

Appendix H

Sustainability Report

Appendix H

Sustainability

1.0 INTRODUCTION TO SUSTAINABILITY

Niagara Falls Transportation Authority (NFTA), which oversees Niagara Falls International Airport (NFIA or the Airport) as well as Buffalo Niagara International Airport (BNIA), has demonstrated its commitment to sustainability by initiating sustainable master plan updates at both NFIA and BNIA. By incorporating sustainability into the NFIA master planning effort, NFTA has committed to a long-term, comprehensive, and integrated approach to airport development that considers the natural environment, community interests, economic factors, as well as operational efficiency.

1.0.0 What is Sustainability?

Sustainability has helped to reshape the values and criteria for measuring airport performance by using a "triple bottom line" approach that considers economic, ecological, and social well-being. While this "three pillar model of sustainability"¹ has been used for close to two decades as the defining principle of sustainability, a recent article in *Nature* reframed the definition of sustainability to view it as a nested concept: "The global economy services society, which lies within Earth's life-support system."² Accordingly, the initial approach to sustainability was recommended to be redefined to "development that meets the needs of the present while safeguarding Earth's life-support system, on which the welfare of current and future generations depends."³ Applying this redefined approach to sustainability focuses organizations on the interrelatedness and interdependencies of these critical systems. Within the airport-specific context, the Airports Council International-North America (ACI-NA) defines airport sustainability as "A holistic approach to managing an airport so as to ensure the integrity of the Economic viability, Operational efficiency, Natural resource conservation, and Social responsibility (EONS) of the airport."⁴ Figure H-1 illustrates this evolution of the definition of sustainability.

A key principle of sustainability is recognizing that addressing one concern does not necessarily come at the expense of another. Optimally, evaluating a project or activity based on environmental and social concerns will spur innovation that ultimately reduces costs over the life of the project. Airport sustainability as part of a business strategy has both immediate and long-term benefits that can be measured and, when persistently managed, present rewards. Some benefits of sustainability initiatives that have been demonstrated at airports across the world include:

- Improved passenger experience
- Better use of assets
- Reduced development and/or operations and maintenance costs
- Reduced environmental footprints
- Facilitation of environmental approvals/permitting

1 As formulated by the United Nations at the United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, 3-14 June 1992.

2 Griggs, D., Stafford-Smith, M., Gaffney, O., Rockström, J., Öhman, M. C., Shyamsundar, P., Steffen, W., Glaser, G., Kanie, N., Noble, I. *Sustainable development goals for people and planet*. *Nature* 495, 305–307 (2013). <http://dx.doi.org/10.1038/495305a>.

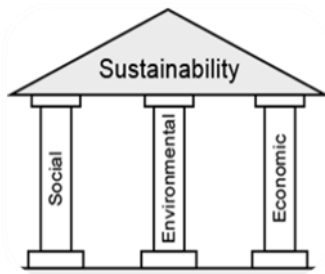
3 Ibid.

4 Airports Council International-North America (ACI-NA). *Airport Sustainability: A Holistic Approach to Effective Airport Management*.

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- Improved relationships within the community
- Enhancement of the regional economy
- Creation of an engaged and enriched place to work
- Creation of new technologies through increased demand and investment in technologies that facilitate sustainable solutions

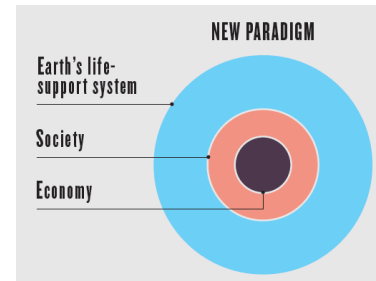
Figure H-1 Evolving Definitions of Sustainability



Three pillar model of sustainability



ACI-NA's "EONS" definition of sustainability



New sustainability paradigm: Nested approach

1.0.1 Sustainability Component of the Master Plan Update

The goal of the sustainability component of the NFIA master planning process is to develop a practical set of sustainability recommendations to address the following resource areas in the context of operational efficiency and economic benefits:

- Natural Resources
- Air Quality and Greenhouse Gases
- Energy
- Waste Management and Recycling
- Socioeconomic, Community Support, and Noise

These resource areas, which address the holistic definition of airport sustainability, were identified as priority areas for the sustainability component of the Master Plan Update during the Project's kick-off. Recently, the Federal Aviation Administration (FAA) has focused on energy and waste management aspects of airport operations. Sections 133 and 512 of the FAA Modernization and Reform Act of 2012 outline FAA's focus on recycling and energy efficiency, requiring that airport

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master plans address solid waste recycling at the airport, and that public-use airports identify opportunities for increased energy efficiency at the airport.⁵

The sustainability planning process follows a similar approach to the master planning process. It includes a baseline inventory, goals setting, developing recommended initiatives/alternatives, and forming a plan for implementation. The sustainability and master planning processes, when combined, provides a powerful planning tool that will create a long-term development vision for the Airport that considers economic, environmental, social, and operational factors. The purposes of unifying the sustainability and master planning processes are to ensure sustainability goals and initiatives developed during the sustainability planning process are also used to inform the recommendations of the Master Plan Update and to ensure stand-alone sustainability strategies are compatible with these recommendations.

Figure H-2 illustrates how the sustainability planning and the master planning processes interrelate. At the **sustainability baseline assessment** step, the Master Planning Team and the Sustainability Team (collectively known as the Project Team) work together to obtain information on existing conditions at the Airport. After developing sustainability goals and objectives, the Sustainability Team prepares **sustainability-related alternatives screening criteria** to be used in the master plan alternatives screening process to make sure the alternatives proposed in the Master Plan Update meet NFIA's established sustainability goals and objectives.

The alternatives proposed in the Master Plan Update, in turn, inform the **sustainability initiatives** identified in the sustainability component of the master plan. Finally, the **evaluation of sustainability initiatives**, which includes a description of costs, benefits, and implementation challenges, shape how initiatives are prioritized. These prioritized initiatives are then incorporated into the **Sustainability Strategy**, as well as the **Project Phasing and Capital Improvement Plan** components of the Master Plan Update.

5 FAA Modernization and Reauthorization Act of 2012. http://www.faa.gov/regulations_policies/reauthorization/media/PLAW-112publ95%5B1%5D.pdf

Figure H-2 Sustainability Study and Master Plan Update Planning Process



I.1 SUSTAINABILITY BASELINE ASSESSMENT

The purpose of the following sustainability baseline inventory is to provide an overview of the current sustainability performance of NFIA. This is an essential piece of the sustainability component of the Master Plan Update because it provides the context for the sustainability objectives and initiatives that are included in the plan. Understanding the Airport’s current sustainability performance also provides the information necessary for Airport Staff to measure and evaluate the impact of any sustainability programs and initiatives that NFTA may implement in the future.

The Sustainability Baseline is organized by the priority resource area, as identified in [Section 1.0.1](#).

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1.1.0 Natural Resources

With regard to NFIA, natural resources include natural land areas that support local biodiversity and water resources (stormwater and potable water). An important element to NFIA's sustainable growth is to ensure the conservation of the quality of NFIA's natural resources. This section describes the natural resources at NFIA and current initiatives to reduce related impacts. It is important to note that many of the resources described below are regulated and described in detail in other sections of this Master Plan Update. Therefore, the sustainability focus for natural resources is primarily on the use of potable water, which is not regulated.

Natural Land Areas and Biodiversity

Large-scale land alterations, including the development of runways, Airport-related buildings, and extensive paved areas, have significantly altered NFIA from its original, natural state. Much of the native vegetation has been removed and over 60 percent of the Airport consists of developed land (i.e., paved land or buildings). Managed grassland, which is located adjacent to runways, on roadway medians, and on landscaped areas around buildings and parking areas, is the second most common land cover, encompassing roughly 30 percent of the Airport. Wetlands, small stands of deciduous trees and shrubs, and landscaping around buildings comprise the remaining 10 percent of vegetation at the Airport.⁶

Of the wildlife present at and near NFIA, the northern harrier (*Circus cyaneus*) is a state-listed threatened bird species and the devil crawfish (*Cambarus diogenes*) is an unlisted species of conservation concern. Conservation of these species is important to maintain the proper functioning of the local ecosystem. However, the presence of birds and other wildlife proximate to the Airport can create aircraft safety concerns. Existing wildlife that can be detrimental to aircraft operations include European starlings, Canada geese, and great blue herons. Dig outs along the perimeter fence, which are created by mammals digging holes under the fence, afford wildlife with the opportunity to gain access to the AOA. These dig outs, along with standing water/wet areas, nesting areas, and off-site attractants such as landfills are areas of concern that have the propensity to attract wildlife.

Projects proposed in the future will need to be designed to avoid, minimize, or mitigate any possible adverse impacts to these natural resources. The use of Best Management Practices (BMPs) during construction will also minimize indirect impacts to wetland resources at NFIA. It is important to note that any wildlife conservation at the Airport should be conducted in accordance with the NFIA Wildlife Hazard Management Plan.

Surface Water

NFIA lies in the Lake Erie-Niagara River Basin. As described in Section 3.19, Cayuga Creek and its tributaries were the only surface water features identified on the Airport during the wetland delineation effort conducted for this Master Plan Update. The locations of the surface waters identified during these two delineations are shown in Figure 3-4. Future projects will be designed and constructed to avoid, minimize, or mitigate any possible impacts to surface water resources to the highest degree possible.

⁶ NFTA. Terminal Construction at the Niagara Falls International Terminal. Environmental Assessment. September 2007.

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If a proposed development is likely to disturb land, NFTA is required to obtain a State Pollutant Discharge Elimination System (SPDES) permit for stormwater discharges associated with construction activities. The SPDES permit requires implementation of a Stormwater Pollution Prevention Plan (SWPPP), developed specifically for the Project, in order to minimize and mitigate any impacts due to erosion and sedimentation during the construction period. As part of the SWPPP, an Erosion and Sediment Control Plan would also be required to control stormwater discharge during the construction phase.

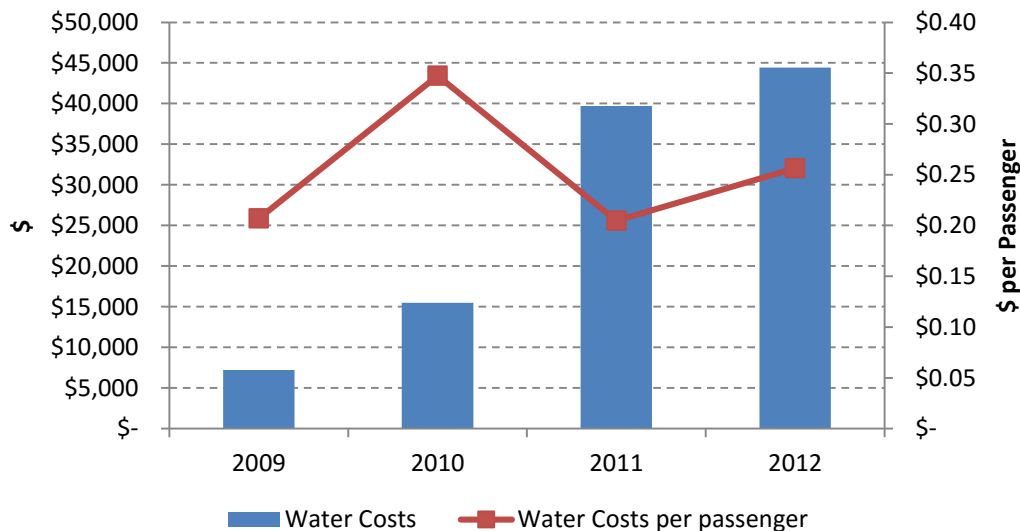
Potable Water

Since 2009, the annual cost of potable water at NFIA has increased from approximately \$7,200 in 2009 to approximately \$44,400 in 2012. (Figure H-3). This increase can be attributed to an increase in per gallon costs of water and an increase in passengers traveling through the Airport. When considering costs on a per-passenger basis, costs have remained relatively stable, aside from a marked increase in 2010, which may be related to the construction and opening of the new terminal.

Airport-wide water consumption similarly indicates an increase since 2009, with per passenger water use remaining relatively constant between 2011 and 2012 (Figure H-4). NFIA tracks its water use through data collected from nine water meters. The new terminal at NFIA has four submeters, tracked through two water bills. One water bill measures domestic water use, while the other tracks fire hydrant water use. Per passenger water use for the new terminal is low, which can be largely attributed to water efficient fixtures installed in the new terminal (Figure H-5).

There is a water meter to measure the use of NFIA's Fixed Base Operator (FBO), but other tenant usage is not monitored. Tenants are not financially responsible for their water consumption.

Figure H-3 Airport Water Costs



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Figure H-4 Airport Water Use

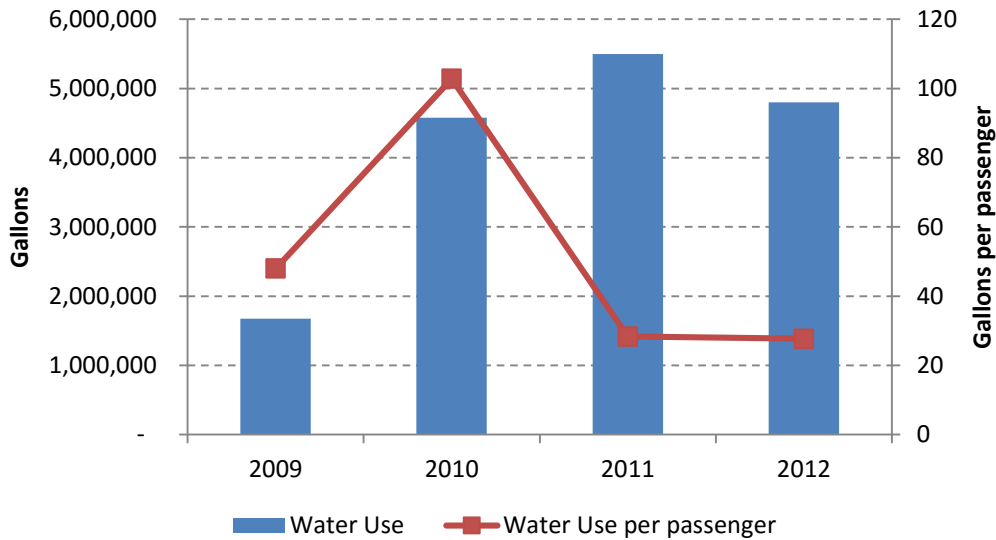
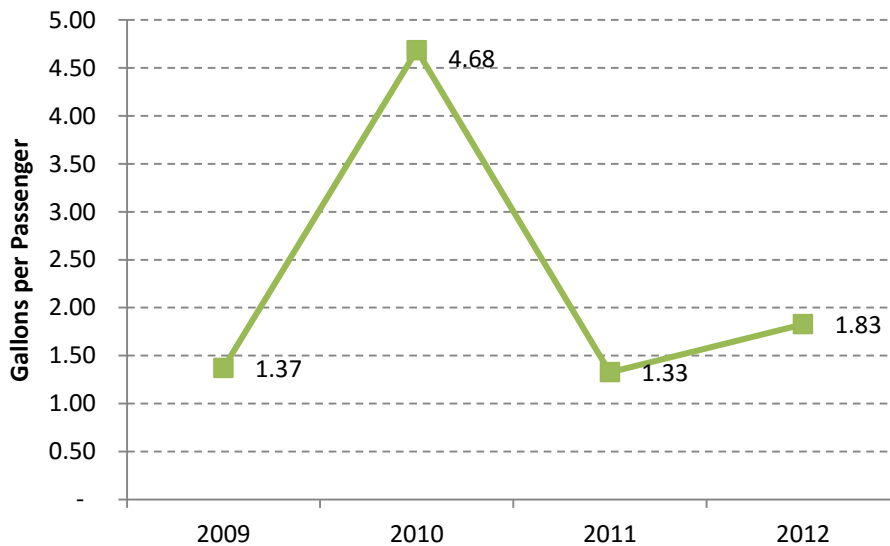


Figure H-5 Terminal Water Use per passenger



Notes:

Water Costs per passenger were only calculated for the new terminal space, since this is the area where passengers would use water.

Data for 2009 is only available for the partial year (due to the terminal opening mid-year)

Q2 2011 and Q4 2012 data are missing

2009 and 2010 passenger data is from FAA's Terminal Area Forecast, 2011 and 2012 passenger data is from this Master Plan Update

When reviewing quarterly water usage for each individual meter at NFIA, the variation is substantial. Two examples are presented herein. In the case of the meter named "Airport Garage (Old Terminal)," water usage in the first quarter of 2009 is approximately 10,000 gallons and then increases steadily to reach approximately 150,000 gallons in the third quarter of 2012 (Figure H-6). For the meter named "NFIA Admin (Old Terminal)," water usage appears more erratic, with a low of just under 10,000 gallons in the third quarter of 2011 and a high of just over 25,000 gallons in the second quarter of 2012 (Figure H-7). The concern with varying water usage is that there

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may be some water leaks that have gone undetected or were not detected in a timely fashion, resulting in increasing operating costs. Reviewing the water bills may help NFTA determine whether there are leaks, or if there is another reason for the variances (e.g., seasonal spikes in usage, changes in fees, etc.).

