

# Memorandum

**To:** Orange County, NC Solid Waste Management  
**From:** Jennifer Porter, GBB Senior Vice President & Project Manager  
**Date:** Finalized June 29, 2023  
**Subject:** Solid Waste Master Plan – *Road to Zero Waste: Task 5*

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## 1 Task 5: Integrated Systems Report – Process Memo

During Task 4, GBB developed an Evaluation Tool to help analyze data and information gathered during the project’s previous stages and develop system recommendations for Orange County’s *Road to Zero Waste Plan*. The Evaluation Tool outlined the recommendations within three Scenarios:

1. **Scenario 1:** No current facility changes, no new programs, and current program adjustments—*Lowest Cost*.
2. **Scenario 2:** Some current facility changes, some new programs, and current program adjustments—*Medium Cost*.
3. **Scenario 3:** Includes current facility changes including a Sustainable Materials Management (SMM) campus, some new programs, and current program adjustments—*Highest Cost*.

Building upon the Task 4 effort, GBB has used the findings from the Evaluation Tool, in conjunction with feedback from the Orange County Zero Waste Team, in Task 5 to refine further recommendations developed to help guide the County advance an effective *Road to Zero Waste* strategy.

The three Scenarios require varying degrees of infrastructure, funding, and programming. The evaluation of recommendations includes the following elements: public input, financial impacts, environmental impacts, equity impacts, and lifecycle impacts.



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*At this juncture, GBB recommends that Scenario 3, which includes the recommendations from both Scenario 1 and Scenario 2, be the chosen path forward for developing the Road to Zero Waste Plan for Orange County.*

Myriad stakeholders, paired with the Solid Waste Advisory Group (SWAG), will help to implement the *Road to Zero Waste* moving forward. One point is certain: there is a great foundation in the County’s materials management program; however, the County’s Zero Waste goal by 2045 is not achievable without change. Most critically, community buy-in and support is vital to success.

### 1.1 Public Input

- Public input is presented as gathered in 2022, detailed in the Public engagement timeline summary noted below.





## 1.2 Financial Impacts

- Financial impacts are presented as the impact of the Scenarios on the Solid Waste Programs Fee (SWPF) for each household in the County.
  - *Evaluation: To complete this effort, GBB estimated the net cost of each of the Scenarios, including staffing, direct expenses, revenues/savings, capital costs, and processing/disposal costs.*

## 1.3 Environmental Impacts

- Environmental benefits
  - *Evaluation (improved or not applicable (N/A) for each): Air quality, Greenhouse gas emissions savings, Open space conservation.*
- Systems analysis: impact on adjacent systems
  - *Evaluation options: None, Transportation, Energy, Wastewater*

## 1.4 Equity Impacts

- Reference The One Orange Countywide Racial Equity Plan – “Appendix B. Racial Equity Tool- Racial Equity Review”:
  - *Evaluation: Meets, Does not meet, Not applicable (N/A)*

## 1.5 Lifecycle Impacts

- Level of system flexibility over time:
  - *Evaluation: High, Medium, Low*
- Geographic area coverage:
  - *Evaluation: Whole County, Part of County, Not applicable (N/A)*
- Implementation timeline:
  - *Evaluation: Within 1 year, 1-2 years (short), 3-5 years (medium), long 5+ years (long)*
- Lifecycle of the project (i.e., how long the recommended system would function):
  - *Evaluation: One-time, Monthly, Annually, Ongoing*
- Impacts all residents and businesses?
  - *Evaluation: Yes or No*
    - *If not, what are the impacts on specific subsections of the population (e.g., on residents located in a particular area, a specific type of businesses, etc.)*
      - *Evaluation options: Business, residential, specific County locations, etc.*

The recommendation options in the three Scenarios were presented to Orange County project team in Spring 2023 meetings with GBB during which time the options were discussed, refined, and evaluated.



## 2 Overview of Recommendations

The following table presents a high-level overview of each recommendation, with specific details to follow in the accompanying narrative. Scenario 1 is the least expensive and least impactful, and Scenario 3 has the highest cost with the most significant zero waste impact. Scenario 2 has a medium cost with an impact more significant than Scenario 1 but less than Scenario 3. Each scenario builds upon the previous one, meaning that Scenario 2 includes all the recommendations listed in the first Scenario in addition to the recommendations outlined in the second scenario, and Scenario 3 includes all the recommendations listed in both the first and second Scenarios in addition to the recommendations outlined in the third Scenario.

Scenario	#	Recommendation
1	1	Update Marketing (imagery; Public education & social media); Create a rallying point
	2	Focus on all language speakers in signage/messaging.
	3	Raise awareness on reuse and waste prevention.
	4	Advocate for more material bans and revise the solid waste ordinance.
	5	Create County-level commercial and multifamily recycling requirements.
	6	Innovation partnerships with UNC and UNC health system.
	7	County purchasing for waste prevention/soil health
	8	Consider becoming part of a reuse marketplace.
2	9	Consistency across items accepted at WRCs (with exception of HHW).
	10	Enforcement at WRCs (with staff and/or security cameras)
	11	More accessible drop-off options/locations for multifamily buildings.
	12	Offer multiple cart sizes.
	13	Create model programs across schools for waste reduction, recycling, and composting.
	14	Implement deconstruction ordinance updates/facility audits/collect C&D recycling data.
3	15	Phased Master Plan for Eubanks Rd (Admin/Disposal Center) and/or alternate location(s)
	16	Consolidation of SSR transfer and MSW transfer.
	17	Organics program development.

### 3 Description of Recommendations

#### 3.1 Recommendation #1: Update Marketing (Imagery; Public Education & Social Media); Create a Rallying Point

Recommendation #1 includes updating Orange County's website's Solid Waste Management page, an essential tool for engaging residents in effective zero-waste practices. As such, this recommendation focuses on updating the website to show growth, progress, and revised guidance with updated images of recent events, recent office changes, updates to solid waste policies, and implementing the Road to Zero Waste Plan. GBB recommends that the County continuously use and update its website to show a clear, consistent, and engaging message. The publishing and posting of correlating social media posts are also recommended. Since the 2045 goal is 20 years away, the County should target interim indicator(s) of success in 2030, aligning with established education and business community goals.

