

Rivanna Solid Waste Authority

RECYCLING PROGRAM PLANNING SERVICES

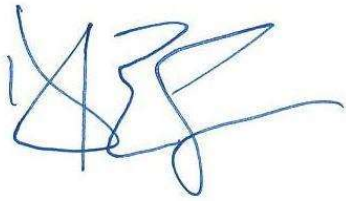
Master Plan Report

January 2019

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RECYCLING PROGRAM PLANNING SERVICES

Master Plan Report



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APPENDICES

A	Ivy MUC Site Master Plan
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ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Office
Arcadis	Arcadis US, Inc.
Authority	Rivanna Solid Waste Authority
C&D	Construction and demolition debris
City	City of Charlottesville, Virginia
County	Albemarle County
HHW	Household Hazardous Waste
Ivy MUC	Ivy Materials Utilization Center
Master Plan	Recycling Program Planning Services Master Plan Report
McIntire	McIntire Road Recycling Center
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
OCC	Old corrugated cardboard
Paper Sort	Paper Sort Facility on Meade Ave
PBR	Permit-by-rule
UVA	University of Virginia
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VSWMR	Virginia Solid Waste Management Regulations
WPO	Water Protection Ordinance

EXECUTIVE SUMMARY

Arcadis developed this Master Plan as input to updating the Rivanna Solid Waste Authority's (Authority) existing recycling program and development of conceptual design for new recycling facilities at the Ivy Material Utilization Center (MUC). The Master Plan is aimed to promote growth in the collection of recyclable materials and reduce dependency on landfill disposal. As part of these services, Arcadis reviewed and assessed the Authority's current recycling program and developed recommendations regarding targeted recyclable materials and outlined operational procedures in support of the envisioned expansion of recycling services offered by the Authority.

Based on a benchmarking study of three counties in Virginia of comparable population, size and demographics, the Authority's recycling program appears to lag behind contemporaries with regards to the number of facilities it offers for materials drop-off. The Authority currently offers one primary recycling convenience center that provides for the range of recyclables accepted by the Authority (McIntire) and two supplemental facilities with limited levels of service (the Paper Sort Facility and the Ivy MUC); whereas the Reference Counties offer between four and 11 drop-off facilities offering levels of service equivalent to McIntire. The Authority's desire to increase recycling services is consistent with the Reference Counties and is anticipated to increase the volume of recyclable materials collected. It should be noted that based on a comparison of annual budgets for recycling and solid waste services, the Authority budgets approximately 3 to 6 times less per resident in the County for solid waste public works than the Reference Counties.

Arcadis considers the Authority's existing source-separated recycling program is the appropriate course of action for its rural population. Industry trends indicate a tightening of contamination standards across global recycling markets with China, the largest global market for recyclable materials, being a primary driver. These trends have resulted in lower commodity prices for recycled materials. Source separated recyclables, dropped off by residents, is already in practice within the County and will provide the Authority with less contaminated and more marketable products. Source separation has had positive impact on reducing contamination and warrants being continued given recent pressure on pricing and revenue associated with market pressures exerted across the global recycling market.

Arcadis recommends for the proposed Ivy MUC Recycling Convenience Center to follow the existing model at McIntire. This model provides separate bins and compactors for source separated recyclables. Regarding materials recycled, we recommend the Authority continues its current recycling program (source-separated collection) but also evaluates its ability to collect and market certain recyclables, including #3 - #7 plastics and mixed paper (for which domestic and global markets are more limited) and establish a process for the regular evaluation of program costs and benefits to determine which materials are accepted, balancing public demand, market availability and reliability, and overall program costs.

Alternatives for the development of source separated recycling drop-off centers were presented to the Authority for review and selection of their preferred approach. Two alternatives were developed conceptually as part of this Mater Plan. Both alternatives provide for a clear separation of truck and passenger vehicle traffic. Alternative 1, adjacent to the existing loading dock, utilizes the multiple elevations of the loading dock, allowing for easy access to bins and compactors from above for recycling of containers and mixed paper, and ground access for recycling of other paper products, OCC, and

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plastic films and bags. Alternative 2, located in the current transfer trailer parking area, utilizes ground access for recycling of all materials, a one-way traffic pattern, and more room for future expansion. In the Authority's October 2018 Board Meeting, Alternative 1 was selected.

In addition, Arcadis developed a conceptual plan for a post-consumer food waste compost facility at the Ivy MUC. The post-consumer food waste compost facility would be used to convert post-consumer food waste into compost. Based on the recommendations of the Authority, the proposed location of the composting operations is on the Cell 1 Unlined area of the closed Ivy Landfill, immediately north of the new MSW transfer station. Customers will access the site via the Transfer Station access road. The conceptual layout of the post-consumer food waste compost facility includes a material receiving and storage area, pre-processing area, composting area for turned windrows, screening and curing area, and final compost area.

A site-wide Master Plan figure is provided as Appendix A. This figure shows how the features discussed above fit within the current and expected future land uses of the 300-acre property.

1 INTRODUCTION AND BACKGROUND

The Rivanna Solid Waste Authority (Authority) facilitates a solid waste management program for residents and businesses within Albemarle County (County) and the City of Charlottesville, Virginia (City). This program currently includes the management and disposal of recyclable material, solid waste, and household hazardous waste. The City provides solid waste collection through the purchase and use of trash stickers and provides curbside pickup of recyclables. County residents may dispose of their solid waste at the Ivy Materials Utilization Center (Ivy MUC) Transfer Station for a fee, contract with a private waste disposal hauler, or drop off recyclables in source separated bins at the McIntire Road Recycling Center (McIntire) with no fee. Residents may also utilize the Paper Sort Facility on Meade Ave (Paper Sort) to drop off recyclable paper and plastic products. Each Spring and Fall, the Authority also sponsors Household Hazardous Waste (HHW) and Bulky Waste Amnesty Days at the Ivy MUC for County, City, and Town of Scottsville residents free of charge.

Arcadis developed this Master Plan Report (Master Plan) as input to updating the Authority's existing recycling program and development of (1) alternative conceptual-level designs for a recycling convenience center and (2) the conceptual layout of a post-consumer food waste compost facility; both located at the Ivy MUC. This conceptual plan will form the basis of the Master Plan aimed to increase waste diversion via growth in overall collection of recyclable materials, reducing the dependency on landfill disposal. As part of these services, Arcadis reviewed and assessed the Authority's current recycling services and developed recommendations, regarding targeted recyclable materials and operational procedures in support of the envisioned expansion of recycling services offered by the Authority.

1.1 Objectives

Objectives of this Master Plan include the following:

- Recycling Master Plan – The Master Plan includes a discussion of the assessment of current recycling services and a description of proposed facilities and services at the Ivy MUC.
- Ivy MUC Recycling Convenience Center – Preparation of two (2) conceptual-level designs for a recycling convenience center at the Ivy MUC. The designs consist of a generalized plan layout, including access and ingress/egress roads and interior traffic patterns. It is assumed that equipment will be positioned at-grade to minimize construction requirements.
- Post-Consumer Food Waste Compost Facility – Preparation of one conceptual layout for a post-consumer food waste compost facility at the Ivy MUC. The design consists of a generalized plan layout, including access and ingress/egress roads. It is assumed that equipment will be positioned at-grade to minimize construction requirements.

Appendix A provides an overall site master plan for the Ivy MUC, showing both current and planned future uses under consideration at this time.

1.2 Existing Recycling Program Facilities within the Service Area

The Authority operates three facilities designated for recyclable materials: McIntire, the Paper Sort Facility, and the Ivy MUC. While residents of the City are welcome to use the Authority's facilities, it is assumed that City residents will make use of curbside pickup before utilizing the Authority's drop off facilities. Recyclable materials from other areas outside of the County may be accepted at the facility, with preference given to County residents, companies, and communities. A map showing the locations of these facilities within the Authority's service area is provided in Figure 1.

