

## 7. Sustainability Initiatives

The purpose of this section is to document the identification of opportunities to advance FLL's sustainability as BCAD embarks on the proposed development projects identified in the MPU, in support of FAA's Airport Sustainable Master Plan Pilot Program,<sup>1</sup> BCAD's sustainability vision and guiding principles, and Broward County's plans and policies related to climate change. Sustainability initiatives that align with these objectives were analyzed and prioritized. The sustainability initiatives build on past BCAD successes, support initiatives and priorities of Broward County, and align with the initiatives implemented at other comparable airports as well as sustainability planning guidance, including the FDOT's *Airport Sustainability Guidebook*.

### 7.1 Sustainability Vision, Guiding Principles, and Goals

BCAD defines sustainability using the "EONS" framework, with EONS representing Economic viability, Operational efficiency, Natural resources, and Social responsibility. The concept of EONS is reflected in BCAD's sustainability vision statement.<sup>2</sup>

In support of its sustainability vision, MPU sustainability initiatives were developed in consideration of the following guiding principles:

- Initiatives should be straightforward and clear to support implementation.
- Initiatives should be achievable through the future implementation of MPU projects.
- Initiatives should be consistent with and in furtherance of Broward County's 2015 Climate Change Action Plan six plan elements (e.g., policy, natural systems, water supply, energy resources, built environment, and community outreach).
- Initiatives should be consistent with and in furtherance of the adopted Broward County Comprehensive Plan's Climate Change Element.

#### BCAD's Sustainability Vision

*Broward County Aviation Department (BCAD) is dedicated to minimizing our impacts on the environment while increasing our operational efficiency, economic viability, and social responsibility.*

<sup>1</sup> Federal Aviation Administration, Memorandum: "Airport Sustainable Master Plan Pilot Program," May 27, 2010.

<sup>2</sup> Broward County Aviation Department, Community – Environmental, <https://www.broward.org/Airport/Business/Community/Pages/Environment.aspx> (accessed March 21, 2019).

- Initiatives should be consistent with and in furtherance of BCAD's Sustainability Vision and Guiding Principles established in 2012.<sup>3</sup>

Broward County has focused on climate change for years. In 2008, the Broward County Board of County Commissioners passed a resolution that established a county-wide greenhouse gas (GHG) emissions reduction target of 80 percent below 2007 emissions by the year 2050. To support achievement of this target, the Broward County Climate Change Task Force drafted the County's first Climate Change Action Plan in 2010 and updated the plan in 2015. Broward County also created a stand-alone Climate Change Element as part of its Comprehensive Plan. How sustainability is defined, the implementation goals, and sustainability initiatives included in this MPU chapter are, therefore, informed by Broward County's longstanding commitment to reduce carbon pollution and strengthen resilience to the effects of global climate change.

#### **Broward County Climate Change Goal**

*Achieve a sustainable, climate resilient community by: promoting energy efficiency and greenhouse gas (GHG) best management strategies; protecting and adapting public infrastructure services, natural systems and resources from climate change impacts; and continuing to coordinate locally and regionally to monitor and address the changing needs and conditions of the community.*

## 7.2 Sustainability Categories

Sustainability categories were defined to focus the review of sustainability opportunities on issues material to development at FLL, especially in the context of the MPU proposed development projects and the County's climate change goal. As such, five sustainability categories were defined to guide the selection of sustainability initiatives for the MPU:

- Waste management – minimize the generation of waste through reduction, reuse, and recycling.
- Energy and GHG reductions – increase sustainable energy use through efficiency and conservation efforts and expand access to renewable and alternative energy sources.
- Water supply – reduce the use of potable water.
- Resilient design – use design strategies that support recovery from disasters and other disruptions.
- Community communication, outreach, and partnering – use communications strategies, community events, and partnerships to build connections between the Airport and the community to increase awareness and mobilize action on climate change.

<sup>3</sup> Broward County Aviation Department, Community – Environmental, <https://www.broward.org/Airport/Business/Community/Pages/Environment.aspx> (accessed March 21, 2019).

The waste management category was assessed in this section to align with the FAA's guidance on airport recycling, reuse, and waste reduction plans.<sup>4</sup>

## 7.3 Baseline and Opportunities

A baseline for each sustainability category was established by reviewing available data that describe current quantities of resource consumption and waste generation, operational and management considerations, and sustainability initiatives implemented to date. The baseline provides an understanding of current sustainability performance at FLL, and it supports the identification of initiatives to enhance sustainability performance during implementation of the MPU proposed development projects.

The baseline year for the resource categories was 2017, which was supplemented with earlier data, where available. Additionally, to provide context for the sustainability performance data, data were compiled for peer Florida airports, as well as a set of peer North American airports. **Appendix J** provides a summary of data compiled in support of this analysis from the following peer airports:

- Florida airports
  - Miami International Airport
  - Palm Beach International Airport
  - Tampa International Airport
  - Orlando International Airport
- North American airports
  - Boston Logan International Airport
  - Minneapolis–St. Paul International Airport
  - Phoenix Sky Harbor International Airport
  - Salt Lake City International Airport
  - Seattle-Tacoma International Airport
  - San Diego International Airport
  - Sacramento International Airport
  - Vancouver International Airport

### 7.3.1 WASTE MANAGEMENT BASELINE

Analyses of waste composition and quantities were conducted to identify opportunities for waste reduction and the enhancement of recycling practices. Municipal Solid Waste (MSW) composition at FLL includes paper, cardboard, metal, glass, plastics, and food waste from FLL terminals. BCAD is responsible for MSW collection and disposal from BCAD facilities and from public areas of the terminals, as well as domestic aircraft waste. Waste from the Rental Car Center (RCC), terminal restaurants, and Fixed-base Operators (FBO) are contracted separately and are not under

<sup>4</sup> U.S. Department of Transportation, Federal Aviation Administration, "ACTION: Guidance on Airport Recycling, Reuse, and Waste Reductions Plans," September 30, 2014.

BCAD's authority. Additionally, international aircraft waste is managed by the airlines under contract to Stericycle, Inc., and construction and demolition (C&D) debris are managed independently by contractors, on a project-by-project basis. Food waste composting is not currently conducted at the Airport; however, landscaping waste is collected by landscaping contractors and removed by BCAD Maintenance. BCAD Maintenance stages landscaping waste for monthly removal by a landscaping waste contractor.