*Achieving this recommendation means updating the website with zero waste imagery; featuring increased transparency about where materials are going once collected; ongoing public education and social media posting; expanding the use of the current Orange County NC Recycles App; creating a tangible interim zero waste rallying point for the community.*

#### 3.2 Recommendation #2: Focus on All Language Speakers in Signage/Messaging

Recommendation #2 focuses on multilingual signs, which are important for the diverse community that the County serves. By guiding in multiple languages, the County will ensure that residents can understand the disposal information that the County seeks to convey to the community. This recommendation includes providing all interpretive educational materials, such as signs at the WRCs, brochures, mailers, cart decals, email blasts, and other County-provided solid waste and recycling information, in the top three (3) most spoken languages among residents within the County's service area. This can be achieved using nearby or national translators in combination with U.S. Census data. Additionally, full utilization of the North Carolina state resources will be critical.

*Achieving this recommendation means: focusing on all language speakers in signage/messaging (fully utilizing State resources) and serving all community members.*



Figure 1 - North Carolina's statewide food waste prevention campaign is available in 16 languages.

### 3.3 Recommendation #3: Raise Awareness on Reuse and Waste Prevention

Recommendation #3 focuses on planning and policies on waste prevention to help eliminate waste at the source. Preventing waste and reusing materials are the first steps in a comprehensive zero-waste program. Successful waste prevention requires creative and analytical thinking first about how a reduction in materials can be accomplished, and then what can be done to reuse the materials that have been used once. For example, the County can collaborate and leverage partnerships with existing organizations such as [www.bagandfilmrecycling.org](http://www.bagandfilmrecycling.org), which is a drop-off directory for individuals to find participating drop-off locations for free plastic bags, film, and wrap recycling. If “Orange County NC” is entered into the search engine, 13 active locations appear. The County could review the resource’s suggestions and potentially promote the locations and/or the resource to its residents through outreach and education efforts.

*Achieving this recommendation means: Raising awareness of reuse and waste prevention (i.e., using refillable bottles, reusable shopping bags, etc.) which is the highest piece of the sustainable materials management hierarchy.*

### 3.4 Recommendation #4: Advocate for More Material Bans and Revise Solid Waste Ordinance

Recommendation #4 includes updating the County’s current Solid Waste Ordinance to amend and include new solid waste management regulations that better reflect the Road to Zero Waste Plan. These amended and new regulations could clarify the requirements, update and simplify terminology, enhance reuse and recycling opportunities, and recycling enforcement protocols to advance the County’s zero waste goals.

The addition of Extended Producer Responsibility (EPR) language to the Ordinance is recommended to support the County’s sustainability goals through shifting the disposal burden of a product away from the municipality and back to the manufacturer. In May 2022, a House Bill, (H.B. 1113<sup>1</sup>), was introduced to the General Assembly of North Carolina to establish extended producer responsibility for certain producers of packaging materials and to ban the manufacture and distribution of packaging materials containing certain toxic substances in order to protect public health. This is one example of utilizing EPR to accomplish waste reduction goals in North Carolina, which Orange County could support and emulate.

In coordination with proposing revisions to the current solid waste management regulations, it is suggested that the County advocate for material bans. Items such as film plastic bags, or expanded polystyrene foam food packaging have been successfully banned in other states at present, which the County could look to as model program examples. Additionally, the County could advocate for Extended Producer Responsibility (EPR) legislation for difficult-to-dispose of items like paint or smoke detectors, which have also been passed in other states, and shift the disposal responsibility from the municipality to the manufacturer. This advocacy occurs through letter-writing and presentations to the elected officials in Raleigh. The national [PaintCare](http://PaintCare.org) could also be a program of interest in this regard. Of note, the County is already working with the Triangle J on the Solid Waste Consortium, including the solid waste departments of Orange County, Durham County, City of Durham, City of Raleigh, Chatham County, Town of Cary, Wake County, and tentatively Holly Springs. This consortium could prove useful for this recommendation moving ahead.

*Achieving this recommendation means: advocating for more material bans and revising the Solid Waste Ordinance to align with the Road to Zero Waste.*

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<sup>1</sup> Source: General Assembly of North Carolina Session 2023. <https://www.ncleg.gov/Sessions/2023/Bills/House/PDF/H279v1.pdf>

### 3.5 Recommendation #5: Create County-level Commercial and Multifamily Recycling Requirements

Recommendation #5 would develop formal requirements for all commercial and multi-family buildings to separate recyclable materials and provide tenants/occupants adequate recycling infrastructure (i.e., bins, dumpsters) alongside regular waste disposal infrastructure. Additionally, the building managers could be required to provide recycling information/guidance to all tenants/occupants.

*Achieving this recommendation means creating County-level commercial and multifamily recycling requirements.*

### 3.6 Recommendation #6: Innovation Partnerships with UNC & UNC Health System

Recommendation #6 emphasizes that the County continues collaborating with and expanding its working relationships with the University of North Carolina (UNC) and the UNC Health System locally. UNC is a large waste generator in the County’s service area. It already offers outreach resources and infrastructure that can help the County implement its zero-waste plan and has engaged stakeholders through SWAG and other sustainability efforts in the region, which the County should fully engage. UNC and the UNC health system are vital resources concerning solid waste management. Expanding the partnership between the County and UNC involves ramping up communication between the entities through regularly scheduled on campus meetings with stakeholders, as well as joint advertising and promotion of waste information within the community, and for the County to consider formalizing for-credit internship opportunities for UNC students. Durham Tech should also be included in planning for similar partnerships to UNC.

*Achieving this recommendation means furthering innovative partnerships with UNC and UNC health system.*

### 3.7 Recommendation #7: County Purchasing for Waste Prevention/Soil Health

Recommendation #7 encourages all purchasing at the County level to include purchasing products made with a percentage of recycled content (minimum 25%), which creates a demand for recycled products and helps sustain local recycling programs. In addition, this recommendation includes connecting agricultural/soil services in the County or Cooperative Extension related to food waste to build partnerships and promote using compost for building soil health.

*Achieving this recommendation means that the County will focus its purchasing on waste prevention and establishing partnership(s) with local agricultural or Cooperative Extension programs to collaborate on food waste/soil health initiatives.*

### 3.8 Recommendation #8: Join a Reuse Marketplace

Recommendation #8 focuses on technology-driven reuse options. There are numerous reuse marketplaces in the public and private sectors for consideration by the County. Examples include North Carolina’s Waste Trader, Austin’s reuse marketplace, and Tennessee’s reuse marketplace.