Figure H-6 Airport Garage (Old Terminal) Water Usage

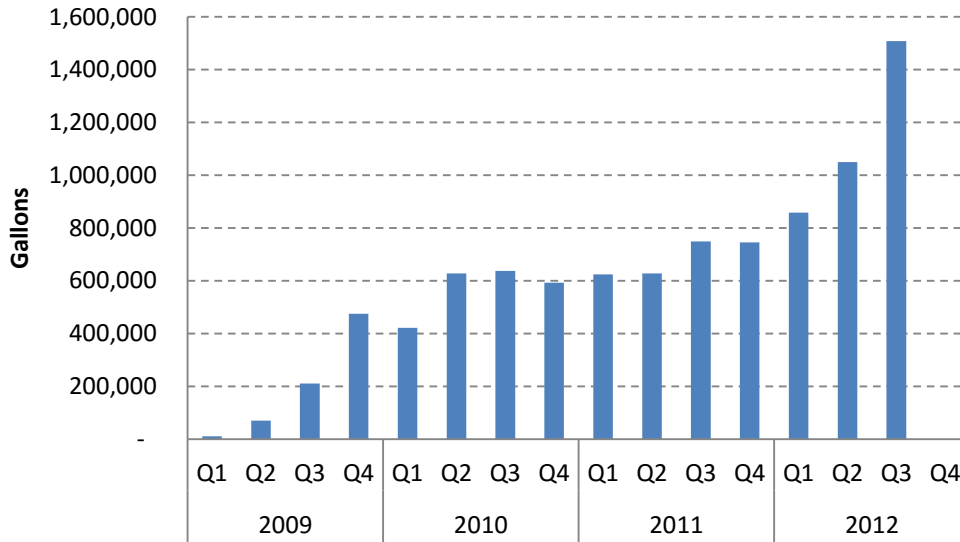
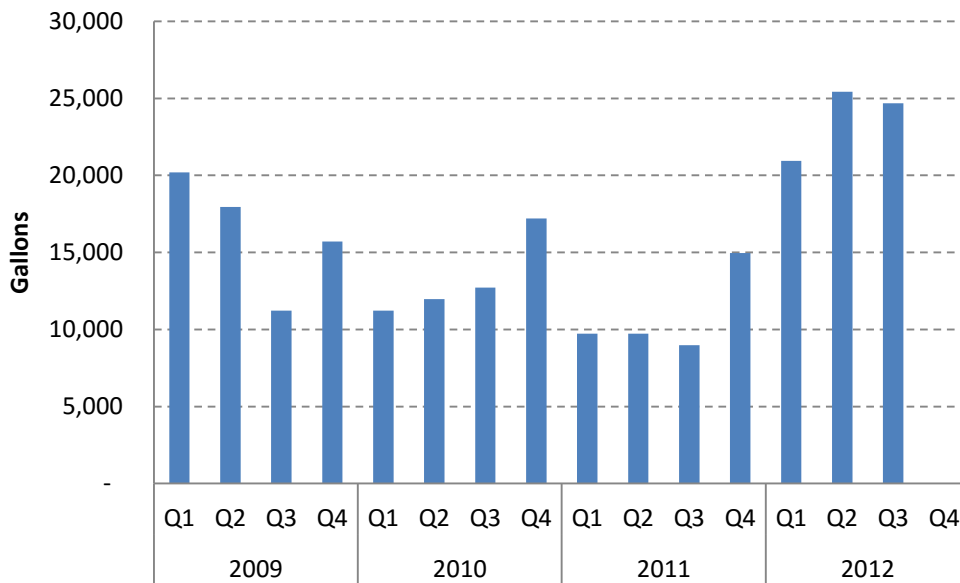


Figure H-7 NFIA Admin. (Old Terminal) Water Usage



Existing Sustainability Activities – Natural Resources

Table H-1 details sustainability initiatives implemented at NFIA that have sought to minimize the use of natural resources and conserve the quality of NFIA’s natural environment. In addition to information about the initiatives, this table also includes the associated sustainability benefits and EONS categories. Many initiatives benefit more than one aspect of sustainability; the “EONS”

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categories refer to the four aspects that underlie airport sustainability: economic viability, operational efficiency, natural resource conservation, and social responsibility. Within Table H-1, each initiative is denoted with a “symbol”- **EONS** - to demonstrate which aspects of airport sustainability each initiative affects.

Table H-1: Natural Resource Sustainability Initiatives - EONS

Natural Resource Sustainability Initiatives	Sustainability Benefits	Applicable Sustainability Categories (EONS ¹)
Spill Prevention Plan NFTA maintains a Spill Prevention Control and Countermeasure (SPCC) Plan at NFIA. This plan documents the facility, spill history, potential spill predictions, and prevention measures.	Decreases likelihood of water quality impacts through spill prevention	O N
New Terminal Design Conventional water-conserving fixtures were used on all plumbing. The lavatory fixtures have integrated automatic sensors, which are mounted on the flush valve units of the water closets and urinals. Hot water is supplied to bathrooms using instantaneous heaters, rather than a central hot water system. Hose bibbs are provided at exterior walls and where required for cleaning/washdown (e.g., glass areas). ²	Increases water efficiency, minimizing potable water use	E O N S

1 Economic viability, Operational efficiency, Natural resource conservation, and Social responsibility

2 Note to NFTA: these features were described in the Terminal Design Rationale, but do not necessarily reflect the final design.

1.1.1 Air Quality and Greenhouse Gases

Emissions inventories of actual and forecast activities at NFIA during 2011, 2015, and 2020 have been prepared to assist NFTA in developing a baseline against which potential sustainability initiatives and emissions reduction measures can be identified and evaluated. The emissions inventories address the U.S. Environmental Protection Agency’s (EPA) criteria air pollutants, including carbon monoxide (CO), Ozone (O₃), respirable particulate matter measuring 10 micrometers or less in diameter (PM₁₀), fine particulate matter measuring 2.5 micrometers or less in diameter (PM_{2.5}), and sulfur dioxide (SO₂).⁷ In addition, the emissions inventories address the emission of greenhouse gases (GHGs) such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), expressed in terms of carbon dioxide equivalent emissions (CO₂e).⁸

7 EPA’s criteria pollutants refer to those pollutants for which EPA has established National Ambient Air Quality Standards (NAAQS) to safeguard human health and environmental welfare from the detrimental effects of air pollution. Notably, oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) are considered precursors to ground-level ozone formation and are evaluated as ozone surrogates in this inventory.

8 The expression CO₂e normalizes the warming effects of individual GHG to the warming potential of CO₂. Consistent with current Intergovernmental Panel on Climate Change (IPCC) guidelines, CH₄ and N₂O are considered 21 and 310 times as potent as CO₂, respectively, although they are emitted in much smaller quantities compared to overall CO₂ emissions.

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The emissions inventories were prepared in accordance with *ACRP Report 11: Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*, using the FAA's Emissions and Dispersion Modeling System (EDMS) version 5.1.3, the US Environmental Protection Agency's Motor Vehicle Emissions Simulator (MOVES) version 2010b, and other relevant and contemporary data sources and tools.

How does EPA Regulate Air Quality?

Under the Clean Air Act, the EPA is charged with establishing the National Ambient Air Quality Standard (NAAQS) for pollutants that have a detrimental effect on outdoor air quality in terms of public health and environmental quality. EPA and its state-level affiliates record and evaluate air monitoring data to ensure areas of the nation are either in compliance (i.e., *attainment*) with or in violation (i.e., *non-attainment*) of these NAAQS.

What Pollutants does EPA Regulate?

EPA regulates air pollutants commonly found across the United States. These pollutants, commonly referred to as "criteria pollutants," are used as indicators of air quality, and include:

- CO (carbon monoxide)
- O₃ (ozone)
- PM₁₀ (respirable particulate matter measuring 10 micrometers or less in diameter)
- PM_{2.5} (fine particulate matter measuring 2.5 micrometers or less in diameter)
- SO₂ (sulfur dioxide)
- NO_x (nitrogen oxides)

Sources of Criteria Pollutant and GHG Emissions

Emissions at NFIA arise primarily from the combustion of fossil fuels (e.g., jet fuel, aviation gasoline, diesel, motor gasoline, natural gas). In the case of GHG, offsite emissions associated with the production of electricity purchased for the facility are also included in the inventory. Table H-2 below identifies and describes emissions sources included in NFIA emissions inventories.

Table H-2: Air Pollutant Emissions Sources

Sources	Characteristics of Emissions
Aircraft	Exhaust products of fuel combustion that vary depending on aircraft engine type (e.g., turbo-jet, turbo-prop), fuel type (e.g., Jet-A, avgas), number of engines, power setting (e.g., taxi/idle, take-off, cruise), and amount of fuel burned.
Ground Service Equipment (GSE) / Auxiliary Power Units (APU)	Exhaust products of fuel combustion from aircraft service trucks, tow tugs, belt loaders, and other portable equipment. Emissions are also emitted by APU used to furnish power to some aircraft when the main engines are off.
Motor Vehicles	Exhaust products of fuel combustion from passenger vehicles, Airport shuttles, buses and other vehicles about the Airport site. Emissions vary depending on vehicle type (e.g., gasoline, diesel) and the amount of fuel consumed.
Stationary Sources and Fuel Facilities	Exhaust products of fossil fuel combustion in boilers for space heating and emergency generator units. Evaporative emissions from fuel storage and transfer facilities are also included.
Electrical Consumption	Emissions associated with the production of electricity at off-site utilities that use coal, oil, or natural gas.

Source: KB Environmental Sciences, 2013.

Air Pollutant Emissions Inventory

In terms of air quality, NFIA is contained within the Niagara County portion of the *Buffalo-Niagara Falls, NY* nonattainment area for the 1997 8-hour Ozone (O₃) National Ambient Air Quality Standard (NAAQS) promulgated by the EPA, although the area will soon be meeting all air quality obligations related to this status. The closest O₃ air monitor to NFIA is located approximately 12 miles southeast at the Audubon Golf Course on Maple Road in Amherst, NY. O₃ data from this monitor for years 2010 through 2012 are summarized on Table H-3 below and show that concentrations in the area have been below the 1997 8-Hour Ozone NAAQS of 0.08 parts per million.

The EPA has since revised the O₃ NAAQS to a more stringent value (referred to as the 2008 8-Hour Standard) and has thus far determined that the Niagara County area is in attainment. As shown in Table H-3, 2012 values at the Amherst monitor exceeded the NAAQS 2008 8-Hour standard of 0.075 parts per million. However, compliance with the NAAQS is based on a three-year average and this average is less than 0.075 parts per million.

Table H-3: Ozone Air Monitoring Data

	Ozone Air Monitor Concentrations at the Amherst Monitor (parts per million)				NAAQS ¹	
	2010	2011	2012	Average	1997 8-Hour	2008 8-Hour
Amherst Monitor	0.072	0.068	0.079	0.073	0.08	0.075

¹ Compliance with both the 1997 and 2008 8-Hour O₃ NAAQS is determined based on a three year average of the fourth highest daily average 8-hour O₃ concentrations measured at a monitor.

Source: EPA AirData, accessed Aug 22, 2013.

Table H-4 presents the results of the 2011, 2015, and 2020 criteria pollutant emissions inventories of NFIA. For the pollutants CO, Volatile Organic Compounds (VOCs), nitrogen oxides (NO_x), and SO₂, aircraft is the largest contributor followed by motor vehicles, GSE, and APU. APU and GSE dominate the estimated PM_{2.5} emissions, largely because PM emissions data are not available

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for all aircraft types operating at NFIA. Total emissions have been forecasted to be highest in 2020.

Table H-4: Criteria Pollutant Emissions Inventories

Source	CY 2011 Pollutant Emissions (tons)					
	CO	VOC	NO _x	SO ₂	PM ₁₀	PM _{2.5}
Aircraft	109.7	12.0	18.2	2.3	0.16	0.16
APU	3.8	0.4	7.8	1.0	0.52	0.52
GSE	9.3	0.8	8.0	0.1	0.57	0.55
Motor Vehicles	13.3	0.7	3.4	0.0	0.18	0.15
Stationary Sources	0.3	0.8	0.3	0.0	0.03	0.03
Total	136.4	14.7	37.7	3.4	1.5	1.4
Source	CY 2015 Pollutant Emissions (tons)					
	CO	VOC	NO _x	SO ₂	PM ₁₀	PM _{2.5}
Aircraft	99.2	12.2	19.5	2.4	0.20	0.20
APU	3.8	0.4	7.7	0.9	0.52	0.52
GSE	8.4	0.7	7.0	0.1	0.54	0.52
Motor Vehicles	10.4	0.5	2.8	0.0	0.17	0.13
Stationary Sources	0.3	0.8	0.3	0.0	0.03	0.03
Total	122.1	14.6	37.4	3.4	1.5	1.4
Source	CY 2020 Pollutant Emissions (tons)					
	CO	VOC	NO _x	SO ₂	PM ₁₀	PM _{2.5}
Aircraft	100.3	12.5	21.9	2.6	0.25	0.25
APU	4.0	0.4	7.8	1.0	0.53	0.53
GSE	7.6	0.6	5.3	0.1	0.48	0.46
Motor Vehicles	9.8	0.4	2.2	0.0	0.15	0.10
Stationary Sources	0.3	0.8	0.3	0.0	0.03	0.03
Total	121.8	14.6	37.5	3.7	1.4	1.4

Source: KB Environmental Sciences, 2013.

As mentioned above, Niagara County is located in an area currently designated nonattainment of the 1997 8-hour NAAQS for O₃. EPA has approved the statewide *2002 Base Year Emissions Inventory* prepared by the New York State Department of Environmental Conservation (NYSDEC) for O₃ air quality planning purposes. This inventory is excerpted in Table H-5 and compared to NFIA emissions inventories. Shown, NFIA emissions in 2011 only comprise less than 0.1 percent of 2002 statewide totals for NO_x and VOC. Although it is not possible to isolate Niagara County from these data, Table H-5 demonstrates that emissions at NFIA contribute negligibly to statewide ozone pollutant levels.

Table H-5: Comparison with NYSDEC Emissions Inventory

NYSDEC Source Category	NFIA Source	CY 2011 Pollutant Emissions (tons)	
		VOC	NO _x
Nonroad Mobile	Aircraft	12.0	18.2
	APU	0.4	7.8
	GSE	0.8	8.0
	Total	13.2	34.0
	<i>2002 Statewide Total</i>	157,892	119,808
	<i>% of Statewide</i>	0.008	0.028
Onroad Mobile	Motor Vehicles	0.7	3.4
	Total	0.7	3.4
	<i>2002 Statewide Total</i>	179,731	313,890

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	<i>% of Statewide</i>	0.000004	0.00001
Point	Stationary Sources	0.8	0.3
	Total	0.8	0.3
	<i>2002 Statewide Total</i>	15,034	118,765
	<i>% of Statewide</i>	0.0053	0.0003

Source: KB Environmental Sciences, 2013.

NYSDEC. Technical Support Document for New York Reasonable Further Progress Plans and Conformity Budgets, contained within the New York SIP for Ozone Attainment Demonstration. February 8, 2008.

GHG Emissions Inventory Results

Research has shown there is a direct correlation between fuel combustion and GHG emissions. In terms of U.S. contributions, the U.S. General Accounting Office (GAO) reports that "domestic aviation contributes about 3 percent of total carbon dioxide emissions, according to EPA data," compared with other industrial sources, including the remainder of the transportation sector (20 percent) and power generation (41 percent) (GAO, 2009).⁹ The International Civil Aviation Organization estimates that GHG emissions from aircraft account for roughly 3 percent of all anthropogenic GHG emissions globally (Melrose, 2010).¹⁰

Given the local air quality status and the aviation sector's presumed contribution to GHG emissions, an important component of NFTA's sustainability efforts comprises an air quality and GHG assessment of activities at NFIA, both currently and in the future.

GHG emissions are segregated in terms of emissions "ownership" (i.e., emissions under the jurisdiction and control of NFTA compared to those generated by the operations of its tenants). Further, consistent with the Transportation Research Board Airport Cooperative Research Program (TRB/ACRP) guidelines,¹¹ emissions reporting "boundaries" have been established according to the following categories:

- Scope 1 / Direct – GHG emissions from sources that are owned and controlled by the reporting entity (NFTA). These may include Airport-owned and controlled stationary sources (e.g., boilers, emergency generators) and vehicles using Airport roadways and associated areas.
- Scope 2 / Indirect – GHG emissions associated with the generation of electricity consumed by the reporting entity (NFTA) and its tenants
- Scope 3 / Indirect & Optional – GHG emissions that are attributed to activities at NFIA, but are associated with sources that are neither owned nor controlled by NFTA. These include aircraft-related emissions, emissions from motor vehicles on Airport roadways, and emissions from other Airport tenant activities.