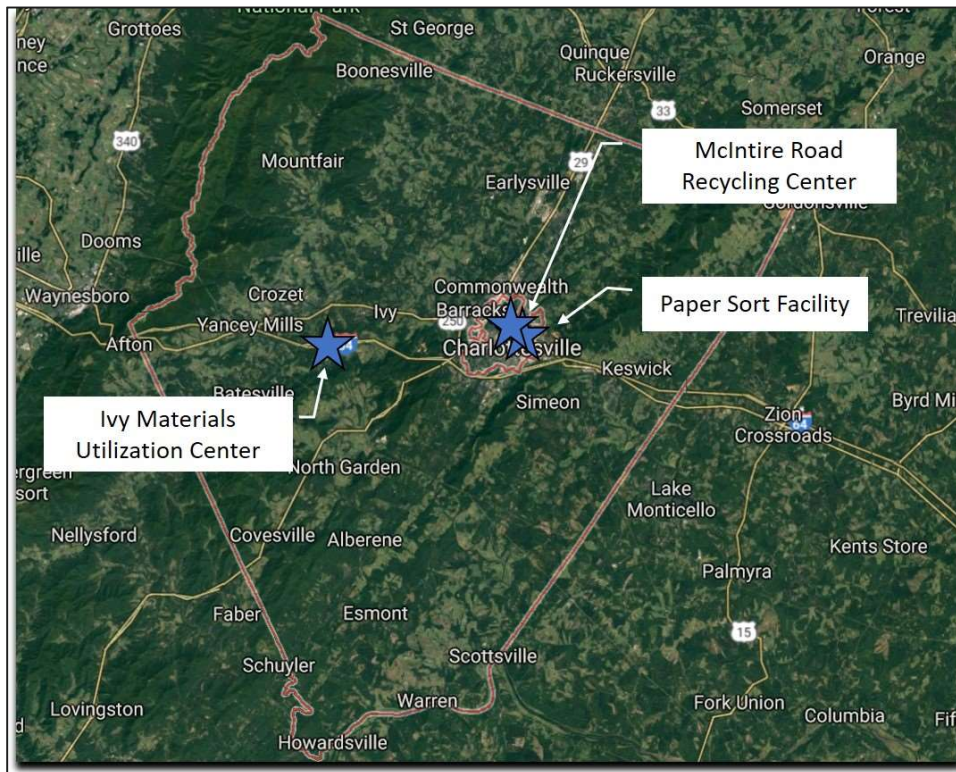


Figure 1. Rivanna Solid Waste Authority Recycling Facilities

1.3 McIntire Road Recycling Center

The Authority currently provides a recycling convenience center for residents to drop-off source separated recyclable materials at McIntire, located at 611 McIntire Road, Charlottesville, VA. There is no fee for recyclable materials. The following materials are accepted in designated bins or containers (source-separated):

- Mixed metals (steel cans, aluminum foil, pet food cans, aluminum beverage cans, other metals)
- Plastic bottles and containers (i.e. coded 1-7 rigid plastic bottles and containers)
- Glass food and beverage containers
- Plastic bags and wraps (clean and dry)

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- Old corrugated cardboard (OCC)
- Office paper (i.e. file stock)
- Newspaper, magazines, and telephone books
- Mixed paper (i.e. brown paper)

A Goodwill drop-off and a book exchange for books in good condition are also provided.

McIntire is open to the public Mondays and Wednesday - Sunday from 8:30 am to 6:30 pm during Daylight Savings Time (otherwise 8:30 am to 5:30 pm). The recycling convenience center is closed on Tuesdays for maintenance.

1.4 Paper Sort Facility

The Paper Sort Facility is located at 100 Meade Avenue, Charlottesville, VA. The following materials are accepted at the Paper Sort for no fee:

- #1 - #7 plastics
- Boxboard
- File stock (computer paper)
- OCC
- Newspapers and magazines

The Paper Sort Facility operates Monday through Friday from 7:30 am to 3:45 pm to local government, commercial enterprises, the University of Virginia (UVA), non-profit groups, and other larger recyclables haulers in the area.

1.5 Ivy Materials Utilization Center

The Ivy MUC is located at the closed Ivy Landfill at 4576 Dick Woods Road, Charlottesville, VA. The Ivy MUC includes a municipal solid waste (MSW) and construction and demolition debris (C&D) material transfer station; a vegetative waste mulching operation; a recycling convenience center for accepted recyclables; HHW collection: collection for white goods, pallets, and tires; and the Encore shop for collection and sale of reusable items.

Recyclable materials accepted at the Ivy MUC currently include the following:

- Cardboard
- Newspaper and magazines
- Motor oil
- Antifreeze.

Paint cans (latex and oil-based) are also collected for disposal on a daily basis to reduce long lines on HHW amnesty days. Paint cans and the above-listed recyclables are accepted at no cost.

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The Authority also accepts residents' compostable food waste in compostable bags and MSW in 32-gallon trash bags with applicable trash stickers (\$2.00 per 32-gallon bags). MSW brought to the Transfer Station is charged a fee of \$6.00 plus a \$1.00 service fee for County residents and \$6.00 plus a \$10.00 service fee for non-County residents. Wood waste brought to the Ivy MUC is ground into mulch for sale to the general public. The Authority also sponsors, free of charge to residents, HHW and Bulky Waste Amnesty Days at the Ivy MUC for County, City, and Town of Scottsville residents.

The Ivy MUC operates Tuesday through Friday from 7:30 am to 4:00 pm and on Saturday from 8:30 am to 4:00 pm. The Ivy MUC is closed on Sundays, Mondays, and designated holidays.

1.6 Projected Throughput Based on Population Projection

Consideration was given to estimating projected future recyclable amounts collected as a result of implementing a convenience center at the Ivy MUC. In a broad-based view, an initial increase is expected, as customers will use the center based on their view of its convenience. This may take away from current uses at other available recycling facilities. However, after the initial increase, it is expected that future growth in recyclable collection at convenience centers to be tied to population growth. Therefore, flexibility is required in developing convenience centers so that the level of service can be adjusted to reflect trends established by customer use. For information purposes, Table 1 presents population and recyclable collection for the last 5 years for Albemarle County, inclusive of the City of Charlottesville.

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Table 1. Historic Population and Recyclable Materials Recovered

RIVANNA SOLID WASTE AUTHORITY

Waste Tonnages Diverted for Reuse or Recycling

Population (estimate as of July 1) (see note 1)		2013	2014	2015	2016	2017
Albemarle County, Virginia		102,349	103,835	105,218	106,419	107,702
Charlottesville City, Virginia		45,081	45,575	46,476	47,286	48,019
Material (tons)	Market User					
Cardboard (corrugated)	Sonoco**	358	279	278	459	812
Newspaper, magazines, catalogs	Sonoco**	782	640	524	512	419
Mixed paper and phone books	Sonoco**	214	265	212	214	156
File stock (office paper)	Sonoco**	192	164	125	125	122
Glass*	Strategic Materials	398	249	219	191	242
Metal cans	Gerdau	47	34	30	32	31
Plastic	Sonoco (#1-7), Trex (#2,4 plastic films)	69	98	95	82	85
Subtotal		2,060	1,729	1,483	1,615	1,868
Recyclable Generation Rate: Albemarle County, Virginia (lb/person/day)		0.110	0.091	0.077	0.083	0.095
White goods (scrap metal)		76	73	80	107	123
Vegetation		3,714	2,016	1,874	1,560	2,864
Pallets		81	71	79	55	72
Tires		131	92	133	169	87
Subtotal		4,002	2,252	2,166	1,891	3,146
Recyclable Generation Rate: Albemarle County, Virginia (lb/person/day)		0.214	0.119	0.113	0.097	0.160
TOTAL		6,062	3,981	3,649	3,506	5,014

* Glass includes glass crushed and reused on roads at Ivy MUC for FY 2012 and prior years.

** Much of the paper products go to Sonoco. However, periodically they are sent to other markets (Georgia Pacific; Greif, Inc., etc.).

(1) Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2017.

Source: U.S. Census Bureau, Population Division. Release Dates: For the United States, regions, divisions, states, and Puerto Rico Commonwealth, December 2017. For counties, municipios, metropolitan statistical areas, micropolitan statistical areas, metropolitan divisions, and combined statistical areas, March 2018.

2 BENCHMARKING AND RECYCLING TRENDS

Arcadis prepared a benchmarking study consisting of an internet search and phone survey to compare the Authority's recyclables drop-off program against three other municipalities of comparable size and demographics.

2.1 Benchmarking Survey of Comparable Communities

Arcadis surveyed the recycling programs of three counties in Virginia of comparable population, size and demographics as the Albemarle County. The counties surveyed are Frederick County, Hanover County, and Warren County (referred to as Reference Counties). The Reference Counties are demographically similar to the County, ranging from 50-61% urban population and 39-50% rural population. Table 2 below provides a summary of the recycling programs in each of the Reference Counties.