*Achieving this recommendation means the County becomes part of a reuse marketplace and diverts material from the landfill for reuse.*

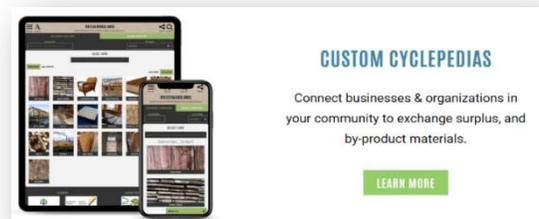


Figure 2 - Sample Reuse Technology from iWasteNot

### 3.9 Recommendation #9: Consistency Across Items Accepted at WRCs

Recommendation #9 is to develop one standardized list of acceptable items for drop-off at all of Orange County’s Waste and Recycling Centers (WRCs), with the exception of HHW. As outlined in the accepted materials table in the Appendix, there would be two to seven items added at each of the WRCs (excluding HHW), including two new items suggested for all locations: expanded polystyrene (EPS, #6) and clamshell-style containers made from polyethylene terephthalate (PET, #1).

**Expanded Polystyrene (EPS)** is a type of thermoformed foam plastic material that is commonly used to make foam packaging. EPS is used to make a variety of items, such as single-use cups, plates, and shipping materials like “packing peanuts” and customized foam shipping inserts for specialty or delicate goods. Currently, EPS is not recyclable in Orange County, however, there are options for recycling it and reselling it into the commodity market. EPS densifiers can be purchased or leased monthly and installed with other recycling equipment to remove the air from EPS (which makes up between 90 and 98 percent of the material) using either heat or pressure to produce a densified plastic material. According to several providers of equipment and brokers of densified EPS, a 200- to 300-pound-per-hour densifier can be leased for approximately \$900 per month, and densified EPS can be sold for about \$0.40 per pound. Depending on the specification and configuration of the equipment, the costs may be more or less.

**Clamshell-style containers** are thermoformed from plastics, such as EPS and PET. Typically, consumers encounter clamshell containers made of #1 PET at grocery stores in the produce, dairy, and dry goods sections to hold foods such as berries, lettuce, nuts, eggs, and baked goods. In fact, the containers are commonly known as “berry boxes” and “plastic egg crates”. Fortunately, there are PET reclaimers throughout the United States, with many of them located in the Southeast. There are multiple [PET reclaimers in North Carolina, as described by the National Association for PET Container Resources \(NAPCOR\)](#)<sup>2</sup>. The County could potentially reconsider the viability of collecting and selling #1 PET into the recycled commodity market.

With respect to the collection of PET containers, there have been advancements in reverse vending technology for the County’s consideration at WRCs or by partnering with grocery stores to place reverse vending machines throughout the community. These machines can collect a variety of recyclable packaging types, including #1 PET containers.

*Achieving this recommendation means gaining consistency across all items accepted at WRCs and, ideally, expanding the list of accepted materials to align with waste diversion goals and public demand.*

The Recycling Partnership has organized a [PET Recycling Coalition](#), and is currently sponsoring [PET Recycling Grants](#) (Round 7 of grants are due July 31, 2023) for publicly, privately, or non-profit-owned and operated material recovery facilities (MRFs), secondary sortation facilities, or PET reclaimers in North America.

Learn more about this at <https://recyclingpartnership.org/pet-recycling-coalition/>

<sup>2</sup> List of PET reclaimers in the US: <https://napcor.com/recycling/pet-reclaimers/>



### 3.10 Recommendation #10: Enforcement at Unstaffed WRCs (with staff and/or security cameras)

In the present system, the Towns (Hillsborough, Chapel Hill, and Carrboro) authorize enforcement of the County's Regulated Recyclable Material Ordinance (RRMO) within their municipal limits. The County assists the Towns' staff members in enforcing the RRMO and landfill bans on privately collected waste containers. Recommendation #10 is to expand the enforcement at each drop-off site through improved surveillance, (additional security cameras), and/or the addition of full- or part-time personnel (staff) positions to oversee residents' and the follow-through of regulations.

While the County has one of the best single stream programs in the area, there is always room for improvement. This recommendation means enforcing that residents drop off acceptable items only (especially at the unstaffed 24-hour sites) and that they place the materials into the correct containers to reduce contamination and increase the value of the materials. This effort will also serve as an added opportunity to provide waste guidance and education.

*Achieving this recommendation means implementing enforcement at WRCs (illegal dumping, littering, and contamination) through additional staff and/or security cameras.*

### 3.11 Recommendation #11: More Accessible Drop-off Options/Locations for Multi-family Buildings

Recommendation #11 increases the number of drop-off opportunities within proximity to multi-family buildings and lower-income areas in the County to increase the convenience and accessibility of recycling infrastructure for those who live there and may not be able to travel to the current WRC locations.

*Achieving this recommendation means more accessible drop-off options/locations for multifamily buildings.*

### 3.12 Recommendation #12: Offer Multiple Cart Sizes

Recommendation #12 suggests offering recycling carts of multiple sizes to customers. Offering more than one size option makes recycling easier for residents who require smaller cart sizes for accessibility. Multiple cart sizes could ultimately lead to increased participation in recycling.

*Achieving this recommendation means offering multiple cart sizes to increase participation by increasing accessibility to aging or disabled customers.*

### 3.13 Recommendation #13: Model Programs Across Schools: Waste Reduction, Composting, Recycling

A strong and consistent waste reduction, composting, and recycling program within schools would become a key driver for implementing zero-waste models in the County. Recommendation #13 focuses on educating the community's children on proper sorting and recycling habits in school. As they grow up in the County, they will already understand and may be accustomed to best practices in recycling, as deemed by the County. The ultimate success of the zero-waste plan will be supported by instilling good habits at a young age, so it is recommended that the schools be "ground zero" when it comes to maintaining a model program that can then be replicated at home and other areas throughout the County.

Additionally, the school system generates a large amount of waste material, having a model program across all schools will not only have educational benefits, it will also help the County reduce and manage its waste.