Table H-6 presents the GHG emissions inventories for 2011, 2015, and 2020 in metric tons of CO_{2e} by ownership and boundary category described above. Figures H-8 and H-9 show the total GHG emissions for each scope category. These charts clearly demonstrates that Scope 3 emissions represent the majority of GHG emissions at the Airport (92 percent), followed by Airport electricity usage (Scope 2, 6 percent). GHG emissions under the direct control and ownership of NFTA (Scope 1) comprise no more than 1.6 percent of the total emissions inventory in any given year. Even with forecasted Airport growth, Scope 1 and Scope 2 emissions will remain constant, with only Scope 3 emissions increasing.

9 Aviation and Climate Change. GAO Report to Congressional Committees, (2009). <http://www.gao.gov/new.items/d09554.pdf>

10 Alan Melrose, "European ATM and Climate Adaptation: A Scoping Study," in ICAO Environmental Report. (2010).

11 ACRP Report 11 – Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories (2009).

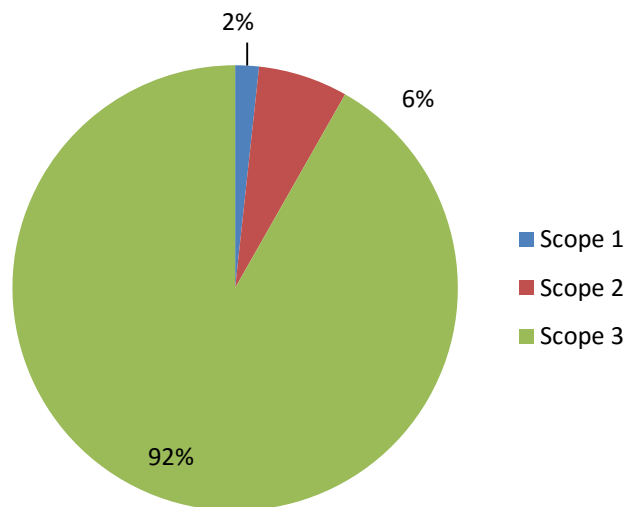
GHG emissions associated with military operations are included within the Scope 3 emissions of aircraft and APU.

Table H-6: GHG Emissions Inventories (metric tons)

Scope	Ownership	Parameter	2011		2015		2020	
			CO ₂ e	%	CO ₂ e	%	CO ₂ e	%
1	Airport	Natural Gas Usage	380	1.6	380	1.6	380	1.5
2	Airport/ Tenant	Electrical Usage	1,439	6.2	1,439	5.9	1,439	5.7
3	Airport/ Tenant/ Public Tenant	Motor Vehicles - Roadways	1,012	4.4	1,165	5.1	1,347	5.7
		Aircraft – Above Ground Level	3,936	17.0	3,997	16.5	4,319	17.2
		Aircraft - APU	2,704	11.7	2,665	11.0	2,709	10.8
		Aircraft - Cruise	11,692	50.6	11,234	46.3	11,274	44.9
		Aircraft - Engine Startup	27	0.1	24	0.1	28	0.1
		Aircraft - Taxi	1,208	5.2	1,271	5.3	1,393	5.5
		GSE	729	3.2	788	3.3	801	3.2
		Total	23,127		22,963		23,691	

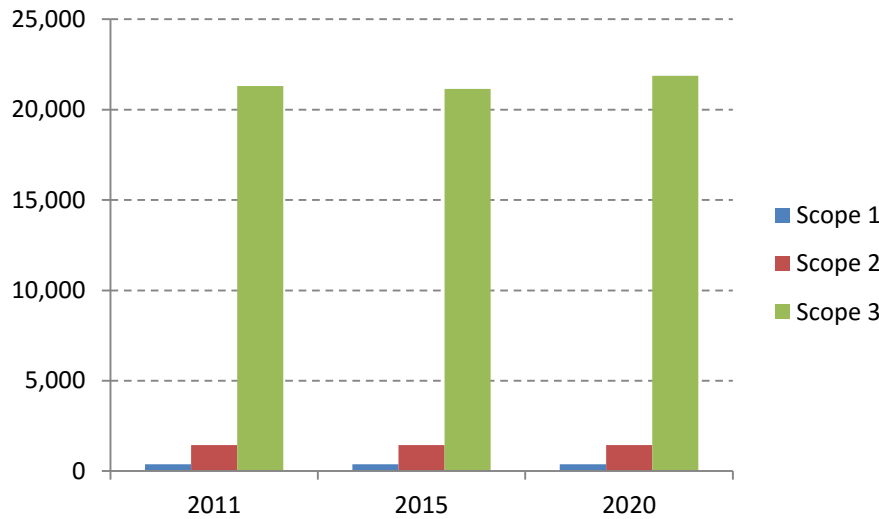
Source: KB Environmental Sciences, 2013.

Figure H-8 GHG Emissions by Scope (2011)



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Figure H-9 Existing and Forecasted GHG Emissions (metric tons) by Scope



It is difficult to compare GHG emissions inventories across airports because the boundaries of the inventory, the sources included, the operational characteristics of the sources, and the inventory purpose can all vary substantially from one airport to another. However, on a percentage basis, NFIA's Scope 1 emissions are comparable to other recently prepared airport sustainability inventories: Scope 1 contributions typically range from as little as less than 1 percent to approximately 5 percent of the total GHG emissions for NFIA.

Existing Sustainability Activities – Air Quality and GHG Emissions

Table H-7 details the air quality initiatives that NFTA has implemented at NFIA to-date.

Table H-7: Air Emissions Sustainability Initiatives - EONS

Air Emissions Sustainability Initiatives	Sustainability Benefits	Applicable Sustainability Categories (EONS ¹)
Pre-Conditioned Air NFIA has two aircraft gates equipped with 400 HZ power and preconditioned air to allow aircraft parked at the gate to be plugged in and operate their electrical and Heating, Ventilation, and Air Conditioning (HVAC) systems without running their engines.	Reduces CO ₂ emissions and aircraft noise, as well as increases fuel savings for the airlines.	⓪ Ⓝ
Air Quality Monitoring NFIA monitors indoor CO ₂ .	Ensures air quality and employee health through reduced exposure to potentially harmful levels of NO ₂ and CO ₂ .	Ⓝ Ⓢ
Cleaning Products NFTA Procurement follows NY Clean and Green policy for chemicals.	Ensures air quality and employee health through reduced exposure to toxic chemicals.	Ⓝ Ⓢ

¹ Economic viability, Operational efficiency, Natural resource conservation, and Social responsibility

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I.1.2 Energy [to be further updated by McFarland Johnson, if necessary]

The purpose of the Energy Audit was to assist NFIA in identifying Energy Conservation Measures (ECMs) that will help reduce building energy consumption and associated GHGs, and improve the overall sustainability of Airport facilities. The audit was accomplished by conducting an on-site inspection of existing conditions at buildings operated by NFTA. The building selection was coordinated among the engineer, NFIA staff, and NFTA management. The buildings surveyed include:

- New terminal
- Old terminal
- Garage/hangar
- FBO building
- NFTA storage hangar
- Triturator building
- Electrical vault
- Air cargo warehouse

The full Energy Audit Report is included in Appendix H1.

As part of the energy efficiency assessment, a physical condition review of the key buildings was carried out. A number of aspects were investigated, including the general condition and heat loss resistance of building envelopes, sources of heating and relative effectiveness, sources of lighting and relative effectiveness, and general condition of visible energy utility infrastructure.

A number of issues and potential ECMs were identified that range from potential envelope improvements, replacement of existing and outdated HVAC equipment, retrocommissioning of existing controls systems, and electrical upgrades.

Existing Sustainability Activities – Energy

Table H-8 details the energy initiatives that NFTA has implemented at NFIA to-date.

Table H-8: Energy Sustainability Initiatives - EONS

Energy Sustainability Initiatives	Sustainability Benefits	Applicable Sustainability Categories (EONS ¹)
<p>New Terminal The new terminal, built in 2008, includes the following energy-related initiatives:</p> <ul style="list-style-type: none"> • Point of use electric water heaters • High efficiency fluorescent lighting • LED lighting • High intensity discharge fixtures • South facing glass protected by an overhang • Glass facades allowing day lighting • Tinted windows • Three new gas fired condensing boilers • Two air handler units use an energy recovery system 	<p>Reduces the overall amount of purchased electricity used, which also reduces GHG emissions.</p>	<p>Ⓔ Ⓗ Ⓐ</p>

Energy Sustainability Initiatives	Sustainability Benefits	Applicable Sustainability Categories (EONS ¹)
<p>General Aviation Administration & Service Garage The General Aviation Administration & Service Garage are pre-manufactured metal building featuring the following energy-related initiatives:</p> <ul style="list-style-type: none"> • Insulated overhead doors 	Reduces the overall amount of purchased electricity used, which also reduces GHG emissions.	E N S
<p>Hangar A – FBO building The Hangar A – FBO is made of a metal frame with non-insulated masonry walls and single-pane windows, but does include the following energy-related initiatives:</p> <ul style="list-style-type: none"> • New, one-piece, well-insulated hangar door 	Reduces the overall amount of purchased electricity used, which also reduces GHG emissions.	E N S
<p>NFTA Equipment Storage/ Maintenance building The NFTA Equipment Storage/ Maintenance building was built in 2 stages, and therefore half the building is 60 years old and the other half is 15 years old and features the following energy-related initiatives:</p> <ul style="list-style-type: none"> • Insulated overhead doors • 2” of fiberglass insulation between metal wall sandwich panels 	Reduces the overall amount of purchased electricity used, which also reduces GHG emissions.	E N S
<p>Triturator Building The triturator building is in adequate condition for its current uses and incorporates the following energy-related initiatives:</p> <ul style="list-style-type: none"> • Rubber roof replaced recently • Insulated overhead doors • Electric point of use water heater 	Reduces the overall amount of purchased electricity used, which also reduces GHG emissions.	E N S
<p>Electrical Vault The Electrical Vault houses most of the electrical equipment on Airport property which provides standby power to airfield lighting, garage, electrical building, and the old terminal</p>	Allows for many of the Airport’s operations to continue and keeps the Airport secure when power outages occur	O

1.1.3 Waste Management and Recycling

The recently passed FAA Reauthorization bill (FAA Modernization and Reform Act of 2012) includes a new requirement for airport master plans to address recycling by:

- Evaluating the feasibility of solid waste recycling
- Minimizing the generation of waste
- Identifying operations and maintenance requirements
- Reviewing waste management contracts
- Identifying the potential for cost savings or revenue generation from recycling

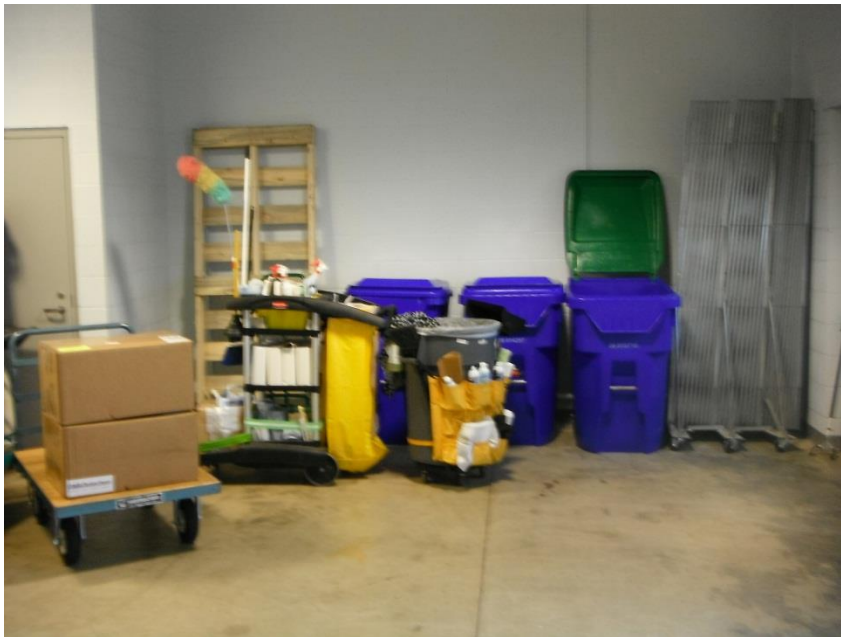
The key steps to developing a recycling plan that meet this FAA requirement include:

1. Collect baseline information on NFIA's waste management program
2. Assess existing waste management program
3. Assess opportunities for expansion of recycling program
4. Develop recommendations for improving the recycling program
5. Measure performance

This baseline inventory addresses the first two steps of the waste management and recycling assessment.

NFIA's Existing Waste Management Program

NFIA has a well-established recycling program, and NFTA has taken on definitive measures to improve recycling rates. NFTA manages the disposal of its waste at NFIA along with tenant waste. Waste is collected by custodial staff after flights, as necessary. Recycled materials primarily consist of paper, plastic, glass, and metal. Each of these waste streams are collected and sorted in a dedicated space adjacent to the loading dock (see photo below). Trash is disposed of in a compactor attached to the loading dock.



Area where recycled materials are sorted for collection.

NFIA's current municipal waste hauler, Modern Disposal Services / Modern Recycling (Modern), picks up trash from two 8-cubic yard containers and four 95-gallon, single-stream recycling bins. Trash containers are typically full; one container is picked up twice a week (Monday and Wednesday) and the other is picked up four times per week (Monday, Wednesday, Thursday, and Friday). The recycling bins are collectively picked up once per week (Monday). Modern does not track the weight or volume of recycled materials or trash, but instead bills NFTA a flat fee based on the number of pick-ups. Currently, NFTA pays \$496 per month or approximately \$6,000 per year in waste disposal fees. Additionally, there is occasionally a \$400 fee for international waste, but that is on an "as needed" basis, and is charged less than once per year.

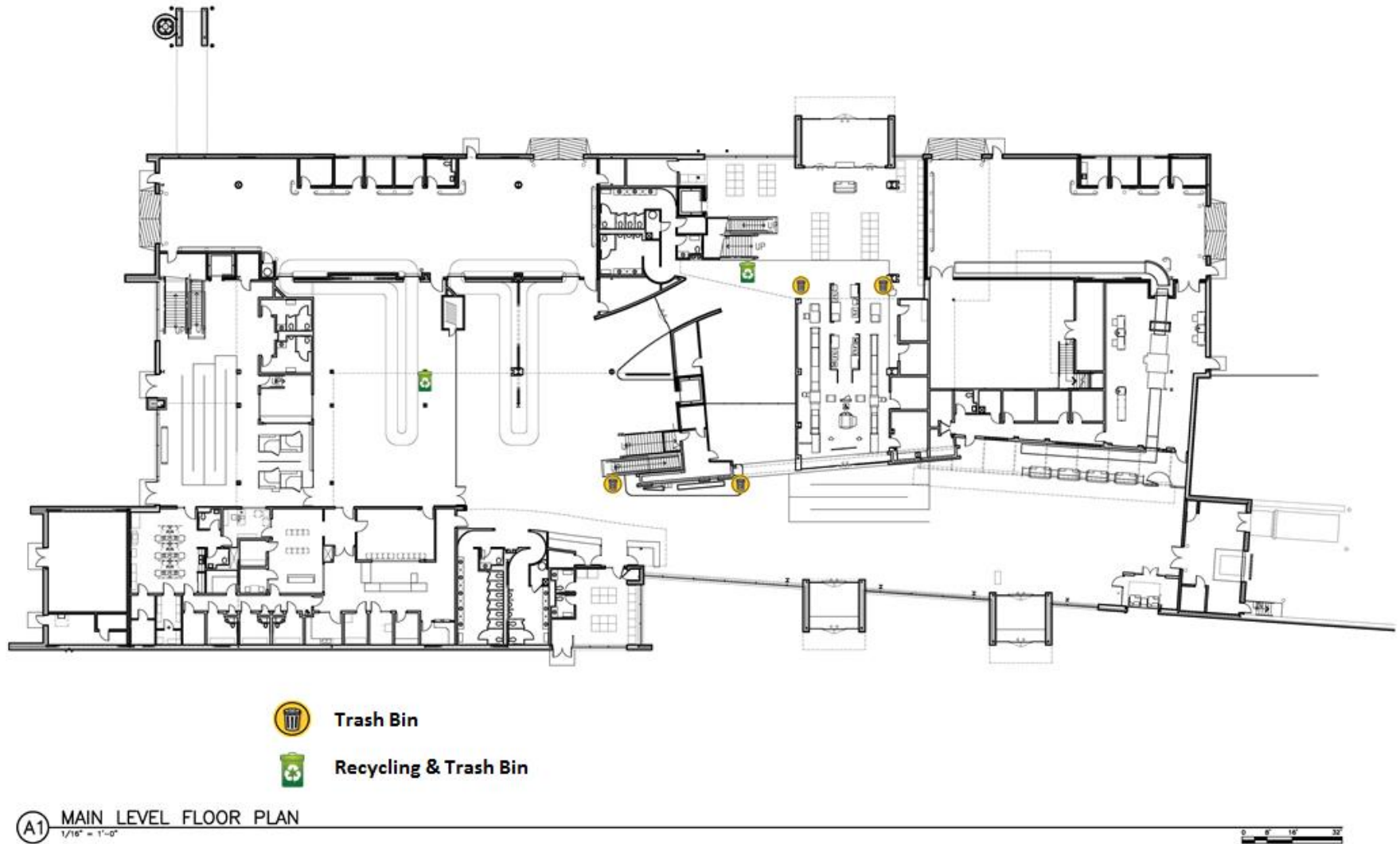
There are trash/recycling bins located throughout the terminal, offices, and tenant areas (Figures H-10 and H-11). These joint trash/recycling bins (see photo below) have a slot for glass/plastics,

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paper, trash, and trash/organics. Although the recycled materials are ultimately comingled, this source separation makes a more visible impression on passengers of NFTA's commitment to recycling. There are also separate bins dedicated to trash collection, located in the terminal area. The ratio of trash bins to recycling bins is approximately 3:2.