Of the Authority's three recycling convenience centers (McIntire, Paper Sort, and Ivy MUC), McIntire provides the widest range of recycling services. At McIntire, bins (or containers) are provided for each recyclable material collected and is consistent with the types of operations provided by the Reference Counties. To compare the cost of services for residential recycling, Albemarle County funds the Authority's operating costs for the McIntire Road Recycling Center, the allocated FY 2018 budget for which is \$641,939, equivalent to approximately \$6.49 per County resident, based on the most recent population census in 2010.¹ The Reference Counties offer between four and 11 recycling convenience centers within their respective counties. Based on the most recent County adopted budgets for FY 2018, the Reference Counties' allocated budgets for solid waste public works range between \$17.79 to \$41.22 per resident, 2.7 to 6.4 times the budget per resident in the County. The approach to increase the number of recycling convenience centers is anticipated to increase the volume of recyclable materials collected.

¹ In FY2019, Albemarle County increased funding to the Authority by 30.6%, from \$641,939 to \$838,579. The funding increase included funds for 10 months of operations of the new Ivy MUC Transfer Station and 4 months of operations of the planned Ivy MUC Recycling Convenience Center. Reference: Albemarle County Adopted FY 2019 Budget. (http://www.albemarle.org/upload/images/Forms_Center/Departments/County_Executive/Forms/FY19_FINAL_ADOPTED_BUDGET_08302018.pdf) Accessed January 15, 2019.

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Table 2. Recycling Program Benchmarking Summary

Item	Albemarle County, VA	Frederick County, VA	Hanover County, VA	Warren County, VA
Population	98,970	78,305	99,863	37,575
Percent Urban	55%	55%	61%	50%
Percent Rural	45%	45%	39%	50%
Solid Waste Budget	\$641,939	\$1,393,372	\$4,550,885	\$857,852
Cost/County Resident (2018)	\$6.49	\$17.79	\$41.22	\$22.83
Source of Cost	FY 2018 County Adopted Budget, pg 147	FY 2018 Adopted Budget, pg 127 (160 pdf), Refuse Collection	FY1 2018 Adopted Budget, pg 148 Pubic Works Operations	FY 2017-2018 Budget Book, pg 127 Refuse Collection-Convenience Sites plus Transfer Station
Recycling Rate (source: Virginia Annual recycling Summary Report, Calendar Year 2016)	32.8% (Thomas Jefferson Planning District - 2016)	51% (projected - 2018) 45.9% (Northern Shenandoah Valley Regional Commission -2016)	58.9% (Central Virginia Waste Management Authority - 2016)	45.9% (Northern Shenandoah Valley Regional Commission -2016)
Recycling Services Provided by the County	1 drop-off convenience center 1 paper sort facility additional materials drop-off at MSW transfer station site	11 drop-off convenience centers	4 drop-off convenience center	5 drop-off convenience centers
Other Recycling Services	City of Charlottesville, VA provides curbside pickup separately (not included in survey)	none provided	Curbside pickup separately on a per subdivision basis, currently for 20 subdivisions. County facilitates the startup phase only (not included in survey)	Town of Front Royal, VA provides curbside pickup separately (not included in survey)
Single Stream / Dual Stream / Source Separated	Source Separated	not provided	not provided	Source Separated
Recyclable Materials Collection:				
Ferrous metal containers (i.e. steel cans)	McIntire	X	X	X
Non-ferrous metal containers (i.e. aluminum beverage cans)	McIntire	X	X	X
Plastic bottles and containers (i.e. coded 1-7 rigid plastic bottles and containers)	McIntire	X	X	X
Glass food and beverage containers	McIntire		X	X
Plastic bags and wraps (clean and dry)	McIntire	X		
Old corrugated cardboard	McIntire, Paper Sort, Ivy MUC	X	X	X
Office paper	McIntire & Paper Sort	X	X	x
Newspaper and magazines	McIntire, Paper Sort, Ivy MUC	X	X	X
Mixed paper	X	X	X	X
Telephone Books	X	X		
Motor Oil	X		X	X
Antifreeze	Ivy MUC		X	X
Goodwill	McIntire	X		
White goods	Ivy MUC		X	
Paint (disposal)	Ivy MUC			X
Batteries			X	X
Scrap metal			X	X
Recyclable Materials Markets:				
Desination of Materials (i.e. MRF, markets, etc.)	Directly to private markets	not provided	Directly to private markets	Directly to private markets
Fee for Recyclables	Free for recyclable materials	Free for recyclable materials	Free for recyclable materials (does not include e-waste or tires)	Free for recyclable materials
Source	County website	County website	e-mail correspondence	e-mail correspondence

2.2 Current Challenges in the Recycling Industry

2.2.1 Drivers Affecting Recycling

Recycling, a commodity-driven operation, is dependent on material supply and market demand for specific products (paper, glass, plastics, etc.). Over the past 10-15 years, domestic recycling has grown through a combination of public demand, collection practices, and availability of global outlets with high tolerances for a wide-range of collected materials. Public demand drove communities to develop increasingly efficient methods to collect recyclables. Much of the progress was realized through combined collections (or single-stream), a practice that has not only increased the volume of recyclables separated from MSW, but also the amount of contamination (inclusion of non-recyclable materials) in the recyclables stream.

Many communities used public or privately-operated materials recovery facilities (MRFs) to process the mixed recyclables, separating products into specific material streams for transfer to markets. While this practice supported a growth in recyclables separated from the waste stream, a decline in the quality of the recycled products was observed, which limited the marketability of the recovered recyclables within the broader market. Contamination in single-stream collected recyclables is reported to be 30% or greater.

At the same time, the global recycling market's material quality tolerance masked the risk of contamination in the recyclables stream. In 2017, China, the major importer of recyclables globally and reported by the United Nations to have accepted nearly 50% of the world's plastics since 1992, began to ban the import of certain recyclables, including several kinds of plastic and mixed paper and instituted a requirement that acceptable recyclables, including cardboard and scrap metal, meet new contamination standards.² In 2016, China and Hong Kong accounted for 72% of all U.S. plastic scrap exports (U.S. Census Bureau / U.S. International Trade Commission).

China's current standard (0.5% contamination) is a major compliance challenge for U.S. recycling. Recyclers report pursuing other global markets (Thailand, Vietnam, Taiwan, India); however, these secondary markets have not presented replacement capacity.³ Additionally, the cost to access these secondary markets is greater than that for China due to more limited shipping routes. In an article published in the Wall Street Journal, Republic Services estimates the impact of these changes could lead to the doubling of average per household costs for curbside recycling services.⁴ The timeline of China's waste import actions is presented below.

² China's trash ban lifts lid on global recycling woes but also offers opportunity. United Nations. July 6, 2018. <https://www.unenvironment.org/news-and-stories/story/chinas-trash-ban-lifts-lid-global-recycling-woes-also-offers-opportunity> (accessed January 3, 2019).

³ The Dirty Truth is Your Recycling May Actually Go to Landfills. The Huffington Post. July 24, 2018. https://www.huffingtonpost.com/entry/america-china-recycling-crisis-landfills_us_5b5170b1e4b0de86f48b7740 (accessed January 3, 2019).

⁴ U.S. Recycling Companies Face Upheaval from China Scrap Ban. The Wall Street Journal. August 2, 2018. <https://www.wsj.com/articles/u-s-recycling-companies-face-upheaval-from-china-scrap-ban-1533231057> (accessed January 3, 2019).

CHINA WASTE IMPORT RESTRICTIONS: TIMELINE



While China's waste import restrictions have certainly caused significant challenges for recycling globally, it has shed light on areas for improvement in current recycling practices. Recycling markets have long been concerned with contamination levels, and MRFs have continued to develop technologies that improve the separation of targeted recyclable materials. Recycling managers should understand this end-of-pipe approach has limitations, and the need to educate the public on what is acceptable for recycling collection, and what is not acceptable, is critical. Public education programs need to be closely aligned with changes in the recycling market to assure the collected materials are marketable.

China has announced plans to further restrict imports of scrap aluminum, steel and copper, starting July 1, 2019. This recent announcement is aligned with China's stated goal of banning all scrap imports by 2020.⁵

Recycling demand has also been impacted by changes in product manufacturing. Packaging is one example. As manufacturers continue to refine product development and increase cost-efficiency, packaging has become lighter, utilizing less materials. Additionally, the commodity price for virgin materials can impact recycling markets. In the case of plastics, the price of oil has significant influence on recyclable plastic markets.

2.2.2 Observed Impacts to Recycling Communities

Current drivers in the recycling market, most specifically contamination restrictions put in place by China, have affected recycling in a number of ways: rising costs, programmatic changes including switching from single-stream to dual-stream collections, limiting the types of materials accepted, and in some cases, disposing of collected recyclables, closing of facilities, and cessation of recycling programs. Examples include:

⁵ China details scrap metal import restrictions for July. www.wastedive.com. January 3, 2019. <https://www.wastedive.com/news/china-scrap-metal-import-restrictions-july/545112/> (accessed January 3, 2019).

