permit to be issued in its name, and the undersigned being all of the property above described, do hereby accept this Conditional Use Permit, together with all its conditions, as binding upon them and their successors in interest.



THE TOWN OF CARRBORO

ATTEST:

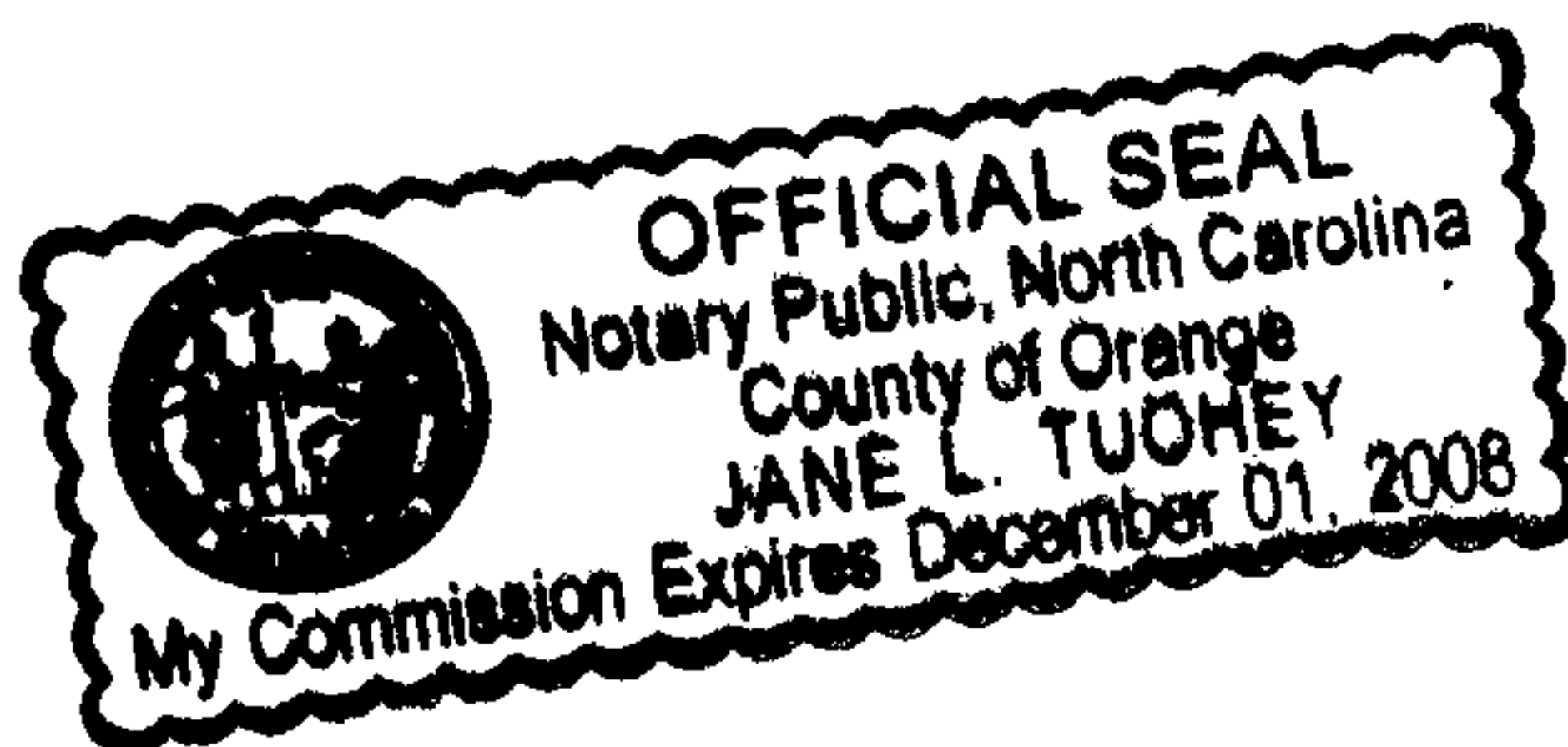
Sarah C. Williamson (SEAL)  
Town Clerk

BY Steven E. Stewart  
Town Manager

I, Jane L. Tuohy, a Notary Public in and for said County and State, do hereby certify that Sarah C. Williamson, Town Clerk for the Town of Carrboro, personally came before me this day and being by me duly sworn says each for himself that she knows the corporate seal of the Town of Carrboro and that the seal affixed to the foregoing instrument is the corporate seal of the Town of Carrboro, that Steven E. Stewart, Town Manager of said Town of Carrboro and Sarah C. Williamson, Town Clerk for the Town of Carrboro subscribed their names thereto; that the corporate seal of the Town of Carrboro was affixed thereto, all by virtue of a resolution of the Board of Aldermen, and that said instrument is the act and deed of the Town of Carrboro.