This baseline analysis focuses on the MSW stream under direct control of BCAD. Opportunities to partner with others managing waste at FLL were considered in the identification and evaluation of initiatives to improve waste reduction, recycling, and reuse.

Historically, BCAD contracted the recovery of recyclables from its MSW stream to Airport Recycling Specialists, Inc. (ARS). ARS's operation at FLL, which started in 1989, ceased in the mid-2010s. ARS operated an on-site Materials Recovery Facility (MRF) for MSW sorting and recycling and managed approximately 40 percent of the total waste stream at FLL, achieving a recycling rate near 30 percent.<sup>5</sup>

Currently, MSW is separated into trash and single-stream recyclables at the point of disposal in public areas of the terminals and other areas operated by BCAD. BCAD Janitorial staff transfers the trash and recyclables to compactors and containers at designated locations in the terminal area and at Gate 100. The BCAD Maintenance Department manages this portion of the waste operation on-Airport. Broward County is responsible for the contracts that manage the hauling and disposal of trash and recyclables from the Airport. Disposal services for recyclables and nonrecyclables (trash) are as follows:

- MSW (Recycled): Broward County's Solid Waste and Recycling Services (SWRS) manages waste and recycling services for the Broward Municipal Services District, including BCAD. Recyclables are hauled from BCAD collection areas by Sunshine Recycling Services of SWFL, Inc. the County's Government Recycling hauler, to a Waste Management, Inc. processing facility in the Town of Davie, west of FLL.
- MSW (Nonrecycled): Broward County is responsible for nonrecycled MSW from FLL, and waste from the Airport is managed under the County's contract with Wheelabrator Technologies, Inc., which includes terms for renewal through 2033.<sup>6</sup> Nonrecycled MSW is sent to the Wheelabrator Technologies, Inc. South Broward waste-to-energy facility. This facility can produce 66 MW of electricity and processes as much as 2,250 tons of MSW daily from FLL and other County sources. The waste-to-energy facility reduces nonrecycled waste volumes by 90 percent, and the ash is disposed at Wheelabrator's Technologies, Inc. South Broward ash monofill adjacent to the waste-to-energy facility.<sup>7</sup>

<sup>5</sup> Broward County Aviation Department, *Final Report – Solid and Hazardous Waste Reduction Opportunities and Recommendations*, September 2007.

<sup>6</sup> Broward County, Solid Waste and Recycling Services, "Broward County Solid Waste and Recycling Update," presentation, <http://www.broward.org/Commission/Documents/SolidWasteWorkshop.pdf> (accessed March 21, 2019).

<sup>7</sup> Wheelabrator Technologies, Wheelabrator South Broward, <https://www.wtienergy.com/plant-locations/energy-from-waste/wheelabrator-south-broward> (accessed March 21, 2019).

As documented in SWRS's Aviation Department Recycling Program Report for Fiscal Year 2017, BCAD's recent solid waste recycling, reuse, and waste reduction efforts include the following<sup>8</sup>:

- Support of the County's 75 percent recycling by 2020 goal (solid waste used to produce renewable energy counts toward the recycling goal and Wheelabrator Technology, Inc.'s waste-to-energy facility reduces non-recycled waste volumes by 90 percent).
- SWRS has conducted periodic waste audits to support the identification of actions to minimize contamination of the recyclables waste stream and to increase the amounts of recyclables collected. Contaminants identified in the recyclables stream included safety vests, earplugs, food waste, Styrofoam, paper plates, plastic cups, plasticware, plastic shrink wrap/film, and other nonhazardous materials. The composition of the recycled waste stream, less contaminants, was quantified as 41 percent commingled recyclables (paper, newspaper, aluminum cans, plastic bottles, other plastics, and glass), 39 percent cardboard, 15 percent pallets, 4 percent metals, and 1 percent magazines.
- SWRS has adjusted the times and frequencies of monitoring and working with BCAD Janitorial staff to maximize staff outreach. Outreach includes demonstrations of proper disposal procedures (e.g., flattening cardboard, pointing out signage for reference).
- SWRS worked collaboratively with BCAD to (1) revise signage for back-of-house compactors and containers to improve clarity and to simplify messaging; (2) redesign recycling and garbage labels; and (3) rearrange the logistics and flow of container placement based on noted patterns of disposal habits.

SWRS identified eight actions to support the achievement of the countywide recycling rate of 75 percent by 2020. Of these actions, the following were considered during the development of MPU sustainability initiatives:

- Train BCAD Janitorial staff on solid waste and recycling best practices.
- Continue to seek alternate reuse and recycling opportunities beneficial to BCAD.
- Identify additional waste reduction and contamination strategies.

Waste reduction, reuse, and recycling performance is often tracked in terms of a waste diversion rate metric and/or a quantity diverted (recycled/reused/reduced) metric. In 2017, BCAD recycled approximately 300 tons of MSW, which was estimated as \$12,288 in avoided disposal costs.<sup>9</sup> In addition to avoided disposal costs associated with recycling, BCAD earns revenues from recycling its cardboard and scrap metal waste streams.

<sup>8</sup> Notosha Austin, Program Manager, Broward County Public Works Department Solid Waste and Recycling Services, "Broward County Aviation Department Recycling Program Report for Fiscal Year 2017," memorandum to Stacy Seibert, Enterprise Assistant Director of Facilities/Maintenance, Aviation-Facilities Maintenance Division, November 17, 2017.