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- As the Virginia Peninsula Public Service Authority's contract with County Waste approaches expiration in June 2019, the three municipalities serviced by it are expecting major cost increases. The Virginia Gazette reports that all involved are looking for different ways to budget ahead of an expected increase to \$6 or more per household for monthly service – up from \$1.58 currently. [www.wastedive.com. How Recycling is Changing in All 50 States. (accessed January 2, 2019)]
- TFC Recycling, in July 2018, notified the City of Norfolk, VA it was terminating its recycling contract that ran through 2022. China's recent changes for recyclables was cited as a driving factor. TFC Recycling also terminated its contract with the City of Hampton. [www.pilotonline.com. Norfolk's recycling collector is leaving town – unless it gets a better deal. August 17, 2018. (accessed January 2, 2019)]
- Three towns on Long Island, NY, representing a population of 625,000, have moved from single-stream to dual-stream collections. This new approach requires residents to sort fiber (paper) and metals and plastics in separate bins. This program modification was reported to be necessary after Green Stream Recycling, in October 2018, opted out of an ongoing contract to process single-stream recyclables due to overall cost. [www.wastetodaymagazine.com. Long Island Communities Eye Dual-Stream Collection. November 22, 2018. (accessed January 2, 2019)]
- On-campus recycling at Virginia Tech, Blacksburg, VA was recently modified to limit plastics recycling to #1 (PET) and #2 (HDPE). Plastics #3 - #7 will no longer be recycled. This change, made in concert with the Montgomery County Regional Solid Waste Authority, is a direct response to China's new requirements for recyclable products. [www.wvnstv.com. National restrictions alter campus recycling. October 12, 2018. (accessed January 2, 2019)]
- Dayton, VA and two other Harrisonburg, VA area communities have ceased curbside recyclables collection. The Town of Dayton explained the move was due to the recycling contractor stating they would no longer be able to recycle the collected materials and would instead need to send them to a landfill. The two other communities, Harrisonburg and Broadway, cited the closure of the van der Linde Recycling facility and cost increases of 63%. [www.whsv.com. Dayton ditches road-side recycling. November 26, 2018. (accessed January 2, 2019)]

2.3 Looking Forward

The current recycling landscape is experiencing significant uncertainty, largely driven by changes in market criteria of global markets. As a result, the cost of recycling is increasing in response to increased risks of material marketability and increasing dramatically in a number of reported cases. These changes have caused both communities and recycling service providers to re-evaluate their recycling programs.

The central issue is what materials are collected and the collection method – the approaches for which are focused on minimizing the potential for contamination and collecting materials that are in-line with market demand. As this relates to the Authority, the current recycling practice of source-segregation via drop-off facilities may be considered a best practice to reduce contamination and control cost, as the process of point-of-generation separation limits cross-contamination. The Authority's current practice can also be adjusted to changing market conditions.

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While the current recycling program positions the Authority to mitigate risks associated with marketability of recovered recyclables, public education remains an important part of a successful program, particularly when market conditions require changes in materials accepted. The high level of customer interface at collection centers benefits the Authority's public education efforts.

The Authority's current approach to recycling is appropriate as it limits exposure to broader recycling markets. Expansion of the recycling program by increasing access to residents should enable growth in a controllable manner. While the Authority enjoys local markets for most recyclables collected, close interaction with markets is a necessity to assure a cost-effective program that provides an appropriate level of service to its residents at an affordable cost. There are numerous reports regarding communities who are facing costs as high as \$70 per ton to send recyclables to markets and as a result have focused on recycling #1 and #2 plastics, metal cans and aluminum, materials for which more reliable markets generally exist.

We recommend the Authority evaluates its ability to collect and market certain recyclables, including #3 - #7 plastics and mixed paper (for which domestic and global markets are more limited) and establish a process for the regular evaluation of program costs and benefits to determine which materials are accepted, balancing public demand and overall program costs.

2.4 Conceptual Site Arrangements

The following section provides the conceptual site arrangements alternatives for collection of source-separated recyclables and a conceptual plan for a post-consumer food waste compost facility at the Ivy MUC.

2.5 Description of Proposed Recycling Convenience Center

Based on the recommendations of the Authority, the proposed recycling convenience center was envisioned at either the Ivy MUC loading dock, to the east of the Maintenance Shop and Encore Shop, or at the transfer trailer storage lot to the east of the loading dock. The Ivy MUC loading dock is presently developed or utilized as a drop-off center for newspaper, magazines, and cardboard. As the name suggests, the transfer trailer storage lot is presently utilized as a parking area for transfer trailers.

The proposed recycling convenience center may accept the following materials in designated bins or containers:

- Mixed metals (steel cans, aluminum foils, pet food cans, aluminum beverage cans, other metals)
- Plastic bottles and containers (e.g., coded 1-7 rigid plastic bottles and containers)
- Glass food and beverage containers
- Plastic bags and wraps (clean and dry)
- Old corrugated cardboard (OCC)
- Office paper (e.g., file stock)
- Newspaper, magazines, and telephone books

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- Mixed paper (e.g., brown paper)

Figure 2 illustrates the potential locations (loading dock area and transfer trailer storage area) for the proposed recycling convenience center.

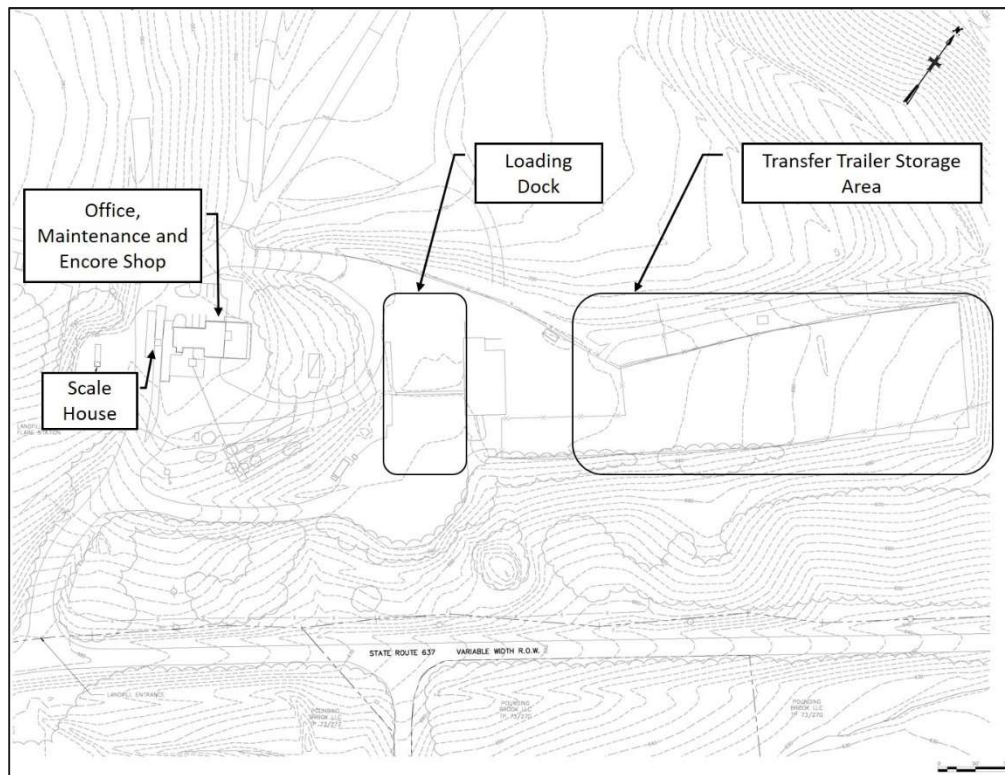


Figure 2. Potential Locations for Ivy MUC Proposed Recycling Convenience Center

2.5.1 Recycling Convenience Center Assumptions

The following assumptions were used in the development of the conceptual plans presented in this Master Plan:

- Materials handled will be recyclable materials and incidental solid waste materials that may be inadvertently placed in with the recyclables at the point of waste generation.
- Recyclable materials will be source separated and placed in up to twelve containers or bins (depending on the materials accepted by the Authority), including a bin for each material plus extra space for future expansion.
- Container and bin dimensions are assumed to be 22 feet long by eight feet wide.