IN WITNESS THEREOF, I have hereunto set by hand and notarial seal this the 31 day of October, 2007.

(SEAL)



Jane L. Tuohy  
Notary Public

My Commission Expires: 12-1-08





M/I HOMES

BY: [Signature]

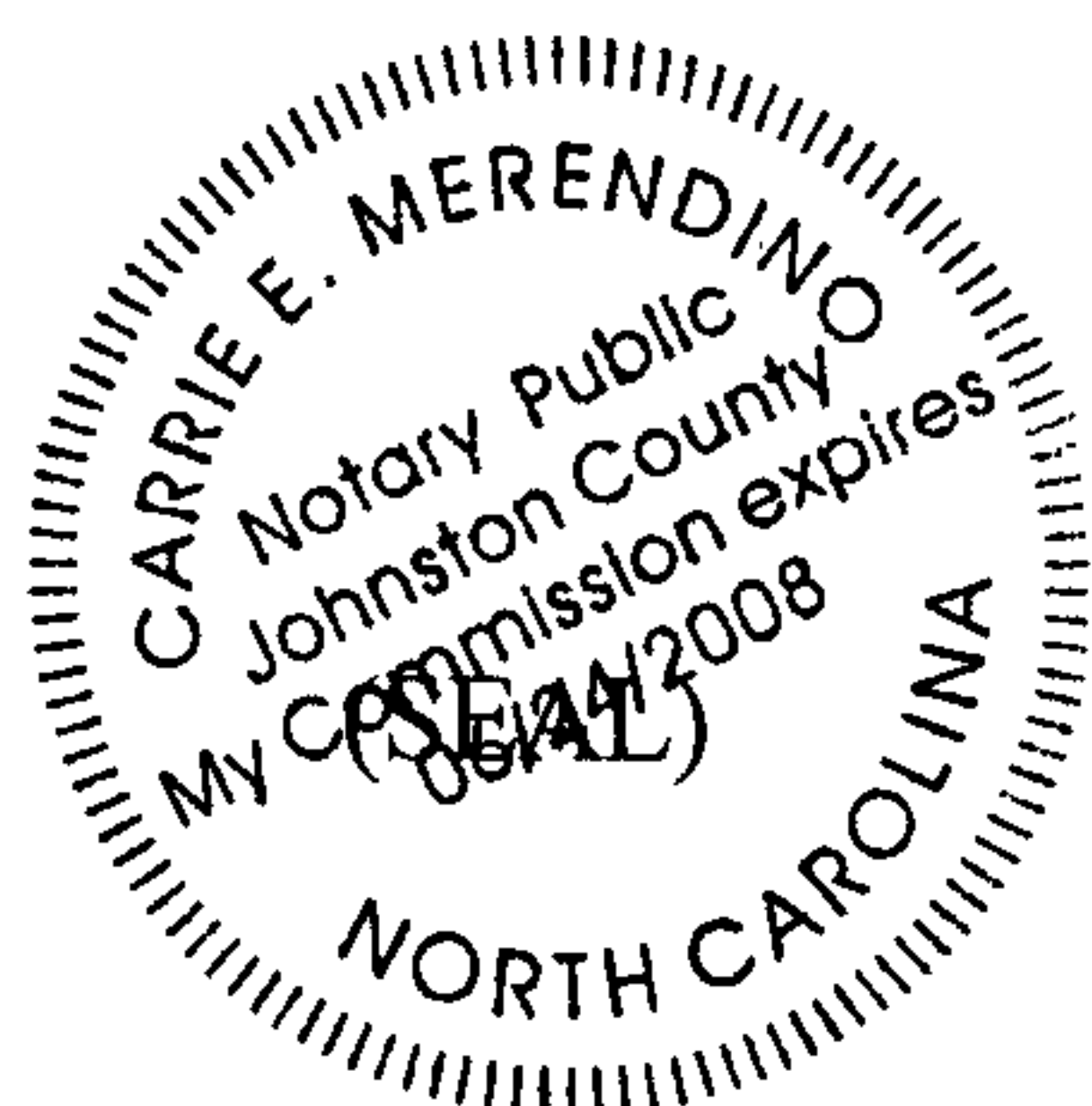
ATTEST:

[Signature]  
Secretary VICE PRESIDENT OF LAND DEVELOPMENT

STATE OF NORTH CAROLINA  
Johnston COUNTY

This the 25 day of October, 2007, personally appeared before me, Carrie E. Merendino, a Notary Public in and for said County and State; Edward F. Kristensen, who being by me duly sworn, says that she knows the common seal of Edward F. Kristensen and is acquainted with Edward F. Kristensen who is the Area President of M/I Homes Raleigh and saw the Area President sign the foregoing instrument and that he/she, Secretary of aforesaid, affixed said seal to said instrument, and signed her name in attestation of the execution of said instrument in the presence of said Jeremy Medlin.