*Achieving this recommendation means creating model programs across all schools for managing recyclables, and that is mirrored at the WRCs.*

### 3.14 Recommendation #14: Deconstruction Ordinance/Updates/ Audits/Collect C&D Recycling Data

Since 2002, the County certifies processors for Construction and Demolition (C&D) waste material. Materials from construction projects must comply with the Regulated Recyclable Materials Ordinance (RRMO), and materials must go to certified facilities. Currently, the County has four (4) listed certified facilities for processing. Recommendation #14 focuses on ordinance updates and more fully enforcing the current RRMO via audits and other means.

*Achieving this recommendation means expanding permitting incentives for deconstruction. The current C&D landfill has 20+ years of life remaining at the current fill rate. Diverting more recyclables from C&D material will extend the life of the landfill.*

### 3.15 Recommendation #15: Phased Master Plan for Eubanks Rd (Admin/Disposal Center) and/or alternate location(s)

Recommendation #15 centers on the Eubanks Road facility (including the Admin building and Disposal Center) which currently has significant limitations and adjacent community concerns. There is a clear need to improve the Material Recovery Facility, including a new covered facility to address the transfer/processing of SSR and incorporate other material streams now separated. Co-located material recovery operations could gain staffing efficiencies in a single location.

Master planning is needed to relocate the Maintenance facility and yard to make room for expanded processing. Alternative locations should be considered with community input.

*Achieving this recommendation means initiating a master plan for Eubanks Rd and/or alternate locations.*



### 3.16 Recommendation #16: Consolidation of SSR Transfer and MSW Transfer

Recommendation #16 presents a strategy for the future. As noted, the County can't achieve Zero Waste without change; however, most critically, community buy-in and support is vital to success. Population growth is projected to be 18% from 2020 to 2040. Currently, the County does not control most of the residential waste collection nor commercial solid waste collection.

Through this recommendation, the County can aim to more efficiently collect and transfer what is being collected (MSW and SSR) to other regional processing. MSW is now collected from Waste & Recycling Center drop-offs and select government buildings and schools (6,000 tons annually); however, solid waste planning is taking place with regional partners, and the County is taking on Recycling collection in July 2024.

***Achieving this recommendation means more efficiently collecting material in the County to reduce vehicle miles traveled and allow the County more cost control in the future.***

### 3.17 Recommendation #17: Organics Program Development

Recommendation #17 would expand the commercial organics program in place, in which the County provides collection of compostables from bars, restaurants, and other eligible businesses throughout the County. Through this recommendation, the County would double the current commercial organics program cost as well as set the stage for a residential pilot program.

Concerning organics materials, the County maintains an existing contract between the Solid Waste Management Department and Judy D. Brooks Contractor, Inc. for commercial organics collections, hauling, and processing services. In this agreement, the County oversees the contractor-approved collection and composting of pre-and post-consumer organic materials from eligible food service establishments. This recommendation also intends to double the current collection beyond participating commercial establishments and start to plan a residential pilot. A residential pilot program should be implemented first to test the process and work out the potential issues and will then be extended to other residential areas.

***Achieving this recommendation means diverting food waste, the most potent greenhouse gas material, from the landfill.***

*Asheville, NC, has a food waste pilot featuring unique program elements including drop-off areas which could be explored further in the County.*

*Another model for consideration of a pilot program that the County could look to for guidance, is the [Residential Food Waste Composting Pilot Program](#) currently in place in the City of Fort Worth, Texas.*

*In Fort Worth's pilot, interested residents can sign up and pay a \$20 subscription fee. All fees collected by the Residential Food Scrap Composting Pilot Program are used to "make compost more accessible to agricultural producers and community gardens." After the subscription sign-up and payment is processed, the City assigns the resident a Composting Starter Kit pickup and a nearby City of Fort Worth Drop-Off Station.*

*The starter kit includes a 5-gallon bucket with a lid for food scraps transportation, a kitchen countertop pail, assorted educational materials and instructions, and a refrigerator magnet detailing what can and cannot be composted. Once a resident drops off their food scraps at one of the 17 collection sites across the city, they bring their bucket back home to repeat the process, and the City processes the material into compost.*



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4- Evaluation of Recommendations

Scenario 1										
#	Focus Area	Recommendation	Public Input	Impact on Adjacent Systems	Equity Impact (RE: One Orange Equity Framework)	System Flexibility Over Time	Geographic Coverage Area	Timeline*	Lifecycle of the Project	Impacts all Businesses & Residences?
1	Marketing	Update imagery; Public education & social media; Expand app; Create rallying point	Need improved website/app; prioritize making recycling easy and accessible.	None	Meets	High	Whole County	Quick win	Annually	Yes
2	Marketing	Focus on all language speakers in signage/messaging.	Increased efforts are needed, but more importantly, to make recycling easy.	None	Meets	High	Whole County	Quick win	Annually	Yes
3	Waste Prevention	Raise awareness on reuse and waste prevention.	Desire to put maximum efforts toward preventing waste in the first place.	None	Meets	High	Whole County	Quick win	Annually	Yes
4	Policy	Advocate for more material bans and revise the solid waste ordinance.	Desire to reduce or ban some items in hospitals and schools.	None	Meets	Low	Whole County	Long	One-time	Yes
5	Policy	Create County-level commercial and multifamily recycling requirements.	Mandating commercial & multi-family recycling is a top choice.	None	Meets (w/ more universal-provided & subsidized services for MFB)	Low	Whole County	Medium	One-time	Focuses on Multifamily/business
6	Partnerships	Innovation partnerships with UNC and UNC health system.	The current system works well but desires to be at the forefront of waste innovation.	None	Meets	High	Whole County	Ongoing	Annually	Yes
7	Waste Prevention	County purchasing for waste prevention and ag-related to food waste.	Prioritized waste prevention above all other activities.	None	N/A	High	Whole County	Short	One-time	Focuses on County business operations
8	Waste Prevention	Consider becoming part of a reuse marketplace.	Most important question: "How should waste be prevented, reduced, or reused?"	None	Meets	Medium	Whole County	Short	One-time	Yes