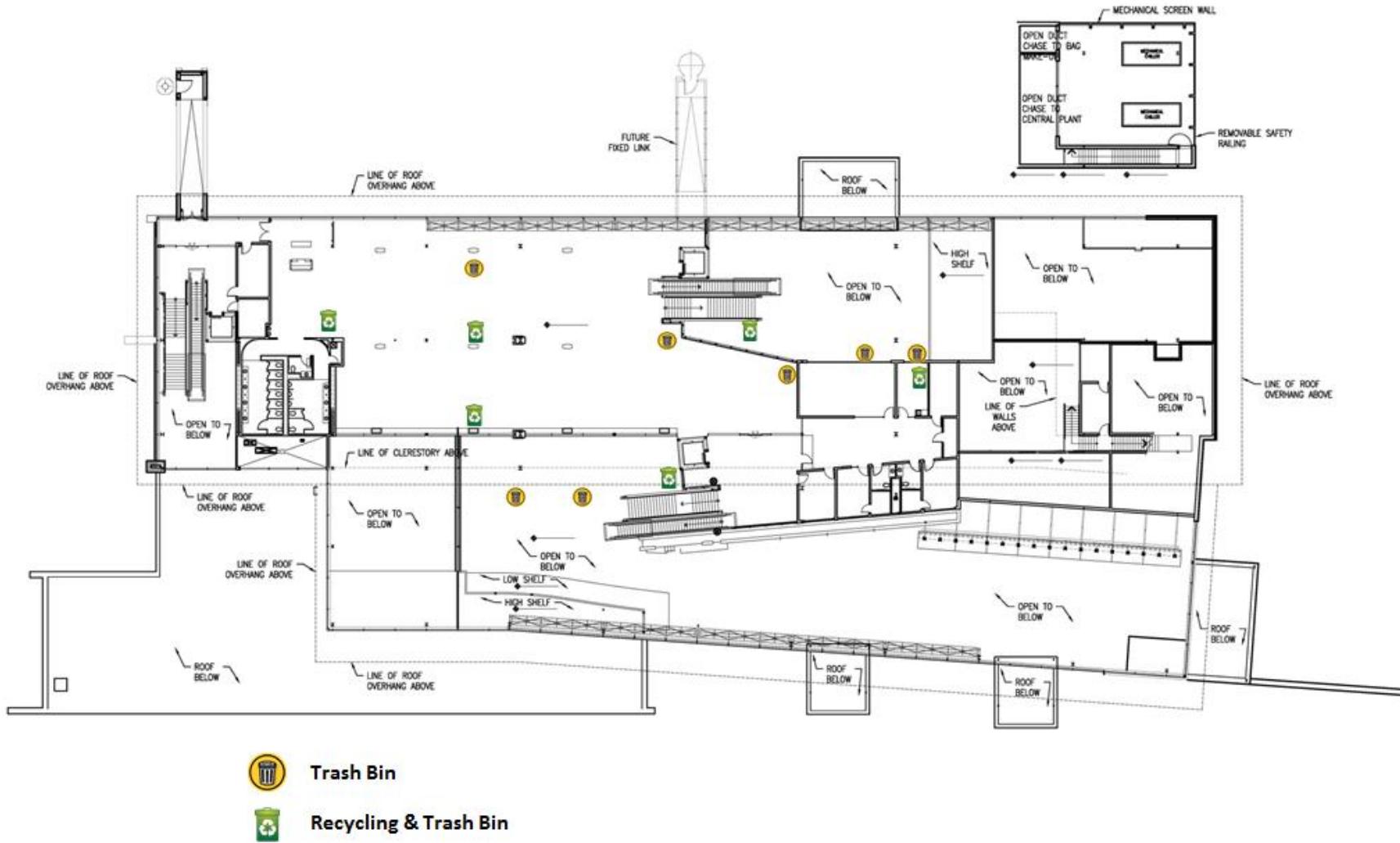
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Figure H-10 Approximate Locations of Recycling Bins in the Terminal Area (Main Level)



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Figure H-11 Approximate Locations of Recycling Bins in the Terminal Area (Upper Level)



A1 UPPER LEVEL FLOOR PLAN
1/16" = 1'-0"





A trash/ recycling bin in the passenger terminal area.

Regarding airline waste and recycling, NFTA lease agreements at NFIA state that tenants should sort their waste and place it in common waste collection areas for the Airport to dispose of. NFTA does not further encourage or track tenant waste. Were airlines to increase recycling, however, NFTA would create savings from economies of scale associated with recycled materials disposal.

Construction Debris

Recycling of construction and demolition (C&D) debris is not required through contractor agreements, but Airport construction projects do typically result in the recycling of scrap metal. Further, concrete (e.g., blocks, pavement) is crushed for reuse as fill material and asphalt is milled from the pavements/ parking lots is reclaimed.

Materials Purchasing & Reuse

In addition to recycling, NFTA limits the amount of material sent to local landfills by focusing on minimizing waste generation and purchasing products with recycled content. Wherever possible, NFTA seeks to either reuse construction debris (e.g., crushed concrete or milled asphalt) or reuse building components. One example of material reuse at NFIA involves NFTA opting to keep the old terminal seating to outfit the new terminal, rather than purchasing new seats and disposing of the old. This not only resulted in reduced waste from the project, but NFTA also saved on costs.

NFIA staff follows NFTA purchasing guidelines. These guidelines include product specifications such as paper that contains recycled content. Because NFIA staff must procure products through NFTA, it is limited in its ability to specify product standards.

Existing Sustainability Activities – Waste Management

Table H-9 details waste and recycling initiatives that NFTA has implemented at NFIA to-date.

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Table H-9: Waste Management and Recycling Sustainability Initiatives - EONS

Waste Management Sustainability Initiatives	Sustainability Benefits	Applicable Sustainability Categories (EONS ¹)
Purchasing of Recycled Materials NFTA purchases recycled paper	Purchasing recycled products reduces waste disposed in landfills.	N
Recycling Education NFTA posts signage in the waste collection room explaining what materials should be recycled.	Reduces waste disposed in landfills.	O N
Waste Minimization Mowed grass clippings are left in place to decompose.	Reduces waste disposed in landfills.	N
Materials Reuse NFTA reused seating and desks from the old terminal in the new terminal.	Reduces waste disposed in landfills, saves money.	N

¹ Economic viability, Operational efficiency, Natural resource conservation, and Social responsibility

1.1.4 Socioeconomic, Community, and Employee Well-Being

NFIA is a key regional economic generator, promotes a positive relationship with its neighbors, and works to enhance passenger and employee well-being. Both NFTA and NFIA staff have conducted proactive community outreach activities. NFTA is particularly active and supports a variety of activities, including health and wellness programs for employees, disadvantaged business enterprise (DBE) programs, and stakeholder outreach.

NFTA strives to provide a positive passenger experience at NFIA. Passenger services and amenities at the Airport include:

- Food concession service in the terminal;
- Vending machines offering beverages and snacks; and
- Free Wi-Fi inside the terminal.

Comment cards are available in the terminal for passengers to express concerns or make suggestions to NFIA.

Aircraft noise is commonly an area of concern in most communities; however, NFIA receives very few noise complaints from its surrounding communities. Currently, the Airport doesn't track noise complaints since they are so infrequent. Land surrounding NFIA is primarily commercial and industrial; however, there are some nearby residential, recreational, and public service lands. Section 3.16, Aircraft Noise, provides an overview of compatible land use criteria and NFIA's noise impacts. As a part of this Master Plan Update, noise contours have been updated and are depicted in Chapter 7.

NFTA offers its employees a number of wellness events such as influenza shots a. These activities are provided to NFIA staff, but because they are often at NFTA headquarters in downtown Buffalo, participation by Airport employees is limited.

Existing Sustainability Activities – Socioeconomic, Community, and Employee Well-being

Table H-10 details socioeconomic and community-related initiatives implemented at NFIA.

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Table H-10: Socioeconomic, Community, and Employee Well-being Sustainability Initiatives - EONS

Socioeconomic/ Community Sustainability Initiatives	Sustainability Benefits	Applicable Sustainability Categories (EONS ¹)
Technical Advisory Committee NFIA recently created a Technical Advisory Committee and has invited 26 potential members. The potential members include FAA, tenants, local communities, the military, and others.	Develops community support for the Airport	Ⓢ
Community Advisory Committee NFIA is in the process of establishing a Community Advisory Committee to further enhance community relations	Develops community support for the Airport	Ⓢ
Passenger Experience The Niagara Tourism and Convention Corporation sends ambassadors to meet / greet passengers	Assist passengers with navigating NFIA, develops community support for the Airport	Ⓞ Ⓢ
Employee Wellness NFTA holds numerous health seminars such as back and heart health	Improves employee well-being	Ⓢ
Disadvantaged Business Enterprise (DBE) Support NFIA staff have participated in numerous outreach activities and coordinated a small information session during DBE public outreach sessions	Develops community support for the Airport	Ⓢ
Local Community Group Support NFIA Stakeholders Group, Inc. is a community group (not sponsored by the Airport) representing most segments of the business community at NFIA. This group has members from the Niagara County Industrial Development Agency, Senator Maziarz's office, the City of Niagara Falls, Hotel/Motel association, Tourism agencies, the Airport's FBO, the Seneca Hotel & Casino, and more. At NFIA Stakeholders Group meetings, NFTA will present on its Air Service Development efforts.	Develops community support for the Airport	ⓔ Ⓢ

¹ Economic viability, Operational efficiency, Natural resource conservation, and Social responsibility

1.2 SUSTAINABILITY VISION AND GOALS

A sustainability vision statement was developed to facilitate the NFIA's sustainability efforts. The vision statement expanded upon the values set forth by NFTA's Mission, Vision, and Environmental Policy Statements as well as the established performance goals for NFIA. NFIA's sustainability vision statement is:

NFIA will serve as a sustainable catalyst for economic growth by promoting air service development and aviation-related business opportunities in a safe, and environmentally and socially responsible manner.

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To support this vision, sustainability goals were developed to define the Airport's commitment to financial, operational, environmental, and social sustainability. These goals informed the sustainability alternatives screening criteria and will act as a guide for the Airport's future sustainability efforts. NFIA's sustainability goals, developed as part of this Master Plan Update and organized by goal category, include:

Economic Vitality

- Maximize the economic potential of NFIA by enhancing air service offerings and developing business and employment opportunities at the Airport

Natural Resources

- Conserve natural resources and minimize air and water pollution

Energy and Infrastructure

- Utilize strategies to operate existing facilities with a reasonable return on investment (ROI) and design future facilities to maximize energy and water efficiency

Waste

- Minimize waste and increase the rate of recycling.

I.3 ALTERNATIVES SCREENING CRITERIA

One of the key objectives in completing this Master Plan Update was to review and identify opportunities to implement a sustainable practice or introduce a sustainable design into the alternatives analysis. Accordingly, sustainability-specific alternatives evaluation criteria were added to the traditional master planning alternatives evaluation criteria developed for the Master Plan Update. The following sustainability-related alternatives evaluation criteria, consistent with NFIA's established sustainability goals, were considered during the alternatives analysis:

Economic Vitality

- Does the alternative maximize aeronautical and/or non-aeronautical revenue-generating opportunities?
- Does the alternative enhance air service?

Natural Resources

- Does the alternative protect and/or conserve natural resources?
- Does the alternative reduce overall air pollutant and GHGs associated with the Airport?

Energy and Infrastructure

- Does the alternative reduce overall Airport energy use?
- Does the alternative incorporate energy-saving measures and/or equipment?

Waste

- Does the alternative allocate adequate space and facilities to support recycling?
- If there is construction, does the alternative incorporate waste minimization practices?

I.4 RECOMMENDED SUSTAINABILITY INITIATIVES

Sustainability initiatives were identified to help NFIA meet its sustainability goals developed earlier in the sustainability planning process. Initiatives, to be implemented by Airport personnel, can range from high-level process changes within an organization (e.g., integrating sustainability considerations into design criteria, typically at the Authority level) to stand-alone strategies defined by resource (e.g., specific water efficiency measures). Sustainability can be more fully integrated into all aspects of the organization when it is approached through both high-level initiatives as well as those that are more specific and detailed. The activity level of NFIA and NFTA's limited financial resources was considered in the determination of which initiatives could be feasible for NFTA to implement at NFIA.

Due to NFTA's budgetary and staffing constraints, initiatives to be implemented at the Airport are primarily low cost and require minimal staffing hours. The Project Team consulted a variety of resources to identify potential sustainability initiatives for NFTA to implement. These resources included the Project Team's sustainability experience at similar airports as well as the following resources:

- Industry publications such as the following Transportation Research Board (TRB) Airport Cooperative Research Program (ACRP) Projects:
 - ACRP Report 43: Guidebook of Practices for Improving Environmental Performance at Small Airports
 - ACRP Report 56: Handbook for Considering Practical Greenhouse Gas Emission Reduction Strategies for Airports
 - ACRP Report 80: Guidebook for Incorporating Sustainability into Traditional Airport Projects
 - ACRP Synthesis 10: Airport Sustainability Practices
 - ACRP Synthesis 19: Airport Revenue Diversification
 - ACRP Synthesis 34: Subsurface Utility Engineering Information for Airports
- The Sustainability Baseline Assessment, which identified existing sustainability initiatives and opportunities for improvement
- Existing sustainability initiatives implemented at other similarly sized airports

The following list presents the recommended sustainability initiatives by goal category that were identified for implementation at NFIA. It should be noted that several buildings may need to be demolished, such as the old terminal, FBO Hangar A, and the General Aviation Administration & Service Garage. For these buildings, only initiatives with immediate payback were included. Appendix H2 provides the recommended sustainability initiatives along with detailed descriptions.