WITNESS my hand and notarial seal, this the 25 day of October, 2007.



[Signature]  
Notary Public

My Commission Expires: 6/24/08

(Not valid until fully executed and recorded)

PREPARED BY AND RETURN TO:  
TOWN CLERK  
TOWN OF CARRBORO  
301 West Main Street  
CARRBORO, NORTH CAROLINA 27510



# Town of Carrboro

Town Hall  
301 W. Main St.  
Carrboro, NC 27510

## Agenda Item Abstract

**File Number:**17-315

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

### TITLE:

Approval of a Development Agreement Regarding South Greensboro Street Property between the Town of Carrboro and Orange County North Carolina

**PURPOSE:** The purpose of this item is to provide the Board of Aldermen with an opportunity to approve a Development Agreement between the Town and Orange County that details terms related to design, permitting, and construction of a building and associated parking at 203 S. Greensboro Street that would provide for new Town office space, the Orange County Southern Branch Library and other possible uses.

**DEPARTMENT:** Planning and Manager's Office

**CONTACT INFORMATION:** Trish McGuire, [pmcguire@townofcarrboro.org](mailto:pmcguire@townofcarrboro.org)

[<mailto:pmcguire@townofcarrboro.org>](mailto:pmcguire@townofcarrboro.org), 919-918-7327; David Andrews, [dandrews@townofcarrboro.org](mailto:dandrews@townofcarrboro.org), 919-918-7308

**INFORMATION:** The Board of Aldermen authorized the Town Manager to enter into a Development Agreement for this project on June 20<sup>th</sup>. Some additional discussion and revisions were needed and occurred during the summer break and early fall. An updated agreement is ready to be considered for approval by the Board of Aldermen and the Board of County Commissioners at their respective meetings this evening.

These efforts culminate the work begun on December 6, 2016 when the boards authorized their respective managers to sign letters of intent related to exploring development options at this location. These actions followed from ongoing work on the exploration of this joint development opportunity, reported previously on April 5<sup>th</sup>, 2016 (see

<https://carrboro.legistar.com/LegislationDetail.aspx?ID=2680872&GUID=E4231122-B65E-4246-A863-C582CEE6F2A4&Options=ID|Text|&Search=library> and October 15<sup>th</sup>, 2016 (see link) and related projects - the Town's Parking Study/Plan, Space Needs Analysis, and Feasibility Assessments of other joint ventures. Exploration of the terms of a development agreement have been underway since the spring. At this time, a possible ribbon cutting in spring 2019 is projected.

**FISCAL & STAFF IMPACT:** Minimal costs estimated in association with authorization to execute the agreement.

---

**Agenda Date:** 10/17/2017

**File Type:**Agendas

**In Control:** Board of Aldermen

**Version:** 1

---

**RECOMMENDATION:** It is recommended that the Board of Aldermen consider the agenda materials and adoption of the resolution authorizing execution of the agreement (*Attachment A*).

A RESOLUTION AUTHORIZING THE TOWN MANAGER TO SIGN AN AGREEMENT WITH ORANGE COUNTY  
REGARDING DEVELOPMENT OF THE TOWN'S 203 S. GREENSBORO STREET PROPERTY FOR TOWN  
OFFICES, THE CONTEMPLATED ORANGE COUNTY SOUTHERN BRANCH LIBRARY AND OTHER POSSIBLE  
USES

WHEREAS, the Town of Carrboro has had a longstanding interest in the siting a new Orange County Southern Branch Library in Town; and

WHEREAS, the Town and County signed a Letter of Intent in December 2016 to work cooperatively on exploration of potential joint development of Town property at 203 S. Greensboro Street for uses including the contemplated Orange County Southern Branch Library, town office uses and other possible uses; and

WHEREAS, staff of the Town and Orange County have been working together to explore possible development options and to identify terms that would allow both parties to cooperatively proceed with planning, financing, and developing the property for joint use; and

WHEREAS, THE Board of Aldermen has reviewed and approved a draft of the Development Agreement on June 20<sup>th</sup>; and

WHEREAS, the Board of Aldermen has reviewed a revised draft of the Development Agreement.

NOW, THEREFORE, BE IT RESOLVED that the Board of Aldermen of the Town of Carrboro hereby authorizes the Town Manager, David L. Andrews, to execute the Development Agreement on the Board's behalf.

This the 17th day of October in the year 2017.