**Environmental Benefits/ Air Quality**  
*(see Appendix for tonnage projections)*

**Improved:**  
Low estimate based on EPA:

- Additional 15,000 tons of recycling
- Additional 6,000 tons of organics

**Env. Benefits/GHG Avoided**

**Improved:**

- -44,912 MTCO2E avoided
- Equivalent to 10,000 cars taken off the road

**Impact on SWPF (Residential tons only)**

**\$9.66**

- 6.8% increase over current \$142/year

\*Timeline: Quick win (less than 1 year), 1-2 years (short), 3-5 years (medium), long 5+ years (long)

Scenario 2										
#	Focus Area	Recommendation	Public Input	Impact on Adjacent Systems	Equity Impact (RE: One Orange Equity Framework)	System Flexibility Over Time	Geographic Coverage Area	Timeline*	Lifecycle of the Project	Impacts all Businesses & Residences?
9	Facilities	Consistency across items accepted at WRCs (with exception of HHW)	Consistent schedule; carless; expanded services/access; additional materials.	Transportation/Energy: reduction in miles traveled	Meets	Low	Whole County	Short	One-time	Yes
10	Enforcement	Enforcement at WRCs (with staff and/or security cameras)	Necessary to enforce illegal dumping & cross-contamination with more focus.	None	Meets	Medium	Whole County	Short	One-time	Yes
11	Facilities	More accessible drop-off options/locations for multifamily buildings.	Mandating commercial/multifamily recycling is among the top 2 policies desired by respondents.	None	Meets	Medium	Whole County	Short	One-time	Focuses on Multifamily
12	Programs	Offer multiple cart sizes.	The current carts are too big/heavy.	None	Meets	Low	Whole County	Short	One-time	Yes
13	Programs	Create model programs across all schools for metal, paper, plastic, glass, food waste, etc.	Food waste collection at schools is among the top 2 public space focus wanted.	None	Meets	High	Whole County	Quick win	One-time	Focuses on K-12 population and staff
14	Waste Prevention	Implement deconstruction ordinance updates/facility audits/collect C&D recycling data.	Proactive C&D diversion among top 2 waste prevention areas of focus wanted.	None	Meets	Low	Whole County	Long	Annually	Yes

**Environmental Benefits/  
Air Quality**  
*(see Appendix for tonnage projections)*

**Improved:**

- Mid-point estimate based on EPA:
- Additional 31,000 tons of recycling over now (not cumulative)
- Additional 16,000 tons of organics over now (not cumulative)

**Env. Benefits/ GHG Avoided**

**Improved:**

- - 93,778 MTCO2 avoided
- Equivalent to 21,000 cars taken off the road

**Impact on SWPF  
(Residential tons only)**

**\$19.89**

- Cumulative 14% increase over current \$142/year

\*Timeline: Quick win (less than 1 year), 1-2 years (short), 3-5 years (medium), long 5+ years (long)

Scenario 3										
#	Focus Area	Recommendation	Public Input	Impact on Adjacent Systems	Equity Impact (RE: One Orange Equity Framework)	System Flexibility Over Time	Geographic Coverage Area	Timeline*	Lifecycle of the Project	Impacts all Businesses & Residences?
15	Facilities	Phased Master Plan for Eubanks Rd (Admin/Disposal Center) and/or alternate location(s)	Significant structural/layout limitations and adjacent community concerns.	Transportation /Energy: potential reduction in miles traveled	Meets (w/ implementation at alternative site only)	Low	Whole County	Medium	One-time	Yes
16	Facilities	Consolidation of SSR transfer and MSW transfer.	The public wants a "sustainable materials management center."	Transportation /Energy: potential reduction in miles traveled	Pending	Medium	Whole County	Medium	One-time	Yes
17	Programs	Organics program development.	Overwhelming support for increased food waste management efforts.	Wastewater: from removing organics from landfill	Pending	High	Whole County	Short	Annually	Yes

**Environmental Benefits/  
Air Quality**  
*(see Appendix for tonnage projections)*

**Improved:**  
Low estimate based on EPA:

- Additional 15,000 tons of recycling
- Additional 6,000 tons of organics

High estimate based on EPA:

- Additional 47,000 tons of recycling over now (not cumulative)
- Additional 26,000 tons of organics over now (not cumulative) organics

**Env. Benefits/GHG Avoided**

**Improved:**

- -142,644 MTCO2E avoided
- Equivalent to 32,000 cars taken off the road.

**Impact on SWPF  
(Residential tons only)**

**\$57.10 to \$62.76**

- Cumulative 40.2%-44.2% increase over current \$142/yr.

\*Timeline: Quick win (less than 1 year), 1-2 years (short), 3-5 years (medium), long 5+ years (long)



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## 4 Financial Analysis - Detail

The objective of this aspect of the evaluation is to present the impact of the Scenarios on the Solid Waste Programs Fee (SWPF) for each household (HH) in the County. To do that, GBB estimated the net cost of each of the Scenarios, including:

- **Staffing** - Additional labor hours are needed for Full-time Equivalents (FTEs). The required FTEs will be multiplied by an average cost – salary plus benefits – for each category of staff required.
- **Direct Expenses** - Added expenses for operations to implement the Scenario, such as signage, educational materials, program set-up and operation, studies, etc., including incremental costs of supporting the additional labor (e.g., utilities, vehicle use). Direct expenses are either year-one or annual.
- **Revenues/Savings** - Some of the recommendations in the Scenarios may have revenue impacts and costs. This may include the additional recycling revenues from increased diversion or efficiency gains in operations.
- **Capital Costs (as appropriate)** - Some recommendations will require new capital items to succeed. These costs will most likely be financed by revenue bonds, so the annual cost used for the evaluation will be the debt service cost of the bonds. GBB's assumption for bond financing is a term of 20 years at 4% per annum or an annual debt service factor of .0736.
- **Processing/Disposal Costs** - Net costs due to additional diversion of residential SSR and organics.

When the net cost of each Scenario is determined, that cost is divided by the number of Orange County HHs (65,085) to derive the Scenario's impact on the SWPF.

Note, all SSR and organics tons modeled in Section 5 represent 25% of the tonnage figures noted in Section 4 table which is the estimation of residential tons component. Also, the increased diversion of SSR and organics resulting from implementing the scenarios would cause a concomitant decrease of MSW tonnages sent to landfills and increased savings in tip fees for landfill customers. The ability of MSW landfill customers to achieve these savings depends on how municipalities/contractors lower their fees to account for the decrease in MSW tonnages due to the increased diversion of SSR and organics. However, since the MSW savings do not accrue to the County government, they have not been included in this analysis.