Economic Vitality

- Enhance business diversity development
- Assess opportunities and promote non-aeronautical development
- Apply for New York State Energy Research and Development Authority's (NYSERDA) Funding Opportunities
- Allocate space in the museum for cultural/locally-sponsored exhibits, and advertise the museum's existence

Natural Resources

- Purchase a water leak detection equipment
- Continue to implement deicing best practices
- Conduct a Utility Master Plan
- Improve monitoring/ tracking of water use
- Conduct routine maintenance of automatic sensors, to ensure water efficiency
- Enforce limits for vehicle idling on the landside and airside
- Encourage single-engine aircraft taxiing
- Improve training and awareness to increase 400 Hz power and Pre-Conditioned Air (PC Air) usage
- Conduct preventive maintenance of HVAC equipment to ensure HVAC doesn't leak
- Continue to implement initiatives from the Wildlife Hazard Management Plan and Wildlife Hazard Assessment recommendations
- Purchase software to track and monitor usage
- Coordinate bus service to match airline schedule, to maximize convenience, as demand warrants (with increased airline activity)
- Consider Low Impact Design measures in future development projects
- Incorporate sustainability considerations into future planning, design, and construction projects at NFIA and BUF as eligible funding becomes available
- Recalculate and report GHG emissions when annual general aviation and commercial aircraft operations change by 10 percent or if significant energy efficiency initiatives are implemented
- Install a charging station on the airside and encourage tenants to convert ground service equipment (GSE) to electric vehicles

Energy and Infrastructure

- Install carbon dioxide (CO₂) sensors for ventilation control
- Replace metal halide lamps with LEDs, as fixtures reach the end of their useful life
- Replace control tower AHU
- Replace gas furnaces
- Lower thermostat temperature setpoint in garage
- Retrofit incandescent light fixtures w/T-5 bulbs
- Retrofit existing louvers with weather seals
- Install manual timer fan switch
- Replace existing light fixtures with T-8 lamp fixtures
- Identify opportunities for utilizing a combined heat and power (CHP) system
- Install solar electric systems (photovoltaic) on NFIA buildings
- Install a rainwater harvesting system
- Separate utility costs for terminal operations as a separate line item in NFIA's monthly calculation of rates and fees

Waste

- Develop a passenger waste and recycling education program
- Periodically monitor fullness of bins and adjust hauling schedule as applicable
- Coordinate with airline tenants to increase recycling of deplaned waste
- Improve signage for recycling receptacles

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- Increase the number of recycling bins; a recycling bin paired with every trash bin is desirable. Recycling bins should also be a different color than the trash bins
- Conduct a new waste audit periodically, based on increased passenger enplanements

In addition to developing initiatives specific to the goal categories identified above, the Project Team also developed initiatives to enable the integration of sustainability within NFTA's operations and throughout the organization. These initiatives include:

- Provide more opportunities at the Airport for employee participation in NFTA programs (e.g., wellness events)
- Coordinate with the Western New York Sustainable Business Roundtable
- Institute Authority-wide "green" office policies
- Develop sustainable procurement policies and procedures
- Encourage contractors to recycle a minimum percentage of construction and demolition waste

1.5 IMPLEMENTATION AND MONITORING PLAN

Implementation and monitoring is vital to the successful implementation of sustainability initiatives and to NFIA's overall sustainability program. Implementation and monitoring generally includes a continuous cycle of Plan-Do-Check-Act. Accordingly, NFTA should refer to the initiatives identified in Appendix H2 and plan for the implementation of its sustainability program. Following the implementation of initiatives, NFTA should attempt to monitor the effectiveness of initiatives implemented at the Airport, and apply corrective actions or necessary changes, as needed. This cycle should be repeated, and NFTA should continually revisit the list of potential initiatives as well as solicit new potential initiatives from its stakeholders for future implementation.

Table H-11 identifies several performance metrics, which are intended to provide an overview of performance for the sustainability program at NFIA as a whole and not for individual initiatives. They derive from the Sustainability Baseline Assessment; industry sources such as ACRP Report 19A, *Resource Guide to Airport Performance Indicators*;¹² and the professional experience of the Project Team. To assist in the identification of performance trends, these metrics will be monitored at variable frequencies, as often as monthly, depending on the associated data and related conditions of collection.

NFTA will begin to develop performance targets after a period of monitoring sustainability performance using the selected metrics to establish an accurate baseline. Establishing an accurate baseline can take between one and three years. Performance targets will ultimately allow NFTA to gauge their performance based on thresholds that are aligned with the Authority's sustainability goals.

¹² ACRP Report 19A – Resource Guide to Airport Performance Indicators. (2011).

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Table H-11: Performance Metrics

Performance Metric	Monitoring Frequency
Economic Vitality	
Operating cost per enplanement	Annually
Parking revenue	Annually
Air cargo tonnage	Annually
Percentage of total non-aeronautical operating revenue	Monthly and Annually
Number of based tenants	Annually
Number of Authority and tenant employees based at Airport	Annually
Natural Resources	
Number of reportable pollutant discharges (based on sampling and monitoring)	Monthly (Winter Season)
GHG Emissions (Scope 1 and 2)	Every five years
Energy and Infrastructure	
Energy Use Index (KBtu/sq ft)	Monthly and Annually
Energy cost per square foot	Monthly and Annually
Water use (gallons) – increase or decrease	Monthly and Annually
Waste	
Percent of janitorial staff trained in the Authority’s recycling practices	Annually
Ratio of trash bins to recycling bins	Quarterly
Recycling rate per passenger (as a percentage of total municipal solid waste generated)	Quarterly

1.5.0 Implementation

Initiative implementation is highly dependent on variables such as budget/funding and staff hours. The initiatives identified above and detailed in Appendix H2 were evaluated based on priority (factors included cost, ease of implementation, and staffing requirements), and are categorized by implementation timeframe. The two defined timeframes are:

- Short-term: High priority initiatives that NFTA wishes to implement within the next five years; and
- Long-term: Initiatives that NFTA would like to implement after five years due to budgetary or feasibility constraints

When prioritizing initiatives, additional consideration was given to the potential impacts of the initiative and potential synergies with other initiatives or Capital Improvement Program (CIP) projects. Appendix H2 identifies the initiatives as short- and long-term, and includes general funding and staffing requirements.

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1.5.1 Monitoring and Reporting

Performance monitoring and reporting is vital to the successful implementation of NFTA's sustainability program at the Airport. NFTA's monitoring plan includes an annual progress report. This progress report is based on the performance metrics identified in Table H-11, and includes descriptions of the previous year's sustainability accomplishments.

The results of performance monitoring can be communicated to the Airport's internal and external stakeholders through their online publication on NFTA's website and their exhibition throughout NFTA and NFIA facilities using information boards and/or kiosks. This communication will not only educate and inform NFTA's stakeholders, but also demonstrate the Authority's commitment to sustainability.

Appendix H1

Energy Audit

Appendix H1

Building Energy Audit Report

I.1 EXECUTIVE SUMMARY

The purpose of this energy efficiency study was to assist the Niagara Falls International Airport (NFIA) management with identifying Energy Conservation Measures (ECMs) that will help reduce building energy consumption and carbon footprint and improve the overall building sustainability. This was accomplished by conducting an on-site inspection of the existing building conditions, at the selected buildings operated by the Niagara Frontier Transportation Authority (NFTA). The building selection was coordinated among the engineer, the NFIA and NFTA management.

The buildings surveyed were the current Air Terminal building, the old Terminal Building, the GA Administration & Service Garage, the Hangar A - Fixed Base Operations (FBO) building, the NFTA Equipment Storage / Maintenance, the Triturator building, Electrical Vault, and the Air Cargo Warehouse.

As part of the energy efficiency assessment, a physical condition review of the aforementioned buildings was carried out. A number of items were investigated that included the general condition and heat loss resistance of building envelopes, sources of heating and relative effectiveness, sources of lighting and relative effectiveness, and general condition of visible energy utility infrastructure.

A number of issues and potential ECMs were identified that range from potential envelope improvements, replacement of existing outdated HVAC equipment, retrocommissioning of existing controls systems and electrical upgrades.

1.1.1 Building Envelope Upgrades Summary

The New Terminal building envelope is excellent condition and does not currently require any improvements.

The large open space buildings, namely the GA Administration & Service Garage, the Hangar A - FBO building and the NFTA Equipment Storage / Maintenance building, are of metal building construction with the standard thickness of insulation at the time they were built. The thermal resistance is significantly lower than the current energy code requirements; however the cost to supplement it is significantly more than what can be recovered from fuel savings at the current fuel prices. Using gas-fired radiant heaters in the large space buildings reduces the exfiltration heat loss through openings in the building envelope, or during the times that the large overhead doors are open. Most of these spaces have radiant heaters; however some of those are old and need replacement. The Hangar A - FBO building has new, well-insulated one-piece hangar doors that have low air leakage. The GA Administration & Service Garage and the NFTA Equipment Storage / Maintenance building buildings have insulated overhead doors, however, some of the doors could benefit from better weather sealing at the edges and with floor bumpers which reduces infiltration air into the buildings.

The Hangar A - FBO building could benefit from the addition of insulation and siding to the exterior of existing uninsulated block wall construction office/tenant room wing. The payback from the

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energy savings would be in the 10-15 year range, however the space comfort would greatly improve. The windows of the building are single-pane and also have poor thermal performance. Replacing single-pane windows for energy savings alone usually requires 20 years or more for payback. If replacement is required for reasons of decay or infiltration, upgrading to good quality thermal pane windows is advised. Adding storm windows to the existing windows provides significant savings with less cost where the window isn't opened for ventilation or to install window A/C units. Storm windows have a typical energy payback of 10-15 years.

The Old Terminal has many envelope and interior finishes issues. The MEP systems are well past their useful life and they would need to be replaced with code compliant systems. The building could be used by a tenant with low operating hours, low space conditioning needs and minimal aesthetic requirements. With surface and finishes repairs and touch-up and an overhaul of the MEP systems, it could be suitable. Investment in upgrades to any one system of the building is not advised and a total renovation not recommended as there is little value to the shell of the building.

The Triturator Building is adequate for its current function. Minor touch-up of the spray-on interior insulation is required including replacing some missing sections of insulation fireproofing.

The Air Cargo Warehouse is another metal building with nominal insulation. This building is remote from any access to electric utility and is therefore currently planned to be used for cold storage. As such, no envelope improvements are recommended.

1.1.2 Mechanical Systems Improvements Summary

Most of the buildings surveyed can benefit from changes, upgrades or replacement of mechanical equipment as listed below:

- Old Terminal: Conversion of the existing stand-alone manual controls/thermostats to an electronic control system.
- New Terminal: Implementation of CO₂ sensors for intermittently used spaces that will reduce the amount of outdoor air during times of low or no occupancy and fine tuning of Occupancy Schedules so that the building's temperature setpoints fall back to unoccupied setpoints during times that there are no scheduled flights.
- NFTA Equipment Storage / Maintenance, Hangar A - FBO, and GA Administration & Service Garage: Replacement of forced hot air systems with low intensity gas fired infrared heaters.
- Electrical Vault: Seal existing summer cooling make-up air louvers to prevent air infiltration during the cold winter months.
- Air Cargo Warehouse: this building is intended to be used for cold storage and as such there are no recommended upgrades.

1.1.3 Electrical Systems Improvements Summary

As part of the energy efficiency assessment and physical condition review the electrical distribution, emergency power and lighting of each building was assessed. The buildings studied are all low density electric energy users with few large electric loads. There is little to be gained from adding variable frequency drives and high efficiency motors. There are several opportunities to add individual or automatic controls to limit system run time or reduce system output to save energy. There are some older style fluorescent and incandescent lights that could be upgraded

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to newer lower wattage technology fixtures. There is emergency power capability to maintain airport operations during power failure. There are no self-generation systems providing electricity to the airport to offset supply from the utility company. This could be considered. The potential lighting improvements include:

- New Terminal Building: Correct emergency power control issues, provide additional occupancy and daylighting sensors and incorporate daylighting strategies into the current lighting control schemes, convert lighting to LED, and provide automatic control for Apron lighting.
- Old Terminal Building: The building's systems are extremely outdated and would require a major overhaul in order to support any future use of the building.
- GA Administration & Service Garage: Replace incandescent metal shade bulbs in garage area with compact fluorescent light bulbs.
- Hangar A - FBO Building: Replace old T-12 light fixtures with more energy efficient types and metal halide lights with high bay T-5 fixtures
- Triturator Building: Replace existing light fixtures with T-8 lamp with electronic ballast fixtures.
- NFTA Equipment Storage / Maintenance: Provide industrial fluorescent fixtures in high bay areas, zone existing lights, and provide controls for exterior lighting.

1.2 CURRENT PERFORMANCE BASELINE INFORMATION BY BUILDING

1.2.1 New Air Terminal

Building Information

- Floor Space: 69,400 Square Feet
- Building type: Metal frame with steel panel exterior having some stone veneer, significant glass, and both sloped metal and flat rubber roofs.
- The building has high headroom lobby spaces, mezzanine departure lounge, and two story office space.
- Occupancy: Administration offices, airline operations space, passenger ticketing and departure, concessions, Customs and TSA space. Note: one wing for international flights is currently shut down.
- Age: 2008 Construction

Mechanical System Description

The Mechanical systems serving the new terminal are in excellent working and cosmetic condition. The systems that serve the terminal building include the following:

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- Three gas fired condensing boilers (Patterson-Kelley model C2000 rated at 2,000,000 btuh each), direct vented for generating the heating hot water. The boilers were installed in 2008.
- The Hot water generated is circulated through the building through the use of a primary/secondary pumping arrangement. Pumps PH-1A and 1B (Taco model KU3507, 211.5GPM @48 ft of head, 5 hp) circulate the primary hot water. Furthermore the secondary loop is broken down into two separate zones, each of which is served by a pair of base mounted pumps, piped in parallel. Pumps PHW-1A and 1B (Taco model KU2508A, 219GPM/58 ft of head, 7.5 hp) serve Zone 1 of the building. Pumps PHW-2A and 2B (Taco model KU2508, 265GPM/72 ft of head, 10 hp) serve Zone 2 of the building.
- Two air cooled chillers (McQuay, model AGS135CH27-ER10, 127.7 tons capacity each) located at the roof of the facility that generate the chilled water (35% propylene glycol mix) utilized for cooling the building. The chilled water generated is circulated through the air handling unit coils through a primary/secondary loop chilled water pump arrangement. For the primary loop chilled water is circulated through the chillers by a set of vertical in-line pumps, PC-1 & PC-2 (Taco, 330 gpm / 40 ft of head, 5 hp). The secondary loop is broken down into two separate zones, each of which is served by a pair of base mounted pumps, piped in parallel. Pumps PCW-1A and 1B (Taco, 227 gpm / 40 ft of head, 5 hp) serve

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Zone 1 of the building. Pumps PCW-2A and 2B (Taco, 265 gpm / 55 ft of head, 7.5 hp) serve Zone 2 of the building.

- *Six (6) split system air conditioners serve spaces through the terminal that require year round cooling.*
- *Air handling units (AHUs) with hot and chilled water coils provide the required conditioned air for the various areas of the terminal building. Those AHUs serve the following areas:*
 - AHU-1 (McQuay, model CAH05GDAC, 22,600 cfm): Lobby/Check-in area.
 - AHU-2 (McQuay model CAH010GDAC, 4,995 cfm): Security/Admin/CBS area.
 - AHU-3 (McQuay Model CAH035GDAC, 15,765 cfm): 1st Flr Holding Room
 - AHU-4 (McQuay model CAH010GDAC, 4,400 cfm): Baggage Area
 - AHU-4A (McQuay model CAH010GDAC, 4,400 cfm): Baggage Area
 - AHU-5 (McQuay model CAH003GHAC, 990 cfm): Fan Room
 - AHU-6 (AAON model NJ15/HW/CW/HV, 15,000 cfm): 2nd Flr Holding room.
 - AHU-7 (McQuay model CAH035GDAC, 18,695 cfm): Customs / Baggage claim
 - AHU-8 (McQuay model CAH017GHAC, 7,600 cfm): Baggage Offload
 - AHU-8A (McQuay model CAH017GEAC, 7,600 cfm): Baggage Offload
 - AHU-9 (Trane model TUX100R948W, 1,500 cfm): Transit area
 - AHU-10 (McQuay model CAH003GHAC, 500 cfm): Mechanical Room
 - The two AHUs that serve the baggage handling areas utilize an energy recovery system that consists of exhaust and supply heat recovery coils that precondition the incoming make-up air for those units.
 - Several exhaust fans provide general and toilet exhaust.
 - Infra Red heaters serving the loading dock and check-in curb areas.
 - Multiple fan coil units, cabinet unit heater, fintube radiation and split system AC units serving individual areas of the terminal.
 - Point of use electric water heaters for individual bathrooms and tank type electric water heaters for public area bathrooms.
 - DDC control system by Andover Controls.

Electrical System Description

The building is served by a separately metered electric service rated at 1,800A, 480V, three-phase with spare capacity available.

The standby power system includes three natural gas fired generators, one (1) of them rated at 300KW and two (2) at 250KW. Power is fed from the generators through a single (1) non-paralleling panel to three (3) separate ATS and three (3) UPS.

The lighting of the new terminal is accomplished by a combination of high efficiency fluorescent, LED and high intensity discharge (HID) fixtures. There is also significant day lighting in the public spaces from the glass facades.

The sound system control is proprietary to the system supplier and access is not permitted for adjustments by airport staff causing inconvenience and cost for service calls.

Evaluation of Systems and Energy Options

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- **Building Envelope** - The terminal building is in excellent condition. No obvious repairs are required. The south facing glass (parking lot side) is protected by an overhang to reduce the summer solar gain. The windows appear to have a tinted film to also reduce solar gain. If the ticket lobby is too bright or too warm on sunny days, a system of automated shades could be considered that would be controlled by day-lighting sensors and integrated with interior lighting control. The shades would be semi-transparent to allow viewing of activities through the shade.
- **Mechanical** - The majority of the systems utilized are appropriate for their intended use and are in good condition consistent with the age of the building. An area of improvement would be the implementation of motion sensors, a thorough examination of the existing control strategies as well as the implementation of occupied/unoccupied schedules.
- **Electrical** - All the equipment in the terminal is in excellent condition. There is more than adequate capacity for the current rate of use in the building which has yet to be fully utilized. There were some aspects of the building design that could be adjusted to better match the low level occupancy between flights.