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- A minimum of 35 feet will be provided to access containers and bins for loading and unloading operations.
- Customer walkways are 10 feet wide
- The customer passenger vehicle area will be separate from the maneuvering space of transfer trailers.
- On-site roadway width for lane of travel is 15 feet and minimum shoulder width is five feet.
- Vehicle turning paths are based on American Association of State Highway and Transportation Office (AASHTO) standard vehicles P (Passenger), SU (single unit), and WB 67 (Truck tractor and 53-foot-long trailer).

2.5.2 Recycling Convenience Center Alternative 1

The site of the proposed facility for Alternative 1 will utilize both the loading dock and a portion of the vegetated area to the west of the loading dock. Photographs of the loading dock are provided in Figures 3 and 4. To fully utilize the space of the loading dock, and to minimize the amount of grading and site transformation, this layout proposes to place up to six bins or containers on both the upper and lower levels of the loading dock, perpendicular to the loading dock wall.

A walking path is proposed on the upper level of the loading dock for customers to access each material bin or container. On the upper level, adequate walking paths will be provided between each bin. On the lower level, containers or bins will be either open-topped, or equipped with top-feeding hoppers, allowing customers to toss their recyclables from the edge of the upper level of the loading dock. Customers would not require access to the lower level of the loading dock.



Figure 3. Loading Dock Lower Level (facing North)



Figure 4. Loading Dock Upper Level (facing South)

The primary feature of the convenience center layout is a separation of passenger vehicle (customers) and transfer trailer traffic (see Figure 5). Both passenger vehicles and transfer trailers will access the convenience center by making an immediate right upon entering the Ivy MUC. However, once vehicles reach the convenience center, passenger vehicles will bear left to access the convenience center parking area, while transfer trailers will bear right to travel an extended loop around the convenience center that will provide loading and unloading access to the containers and bins and access to the transfer trailer storage lot. The convenience center parking area consists of a single row of pull-in/pull-out parking adjacent to the upper level of the loading dock. Customers will exit the parking area along the same two-lane road they travelled to enter the parking area, diverting recycling customer traffic away from the scales. The layout proposes shifting the access road to the Maintenance Shop to the west of the parking area.

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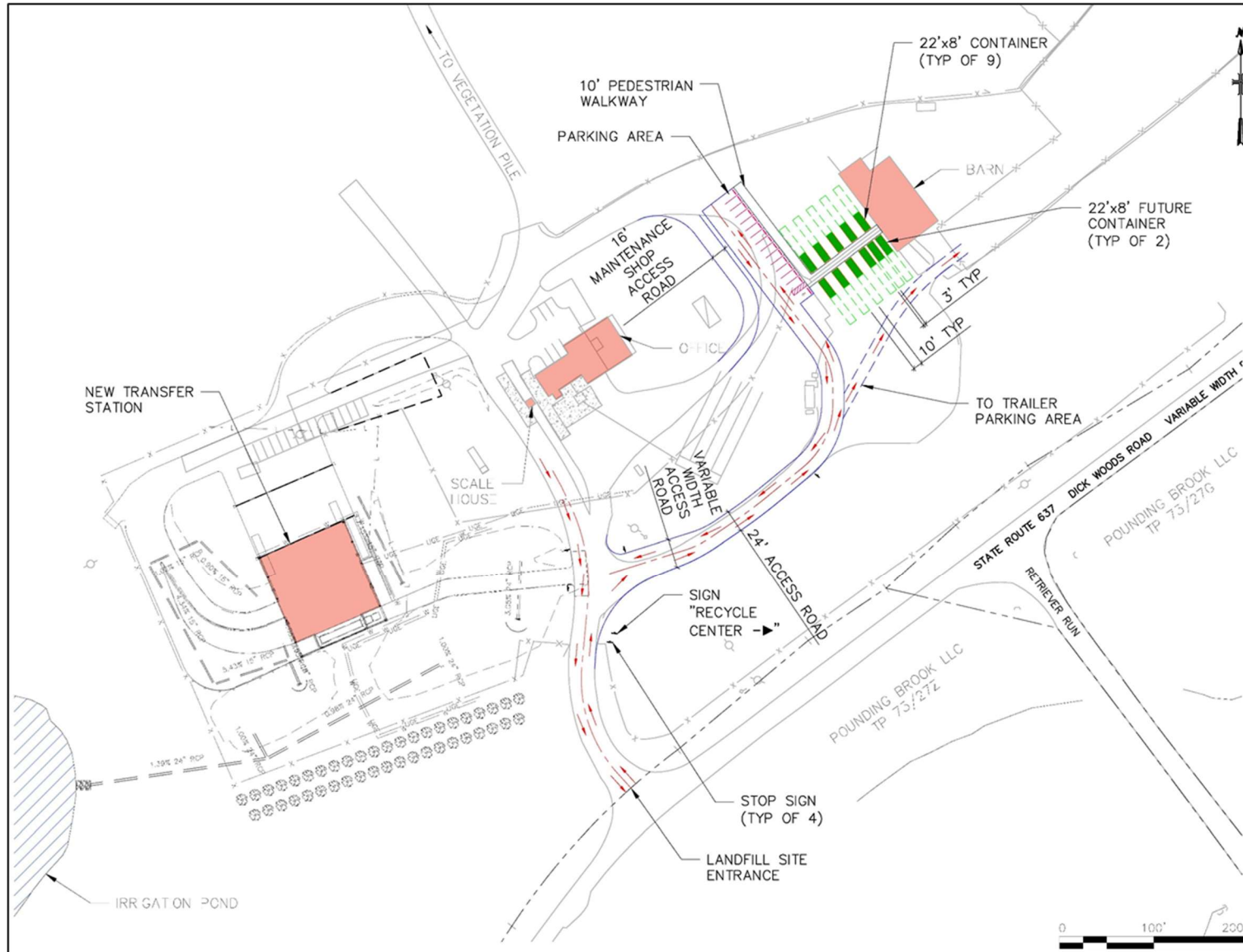


Figure 5. Recycling Convenience Center Alternative 1

2.5.3 Recycling Convenience Center Alternative 2

Alternative 2 will utilize the eastern portion of the transfer trailer storage area. The layout proposes containers aligned diagonally with adequate walking paths between each bin or container for customers to walk back and forth to access each material bin or container. Figure 6 illustrates the concept for Alternative 2, shown with 11 containers.

This alternative features an access road with two driving lanes that circles around the convenience center in a counter-clockwise direction. Both passenger vehicles and transfer trailers will access the convenience center by making an immediate right upon entering the Ivy MUC. The inner lane is to be designated for passenger vehicles, while the outer lane is to be designated for transfer trailer traffic. Once vehicles reach the convenience center, passenger vehicles in the inner lane may park in a single row of pull-in/pull-out parking south of the bins or containers. Transfer trailers in the outer lane can continue around the access road to the north side of the bins or containers, where they can access the bins or containers for loading and unloading operations. Transfer trailers can also continue past the convenience center where they store trailers in the open area to the west of the convenience center. The layout also proposes creating a single lane of traffic to the west of the loading dock for passenger vehicles to exit the site, diverting recycling customer traffic away from the scales, and shifting the access road to the Maintenance Shop to the west of the exit road.

2.5.4 Comparison of Recycling Convenience Center Alternatives

The layouts for both Alternatives 1 and 2 were compared to evaluate both in terms of advantages and disadvantages. The layouts were evaluated based on the following key criteria:

- ease of vehicle movement throughout the site;
- separation of vehicle types;
- inbound queuing space prior to the convenience center;
- minimize impact of site operation on adjacent properties; and
- options for future expansion.

2.5.5 Advantages

Both layouts provide access to the convenience center separate from the Transfer Station and scales and backing access for loading and unloading of the bins and containers. Both layouts also provide for queuing of inbound vehicles along the site access road.

The main advantage to Alternative 1 is a clear separation between passenger vehicles and transfer trailer traffic. Once passenger vehicles turn into the convenience center, they are separated from other site activities. There is minimal opportunity for interaction between transfer trailers and pedestrians during bin or container loading and unloading operations. Another advantage to Alternative 1 is that construction activities will be limited to the loading dock area and will not impact the transfer trailer storage area.