### 4.1 Scenario 1

GBB estimates that the implementation of Scenario 1 will require an **additional staff of 4 FTEs**. At an average compensation of about \$72,000 per FTE for the type of staff needed for these tasks, the additional annual staff cost would be \$288,000. Scenario 1 would also require an additional \$200,000 in direct expenses for materials, staff support, etc.

The activities of Scenario 1 will increase the diversion of residential SSR by 3,750 tons leading to additional net recyclable costs of \$107,438 at the current net processing cost of \$28.65 per ton (net cost equals processing cost per ton less recyclable revenues per ton; this figure will change depending on the status of commodity sales markets, which fluctuate considerably). The activities of Scenario 1 will also increase the diversion of residential organic materials by 1,500 tons which, at a disposal cost of \$22.00 per ton, will add \$33,000 to the cost of the Scenario.



This brings the Scenario 1 total annual cost to \$628,438, as follows:

Description	Cost
Additional Staffing	\$288,000
Additional Direct Expenses	\$200,000
Additional Recycling Costs	\$107,438
Additional Organics Costs	\$33,000
<b>Total</b>	<b>\$628,438</b>

The impact on the SWPF would be **\$9.66 per HH per year** (\$628,438/65,085).

## 4.2 Scenario 2

GBB estimates that implementing Scenario 2 will require an **additional staff of 2 FTEs**. At an average compensation of about \$48,000 per FTE for the type of staff needed for these tasks, the additional annual staff cost would be \$96,000. Scenario 2 would also require an additional \$400,000 in direct expenses for materials, staff support, etc. The activities of Scenario 2 will increase the diversion of residential SSR by 4,000 tons and organics by 2,500 tons, leading to additional recyclable net costs of \$114,600 and organics costs of \$55,000 (see Scenario 1 for details of these calculations).

Thus, the overall annual cost of Scenario 2 would be as follows:

Description	Cost
Additional Staffing	\$96,000
Additional Direct Expenses	\$400,000
Additional Recycling Costs	\$114,600
Additional Organics Costs	\$55,000
<b>Total</b>	<b>\$665,600</b>

The impact on the SWPF would be **\$10.23 per HH per year** (\$665,600/65,085).



Scenario 2 also includes \$100,000 in year 1 to study multi-family drop-off locations.

Description	Cost
Additional Staffing	\$96,000
Additional Direct Expenses	\$400,000
Additional Recycling Costs	\$114,600
Additional Organics Costs	\$55,000
Study	\$100,000
<b>Total</b>	<b>\$765,600</b>

The first-year impact on the SWPF would be **\$11.76 per HH per year** (\$765,600/65,085).

### 4.3 Scenario 3

GBB estimates that the implementation of Scenario 3 will require an **additional staff of 5 FTEs**. At an average compensation of about \$71,000 per FTE for the type of staff needed for these tasks, the additional annual staff cost would be \$355,000. Scenario 3 would also require an additional \$1,382,500 in direct expenses for materials, equipment maintenance, utilities, commercial organics program expansion, etc. The activities of Scenario 3 will increase the diversion of SSR by 4,000 tons and organics by 2500 tons, leading to additional costs of \$114,600 and \$55,000, respectively (See Scenario 2 for details).

Implementation of Scenario 3 also requires significant investments in capital facilities of \$7 million to \$12 million for the SSR consolidation facility. Assuming the financing of those facilities uses revenue bonds at 4%/20 years, the annual debt service for that facility (at .0736 per year) would be \$515,000-\$883,000.

Thus, the overall annual cost of Scenario 3 would be as follows:

Description	Cost
Additional Staffing	\$355,000
Additional Direct Expenses	\$1,382,500
Additional Recycling Costs	\$114,600
Additional Organics Costs	\$55,000
Debt Service	\$515,000-\$883,000
<b>Total</b>	<b>\$2,422,100 - \$2,790,100</b>

The impact on the SWPF would be **\$37.21-\$42.87 per HH per year** (\$2,422,100/65,085 to \$2,790,100/65,085). It should be noted that the tipping fees charged solid waste accepted at the SSR consolidation facility would include the cost of consolidating and loading of the solid waste into transfer trailers, long-haul transportation to the designated disposal site and the disposal cost charged by the disposal site.

Scenario 3 also includes \$425,000 in Year 1 costs for facility planning, designing, permitting, etc., including \$175,000 for master planning and \$250,000 for SSR consolidation design and permitting. However, since



the SSR facility would not be in operation in Year 1, the added costs of staffing, operating expenses, and debt service would not be incurred. With the additional residential SSR and organics disposal cost of \$169,600, the total year 1 cost will be \$594,600. The impact on the SWPF in Year 1 would be **\$9.14 per HH per year** (\$594,600/65,085).

#### 4.4 Summary

The impact of each of the Scenarios is summarized in the table below. Because each Scenario includes the previous Scenario(s) (Scenario 2 =2+1; Scenario 3 = 3+2+1), a column with the cumulative impact of the Scenarios is added to the summary.

	Impact on SWP Fee within Scenario		Cumulative Impact of Scenario on SWP Fee		
	Added Cost per HH/yr.	Added Diversion (tons)	Added Cost per HH/yr.	Added Diversion (tons)	Increase on Current Fee (\$142/yr.)
Scenario 1	\$9.66	5,250	\$9.66	5,250	6.8%
Scenario 2	\$10.23	6,500	\$19.89	11,750	14.0%
Scenario 3	\$37.21-\$46.14	6,500	\$57.10-\$62.76	18,250	40.2%-44.2%

For the unique Year 1 results, the impacts are as follows:

	Impact on SWP Fee within Scenario	Cumulative Impact of Scenario on SWP Fee	
	Added Cost per HH/yr.	Added Cost per HH/yr.	Increase on Current Fee (\$142/yr.)
Scenario 1	\$9.66	\$9.66	6.8%
Scenario 2	\$11.76	\$21.42	15.1%
Scenario 3	\$9.14	\$30.56	21.5%

## 5 Environmental Impacts Analysis - Detail

### 5.1 GHG Emissions Analysis using WARM Model (based on Scenarios)

#### Methodology:

The EPA's Waste Reduction Model (WARM) Version 15 was used to estimate the GHG emissions from systems recommendations in the Road to Zero Waste Plan. WARM is the preferred model for analyzing the GHG impacts from recommendations in Scenarios 1, 2, and 3, as it considers the total life-cycle emissions from material disposal under several Scenarios (e.g., landfilling, recycling, combustion, anaerobic digestion, etc.). The life cycle included in the model output includes waste transport, facility energy use, landfill methane emissions, and more. The main inputs required for the model are the volumes of waste processed by type in the absence of the proposed recommendations ('baseline Scenario') and the volumes processed by type with the proposed recommendations ('alternative Scenarios').