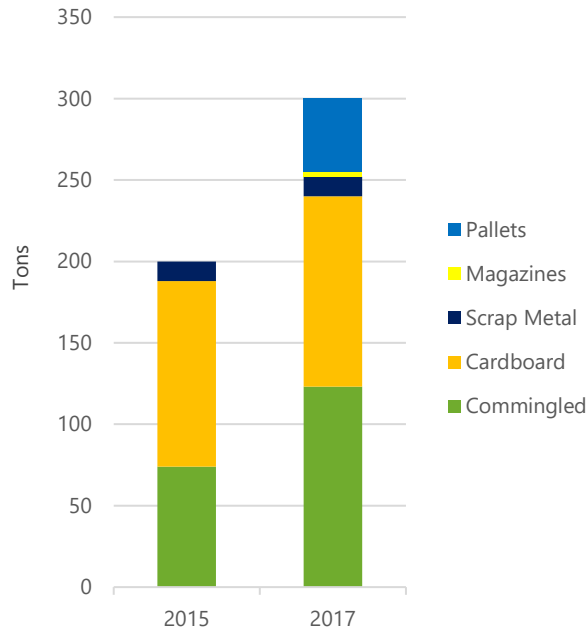
<sup>9</sup> Notosha Austin, Program Manager, Broward County Public Works Department Solid Waste and Recycling Services, "Broward County Aviation Department Recycling Program Report for Fiscal Year 2017," memorandum to Stacy Seibert, Enterprise Assistant Director of Facilities/Maintenance, Aviation-Facilities Maintenance Division, November 17, 2017.



Based on average trash disposal rates of approximately 8 tons per day, and up to 10 tons per day during the peak season,<sup>10</sup> it is estimated that BCAD manages approximately 3,000 tons of trash annually, for a total tonnage of 3,300 tons of MSW. Therefore, the current rate of diverting recyclables from trash is approximately 9 percent. The operators of the peer airports reported waste diversion quantities ranging between 1,100 and 1,900 tons per year and diversion rates ranging from 15 to 51 percent. **Exhibits 7.3-1** and **7.3-2** present BCAD’s recycled quantities and estimated diversion rate metrics.

Under a recent construction project at FLL, the Maintenance Facility, approximately 95 percent of C&D debris was recycled, which was similar to peer airports’ reporting of 94 to near 100 percent C&D debris recycling rates.

**Exhibit 7.3-1: Recycled Quantities (2015 and 2017)**

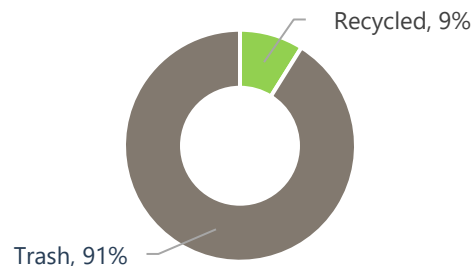


SOURCES: Notosha Austin, Program Manager, Broward County Public Works Department Solid Waste and Recycling Services, "Broward County Aviation Department Recycling Program Report for Fiscal Year 2017," memorandum to Stacy Seibert, Enterprise Assistant Director of Facilities/Maintenance, Aviation-Facilities Maintenance Division, November 17, 2017 (2017 Recycled Quantities); Notosha Austin, Recycling Program Manager, Broward County Public Works Department Solid Waste and Recycling Services, "Broward County Aviation Department Recycling Program Report for Fiscal Year 2015," memorandum to Stacy Seibert, Administrative Manager II, November 25, 2015 (2015 Recycled Quantities).

PREPARED BY: Ricondo & Associates, Inc., March 2019.

<sup>10</sup> Broward County Aviation Department, Sustainability Workshop, March 18, 2019.

### Exhibit 7.3-2: Estimated Diversion Rate (2017)



SOURCES: Notosha Austin, Program Manager, Broward County Public Works Department Solid Waste and Recycling Services, "Broward County Aviation Department Recycling Program Report for Fiscal Year 2017," memorandum to Stacy Seibert, Enterprise Assistant Director of Facilities/Maintenance, Aviation-Facilities Maintenance Division, November 17, 2017 (2017 Recycled Quantities); Broward County Aviation Department, Sustainability Workshop, March 18, 2019 (Trash Estimate).

PREPARED BY: Ricondo & Associates, Inc., March 2019.

Several challenges affect reduction, recycling, and reuse opportunities at FLL. These include:

- BCAD does not manage waste generated by concessionaries, FBOs, and tenants, or waste generated at the RCC, and it does not specify C&D debris recycling requirements for Airport construction projects.
- Waste management procedures are not documented and training on recycling procedures are not routine, particularly for concessionaries and tenants.
- Recycling guidance at points of disposal in public areas is not consistent.

Several of these challenges contribute to the contamination of the recycling stream with trash.

## 7.3.2 ENERGY USE BASELINE

Energy use at airports typically comprises electricity generated off-site from fossil fuels or renewable sources; natural gas used on-site; and fuel used for airport operator and tenant fleets, ground access to the airport, and aircraft operations. Nonrenewable energy use represents a significant source of GHG emissions generated at airports. Although GHG emissions were not quantified for this analysis, opportunities to reduce energy use, and thereby reduce GHG emissions, will be considered together in Section 7.4.

### 7.3.2.1 Electricity and Natural Gas

FPL provides electricity to the Airport. TECO Peoples Gas, Inc. provides natural gas, which is used by BCAD's concessionaires, HMS Host, Inc. and Delaware North, Inc. Electricity, measured in kWh, and natural gas, measured in therms, can be expressed in a common unit to quantify overall energy use—thousand British thermal units (kBtUs). **Table 7.3-1** presents the electricity and natural gas use at FLL in 2017; **Exhibit 7.3-3** presents the annual electricity and natural gas use from 2015 to 2017. To support comparisons to peer airports and a refined understanding of how energy use may change as activities and facilities change at FLL over the MPU planning horizon, two energy use intensity metrics were considered—kBtUs per square foot and kBtUs per passenger—as presented in Table 7.3-1.

Based on an analysis in 2005, the largest consumer of energy at the Airport is the HVAC, followed by lighting and other uses, including escalators, conveyor belts, aircraft power, and business and computer equipment. While the balance among large consumers of energy may have changed since 2005 given modernization projects, HVAC and lighting are typically the largest energy users at airports.<sup>11</sup> As of 2017, renewable energy has not been generated on-site at the Airport.