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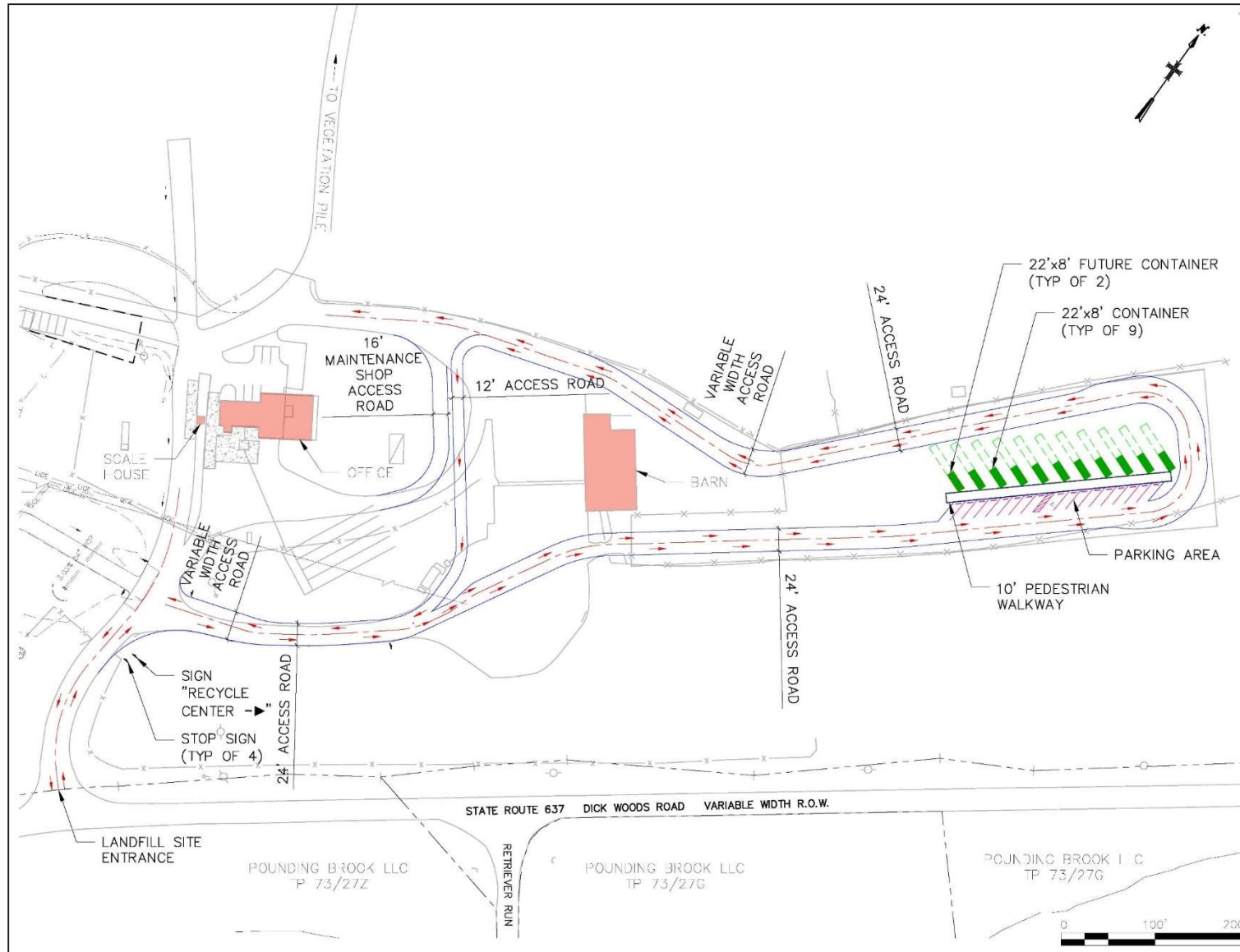


Figure 6. Recycling Convenience Center Alternative 2

An advantage of Alternative 2 is that traffic is directed in a one-way circular loop around the convenience center. Alternative 2 also provides more flexibility for future expansion. Although only two spaces are shown in the site plan below for expansion of additional bins or containers, additional containers can be added to the west of the bins shown, as future needs may require.

2.5.6 Disadvantages

In both alternatives, passenger vehicles share a portion of the access road with transfer trailers. This interaction is greater with Alternative 2, in which the entire access road is shared. Construction of both layouts will also impact access to the Maintenance Shop, requiring construction of a new access road to the west of the loading dock area to maintain the current level of access to this facility.

A primary disadvantage of Alternative 1 is that vehicles are directed to the parking area through a two-way traffic pattern. This two-way traffic may also impact queuing of inbound vehicles. In addition, there is limited space available for future expansion for both customer parking and bin placement.

The primary disadvantage of Alternative 2 is the sharing of the access road between transfer trailers and pedestrian vehicles. While there is a clear separation of travel lanes, a parking area for passenger vehicles, and the loading and unloading of bins and containers is the opposite side of the site from pedestrian walkways, pedestrians may still be impacted if operations are performed during time that is open to the public. Alternative 2 also reduces available transfer trailer parking. A summary of advantages and disadvantages of Alternatives 1 and 2 is provided in Table 3.

Table 3. Advantages and Disadvantages of Proposed Recycling Convenience Center Alternatives

Evaluation Attribute		Alternative 1 Loading Dock	Alternative 2 Transfer Trailer Storage Area
Advantages	a. Ease of vehicle movement throughout the site	<ul style="list-style-type: none"> • Site access is separate from Transfer Station and scales • Backing movement is provided for loading/unloading of bins/containers 	<ul style="list-style-type: none"> • Site access is separate from Transfer Station and scales • Backing movement is provided for loading/unloading of bins/containers • One-way vehicle circulation for customers and transfer trailers
	b. Separation of vehicle types	<ul style="list-style-type: none"> • Passenger vehicles are separated from transfer trailers at convenience center • Loading and unloading of bins/containers is separate from pedestrian walkways 	<ul style="list-style-type: none"> • Dedicated travel lanes are provided for recycling customers and commercial traffic • Loading and unloading of bins/containers is separate from pedestrian walkways
	c. Inbound queuing space prior to convenience center	<ul style="list-style-type: none"> • Inbound queuing space provided along access road 	<ul style="list-style-type: none"> • More inbound queuing space provided along access road, including back to barn and past loading dock area

Evaluation Attribute		Alternative 1 Loading Dock	Alternative 2 Transfer Trailer Storage Area
	d. Minimize impact of site operation on adjacent properties	<ul style="list-style-type: none"> Construction is limited to loading dock area 	<ul style="list-style-type: none"> N/A
	e. Future Expansion	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Can be expanded to the west for future expansion
Disadvantages	a. Ease of vehicle movement	<ul style="list-style-type: none"> Two-way traffic for passenger vehicles 	<ul style="list-style-type: none"> N/A
	b. Separation of vehicle types	<ul style="list-style-type: none"> Passenger vehicles share access road with transfer trailers at convenience center approach only Operational controls are required to maintain safety when bins are changed out while customers on site 	<ul style="list-style-type: none"> Passenger vehicles share access road with transfer trailers for full access road Operational controls are required to maintain safety when bins are changed out while customers on site
	c. Inbound queuing space prior to convenience center	<ul style="list-style-type: none"> Two-way traffic in parking area may impact inbound queuing, potentially impacting access to the transfer trailer storage area 	<ul style="list-style-type: none"> N/A
	d. Minimize impact of site operation on adjacent properties	<ul style="list-style-type: none"> Temporary impact access to Maintenance Shop 	<ul style="list-style-type: none"> Temporary impact access to Maintenance Shop Construction impacts both loading dock and trailer storage areas
	e. Future Expansion	<ul style="list-style-type: none"> Future expansion is limited 	<ul style="list-style-type: none"> N/A

2.5.7 Selection of Site Arrangement

The layouts, features, and operating schemes for Alternative 1 and Alternative 2 were summarized separately and presented at the Authority's October 2018 Board meeting. Following the Authority's discussions, the Authority selected Alternative 1 as the preferred approach for expanding recycling services at the Ivy MUC.

2.6 Post-Consumer Food Waste Compost Facility

The proposed post-consumer food waste compost facility would be used to convert post-consumer food waste into compost. Based on the recommendations of the Authority, the proposed location of the composting operations is over top of the unlined portion of Cell 1 of the closed landfill, north of the new MSW transfer station. The closure system of this cell consists of 12 inches of intermediate cover soil, covered with 18 inches of low permeability soil⁶, and topped with six inches of vegetative cover soil. Prior to detailed design, it will be necessary to evaluate the integrity of the cap system of this portion of the landfill to determine its ability to prevent public contact; as well as evaluate effect of operations and surcharge loading on stability of the cap.

2.6.1 Compost Facility Assumptions

The following assumptions have been used in the development of the compost facility site arrangement:

- The compost technology will be aerobic digestion in turned windrows.
- Materials accepted will include only post-consumer food waste, including compostable bags.
- Food exclusions include: large bones, mussel and clamshells, pineapple tops, cornhusks, and raw bread dough.⁷
- A fee will be collected for materials delivered. Weights will be determined using the existing scales at the Ivy MUC.
- Windrow height is six feet high, to be turned manually by front-end loader.
- Windrow width is 12 feet wide.
- The volume of material to be processed in windrows is a maximum of 1,000 cubic yards at any time. This yields a maximum of four windrows at a length of 120 feet long.
- Aisle width is 25 feet between windrows.