#### GHG analysis:

The WARM model determined that Scenarios 1, 2, and 3 could prevent the following approximate net totals of metric tons of carbon dioxide equivalent "MTCO<sub>2</sub>E" per year:

- **Scenario 1** - 44,912 (a decrease of 49% of MTCO<sub>2</sub>E per year)
- **Scenario 2** - 93,778 (a decrease of 68% increase of MTCO<sub>2</sub>E per year)
- **Scenario 3** - 142,644 (a decrease of 77% of MTCO<sub>2</sub>E per year)

The net total of metric tons of carbon dioxide equivalent reduction for Scenarios 1,2 and 3 is equivalent to the greenhouse gas emissions in the following sources:

- The net total of metric tons of carbon dioxide equivalent reduction for Scenario 1 equals greenhouse gas emissions from 9,994 gasoline-powered passenger vehicles driven for one year or 115,133,797 miles caused by an average gasoline-powered passenger vehicle.
- The net metric tons of carbon dioxide equivalent for Scenario 2 is the equivalent to greenhouse gas emissions from 20,868 gasoline-powered passenger vehicles driven for one year or 240,403,968 miles caused by an average gasoline-powered passenger vehicle.
- The net total of metric tons of carbon dioxide equivalent for Scenario 3 is the equivalent to greenhouse gas emissions from 31,743 gasoline-powered passenger vehicles driven for one year or 365,674,139 miles driven by an average gasoline-powered passenger vehicle.

### 5.2 Incremental Diversion Tonnages modeled in GHG Scenario

#### Methodology:

To estimate potential system impacts for these Scenarios, zero diversion tonnage assumptions for recycling and organics were created to understand potential volumes of SSR and Organics (composting and food) within Orange County. The model inputs are based on current recycling and organics (yard waste), tonnages managed by Orange County, as reported by Orange County and the Towns, County's population, and US Environmental Protection Agency (EPA) Per Capita Rates (2018). SSR and Organics diversion tonnage assumptions were used to reflect tonnages from the commercial sector and multifamily properties (provided that universal recycling for residential and commercial establishment requirements are implemented as implied in the system's recommendations).

EPA Per Capita Rates (2018) assumptions used were as follows:



- The US EPA recycling rate (including composting) was 32.1 percent in 2018, down from 34.7 percent in 2015.

The per capita generation rates in 2018 were as follows and formed the basis for the Scenario projections.

- 1.16 pounds per person per day for recycling.
- 0.42 pounds per person per day for composting.
- 0.30 pounds per person per day for other food management.

## 6 Equity Analysis - Detail

The One Orange Countywide Racial Equity Framework: Racial Equity Assessment Lens (REAL) was used to conduct an equity analysis of Scenarios 1,2 and 3. Through the assessment, a preliminary screening of the seventeen recommendations was performed to ensure that racial equity impacts, and potential barriers to equity-related outcomes, were assessed and identified during the planning and decision-making process. Each recommendation was evaluated based on the following criteria:

- Alignment with the County’s racial equity goal, as indicated in Orange Countywide Racial Equity Framework: Racial Equity Assessment Lens (REAL), and the desired outcomes for the Road to Zero Waste Plan,
- Potential missing information and/or gaps in needed impacts for data researched,
- Needed changes or support systems for programs and solid waste infrastructure with the potential of creating or extending racial inequities,

Table 1 displays the categories and associated questions that GBB uses as diagnostic testing to evaluate whether recommendations reflect racial equity goals and principles included in the One Orange Countywide Racial Equity Framework. The EJ Screening Tool provided supplemental community-level data for recommendations anticipated to impact targeted communities, including communities of color. Data gaps were present due to limited data gathered during the public engagement process for the Road to Zero Waste Plan.

Table 1 -Preliminary Racial Equity Questions based on One Orange Countywide Racial Framework

Questions (Yes/No)
Does the recommendation align with the County’s racial equity goal and principles indicated by Orange Countywide Racial Equity Framework: Racial Equity Assessment Lens (REAL)?
Does the recommendation align with the desired outcomes for the Road to Zero Waste Plan?
Are there any missing information and/or gaps in data needed to assess the impacts of this recommendation?
Are there changes or support systems for programs and solid waste infrastructure with the potential of creating or extending racial inequities



## 6.1 Equity Analysis using One Orange Countywide Racial Equity Framework: Racial Equity Assessment Lens (REAL)

The Racial Equity Assessment Lens (REAL), adapted by the Racial Equity Toolkit created by Government Alliance on Race and Equity (GARE), is a governance tool that helps jurisdictions in Orange County address racial disparities by providing a systematic approach to evaluating policies and programs during the strategic planning process. The REAL was used to evaluate the initiatives and understand whether the Plan aligns with Orange County Racial Equity Goal: “When we achieve racial equity, race will no longer predict opportunities, outcomes, or the distribution of resources for residents of Orange County, North Carolina, particularly for communities of color”.