The generators are not connected together with conventional paralleling switch gear but with a DDC (direct digital control) controller to synchronize the generators. At times this controller does not work as intended resulting in the generators shutting down and thus making the system unreliable. There is sufficient generator capacity to operate the entire building with minimal load shedding to control peaks. The paralleling control of these units should be evaluated and changes made to ensure reliable operation.

The new terminal building has a quality lighting system that is aesthetically pleasing and provides comfortable lighting utilizing indirect lighting in most public areas. There is significant day lighting in the public spaces from the glass facades. The energy savings stemming from

automatically turning the lights off are frequently not realized because of the lack of daylight and occupancy sensors. Instead, the staff frequently overrides the existing lighting controls, based on flight schedules and anticipated sunshine.

PC based automatic lighting level reduction control with remote status, access and local override capabilities in combination with daylighting and occupancy sensors will improve lighting energy utilization and thus yield significant energy savings while it will, at the same time, reduce maintenance staff involvement.

The ticket lobby fixtures are indirect type with metal halide lamps. These fixtures are integrated into the structure and should remain in place. There are several manufacturers making LED light strips that could be installed in these fixtures, with fixture modifications, replacing the metal halide lamp and ballast. Changing to an LED source will allow more automatic control options as there is no lamp warm-up or re-strike time for the LED lamps to come on.

There are several large UPS systems in the building supporting the main data room and the ATO offices. These units have large battery storage capacity that could be smaller if the generators were reliable. There are however no energy savings benefits from replacing them until they reach the end of their useful life.

Proposed Systems Upgrades

Install carbon dioxide (CO₂) sensors for ventilation control

- Cost of CO₂ sensor: \$250 each * 10 sensors = \$2,500
- Wiring: 2,000 ft at \$60/100 ft coil = \$1,200
- Installation labor: 2 people * 2 days (8hrs) * \$80/hr = \$2,560
- Programming: 1 person * 2 days (8 hrs) * \$80/hr = \$1,600
- Total Cost: \$7,860
- Savings: Savings range¹ from \$0.05 to \$1 per ft² and are highly dependent on the type of occupancy. The highest payback can be expected in high-density spaces in which occupancy is variable and unpredictable.
Use \$0.05/ft² * 69,400 ft² = \$3,470
- Payback: ≈ 2.3 years

Evaluate generator controls

- Cost of evaluation/study: \$5,000
- Cost of paralleling gear: ≈ \$20,000 ea * 3 (one for each generator) = \$60,000
- Savings: N/A – Measure is intended to improve emergency power reliability.
- Payback: N/A

Install daylighting controls

- Cost of replacement: \$1.5/ft² * 9,500 ft² (Approximate area of large passenger holding areas) = \$14,250
- Savings: Assume: 40 light fixtures * 175 Watts/fixture / 1000W/KW * 16hrs/day * 300 days/yr * 35% reduction (daily ON)² * \$0.1/kWh = \$1,176
- Payback: 12.1 years

Replace metal halide lamps w/LED

- Currently, the lighting in the Domestic Bag Hall, International Bag Hall, Arrivals Hall and Departure Hall consists of ten (10), 175-watt and ten (10), 150-watt metal halide fixtures.
- Recommendation: replacement of the existing metal halide fixtures with twenty (20), 59 Watt LED retrofit fixtures.
- **Cost of LED retrofit kit:** \$500 each x 20 fixtures = \$10,000
- Estimated Lighting Schedule:
 - Monday-Friday 6AM-6PM
 - Saturday – Sunday: *Not typically used*
- Existing light fixtures annual energy consumption:
 - 3.25 kW * 12 hours/day * 5days/wk * 52 wks/yr = 10,140 kWh/year
- Existing light fixtures maintenance cost:
 - (4 lights/yr * \$50) + \$50/hr*4 hrs * 4 lights/yr = \$1000/yr
- Retrofitted light fixtures annual energy consumption:
 - 1.18 kW * 12 hours/day * 5days/wk * 52 wks/yr = 3,681 kWh/year

¹ U.S. Department of Energy, Energy Efficiency and Renewable Energy, Demand Control Ventilation Using CO₂ Sensors, March 2004 - www.eere.energy.gov/femp

² Square D Lighting Controls Calculator

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- Retrofitted light fixtures maintenance cost:
 - $(2 \text{ lights/yr} * \$100) + \$50/\text{hr} * 4 \text{ hrs} * 2 \text{ lights/yr} = \$600/\text{yr}$
- Estimated Savings:
 - Energy $6,458 \text{ kWh/yr} * \$0.10/\text{kWh} = \$645/\text{yr}$
 - Maintenance: $\$1,000/\text{yr} - \$600/\text{yr} = \$400/\text{yr}$
 - **Total Savings: \$1,045/yr**
- **Simple payback** = $\$10,000 \text{ initial cost} / \$1,045/\text{yr} = 9.5 \text{ years}$

1.2.2 Old Terminal & Control Tower

Building Information

- Floor Space: 22,300 Square Feet
- Building Type: Metal building steel frame with glass storefront street side and airside at Departure Lounges
- Number of Stories: One story main building attached to a four story Tower for air traffic control (ATCT) and attached commercial space with small second floor space for Weather Bureau.
- Occupancy: Not currently occupied, except for FAA in Tower, Weather Bureau and an Office Tenant.
- Potential site for air museum.
- Age: More than 50 years

Mechanical System Description

The existing terminal building is served by multiple gas-fired air handling units (AHU) which are located in the outgoing baggage area (Magic Chef Model # EG8A150DC20-13, 150,000 Btu/hr (MBH) heating capacity) and at the upper level of the departure lounge. One of the AHUs was manufactured by LuxAire. There are also two unit heaters rated at 150 MBH each. Due to difficulty in accessing the AHUs in the departure lounge upper level no capacity information or unit sizes has been obtained for some of the units.

The control tower is served by a modular AHU located in the tower's utility room, window air conditioning units, cabinet unit heaters and fin-tube radiation. The AHU is original to the building, is manufactured by Trane (Climate Changer Series), with no visible model or capacity information (Serial number K-61718). The AHU has a hot water heating coil and a DX cooling coil.

The required heating hot water for the AHU coil, and for miscellaneous cabinet unit heaters (CUH) that serve the cooling tower, is generated by a gas-fired cast iron sectional boiler located at the basement of the old restaurant / control tower building. It is a Weil McLain Model 378 with an output of 242 MBH. The hot water generated by the boiler is circulated throughout the building by an inline centrifugal pump.

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The condensing unit (CU) for the AHU DX coil is located on the roof and was not accessible for close inspection at the time of the visit. It is a York manufactured condensing unit.

The Weather Station office is heated and cooled by a combination of a wall mounted Packaged Terminal AC (PTAC) unit and a through the window AC unit. The ground floor of the weather station building is divided into a restaurant area, currently unoccupied and some office space, mostly unoccupied as well. The old restaurant space is served by a Goodman gas-fired furnace and an associated DX coil and condensing unit. No name plate data was available for the gas furnace. The condensing unit is located on the ground level, on the parking lot side of the building and is a 5-ton unit (Goodman Model GSC130601BC, 13 SEER, 5-ton Nominal Capacity). The office area is subdivided in multiple spaces. They are served by a two-ton Samsung and a single ton Mitsubishi split system. The condensing units are located on the ground, on the airside of the building in a fenced area. The 2-ton Samsung condenser is a Model # US24A2RC unit and the single ton Mitsubishi Electric condenser is a MrSlim Model MUZ-FE12NA unit.

The temperature is controlled by wall-mounted dial thermostats at the old terminal building and the old restaurant space. The Weather Station office temperature is controlled by a wall-mounted electronic thermostat.

The control tower building temperature is controlled by Honeywell electronic control system.

The domestic hot water for the facility is generated by a gas fired atmospheric water heater. It is located in the basement mechanical room and is a Bradford White, model # MI403S6FBN, 40 gallon, 40,000 btuh input heater. The facility's bathrooms have manually operated plumbing fixtures (lavatories and flush valves).

There is general and toilet exhaust at the terminal building, the exhaust fans are located on the roof of the facility. There are relief air dampers installed in various areas of the drop ceiling and three associated relief air hoods on the roof of the old terminal.

The control tower staircase is served by a supply air propeller fan and associated louver that is used for pressurizing the space (smoke control). There are individual light switch controlled toilet exhaust fans at the weather station office area and at the control tower.

There is no automatic water sprinkler system installed in any of the spaces of the old terminal, control tower, restaurant or weather station office.

Electrical System Description

The electrical system is fed at 13,200 volts from the electric vault to a pad mount 150KVA transformer providing 400A of 480V power to the building. There is a distribution panel in the Basement with new control circuits to the airfield lighting in old duct bank and conduit.

The terminal and commercial space portion of the facility lighting is made up of Recessed Can compact fluorescent lamp (CFL) fixtures (2-lamp, 18W each), T12-2x2 Parabolic fixtures and T-12-2x4 Acrylic fixtures. The Baggage Claim Area has metal halide lighting which is on constantly, with no control. The building's exterior canopy has acrylic fluorescent fixtures.

The Control tower has a combination of lay-in and surface mounted fixtures while the weather station is served by surface mounted lighting.

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The telecom equipment is in the Basement Mechanical Room, which is a poor environment for data. The Data/Security Room is located in the Main Floor Ticket Area. This area is not secure and is not located in a clean environment.

The FAA Tower gets emergency power feed from the 250 KW generator (approximately 35 yrs old) in the vault, however the uninterruptible power supply (UPS) unit is old. There is no emergency power backup for the terminal portion of the building.

Evaluation of Systems and Energy Options

- **Building Envelope** - The Building Envelope is in poor condition in terms of thermal energy performance. The storefront glass is single-pane with no solar shielding, except in the air traffic control tower. The walls are poorly insulated or uninsulated masonry. Some spray-on insulation under canopy wings over Departure Lounges is combustible material where outer fire coating has been knocked off. Sloped metal roof appears to have rigid insulation on top of the metal roof panels and a rubber membrane surface. This roof may have adequate thermal resistance for continued use of the building if spray-on is covered below. Insulation is inadequate in the Tower and the commercial addition.
- **Mechanical** - Overall, the heating, cooling and ventilating systems serving the old terminal, cooling tower, restaurant and miscellaneous areas of the building are outdated and would need to be replaced or repaired/upgraded as needed should the decision be made to retrofit the building for future use.

More specifically the AHUs serving the terminal are original to the building and they are well past their expected life span. One of the furnaces, located in the baggage handling area, has been installed through what is believed to be a load bearing wall without any provisions made to support the opening. The AHU's associated ductwork insulation has deteriorated beyond repair and needs to be replaced.

The control tower air handling unit is original to the building and thus has far exceeded its expected useful life, has exposed belts and pulleys, is in poor cosmetic condition, and is showing signs of its age.

The hydronic pump serving the control tower HW loop, located in the basement mechanical room, has a leaky flange. The hot water piping located in the crawlspace of the building is uninsulated. The hydronic boiler is in very good cosmetic condition (installed new in 2009) and appears to be operating as intended. The 40 gallon gas-fired heater appears to be in very good cosmetic condition with no visible leaks or defects.

The janitor's sink located at the air traffic control tower has a leaky faucet

The analog thermostats located throughout the terminal and the restaurant area, although functional, offer limited system control and no scheduling capabilities.

The Honeywell control system serving the air traffic control tower is very old and in poor cosmetic condition, however it still functions. Should the building be renovated it is recommended that a central electronic control system be installed for the building.

- **Electrical** - The transformer and main disconnect serving the building is serviceable and can provide 14 watts/square foot power to the building, which should be adequate for a

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moderate energy intensive occupancy. Any occupancy with a heavy air conditioning load would require a service upgrade.

Except for some conduit that may be re-usable, the electrical distribution for the building, including the lighting, should all be replaced.

The wiring electrical equipment and light fixtures are beyond end of useful life. Lighting in Lobby and Departure Lounges is old and unsightly and should be replaced with T5 and T8 fluorescent lighting in combination with daylight and occupancy sensing controls. Consideration should be given to the use of light-emitting diode (LED) lighting.

Proposed System Upgrades:

Replace single pane glazing w/double pane low-e glazing

- Cost : Replace perimeter glazing, approximately 3,000 ft² glazed perimeter.
Low E glazing, 1/8" thick, double pane: \$30/ft² * 3,000 ft²

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Aluminum Storefront: $\approx \$20/\text{linear foot (L.F.)} * 1,250 \text{ ft} = \$25,000$

Total Cost of Glazing: \$115,000

- Payback is dependent on the future use of the building and type of occupancy, operating hours etc. Typical payback ranges from 10-15 yrs for retrofit applications.

Replace gas furnace

- Cost : Includes 5-ton condensing unit, A-coil and high efficiency condensing furnace: \$5,500 each
 - o Labor: \$2,000Total installed cost per furnace: \$7,500
- Savings: $\approx \$300/\text{yr}$, based on analysis of actual utility bills. Building is currently underutilized and savings potential will increase as temperature setpoints rise consistent with an occupied building.
- Simple Payback: 25 years

Replace control tower AHU

- Cost : AHU, packaged, DX cooling coil, HW heat, constant volume, 5,000 CFM: \$14,600
 - o Labor: \$3,800Total installed cost: \$18,400
- Savings: N/A existing is well past its useful life.
- Payback: N/A

Install direct digital control (DDC) system

- Cost : $22,300 \text{ ft}^2 * \$6/\text{ft}^2 \approx \$133,800$
- Savings: N/A – Savings will be highly dependent on the type of occupancy, use of the building and numerous other variables.
- Payback: N/A

Replace electrical distribution system

- Cost of replacement: $\$8/\text{ft}^2 * 22,300 \text{ ft}^2 = \$178,400$
- Savings: N/A (system in disrepair and well past useful life)
- Payback: N/A

Replace existing light fixtures

- Cost of replacement: $\$2/\text{ft}^2 * 22,300 \text{ ft}^2 = \$44,600$
- Savings: N/A (lights in disrepair and well past useful life)
- Payback: N/A

1.2.3 GA Administration & Service Garage

Building Information

- Floor Space: 11,250 Square Feet
- Building Type: Pre-manufactured metal building garage space with overhead doors on both sides of each bay.
- Overhead doors are insulated; however, floors have settled leaving large cracks under door.
- One-story frame office building on one end.
- Occupancy: Garage used for long range vehicle storage. Offices for maintenance staff.
- No planned change of use
- Age: ± 40 years

Mechanical System Description

The hangar area of the building is heated by two, 175 MBH each, gas-fired unit heaters, one on each side of the hangar space. Each unit heater is controlled by an analog round dial type thermostat.

The office and locker room space on the north side of the facility are served by two gas fired furnaces (Magic Chef, Model no. EG8A100DC14-12) rated at 100 MBH each. Each furnace is control by a wall-mounted, dial thermostat

The domestic hot water for the facility is generated by a 40 gallon gas-fired water heater (Bradford-White, Model No. MI 40356EN12) also located in the hangar storage area.

Electrical System Description

The building is fed from the Medium Voltage (MV) Switch located in the adjacent electric vault, 50 feet away. There are two (2) 225A electric panels serving the building.

The Office portion of the structure is served by 2x4 recessed troffer lights and the garage portion by incandescent metal shade fixtures (250-400 watt each).

Evaluation of Systems and Energy Options

- **Building Envelope** - The building envelope is in serviceable condition. The metal exterior wall panels do not show corrosion. The building has 2-4" of fiberglass batt insulation, which was standard at the time of this building construction. Overhead doors are in fair condition and insulated office area ceilings and wall finishes show signs of wear; however, as a non-public space, wall painting and ceiling tile replacement is not a priority item.

The garage should be minimally heated and the office area is small, no changes are recommended to the building insulation. Settlement of the floor at the sides of some of the overhead doors was noted. Compressible bumper guards could be installed on the bottom of the overhead doors to close the gaps between door and floor.

- **Mechanical** - The existing gas furnaces and associated condensing units appear to be in good cosmetic condition. They are however past their expected useful life. Unit heater thermostats in the garage area of the building were observed to be set at 65°F. As a vehicle storage building, this could be set at a lower temperature to save significant heating cost. However, care must be taken to maintain the space temperature at a minimum of 50-55°F in order to avoid any potential problems with freezing of the domestic water service.
- **Electrical** - The existing electrical panels are in poor condition but are serviceable as long as building use does not change. The lighting fixtures in both the garage and office areas are in good condition. The existing incandescent metal shade fixtures in the garage are intended for 250-400 watt incandescent bulbs. Although need for lights is short duration, the total wattage is high. Turning the lights on creates a high demand charge for the limited need for light. These fixtures could be converted to compact fluorescent by installing a medium base-mogul base lamp adapter and installing 23 watt equivalent R40, compact

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fluorescent flood lamps. The lower wattage bulbs would provide adequate illumination for the room's current use, at a retrofit cost of \$15 per fixture.