2.6.2 Compost Facility Site Arrangement

The proposed post-consumer food waste compost facility will be located north of the new MSW Transfer Station. Customers will access the site via the Transfer Station access road and will enter a gated gravel parking area located in the southwest corner and along the southeaster side of the site. The receiving and storage areas are located to the north of the parking area. Starting from the receiving and storage area, the following designated areas are laid out, in a counter clockwise arrangement: pre-processing area, composting area for turned windrows, screening and curing area, and final compost area. The site will be arranged such that customers can access the final compost area from the parking lot. The conceptual layout of the post-consumer food waste compost facility is provided in Figure 7.

⁶ Permeability $\leq 1 \times 10^{-5}$ cm/s

⁷ Yeast bacteria in bread dough would destroy the unit's bacteria colonies.

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The conceptual layout of the post-consumer food waste compost area assumes the operations to include windrows. The primary concern is odor control. There are alternate technologies, which include, but are not limited to forced-air static piles (a fan and header system to draw air into the windrows) and closed systems, such as in-vessel composting. Given the location of the proposed compost facility, the limited proximity of neighbors, and the uncertainty of the volume of post-consumer food waste that may be received by the Authority, it is recommended initially the compost facility be windrows, with material mixing/turn-over using existing Transfer Station equipment. It is assumed that the Authority would rent specialty equipment (e.g., grinders, screens) necessary to support the compost facility operations until such time that the demand would justify capital equipment purchase.

This approach will minimize initial capital expenditure and maintain flexibility as the compost facility is established and operating on a consistent basis. The windrow concept shown in Figure 7 is easily modified to include a forced-air system. For odor control, the fan exhaust can be routed through a bio-filter (mulch or wood chip pile). In addition, it is recommended that yard waste (e.g., soil, mulch, wood chips) be used as an amendment to create an acceptable and marketable end-product.

A preliminary estimate of construction cost is presented in the section below. As available topography data is limited, general assumptions include:

- The landfill's existing cap surface (top of cap) will not be cut by more than 0.5 feet.
- A level surface is assumed for the compost facility.
- Fill required is conservatively estimated to be equivalent to three feet (compacted) across the compost facility footprint. Up to 10 feet of fill may be required along the northeast boundary.
- Utilities, limited to water supply, are included. It is assumed power would be taken from the Transfer Station.

The above assumptions, including grade, erosion and sediment controls, and stormwater management, will be optimized during detailed design. Resolution of these and other design criteria will impact the capital cost of the facility.

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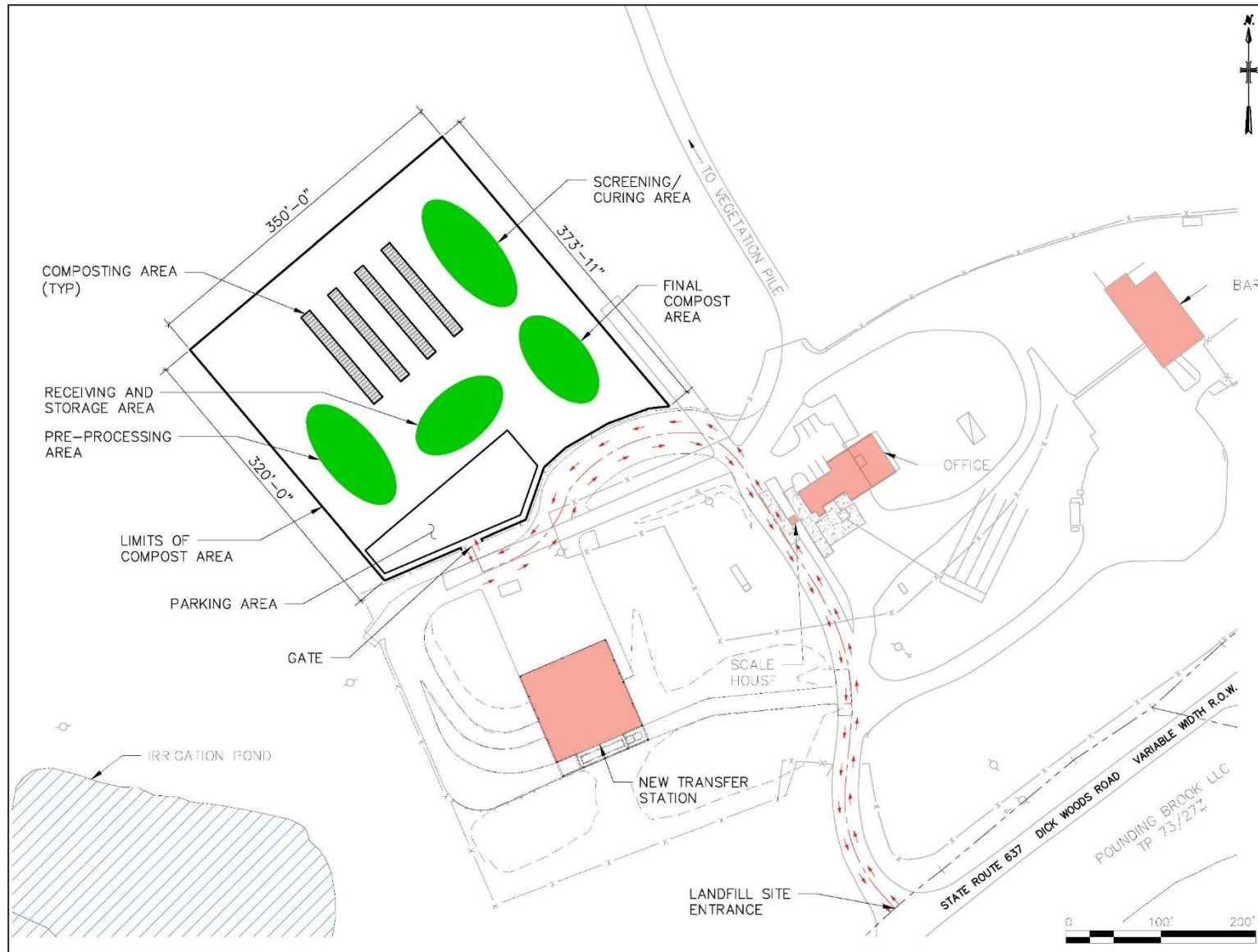


Figure 7. Post-Consumer Food Waste Compost Facility

3 IVY MUC RECYCLING CONVENIENCE CENTER IMPLEMENTATION

3.1 Implementation Schedule

A generic implementation schedule was prepared for design, permitting, and construction activities associated with the preferred alternative. Generalized activities and durations are indicated to enable the schedule to serve as a planning document. Table 4 provides a preliminary project schedule of activities required for the design, procurement, and construction of the proposed Ivy MUC Recycling Convenience Center. A schedule of approximately twelve months is required for design, seven and half months for procurement of equipment and a general contractor, and seven months for construction and start-up and testing of equipment. The total time to implement the project is estimated to be approximately 15 months, as shown in Table 4.

Table 4. Preliminary Project Schedule

Activity	Duration
Facility Design ⁽¹⁾	6.5 months
Survey and Geotechnical	1 months
30% Preliminary Design	1 months
Authority Review and Approval	0.5 month
60% Design	1 months
Authority Review and Approval	0.5 month
90% Design	1 months
Authority Review and Approval	1 month
Final Design	0.5 month
Procurement	2.5 months
Contract (Bid) Development Preparation	1 months
Bid Development	0.5 months
Bid Evaluation and Contract Award	1 month
Construction	6 months
Shop Drawing Development and Approval	1 months
Permitting	0 months (concurrent)

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Activity	Duration
Equipment Fabrication	2 months
Site Work and Construction	2 months
Start-up and Punchlist	1 month (concurrent)
Total Duration	16 months

- (1) The projected schedule begins upon finalization of agreements, procurement of the engineer, and notice to proceed is given to the Engineer to start design.

3.2 Permitting

The following provides a summary of both Albemarle County and Virginia Department of Environmental Quality (VDEQ) permitting requirements.