**Table 7.3-1: Electricity and Natural Gas Use (2017)**

	kWh	THERMS	kBTU	COST (DOLLARS)	NORMALIZATION DATA
<b>Energy Use</b>					
Electricity Use	112,333,062		352,862,198	\$8,521,795	
Natural Gas Use		233,707	23,370	(charged to tenants)	
Total Energy Use			352,885,569		
<b>Normalization Data</b>					
Total Passengers					32,511,053
Total Terminal Area (Sq. Ft.)					2,421,000
<b>Energy Use Intensity Metrics</b>					
kBTU/Sq. Ft. (Terminal Facilities)			145.8		
kBTU/Passenger			10.9		

NOTES:

Totals may not add due to rounding.

kWh = Kilowatt Hour

kBTU = Thousand British Thermal Units

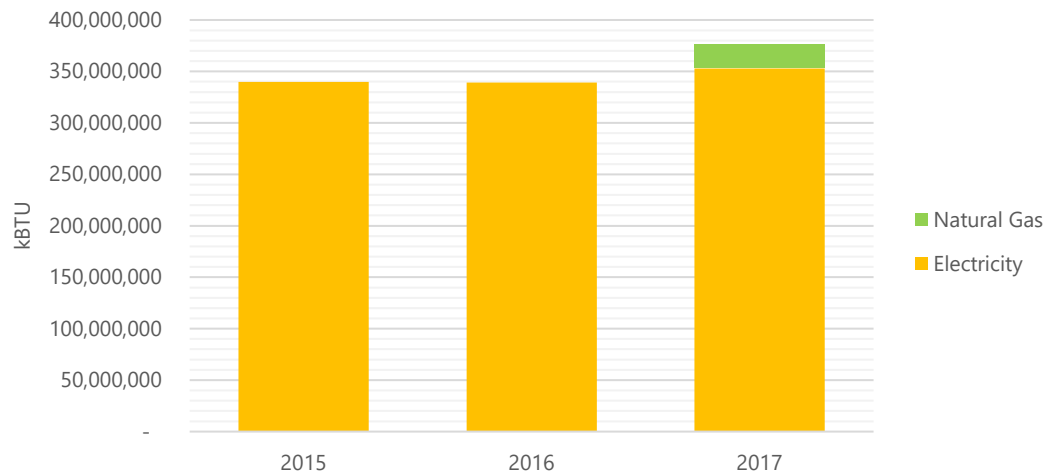
Sq. Ft. = Square Feet

SOURCES: Broward County Aviation Department, Summary of Electricity Use (2015–2017), January 2019 (Electricity); Broward County Aviation Department, Summary of Natural Gas Usage (2015–2017), January 2019 (Natural Gas); Ricondo & Associates, Inc., *Draft Airport Master Plan Update for Fort Lauderdale-Hollywood International Airport*, Existing Conditions Inventory, Table 2.3-8, "Terminal Space Inventory by Major Categories (in square feet)," April 2016 (Terminal Facilities Area); Broward County Aviation Department, <http://www.broward.org/Airport/Business/about/Documents/FLStatsdecember2018.pdf> (accessed January 31, 2019; 2017 Passengers).

PREPARED BY: Ricondo & Associates, Inc., September 2019.

<sup>11</sup> CASCADE – Information and Communication Technologies (ICT) for Energy Efficient Airports, *Energy and Technical Characterization, Operational Scenarios of European Airports as Open Spaces*, 2013.



**Exhibit 7.3-3: Electricity and Natural Gas Use (2015–2017)**


## NOTES:

kBTU = Thousand British Thermal Units

Natural gas data were only available for 2017.

SOURCES: Broward County Aviation Department, Summary of Electricity Use (2015–2017), January 2019 (Electricity); Broward County Aviation Department, Summary of Natural Gas Usage (2015–2017), January 2019 (Natural Gas).

PREPARED BY: Ricondo & Associates, Inc., March 2019.

The most commonly reported energy use metric among peer airports (see Appendix J) was annual kBTUs per passenger, which ranged from 10.7 to 33.0, indicating that BCAD uses less energy (at 11.6 kBTUs per passenger) in comparison to its peer airports to serve an equivalent number of passengers. However, as the MPU proposed development projects are constructed and increased building square footage translates to an increase in energy use, tracking the kBTU per square foot metric would provide a good indicator of long-term energy efficiency as the FLL developed footprint expands.

Broward County established a countywide goal that promotes the use of renewable energy, with a specific emphasis on the use of solar and geothermal energy, to reduce countywide GHG emissions by 80 percent below 2007 levels by 2050. Additionally, Broward County encourages the design of efficient buildings locally, and supports the measure by building all new construction of County-owned facilities to LEED standards in accordance with resolution 2008-856, approved by the Board of County Commissioners.<sup>12</sup> At FLL, BCAD has pursued energy efficiency projects, such as the conversion to light emitting diode (LED) lighting.

<sup>12</sup> Broward County, *Comprehensive Plan, Draft Climate Change Element*, August 7, 2018.



7.3.2.2 Fleet Fuel Use

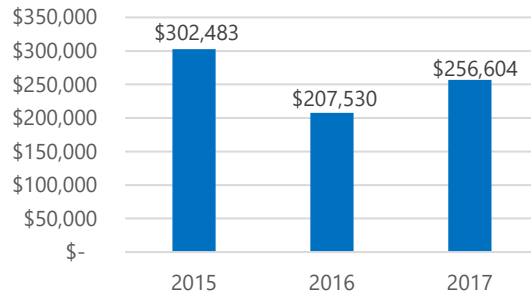
BCAD currently maintains a fleet of vehicles, shuttle buses, and pieces of equipment that primarily use diesel and unleaded gasoline, along with the use of compressed natural gas and electricity. Exhibits 7.3-4 and 7.3-5 present the gasoline and diesel use for BCAD’s fleet. As activity increases over the MPU planning horizon, BCAD’s fleet fuel use is anticipated to increase as well. From 2015 to 2017, diesel fuel use was relatively consistent, averaging about 20,000 gallons per year, while gasoline use fluctuated slightly around 90,000 gallons per year. Annual fuel costs varied based on fluctuating unit (per gallon) costs, with total fuel costs in 2017 being approximately \$256,600.

Exhibit 7.3-4: Fleet Fuel Use and Cost Per Gallon (Diesel and Gasoline, 2015–2017)



SOURCE: Broward County Aviation Department, Summary of Fuel Use (2015–2017), January 2019.  
 PREPARED BY: Ricondo & Associates, Inc., March 2019.