Proposed Systems Upgrades

Replace gas furnaces

- Cost : Includes 5-ton condensing unit, A-coil and high efficiency condensing furnace: \$5,500 each
 - o Labor: \$2,000
- Total installed cost per furnace: $\$7,500 * 2 = \$15,000$
- Savings: $\approx \$850/\text{yr}$, based on analysis of actual utility bills. Building is currently underutilized and savings potential will increase as temperature setpoints rise consistent with an occupied building.
- Simple Payback: 17.5 years. Note that existing furnaces have exceeded their normal service life and will soon need to be replaced.

Lower thermostat temperature setpoint in garage

- **Cost: \$0**
- Savings: Set back temperature setpoint by 10°F.
At 65°F: Estimated unit heater runtime → 260 mins.
Annual energy consumption:
 $175,000 \text{ btu/hr} * 260 \text{ mins/day} / 60 \text{ mins/hr} * 2 \text{ units} * 365 \text{ days /yr} = 553,583,333 \text{ btus} / 100,000 \text{ btu/therm} \approx 5,535 \text{ therms}$
 - o At 60°F: Estimated unit heater runtime → 180 mins.
Annual energy consumption:

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175,000 btu/hr * 180 mins/day / 60 mins/hr * 2 units * 365 days /yr = 383,250,000 btus / 100,000 btu/therm ≈ 3,832 therms

- Energy Savings: 5,535 therms – 3,832 therms = 1,703 therms /yr
- **At \$1.3/therms this is a savings of approximately \$2,200 / yr**
- Payback: N/A – Instant

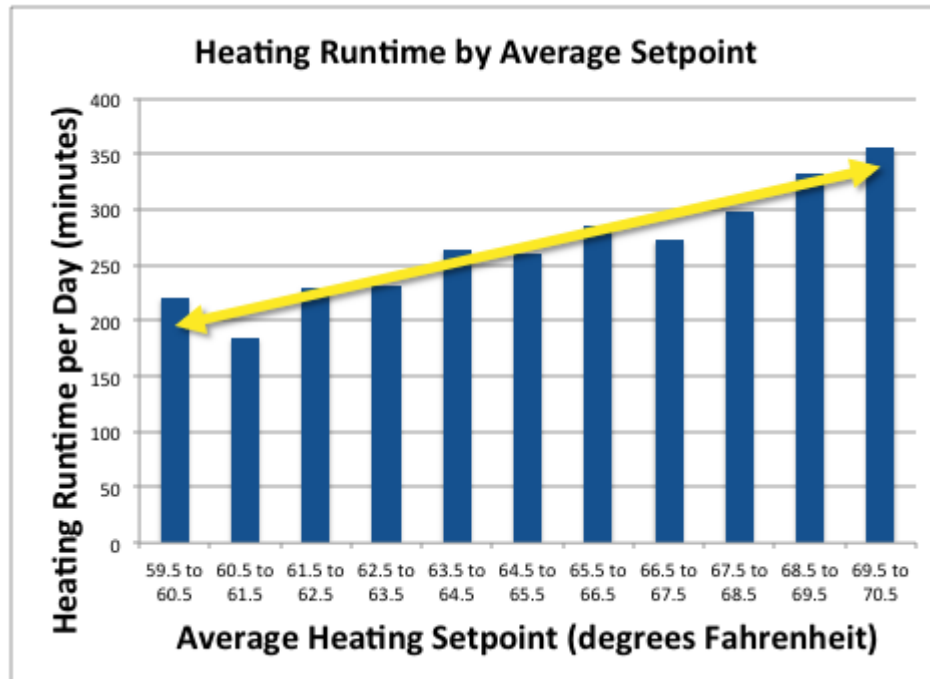


Image Source: <http://energyhub.com/news/how-much-is-one-degree-worth>

Retrofit incandescent light fixtures w/T-5 bulbs

- Cost of replacement: \$50/fixture * 10 fixtures = \$500
- Savings: N/A – Shave off peak demand.
- Payback: N/A

1.2.4 Electrical Vault Building

Building Information

- Floor Space: 2,500 Square Feet (one story)
- Masonry wall construction with concrete plank roof with insulation and rubber roof on top.
- Building contains the main power distribution for the airfield lighting, garage, electric building, and the old terminal.
- Building also has a diesel emergency generator to provide standby power to all these same buildings.
- The building was built in 2000.

Mechanical System Description

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The building is served by 4 gas-fired unit heaters (manufactured by Beacon Morris). There are also 3 exhaust fans and several large louvers/dampers for providing ventilation in the hot summer months. Those dampers are controlled by cooling duty thermostats.

Electrical Service Description

The building has an 800 Amp, 480V three phase service that feeds through an Automatic Transfer Switch (ATS) along with the 250KW generator (approximately 35 yrs old) output. There are five step-down transformers 480V-208V to feed lower voltage loads. The building lighting consists of gasketed, wrap around fluorescent and T-8 industrial type fixtures. The (10) airfield lighting regulators are located here.

Evaluation of Systems and Energy Options

- **Building Envelope** - The building is in good condition. No envelope improvements are recommended.
- **Mechanical Systems** - The unit heaters are in good condition and are appropriate for the application. The fresh air louvers utilized for cooling (primarily in the summer months) have visible gaps and do not provide a tight seal, resulting to considerable infiltration in the winter months and thus waste of energy. The louvers should be retrofitted with seals.
- **Electrical Systems** - The building lighting fixtures are in good condition and require no changes. The electrical panel and transformer are also in good condition and no energy changes are recommended at this time.

Proposed Systems Upgrades

Weather seal existing louvers

- Cost : \$20/L.F. * approx. 50 L.F. = \$1,000
- Savings: Niagara Falls Heating Degree Days (HDD) = 7,062
Loose construction infiltration of 4 cfm / ft² * 100 ft² = 400 cfm
Tight louver construction infiltration: 1 cfm / ft² * 100 ft² = 100 cfm
Infiltration reduction of 300 cfm
 - 7,062 HDD * 20°F DT * 300 cfm = 42,372,000 btu
 - 42,372,000 btu / 100,000 btu/therm = 423 Therms
 - 423 Therms * \$1.3/therm = \$550 /year
- Simple Payback: 1.8 yrs

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1.2.5 Hangar A - FBO

Building Information

- Floor Space: 13,500 Square Feet
- Building Type: Metal building frame, metal roof, office has masonry walls (not insulated) and single pane glass windows.
- Hangar door single panel stud wall type with 4" of insulation and lifts with hydraulic arms.
- Occupancy: FBO offices, rental office space for tenants, and hangar space for tenant aircraft.
- Building has no sprinklers.

Mechanical System Description

The FBO office area is served by a combination of wall mounted PTAC units (3 Sea Breeze PTAC), electric baseboard and a portable AC unit in the locker room area. The aircraft hangar portion of the building is served by nine gas fired infrared heaters (Manufactured by Gordon Ray, model and nameplate data could not be obtained).

Electrical System Description

The building is served by two (2) 200A Panels, fed overhead, directly from the utility. The hangar part has metal halide lighting (400W each). Office areas are served by 2x4 fluorescent troffers, the majority of which have older T-12 lamps with magnetic ballasts and some of them T-8 lamps with electronic ballasts. There is no emergency power available at this building.

Evaluation of Systems and Energy Options

- **Building Envelope** - The building envelope is weather resistant; however, it is poorly insulated. The office spaces should have furring and insulation added to the building exterior with new metal siding. Storm windows should be installed on the interior or exterior of existing windows. Replacing the windows with thermal pane glass units with a thermal break would save more energy however the installation cost will be too high for a reasonable payback.

The hangar insulation could be improved by adding fiber glass insulation with a new vinyl vapor barrier and strap suspension system. It would reduce winter heating load and keep the building cool in the summer.

- **Mechanical** - The infrared heaters in the hangar area, although old, are still functional and are the appropriate type of system for the function of the hangar. When the heaters fail and are due for replacement, they should be replaced with modulating type gas-fired infrared heaters. This newer type of infrared heater is more energy efficient but the increased savings are not enough to provide a justifiable payback, and should only be considered when the existing equipment has already failed and will be getting replaced.

The office portion of the building (FBO) could benefit from replacing the existing PTAC unit with a high efficiency gas-fired furnace and an associated DX coil. This arrangement would improve occupant comfort, and offer improved energy efficiency (up to 96%

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efficient). It would also improve the space's indoor air quality (IAQ) by introducing outside air into it as required by the Mechanical Code of New York State.

- **Electrical** - The electric panels have sufficient capacity however, they are old. The metal halide lighting in the hangar should be replaced with high bay T-5 high output fixtures with multiple switching and/or occupancy sensors.

The office area troffers that have not yet had ballast and lamps replaced, should be retrofitted with electronic ballast and the latest low energy T-8 lamps.

Proposed Systems Upgrades

Replace PTACs with high efficiency furnace

- Cost : Includes 5-ton condensing unit, A-coil and high efficiency condensing furnace: \$5,500 each
 - Labor: \$2,000Total installed cost per furnace: \$7,500
- Savings: ≈ \$500/yr
- Simple Payback: 15 years

Replace metal halide lamps w/high bay T-5 fixtures

- Replace 16, 400-watt metal halide fixtures with 16 6-lamp (56W/lamp) high bay T-5 fixtures.
- Cost: \$800 each x 16 fixtures = \$12,800
- Estimated Savings: N/A – Improvement in illumination levels and light controls.

1.2.6 Triturator Building

Building Information

- Floor Space: 450 Square Feet
- Building Type: Masonry with flat steel roof, one story, with overhead doors on opposite walls.
- Building is used for emptying portable sewage waste container to the airport sewer system.
- Building is at least 50 years old.

Mechanical System Description

The building is served by a natural gas-fired furnace (Inter city gas fired, model NHGK050AF01, 50 MBH input) that is suspended from the ceiling and a roof mounted exhaust fan. There are two abandoned unit heaters within the space.

There is also an electric point of use (POU) electric water heater (Eemax model SP2412, 2.4KW capacity) mounted on the wall that provides the domestic hot water for the building.

Electrical System Description

The building has an old but serviceable 100 amp, 208 volt three phase service feeding the minimal lighting and hot water heating loads. The panel and wiring should be upgraded in the next five years. The lighting source is T-12 fluorescent industrial fixtures.

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Evaluation of Systems and Energy Options

- **Building Envelope** - The building has had a recent rubber roof replacement. One section of the ceiling that had the spray on insulation removed during a repair has not been replaced. This insulation should be replaced and a new spray coating or fire protective coating installed on all the walls and ceiling as there are locations where the flammable insulation underneath is exposed. The overhead doors are insulated and in good condition.
- **Mechanical** - The exhaust fan runs continuously even though this is not necessary. A manual timer switch should be provided that would allow the fan to run on an as-needed basis. The unit heaters do not seem to be necessary for maintaining space temperature, the ceiling mounted furnace (50,000 btuh input capacity) can adequately handle the building load.
- **Electrical Systems** - The existing light fixtures are more than 30 years old and should be replaced with fiberglass housing, gasketed lens, T-8 lamps with electronic ballast fixtures when the building wiring is upgraded.

Proposed Systems Upgrades

Install manual timer fan switch.

- Cost : \$500 each
- Savings: Fan run time 365 days/yr * 24 hrs/day = 8,760.hrs
 - 8,760 hrs * ½ hp * 746 Watts/hp = 3,267 kWh /yr
 - Run time reduction w/timer switch: 1hr/day * 365 days/year = 365 hrs/yr
 - 365 hrs/yr * ½ hp * 746 Watts/hp = 136 kWh/yr
 - Energy savings of 3,131 kWh / year * \$0.10/kWh = \$313/yr
- Simple Payback: 1.6 years

Replace existing light fixtures with T-8 lamp fixtures.

- Replace 8 light fixtures with new T-8 fiberglass housing fixtures:
- Cost: \$400 each x 8 fixtures = \$3,200
- Estimated Savings: N/A – existing lights well beyond useful life

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1.2.7 NFTA Equipment Storage /Maintenance

Building Information

- Floor Space: 15,000 Square Feet
- Metal building, one half is 60 years old, other half is 15 years old.
- Exterior walls are metal sandwich panels with 2 inches of fiberglass insulation between.
- Roof insulation is standard 2-3" fiberglass stretched over the framing.
- O.H. doors are insulated metal type in good condition.
- The building has sprinklers
- The older portion of the building has too low headroom for the current larger trucks.
- New wing has 14' tall O.H. doors which all equipments fits through. O.H. doors are on both sides of the building allowing drive-through parking.
- Building Occupancy: Storage and service of airport snow removal and mowing equipment.

Mechanical System Description

The storage garage building is heated through a combination of 5 gas fired unit heaters and 11 infrared heaters. Some of the individual office spaces are served by through the wall AC units. Three of the above mentioned unit heaters are Advanced Distributor Products (Model SEP-145A-5), 145 MBH gas input, one is by the same manufacturer, Advanced Distributor Products (model 3E371) and the final one is an Armstrong model UHPA175AE-5, 175 MBH gas input capacity.

Electrical System Description

The building has a 400 Amp, 208V three phase service, the old section is sub-fed with a 200A service that splits into two (2) 100A panels and the new section has a 200A service going to a 225A panel. The original building has low bay, high pressure sodium lighting (H.P.S.) and fluorescent industrial lights over perimeter work benches. The newer wing has metal halide low bay fixtures. The exterior perimeter of the building is illuminated all night with 150 watt H.P.S. wall packs.

There is no emergency power available.

Evaluation of Systems and Energy Options

- **Building Envelope** - Building future must be determined before investing in energy improvements. The original building is too low to serve the larger trucks limiting its use to park smaller vehicles and perform service and maintenance tasks. If the original building is replaced with a taller one, it should have a minimum of R-30 insulation in the roof and R-20 in the walls. If the existing building is retained the roof should have additional insulation suspended beneath the existing one. The existing exterior wall panels will be adequate.
- **Mechanical** - The gas fired infrared heating systems being utilized for heating the open areas of building are consistent with what is recommended for the function of the space. There is however a unit heater that has been retrofitted to blow warm air in the office area below. Even though this works in practice, it is an inefficient way to heat the space. Instead

Sustainable Airport Master Plan

those spaces can be served by a high efficiency condensing furnace with a DX coil, and in the process eliminate the need for utilizing the window AC units.

- **Electrical Systems** - The electric service should provide adequate power for the current building use. The electrical wiring in the original building should be inspected and if insulation is brittle or damaged at devices, it should be entirely replaced. The panel boards observed are serviceable however any original ones remaining should be replaced. The low bay HPS fixtures are serviceable, however new industrial fluorescent fixtures will provide similar or less wattages and the capability for instant ON-OFF switching. With current occupancy and use patterns where there is active work in only some portions of the building at one time, providing multiple switches or occupancy sensors would reduce lighting energy usage. The exterior wall packs could be controlled with a minimum level on during normal nighttime activity and the rest brought on during snow events or when more light is required.

Proposed Systems Upgrades

Replace HPS fixtures with industrial fluorescent fixtures

- Replace with 38 6-lamp (56W/lamp) high bay T-5 fixtures.
- Cost: \$800 each x 38 fixtures = \$30,40
- Estimated Savings: N/A – Improvement in illumination levels and light controls.

1.2.8 Air Cargo Warehouse

Building Information

- Floor Space: 10,000 Square Feet
- Building type: metal building frame and siding
- Occupancy: Building is used for unheated storage space with all utilities turned off.
- No plans for re-occupying the building.

Mechanical System Description

Not applicable.

Electrical System Description

The building electric service was formerly connected to an adjacent privately owned building. This service has been disconnected. Access to this building with a new utility service from the existing NFTA power systems will be difficult because of its remote location.

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1.3 SUSTAINABILITY STRATEGIES

There are several sustainable systems that could be incorporated into existing buildings to reduce energy demand or to provide on-site generation. New lighting technologies and control were mentioned in individual building discussion above. The following are systems to consider in major renovation project to the Old Terminal or as standalone projects:

1.3.0 Power-Burner

A new product available is a power-burner unit. LEVA Energy, Inc. manufactures the power-burner as a replacement burner on a boiler in the 2,000,000 BTUH to 15,000,000 BTUH range. It is a gas fired turbine (miniature jet engine) that fires into the boiler passing through a 100KW turbine prior to entering the boiler. The spinning turbine is connected to a generator producing 100KW of electricity. The burner uses 3% less gas than the original burner and produces 100KW of electricity for no additional energy input. To make this system pay for itself the boiler it is connected to should have a stable year-round load to maximize burner run time. The boiler can be tied to an absorption chiller to provide chilled water, which creates a summer heating load to keep the turbine-burner running.

1.3.1 Micro-Turbine

Natural gas or other gaseous fuel can also be burned in micro-turbine to generate electricity. Heat recovery coils are installed on the exhaust gas to generate heating water to provide domestic hot water, heating and through an absorption chiller, to provide cooling. Micro-turbine installations in buildings with sufficient thermal load have a payback in the 4-6 year range.