3.2.1 Local Albemarle County and VDEQ – Regulatory Permitting

During the design phase, it is recommended to confirm the extent to which any development of the recycling convenience center or post-consumer food waste composting facility is located overtop of portions of the waste mass in the landfill. It appears that the proposed location of the recycling convenience center is adjacent, if not overlying a former asbestos disposal area. The proposed location of the composting operations is over top of Cell 1 Unlined. Note that prior to detailed design, it will be necessary to evaluate the integrity of the cap system of this portion of the landfill to determine its ability to prevent public contact; as well as evaluate effect of operations and surcharge loading on stability of the cap.

3.2.2 Albemarle County Site Planning and Stormwater Permitting

County permitting is overseen by the Department of Community Development which administers various requirements pertaining to development of Site Plans for new infrastructure to ensure conformance to zoning and water protection ordinances, as well as other aspects of County authority. It is most likely the proposed development will require a major amendment to the existing site plan. County Code Chapter 18, Section 32.4 requires submittal/approval of a pre-application plan, initial Site Plan review, and final Site Plan review.

In addition, the project will require a DEQ General Construction Permit, and will need to follow the County's Water Protection Ordinance (WPO) Application Process. The WPO process requires numerous submittals, including a stormwater pollution prevention plan, stormwater management plan, maintenance agreement, registration statement, and erosion and sediment control plan. Stormwater controls will be determined based on final configurations and during final design. The review process for obtaining the General Construction Permit may require more than 6 months duration to obtain necessary approvals.

3.2.3 VDEQ Permitting

Based on communications with VDEQ, permitting is not required for the recycling convenience center. However, it is recommended that the Authority update the Ivy Landfill facility's Operations Manual or the new Transfer Station Operations Manual to reflect the addition of the proposed Ivy MUC Recycling Convenience Center. It is suggested to add the recycling convenience center operations as an addendum and include a site plan drawing, brief description of ingress/egress, rolling stock, and health and safety plan.

The conceptualized post-consumer food waste composting facility is subject to the regulatory requirements under 9 VAC 20-81. The VDEQ Permit-By-Rule process is available and includes requirements certifying regulatory requirements governing, siting, operations, design and construction, and closure. VDEQ may, at its discretion, require full permitting. Should the Authority continue with the development of the post-consumer food waste composting facility, a pre-application meeting with VDEQ is recommended to clarify required permitting requirements.

4 CONCLUSIONS

Based on a benchmarking of three Virginia counties of comparable population, size and demographics, the Authority's recycling program appears to lag behind its contemporaries with regards to the number of facilities it offers for materials drop-off. The Authority currently offers one primary recycling convenience center that provides for the range of recyclables accepted by the Authority (McIntire) and two supplemental facilities with limited levels of service (the Paper Sort and the Ivey MUC); whereas the Reference Counties offer between four and 11 drop-off facilities offering levels of service equivalent to the McIntire. The Authority's desire to increase recycling services is consistent with similar operations within the Reference Counties and is anticipated to increase the volume of recyclable materials collected. Based on a comparison of annual budgets for recycling and solid waste services, the Authority budgets approximately 3 to 6 times less per resident in the County than the Reference Counties

Arcadis considers maintaining the Authority's existing source-separated recycling program as the appropriate course of action for its rural population. Industry trends clearly indicate a tightening of contamination standards across global recycling markets with China, the largest global market for recyclable materials, being a primary driver. These trends have resulted in lower commodity prices for recycled materials and in some cases a lack of available markets.

Source separated recyclables collection is in practice within the County and provides the Authority with less contaminated and more marketable products. Source separation has had positive impact on reducing contamination and warrants being continued given recent pressure on pricing and revenue associated with market pressures exerted across the global recycling market. Arcadis recommends Authority continues this practice in establishing a recycling convenience center at the Ivy MUC. We recommend the Authority evaluates its ability to collect and market certain recyclables, including #3 - #7 plastics and mixed paper (for which domestic and global markets are more limited) and establish a process for the regular evaluation of program costs and benefits to determine which materials are accepted, balancing public demand and overall program costs.

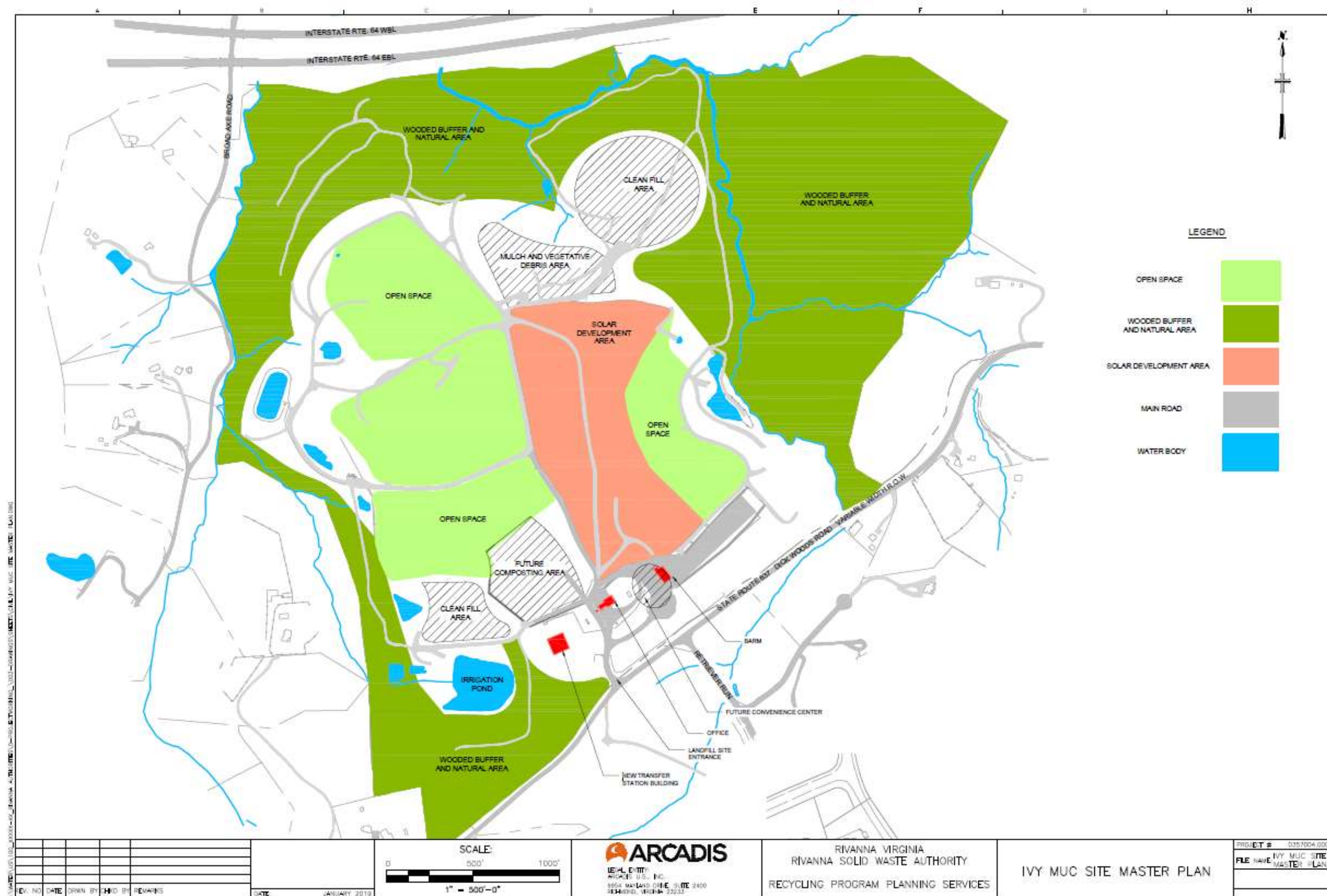
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Two alternatives were considered at the Ivy MUC for the proposed recycling convenience center. Both provide for a clear separation of truck and passenger vehicle traffic. In the Authority's October 2018 Board Meeting, Alternative 1 was selected as the preferred alternative.

In addition, Arcadis developed a conceptual plan for a post-consumer food waste compost facility at the Ivy MUC. Based on the recommendations of the Authority, the proposed location of the composting operations on Cell 1 Unlined of the closed Ivy Landfill, immediately north of the new Transfer Station. Customers would access the compost site via the Transfer Station access road. The conceptual layout of the post-consumer food waste compost facility includes a material receiving and storage area, pre-processing area, composting area for turned windrows, screening and curing area, and final compost area.

APPENDIX A

Ivy MUC Site Master Plan



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A decorative graphic consisting of three thin orange lines. One line is horizontal, extending from the left edge of the page towards the right. Two other lines are diagonal, starting from the bottom left and extending towards the top right, intersecting the horizontal line.