Exhibit 7.3-5: Fleet Fuel Cost (Diesel and Gasoline, 2015–2017)



SOURCE: Broward County Aviation Department, Summary of Fuel Use (2015–2017), January 2019.  
 PREPARED BY: Ricondo & Associates, Inc., March 2019.

Broward County established a countywide goal of a 100 percent zero-emission vehicle fleet by 2030 for County-owned vehicles.<sup>13</sup> Furthermore, several peer airports address fleet fuel efficiency in terms of alternative fuel vehicles comprising their fleet (percentage of total or total pieces of equipment). Therefore, BCAD may consider tracking the transition of its fleet from petroleum-based fuels to renewable fuels. As this transition occurs, BCAD should consider the infrastructure for alternative fuels and the increased electricity demand associated with an increase in use of electric vehicles. BCAD Maintenance has experience with electric vehicle use in its fleet and recognizes the need to balance fossil fuel efficiencies with best-fit technology given the typical use of vehicles and equipment in an airport operating environment. Overall, operational efficiency is a driving consideration of fleet fuel-use decisions.

### 7.3.3 WATER SUPPLY

In 2017, approximately 214.5 million gallons of potable water was consumed at FLL, which equates to approximately 6.6 gallons of water per passenger. Many of the operators of the peer airports considered in this analysis report water use per passenger, with rates ranging from 3.2 to 13.5 gallons per passenger, as presented in Appendix J.

BCAD has implemented several initiatives to reduce potable water use:

- Design standards define the use of low-flow toilets and faucets, which have been implemented with several recent renovation projects, such as Terminal 1 Renovations, Terminal 2 Modernization Project, and Concourse A Improvements.
- Rainwater collected in the Northeast Pond is used to irrigate the 22.9-acre Greenbelt along the south Airport boundary.

Currently, FLL is not connected to Broward County's reclaimed water system. However, if a connection is provided in the future, then BCAD may consider reclaimed water use to reduce potable water consumption.

### 7.3.4 RESILIENT DESIGN

Resilient design is the process of designing the built environment in a way that not only reduces impacts on natural resources but also creates resiliency to the effects of climate change, including weather events and sea-level rise. The FLL MPU defines development, including new structures and paved areas on land that is currently pervious (i.e., supports infiltration of stormwater). Addressing the need for additional stormwater retention will occur during the design and development for each project. The MPU indicates certain properties for retention purposes that will be validated as part of a separate stormwater master plan update.

Current BCAD resiliency design guidance specifies that floors are higher in new construction compared to older existing facilities, and electrical, mechanical, and life safety equipment is installed at elevations sufficient to protect critical facilities from flooding impacts. It is noted that Broward County supports the U.S. Army Corps of Engineers'

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<sup>13</sup> Broward County, *Comprehensive Plan, Climate Change Element*, March 28, 2019.

worst-case sea-level rise scenario model for planning purposes.<sup>14</sup> The worst-case scenario model estimates a 2-foot rise in sea level by 2060.

Additionally, BCAD is applying the LEED rating system to new construction projects that will guide sustainable design. Peer airports have adopted a range of sustainability design guidance, including requiring LEED Silver certification for new construction and major renovations and adopting the LEED or Envision frameworks to guide the design of new facilities.

### 7.3.5 COMMUNITY EDUCATION, OUTREACH, AND PARTNERING

Community education, outreach, and partnering efforts demonstrate BCAD's commitment to be a good neighbor and position BCAD to increase awareness and mobilize action on climate change. BCAD conducts several community outreach and engagement activities, which can be leveraged to advance the Airport's sustainability message:

- BCAD Airport Noise Abatement Committee Meetings
- FLL Master Plan Updates and status updates on key FLL projects
- Monthly partnership meetings with Airport stakeholders regarding operations, security, and construction
- Winter Festival of Music at FLL in cooperation with the Broward County School District
- Autism in Flight in cooperation with the Broward County School District
- AmbassaDog Program
- FLL Terminal Tunes
- "I Bet You Didn't Know" public art partnership with the Broward County Cultural Division
- FLL tours and volunteer programs
- FLL Will Never Forget Commemoration in Terminal 1

BCAD uses several strategies to communicate with stakeholders in a strongly branded style, including the FLL website, internal email distribution lists, employee flyers, the Broward County employee intranet, social media, and the FLLash Newsletter.

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## 7.4 Sustainability Initiatives

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The MPU's proposed development projects include expanding or replacing terminal facilities and parking garages, constructing new tenant and support facilities, and adding pavement to support forecast growth at FLL. The proposed new/expanded facilities and the activities supported by these facilities can be expected to result in an increase in energy use (which correlates to an increase in GHG emissions), water consumption, and waste generation.

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<sup>14</sup> Broward County Board of County Commissioners, Broward County Planning Council, *2017 Broward County Land Use Plan of the Broward County Comprehensive Plan*.

Additionally, given future flooding and sea-level rise projections, the proposed new/expanded facilities may require stormwater retention capacity that exceeds current standards, and the development of these facilities should be increasingly resilient to the effects of climate change.

#### 7.4.1 DEVELOPMENT OF SUSTAINABILITY INITIATIVES

To support a sustainable approach to developing and managing future growth at FLL, a series of sustainability initiatives were identified to enhance the design and operation of the MPU proposed development projects to enable FLL to align with the County's climate change goal. BCAD Planning and Maintenance staff reviewed candidate sustainability initiatives during a Sustainability Initiatives Workshop conducted on March 18, 2019. Candidate initiatives were defined to build on BCAD sustainability successes, to support Broward County initiatives, and to align with proven sustainability initiatives implemented at other airports.