Table 2 - One Orange Countywide Racial Equity Framework: Racial Equity Assessment Lens (REAL)

ORIGIN and DESCRIPTION of process	<ul style="list-style-type: none"> <li>For New initiatives – Why this initiative and why now?</li> <li>For Existing initiatives- including background information and milestone dates</li> </ul>
DESIRED RESULTS	<ul style="list-style-type: none"> <li>What specific results/outcomes are intended for the community or organization? (How will this initiative achieve this goal? Is anything being created, removed, incentivized, mandated, allowed, or assigned by this initiative?)</li> <li>What policies are relevant to this initiative? How do racial and social inequities impact these areas? Consider topics and subtopics related to what you are trying to achieve, i.e., business, and economic development, labor and workforce development and retention, the judiciary, public safety, housing, education, health, transportation, environment, human services, youth, recreation, and COVID-19.</li> </ul>
DEMOGRAPHICS (be as specific as possible)	<ul style="list-style-type: none"> <li>Who is this initiative focused on? (Neighborhoods, geographic areas, racial groups, income groups, employees, etc.)</li> <li>What data can you provide to describe your target population?</li> <li>What data needs to be included?</li> </ul>
BENEFITS	<ul style="list-style-type: none"> <li>Who benefits directly and indirectly from this initiative? How?</li> <li>Share any relevant data (link to the jurisdictional map and/or information)</li> </ul>
IMPACTS	<ul style="list-style-type: none"> <li>Who is negatively impacted by this initiative? How?</li> <li>For new initiatives, consider impacts during and after this initiative. How?</li> <li>What can be done to mitigate (any) negative impacts?</li> <li>Are there any challenges that need to be overcome? How?</li> <li>Share any relevant data."</li> </ul>
COMMUNITY ENGAGEMENT	<ul style="list-style-type: none"> <li>How have you involved community members in developing this initiative?</li> <li>Have you involved those directly impacted?</li> <li>How have you addressed the concerns raised by community members? Especially those directly impacted.</li> <li>Going forward, how do you plan to include the voices of those most impacted/burdened? How? Please note if they are:               <ol style="list-style-type: none"> <li>Already involved in the drafting of the process;</li> <li>What is your first step in involving them; or</li> <li>Why you do not involve them in the process.</li> </ol> </li> </ul>
ACCOUNTABILITY	<ul style="list-style-type: none"> <li>How will the impact of the initiative be measured?</li> <li>How will you share results with your department and leadership?</li> <li>How will you share results with community members and stakeholders?</li> <li>How will you incorporate feedback from community members and stakeholders?</li> </ul>



## 7 Appendix - Tonnage Projections and Financial Impacts

As noted in Section 6 for the GHG modeling, the EPA’s per capita generation rates in 2018 are as follows and formed the basis for the Scenario projections.

- 1.16 pounds per person per day for recycling.
- 0.72 pounds per person per day for organics.
  - 0.42 pounds per person per day for composting.
  - 0.30 pounds per person per day for other food management.

Given Orange County and the Towns’ baseline of 16,510 tons of recycling and 13,361 tons of organics, GBB calculated the pounds per person and then set targets for the impact of recommendations in the Scenarios as follows:

1. **Scenario 1:**  
Brings Orange County to the current EPA pounds per person per day for recycling and organics.
2. **Scenario 2:**  
Targets 50% more than the current EPA pounds per person per day for recycling and organics.
3. **Scenario 3:**  
Doubles the current EPA pounds per person per day for recycling and organics.

Taking the above figures, GBB built the financial impacts as detailed in Section 5. Financial impacts were modeled at 25% of the tonnage.

Single Stream Recycling (Baseline is 16,510 tons)	Scenario 1	Scenario 2	Scenario 3
Additional Tonnage - Cumulative	15,000	31,000	47,000
Additional Tonnage - Incremental	15,000	16,000	16,000
Residential Tonnage at 25%	3,750	4,000	4,000
Net Tip Fee @ \$28.65	\$107,438	\$114,600	\$114,600

Organics (Baseline 13,361 tons)	Scenario 1	Scenario 2	Scenario 3
Additional Tonnage - Cumulative	6,000	16,000	26,000
Additional Tonnage - Incremental	6,000	10,000	10,000
Residential Tonnage at 25%	1,500	2,500	2,500
Net Tip Fee @ \$22.00	\$33,000	\$55,000	\$55,000



Furthermore, the Full-time equivalent (FTE), Operational, Capital and One-time charges utilized are detailed below.

Scenario	#	Recommendation	FTEs	OPEX	CAPEX	One-time Charges
1	1	Update Marketing (imagery; Public education & social media); Create a rallying point	1			
	2	Focus on all language speakers in signage/messaging.		\$50,000		
	3	Raise awareness on reuse and waste prevention.		\$50,000		
	4	Advocate for more material bans and revise the solid waste ordinance.	0.25	\$100,000		
	5	Create County-level commercial and multifamily recycling requirements.	2			
	6	Innovation partnerships with UNC and UNC health system.	0.25			
	7	County purchasing for waste prevention/soil health	0.25			
	8	Consider becoming part of a reuse marketplace.	0.25			
2	9	Consistency across items accepted at WRCs (with the exception of HHW).	2	\$200,000		
	10	Enforcement at WRCs (with staff and/or security cameras)		\$200,000		
	11	More accessible drop-off options/locations for multifamily buildings.				\$100,000
	12	Offer multiple cart sizes.				
	13	Create model programs across schools for waste reduction, recycling, and composting.				
	14	Implement deconstruction ordinance updates/facility audits/collect C&D recycling data.				
3	15	Phased Master Plan for Eubanks Rd (Admin/Disposal Center) and/or alternate location(s)	N/A	N/A	N/A	\$175,000
	16	Consolidation of SSR transfer and MSW transfer.	5@ \$71,000	@\$10/ton = \$182,500	\$7mm-\$12mm	\$250,000
	17	Organics program development.	N/A	\$1.4 million	N/A	N/A



8 Appendix - WRCs

Summary of Materials Accepted at all Orange County WRCs																						
WRC Name	Materials Types																				Material Types Accepted Now	Material Types to Add
	1. Trash/Garbage	2. Single-Stream Recycling	3. Yard Waste	4. Food Waste	5. Scrap Metal	6. Plastic Bags & Film	7. Clothing, Textiles, & Shoes	8. Large Rigid Plastics	9. Used Cooking Oil	10. Motor Oil & Oil Filters	11. Anti-Freeze	12. HHW	13. Batteries	14. Electronics	15. Appliances	16. Clean Wood	17. Tires	18. Glass	19. Styrofoam/EPS	20. #1 Berry boxes, clamshells		
<b>Full-Service District Waste &amp; Recycling Centers</b>																						
Eubanks Road	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	18	2
Walnut Grove Church Road	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	18	2
<b>Neighborhood Satellite Waste &amp; Recycling Centers</b>																						
Bradshaw Quarry Road	Y	Y	N	N	Y	N	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	12	8
Ferguson Road	Y	Y	Y	N	Y	N	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	13	7
High Rock Road	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	16	4