**Table 7.4-1** presents the candidate initiatives reviewed during the Sustainability Initiatives Workshop. The following key considerations were evaluated to guide staff review and selection of initiatives:

- Does the initiative apply to BCAD owned/operated facilities and operations or can applicability be extended to tenants?
- Does the initiative address the design and structural issues associated with MPU proposed development projects or does the initiative apply to Airport operations?
- What is the rough-order-of-magnitude investment BCAD may expect to implement the initiative, comparatively, in terms of?
  - initial capital cost, ranging from minimal/no capital expenditure to a new facility or other significant capital investment
  - staff level of effort, ranging from little/no added staff effort to significant new staff responsibility
  - ongoing operations and maintenance (O&M) costs, ranging from reduced/no effect on O&M to significant new O&M effort or effect

Table 7.4-1 (1 of 4): Candidate Sustainability Initiatives Considered

CANDIDATE INITIATIVES	INITIATIVE APPLIES TO		INITIATIVE ADDRESSES		INVESTMENT REQUIRED <sup>4/</sup>		
	BCAD	TENANTS	DESIGN	OPERATIONS	CAPITAL COST	STAFF EFFORT	O&M COST
<b>Resilient Design</b>							
1	Formalize sustainable design guidance for upcoming MPU projects (e.g., adopt LEED Silver requirement).	■	■	■	+	++ to +	+ to ○
2	During advanced planning and design, evaluate opportunities to increase the resiliency of new construction to intense storm events.	■	■	■	+	+	○
3	Support County planning efforts to evaluate vulnerability of existing infrastructure to climate change effects and adapt building strategies to minimize infrastructure vulnerability.	■	■	■	+	+	○
4	Develop a stormwater master plan that considers the latest County mapping and guidance (U.S. Army Corps of Engineers, 2-foot sea-level rise by 2060) and integrates strategies during advanced planning and design of MPU projects to address the effects of sea-level rise and increased flooding associated with new development.	■		■	○	+	○
5	Identify opportunity to partner with County or State to evaluate/test resilient building strategies.	■		■	+	+	○
6	Use economic models (i.e., REMI) to evaluate development risks and climate adaptation strategies, including flood mitigation.	■	■	■	○	+	○
<b>Waste Management</b>							
1	Develop and operate on-Airport facilities to support material recovery from the MSW waste stream.	■		■	++	+	++
2	Design new facilities to provide sufficient space for waste collection, sortation, and circulation.	■	■	■	+	○	○
3	Improve public messaging regarding recycling opportunities and initiatives (County recommendation).	■	■	■	+	+	○
4	Establish a recycling level/goal for all construction projects.	■	■	■	○	○	○

NOTE: See page 7-17 for explanation of symbology.

Table 7.4-1 (2 of 4): Candidate Sustainability Initiatives Considered

CANDIDATE INITIATIVES	INITIATIVE APPLIES TO		INITIATIVE ADDRESSES		INVESTMENT REQUIRED <sup>4/</sup>		
	BCAD	TENANTS	DESIGN	OPERATIONS	CAPITAL COST	STAFF EFFORT	O&M COST
5 Designate a waste management lead to champion waste reduction efforts (as well as recyclables contamination reduction).	■	■		■	○	++	○
6 Track and report waste and recycling statistics for comparisons to peers and for right-sizing collection service levels as recycling increases.	■	■		■	○	+	○
7 Increase recycling and waste education and awareness efforts for janitorial staff, tenants, and the public.	■	■		■	○	++	○
8 Tour or visit other facilities, such as the Convention Center, to inform BCAD's recycling best practices.	■			■	○	+	○
9 Collaborate with County during next contract renewal cycles for MSW and recycling to promote BCAD needs in contract.	■			■	○	+	○
<b>Energy (Electricity and Natural Gas)</b>							
1 Evaluate opportunities to offset FLL development impacts with renewable energy project(s) (such as at North Perry Airport).	■		■		++	○	+
2 Integrate renewable energy strategies into new development (e.g., rooftop solar) and examine potential for use of floating solar panel systems on retention ponds.	■	■	■		++	○	+ to ○
3 Provide electric vehicle charging infrastructure in new parking garages.	■		■		+	○	+
4 Market and brand solar renewable energy efforts at the Airport, highlighting Airport and County efforts. Message energy efficiency successes at FLL.	■	■		■	+	+	○
5 Develop an energy management program for monitoring, auditing, and reporting.	■	■		■	○	++	○
6 Define energy tracking metrics and initiate ongoing tracking, reporting, and messaging of energy use.	■			■	○	+	○
7 Adopt the County's Indoor Space Temperature policy for new facilities.	■			■	○	+	○

NOTE: See page 7-17 for explanation of symbology.



Table 7.4-1 (3 of 4): Candidate Sustainability Initiatives Considered

CANDIDATE INITIATIVES	INITIATIVE APPLIES TO		INITIATIVE ADDRESSES		INVESTMENT REQUIRED <sup>4/</sup>			
	BCAD	TENANTS	DESIGN	OPERATIONS	CAPITAL COST	STAFF EFFORT	O&M COST	
<b>Energy (Fuel)</b>								
1	Provide electrical infrastructure and fuel stations to support County requirements for a zero-emission vehicle fleet (consider public accessibility and connection to “building” electricity use).	■		■		++	○	+
2	Ensure ability of new parking facilities to support the increase in electric vehicles (consider incentivizing through parking priorities, etc.).	■	■	■		+	+	+
3	Require airfield operational or design changes to demonstrate a reduction in greenhouse gas emissions.	■		■		○	+	○
4	Convert fleet segments (e.g., shuttles, personal vehicles) to zero-emission vehicles.	■	■			++	+	(varies)
5	Convert fleet segments (e.g., shuttles, personal vehicles) to hybrid/alternative fuel vehicles.	■	■			++	+	(varies)
6	Establish goal to convert to electric GSE fleet.		■			○	+	+
<b>Water Supply</b>								
1	Require some form of stormwater reuse in all new development (consider applicability to major and/or minor renovations).	■	■	■		++	○	○
2	Pursue water reuse opportunities, including use of nonpotable water (e.g., fixtures, cooling towers, and car washes) and expanding rainwater harvesting for irrigation.	■	■	■		++	○	○
3	Install submeters in new buildings/renovations to strategically manage water use more effectively and to allow for tenant-level water analysis to engage high-water users in reducing consumption.	■		■		+	+	○
4	Establish minimum standards for incorporating native vegetation and landscaping to reduce or eliminate need for irrigation.	■	■	■		+	○	○
5	Effectively communicate water conservation efforts to tenants and the public (e.g., signage, expose purple pipes).	■		■	■	+	+	○

NOTE: See page 7-17 for explanation of symbology.





Table 7.4-1 (4 of 4): Candidate Sustainability Initiatives Considered

CANDIDATE INITIATIVES	INITIATIVE APPLIES TO		INITIATIVE ADDRESSES		INVESTMENT REQUIRED <sup>1/</sup>		
	BCAD	TENANTS	DESIGN	OPERATIONS	CAPITAL COST	STAFF EFFORT	O&M COST
<b>Community Education, Outreach and Partnering</b>							
1	Consider demonstration/education opportunities of sustainable design strategies (local developers, community, students, etc.).	■		■	○	+	○
2	Effectively market ongoing and future sustainability programs, projects, and features (e.g., water reclamation, renewable energy, energy efficiency, recycling, and emissions/greenhouse gas reductions).	■	■	■	○	+	○
3	Enhance transportation amenities for Airport employees (intermodal center with employee parking, child care, etc.).	■		■	++	○	++

NOTES:

BCAD = Broward County Aviation Department

MPU = Master Plan Update

FLL = Fort Lauderdale-Hollywood International Airport

MSW = Municipal Solid Waste

GSE = Ground Support Equipment

O&M = Operations and Maintenance

LEED = Leadership in Energy and Environmental Design

REMI = Regional Economic Models, Inc.

■ = Applicable

1/ Investment required symbology:

Symbol	Capital Cost	Staff Effort	O&M Cost
○	Minimal to No Capital Expenditure	Little to No Added Staff Effort	Reduced O&M or No Effect on O&M
+	Facility Renovation or Minor System Capital Expenditure	Reoccurring/Minor New Staff Responsibility	Minor O&M Effort/Effect
++	New Facility or Significant System Capital Expenditure	Significant New Staff Responsibility	Significant O&M Effort/Effect

SOURCE: Ricondo & Associates, Inc. and Broward County Aviation Department, March 2019.

PREPARED BY: Ricondo & Associates, Inc., March 2019.

#### 7.4.2 IMPLEMENTATION OF SUSTAINABILITY INITIATIVES

Based on feedback received from BCAD staff during the Sustainability Initiatives Workshop, candidate initiatives were either eliminated or revised/supplemented to derive a set of initiatives that support implementation of the MPU and operation of MPU projects. The initiatives presented in **Table 7.4-2** were prioritized for consideration during advanced planning, design, and implementation of the MPU's proposed development projects.

The table identifies initiatives that have sustainability benefits across multiple categories. Although many initiatives were identified to support the sustainable design of proposed MPU development projects, either those developed by BCAD or FLL tenants, some initiatives are included to address operational issues associated with future Airport operations. Therefore, the table also defines what the initiative affects—BCAD design, BCAD operations, tenant design, or tenant operations.

BCAD will manage sustainability initiative implementation by integrating consideration of sustainability into the project development process (e.g., advanced planning, design, construction, and operation). The initiatives that apply directly to the design process should be integrated into BCAD's design guidance. The order of initiatives does not reflect prioritization; rather, the initiatives should be reviewed for relevance to the effort under consideration, such as "BCAD Design" for design of a BCAD facility or "Tenant Design" for design of a tenant facility.

To support implementation, it is recommended that BCAD develop a checklist of initiatives that must be reviewed for applicability at relevant points in the project development process. Suggested points in the project development process that BCAD may evaluate sustainability opportunities are identified in Section 8.3.4, "Project Timing Considerations."

#### 7.4.3 TRACKING IMPLEMENTATION OF SUSTAINABILITY INITIATIVES

It is recommended that BCAD implement a performance monitoring program to support evaluating the effectiveness of the sustainability initiatives and the messaging progress. A review of baseline data indicates the following metrics can be tracked to support performance monitoring:

- Facilities or square footage of new development achieving LEED certification, along with highlights of innovative design solutions.
- MSW generated and quantity/percent diverted through reuse and recycling.
- Electricity and natural gas use, along with building square footage and passenger activity, to calculate energy use intensity metrics as total building area and passenger activity levels change.
- Conversion of BCAD fleet to renewable and zero-emission vehicle types (number or percentage of vehicles).
- Water consumption, along with passenger activity, to generate a water use intensity metric, as well as quantities of water saved through rainwater reuse and other water conservation projects.

These metrics should be tracked during design and construction of MPU projects and updated as new projects are added, in a visual format, to support visualization of BCAD's sustainability performance.



Table 7.4-2 (1 of 3): Prioritized Master Plan Update Sustainability Initiatives

SELECTED MPU SUSTAINABILITY INITIATIVES	CATEGORIES SUPPORTED ▼					AFFECTS ▼			
	RESILIENT DESIGN	WASTE SUPPLY	ENERGY/GHG EMISSIONS	WATER CONSERVATION	COMMUNITY EDUCATION, OUTREACH, AND PARTNERING	BCAD		TENANT <sup>2/4</sup>	
						DESIGN	OPERATIONS	DESIGN	OPERATIONS
<b>Resilient Design</b>									
1	Commit to LEED certification for new BCAD facilities construction. Start considering sustainable design opportunities in advanced planning efforts, which may include a cost comparison of obtaining the various LEED certification levels, prior to issuance of design bid documents.	■	■	■	■	■			
2	Require developers of new cargo, GA, and FBO facilities to make a sustainable design commitment. Consider establishing minimum sustainable design standards for tenant development on Airport property.	■	□	□	□	■		■	
3	Integrate daylight-harvesting <sup>2/</sup> into new buildings with proper sensor technology. Initiative should be supported by messaging to address potential concerns that “lights are not working.”	■		■	■	■		□	
4	Ensure commissioning and operational readiness strategies are in place to transition emerging sustainability technologies from design/construction to operation. Maintenance staff should be fully trained in new O&M procedures and should have detailed O&M manuals to support ongoing operations.	■				■			
<b>Waste Management</b>									
5	Integrate flexibility to accommodate recycling/reuse collection, sortation, and circulation needs, and consider pre- and post-security issues for waste collection and processing in all new facilities.	■	■			■			
6	Require contractors to develop waste management plans for construction projects. Plans should identify project goals for waste reduction, recycling, and reuse, as well as methods to track and report performance to BCAD. Integrate the new requirement into design and construction bid documents.		■			■		■	
7	Implement a public art project themed to reinforce the Broward County recycling message.		■		■	■			
8	Evaluate and enhance MSW public and back-of-house signage and training of janitorial staff to promote proper waste sortation practices at points of disposal and at compactors/containers. If the development of a mini-MRF is pursued, then ensure public messaging recognizes the benefits of this BCAD sortation activity to instill the importance of recycling in Broward County to the traveling public (also supports Initiative #25).		■		■	■	■		
<b>Energy and GHG Emissions</b>									
9	Evaluate opportunities for canopy solar installations on the top level of parking garages, in surface parking lots, and on other BCAD-owned parcels, such as retention basins.	■		■		■		□	
10	New construction should maximize energy efficiency strategies, consistent with the LEED rating system.	■		■		■		□	

NOTE: ■ = Applicable □ = Potentially Applicable



Table 7.4-2 (2 of 3): Prioritized Master Plan Update Sustainability Initiatives

SELECTED MPU SUSTAINABILITY INITIATIVES	CATEGORIES SUPPORTED ▼					AFFECTS ▼			
	RESILIENT DESIGN	WASTE SUPPLY	ENERGY/GHG EMISSIONS	WATER CONSERVATION	COMMUNITY EDUCATIONAL, OUTREACH, AND PARTNERING	BCAD		TENANT <sup>4/</sup>	
						DESIGN	OPERATIONS	DESIGN	OPERATIONS
11 Prioritize multimodal connectivity through development of the Intermodal Center, an MPU recommended development project that provides opportunities to connect the Airport to Broward County busing/mass transit and that can support bicycle and pedestrian mode access to the Airport with amenities.			■		■	■			
12 Integrate flexibility in utility delivery systems to support future electric fleets on the airside and landside. Consider metering/tracking opportunities to support tenant use charges.	■		■			■			
13 To support reductions in operational GHG emissions, integrate the evaluation of energy demand changes and quantify associated GHG emissions changes associated with new development alternatives, where practical.			■			■		□	
14 Consolidate chillers and energy backup systems (generators) in a purpose-built facility (Central Plant) to promote long-term system efficiencies in energy use and maintenance, as well as to provide the ability to efficiently support incremental growth. In the consolidated facility, consider the use of alternative/low-emission fuels for generators.	■		■			■			
15 Seek opportunities to purchase renewable energy from utility providers. Consider participation in FPL's SolarTogether program, under which BCAD subscribes to the FPL program to develop off-site solar, and BCAD receives the renewable energy credit for electricity produced.			■				■		
16 Consider further opportunities to responsibly convert BCAD fleet to alternative fuel and/or zero-emission vehicles and equipment e.g. similar to those previously considered in the busing operation agreement recently awarded. As part of the decision-making process, investigate emerging technologies to understand maintenance requirements and equipment operational compatibility with Airport operational needs.			■				■		□
17 Consider opportunities to incentivize zero-emission vehicle fleets and alternative fuel vehicle fleets by ground transportation providers (e.g., taxis, shuttles, TNCs).			■				□		■
<b>Water Conservation</b>									
18 Develop a stormwater master plan to prepare for stormwater runoff storage needs associated with MPU proposed development projects. The stormwater master plan should consider storage needs given the current accepted planning standards and should evaluate the feasibility of rainwater harvesting opportunities.	■			■		■			
19 Strive for long-term resiliency to flooding and sea-level rise in future development, consistent with County planning guidance and within the constraints of the existing built environment (given operational dependencies among Airport facilities and aircraft operations). Evaluate risks if infrastructure cannot achieve minimum elevation standards.	■			■		■		□	

NOTE: ■ = Applicable □ = Potentially Applicable



Table 7.4-2 (3 of 3): Prioritized Master Plan Update Sustainability Initiatives

SELECTED MPU SUSTAINABILITY INITIATIVES	CATEGORIES SUPPORTED ▼					AFFECTS ▼		BCAD		TENANT <sup>1/2/</sup>	
	RESILIENT DESIGN	WASTE SUPPLY	ENERGY/GHG EMISSIONS	WATER CONSERVATION	COMMUNITY EDUCATION, OUTREACH, AND PARTNERING	DESIGN	OPERATIONS	DESIGN	OPERATIONS	DESIGN	OPERATIONS
<b>20</b> Adopt a xeriscaping policy for new development that minimizes the need for irrigation and is compatible with goals to minimize wildlife attractants at FLL. This new policy should be incorporated into minimum design standards and should apply to new tenant development as well.	■			■		■	□	■	□		
<b>21</b> Install submetering in new development to strategically manage water use more effectively and to allow for tenant-level water use analysis to engage high-water users in considering opportunities to reduce consumption.				■		■					
<b>22</b> Continue conversion to low-flow fixtures in future renovations and continue to install low-flow technology in new construction that aligns with BCAD's customer level of service and maintenance objectives.	■			■		■					
<b>Community Education, Outreach, and Partnering</b>											
<b>23</b> Provide passenger amenities at the proposed Intermodal Center that support alternative mode access to the Airport and may reduce vehicular trip generation by providing on-site services, such as a day care facility, commercial and retail facilities, and a wellness center.					■	■	□				
<b>24</b> Identify opportunities to communicate FLL's sustainability successes through public art, signage, website, FLLash newsletters, etc. Prioritize sustainability messaging associated with the development of MPU proposed development projects.					■	■	■	□	□		

NOTES:

■ = Applicable

□ = Potentially Applicable

BCAD = Broward County Aviation Department

FBO = Fixed-Base Operators

FLL = Fort Lauderdale-Hollywood International Airport

FPL = Florida Power & Light Company

GA = General Aviation

GHG = Greenhouse Gases

LEED = Leadership in Energy and Environmental Design

MPU = Master Plan Update

MRF = Materials Recovery Facility

MSW = Municipal Solid Waste

O&M = Operations and Maintenance

TNC = Transportation Network Company

1/ For purposes of this analysis, the term "tenant" is broadly applicable to non-BCAD entities developing facilities and/or conducting operations at FLL, including airlines, concessionaires, FBOs, government agencies, and ground transportation providers.

2/ The practice of designing a facility to use daylight to reduce artificial lighting (and electricity) use.

SOURCE: Broward County Aviation Department, Sustainability Initiatives Workshop, March 18, 2019.

PREPARED BY: Ricondo & Associates, Inc., March 2019.



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