1.3.2 NYSERDA Incentives

NYSERDA currently has an incentive program (P.O.N.) that runs through 215 that will pay \$1,500 per KW of installed Combined Heat and Power (CHP) systems. Both the Leva Burner and micro-turbine are CHP systems. To qualify for the incentive the system must be capable of running in a standby mode when the utility is down and the applicant must prove they will have enough thermal load to provide a minimum annual system efficiency of 60%.

1.3.3 Solar Electric

A solar electric system (photo-voltaic) could be installed on several of the buildings. The electrical building would be ideal because the power output can be tied directly into the power distribution. P.V. panels could be integrated into any replacement of the Old Terminal or on other building roofs that are flat or south facing. A newly developed solar film could be installed on the south facing terminal glass windows. The electric output per square foot of film is low, so a large glass area is required to be practical. The Greater Rochester International Airport has a recently installed 100KW system in operation.

1.3.4 Rainwater Harvesting

If the Old Terminal Building is replaced, a rainwater harvesting RWH system could be considered. The best water for harvesting is collected from the roofs. Stormwater from parking lots is problematic because of the sediment oils and salts it will pickup. To incorporate RWH in a building the roof storm water should be piped separately to filter units and then to a storage tank; usually below ground because of the size required. A pumping system is used to supply the “gray water”

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to building uses including toilet flushing, cooling tower make-up and vehicle or laundry washing. Because rain is intermittent, a large tank is required to hold the water collected in one day, for use over extended periods. RWH systems do not save significant utility cost. They are a green technology that helps balance the overuse of limited resources.

Appendix H2

Sustainability Initiatives

NFIA Sustainable Master Plan
 NFTA-Wide Initiatives

ID	Primary Goal Category	Initiative	Description of Initiative	Which NFIA Sustainability Goals/Objective categories does this strategy contribute to meeting? (bold indicates primary goal area the objective helps meet)					Overall Relative Ability of Initiative to Advance Sustainability (1-5)	What are the costs to implement the initiative? (High, Medium, Low)	What are the annual costs to maintain the initiative? (High, Medium, Low)	What level of staff effort is required to maintain the initiative? (High, Medium, Low)	Return on Investment (if available) (years)	Overall Relative Cost/Staff Level of Effort of Initiative (1-5)	Implementation Timeframe
				Natural Resources	Energy / Infrastructure	Waste	Economic Vitality	NFTA							
NFTA-1	N/A	Provide more opportunities at the Airport for employee participation in NFTA programs (e.g., wellness events)	NFTA provides wellness programs, but most activities take place at NFTA central offices. Consider holding events such as annual health screenings and other wellness activities at NFIA, to increase opportunities for NFIA employee participation.					X	2	Low	Low	Low	N/A	1	Short-Term
NFTA-2	N/A	Coordinate with the Western New York Sustainable Business Roundtable	The Western New York Sustainable Business Roundtable (WNY-SBR) is a collaboration open to all businesses that want to share ideas and best practices to become more sustainable. The only criteria for joining the WNY-SBR is to have a sustainability plan and remain accountable for the goals you set. NFIA and BNIA should consider joining or collaborating with the WNY-SBR to enhance its sustainability efforts. In addition to sharing best practices and shift the perception of the airport, opportunities to partner on sustainability may also exist.	X	X	X	X	X	5	Low	Low	Low	N/A	1	Short-Term
NFTA-3	N/A	Institute Authority-wide "green" office policies	"Green" office policies reduce waste by instituting policies such as: - default double-sided printing - turn off office lights, computers, copiers, printers, and other equipment when not in use.	X	X	X		X	3	Low	Low	Low	N/A	1	Short-Term
NFTA-4	N/A	Develop sustainable procurement policies and procedures	Implement an environmentally preferred purchasing program. Additionally, through procurement processes, communicate sustainability goals to contractors/sub-contractors.					X	4	Low	Low	Low	N/A	1	Long-Term
NFTA-5	N/A	Encourage contractors to recycle a minimum percentage of construction and demolition waste	To minimize waste specify "no less than XX % by weight". This helps to ensure best practices for sustainable waste management during construction and deconstruction. It's also important to communicate information to 3rd party contractors working on site, if applicable.	X		X		X	3	Low	Low	Low	N/A	1	Long-Term

Short-Term: 0-5 years
 Long-Term: 5+ years
 *denotes initiatives that depend on building replacement

1 = Low cost/staff effort
 5 = High cost/staff effort
 Short ROI reduces overall effort rating

High ≈ 1+ full-time staff
 Med ≈ 1 part-time staff
 Low ≈ minimal effort

High ≈ \$100,000+
 Med ≈ \$10,001 - \$100,00
 Low ≈ <\$10,000

High ≈ \$100,000+
 Med ≈ \$10,001 - \$100,00
 Low ≈ <\$10,000

1 = Low Effect
 5 = High Effect

ID	Primary Goal Category	Initiative	Description of Initiative	Which NFIA Sustainability Goals/Objective categories does this strategy contribute to meeting? (bold indicates primary goal area the objective helps meet)					Overall Relative Ability of Initiative to Advance Sustainability (1-5)	What are the costs to implement the initiative? (High, Medium, Low)	What are the annual costs to maintain the initiative? (High, Medium, Low)	What level of staff effort is required to maintain the initiative? (High, Medium, Low)	Return on Investment (if available) (years)	Overall Relative Cost/ Staff Level of Effort of Initiative (1-5)	Implementation Timeframe
				Natural Resources	Energy / Infrastructure	Waste	Economic Vitality	NFTA							
E&I-1	Energy and Water Efficiency: New Air Terminal	Install carbon dioxide (CO2) sensors for ventilation control	To implement demand control ventilation, carbon dioxide (CO2) sensors can be installed in the return air duct. The outside damper position will be modulated to maintain a certain CO2 level in the return air (800 ppm is a typical setpoint). When the space is more heavily occupied, the CO2 level will rise and more outside air will be brought into the space. As occupancy decreases, the CO2 level will drop and less outside air will be brought into the space.	X	X				2	Low	Low	Low	2.3	1	Short-Term
E&I-2	Energy and Water Efficiency: New Air Terminal	Replace metal halide lamps with LEDs, as fixtures reach the end of their useful life	Currently, the lighting in the Domestic Bag Hall, International Bag Hall, Arrivals Hall and Departure Hall consists of ten (10), 175-watt and ten (10), 150-watt metal halide fixtures. When metal halide fixtures reach the end of their useful life, recommend replacement with twenty (20), 59 Watt LED retrofit fixtures.		X				2	Low	Low	Low	9.5	1	Short-Term
E&I-3	Energy and Water Efficiency: Old Terminal & Control Tower	Replace control tower AHU	It is recommended that furnaces are replaced with high efficiency condensing type furnaces. Those types of furnaces have advertised efficiency of up to 96% (88-90% is more realistic). In comparison, the existing furnaces operate at a max efficiency of 80% and are well past their useful life.		X				2	Medium	Low	Low	N/A	2	Short-Term

1 = Low cost/staff effort
5 = High cost/ staff effort
Short ROI reduces overall effort rating

Short-Term: 0-5 years
Long-Term: 5+ years
*denotes initiatives that depend on building replacement

ID	Primary Goal Category	Initiative	Description of Initiative	Which NFIA Sustainability Goals/Objective categories does this strategy contribute to meeting? (bold indicates primary goal area the objective helps meet)					Overall Relative Ability of Initiative to Advance Sustainability (1-5)	What are the costs to implement the initiative? (High, Medium, Low)	What are the annual costs to maintain the initiative? (High, Medium, Low)	What level of staff effort is required to maintain the initiative? (High, Medium, Low)	Return on Investment (if available) (years)	Overall Relative Cost/ Staff Level of Effort of Initiative (1-5)	Implementation Timeframe
				Natural Resources	Energy / Infrastructure	Waste	Economic Vitality	NFTA							
E&I-4	Energy and Water Efficiency: GA Administration & Service Garage	Replace gas furnaces	Existing furnaces have exceeded their normal service life and will soon need to be replaced. It is recommended that furnaces are replaced with high efficiency condensing type furnaces. Those types of furnaces have advertised efficiency of up to 96% (88-90% is more realistic). In comparison, the existing furnaces operate at a maximum efficiency of 80%. This strategy is contingent upon long-term plans for the building calling for a building retrofit instead of demolition.		X				2	Medium High ≈ \$100,000+ Med ≈ \$10,001 - \$100,00 Low ≈ <\$10,000	Low High ≈ \$100,000+ Med ≈ \$10,001 - \$100,00 Low ≈ <\$10,000	Low High ≈ 1+ full-time staff Med ≈ 1 part-time staff Low ≈ minimal effort	17.5	2	Short-Term*
E&I-5	Energy and Water Efficiency: GA Administration & Service Garage	Lower thermostat temperature setpoint in garage	Building is currently underutilized and savings potential will increase as temperature setpoints rise consistent with an occupied building. Because this building is not regularly occupied, reducing the temperature setpoint by 10 degrees (from 60-65 to 50 degrees) would result in savings of approximately \$2,200 per year. This strategy is contingent upon long-term plans for the building calling for a building retrofit instead of demolition.		X				2	0	Low	Low	Instant	1	Short-Term
E&I-6	Energy and Water Efficiency: GA Administration & Service Garage	Retrofit incandescent light fixtures w/T-5 bulbs	The most commonly used lighting at airports is typically incandescent and fluorescent lamps and lighting is a large source of energy and indirect source of GHG emissions. Replace incandescent light fixtures with T-5 bulbs which are more energy efficient. This strategy is contingent upon long-term plans for the building calling for a building retrofit instead of demolition.		X				2	Low	Low	Low	Savings	1	Short-Term*
E&I-7	Energy and Water Efficiency: Electrical Vault Building	Retrofit existing louvers with weather seals	Seal existing summer cooling make-up air louvers to prevent air infiltration during the cold winter months.		X				2	Low	Low	Low	1.8	1	Short-Term

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				Natural Resources	Energy / Infrastructure	Waste	Economic Vitality	NFTA							
E&I-8	Energy and Water Efficiency: Triturator Building	Install manual timer fan switch	The exhaust fan in the Triturator Building runs continuously even though this is not necessary. A manual timer switch should be provided that would allow the fan to run on an as-needed basis.		X							1.6	1	Short-Term	
E&I-9	Energy and Water Efficiency: Triturator Building	Replace existing light fixtures with T-8 lamp fixtures	When existing lights reach the end of their durable life, replace these 8 light fixtures with new T-8 fiberglass housing fixtures; existing lights are well beyond useful life.		X							N/A	1	Short-Term	
E&I-10	Energy and Water Efficiency: Major Renovation / Standalone Projects	Identify opportunities for utilizing a combined heat and power (CHP) system.	One innovation that is finding applications in commercial and industrial type settings is what is known as Combined Heat and Power (CHP) systems. This system works by taking the waste heat from the burning of fossil fuels and applies it to power another process, i.e. generate electricity through gas-fired turbine and use the generated waste heat to for generating heating water instead of allowing it to escape. Because more of the energy contained in the natural gas is used in A CHP system setting efficiency increases, thus resulting in less energy needed (costing the user less), and fewer emissions generated. Typically, a CHP system produces a given amount of electricity and usable heat with 10 to 30 percent less fuel than would be needed if the two functions were separate. The key determinant of whether or not combined heat and power technology would be of use is the nearby need or purpose for the captured waste heat. Often, CHP systems are paired with an absorption chiller, allowing the utilization of the captured waste heat for generating cooling in the summer months.	X	X							<10	5	Long-Term	

NFIA Sustainable Master Plan
Natural Resources Initiatives

ID	Primary Goal Category	Initiative	Description of Initiative	Which NFIA Sustainability Goals/Objective categories does this strategy contribute to meeting? (bold indicates primary goal area the objective helps meet)					Overall Relative Ability of Initiative to Advance Sustainability (1-5)	What are the costs to implement the initiative? (High, Medium, Low)	What are the annual costs to maintain the initiative? (High, Medium, Low)	What level of staff effort is required to maintain the initiative? (High, Medium, Low)	Return on Investment (if available) (years)	Overall Relative Cost/ Staff Level of Effort of Initiative (1-5)	Implementation Timeframe
				Natural Resources	Energy / Infrastructure	Waste	Economic Vitality	NFTA							
NR-1	Natural Resources	Purchase a water leak detection equipment	If old infrastructure is continued to be used, purchase water leak detection equipment to detect leaks and repair water supply before significantly increasing water usage.	X	X				2	Low	Low	Low	Savings	2	Short-Term*
NR-2	Natural Resources	Continue to implement deicing best practices	Consistently implementing best practices for deicing reduces the likelihood of hazardous material discharges to local water resources. De-icing is fairly minimal at this time because no remain overnight. NFTA should monitor airline growth and use of NFIA, and if operational patterns change consider implementing new measures.	X					1	Low	Low	Low	N/A	1	Short-Term
NR-3	Natural Resources	Conduct a Utility Master Plan	Conduct a Utility Master Plan to document the overall utility requirements (water, gas, telecommunications, sewer, electrical) for all NFIA facilities. This will help identify the location of meters and what each meter is measuring, and will identify weaknesses in the utility infrastructure, which will assist with decision-making for maintenance of the facilities' infrastructure.	X	X				2	Medium	Low	Low	Savings	2	Short-Term
NR-4	Natural Resources	Improve monitoring/ tracking of water use.	Develop procedures to ensure NFIA receives water bills from NFTA in a timely manner. Bills and usage information should be reviewed by NFIA maintenance staff. Monitoring and track of water use includes: - Tracking and reporting quarterly water use - Accounting for variation in water use - Ensure metering dates remains synchronized with both towns	X				X	2	Low	Low	Low	Savings	1	Short-Term
NR-5	Natural Resources	Conduct routine maintenance of automatic sensors, to ensure water efficiency	Implement an ongoing maintenance plan to ensure automatic sensors are functioning as designed.	X					2	Low	Low	Low	Savings	1	Short-Term
NR-6	Natural Resources	Enforce limits for vehicle idling on the landside and airside	Vehicle/equipment idling can quickly compound emissions due to the consumption of fuel at very inefficient engine power settings. Existing idling restrictions exist but should be enforced on both airside and landside. Emissions can be greatly reduced by enforcing idling reduction. Vehicle idling restrictions can be communicated with signage, but also needs to be enforced to be effective.	X					2	Low	Low	Low	N/A	1	Short-Term

NFIA Sustainable Master Plan
Natural Resources Initiatives

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				Natural Resources	Energy / Infrastructure	Waste	Economic Vitality	NFTA							
NR-7	Natural Resources	Encourage single-engine aircraft taxiing	If safety considerations allow, pilots may conduct taxi operations using a reduced number of aircraft engines (i.e., "single-engine taxi"). Reducing the level of engine operation regardless of engine setting reduces fuel burn overall, creating an emissions savings.	X					2	Low	Low	Low	N/A	1	Short-Term
NR-8	Natural Resources	Improve training and awareness to increase 400 Hz power and Pre-Conditioned Air (PC Air) usage	Increase training to ensure aircraft are utilizing ground power and PC Air that is provided at the gates. NFIA provides two passenger gates with 400 Hz power and PC Air, which reduces emissions through reduced APU usage. While training has been conducted, the ground power and PC Air is not utilized as often as it should.	X					1	Low	Low	Low	N/A	1	Short-Term
NR-9	Natural Resources	Conduct preventive maintenance of HVAC equipment to ensure HVAC doesn't leak	Implement an ongoing maintenance plan to ensure HVAC equipment is functioning as designed; reducing leaking of ozone-depleting refrigerants and emissions. Consider installing an Intelligent Fault Diagnosis for HVAC Refrigerant Systems (see ACRP Report 56, AQ-8). Ensuring HVAC equipment isn't leaking will result in improved functionality of equipment and increased energy efficiency.	X	X				2	Low	Low	Low	Savings	1	Short-Term
NR-10	Natural Resources	Continue to implement initiatives from the Wildlife Hazard Management Plan and Wildlife Hazard Assessment recommendations	Recommendations from the WHA (2011) include: - Habitat management - Perimeter fence patrol	X					2	Low	Low	Low	N/A	1	Short-Term
NR-11	Natural Resources	Purchase software to track and monitor usage	Utilizing software that supports reporting and data analysis will assist in more easily and accurately monitoring and tracking of resources (e.g., water and energy use). Consider implementing software for both NFIA and BUF to maximize software investment. The software could be expanded to track compliance issues and/or other resources.	X	X		X		3	Medium	Low	Low	N/A	1	Short-Term
NR-12	Natural Resources	Coordinate bus service to match airline schedule, to maximize convenience, as demand warrants (with increased airline activity).	As the Airport grows, consider increasing access to bus service. Work with NFTA and Greyhound Canada to coordinate airline and employee work schedules with bus schedules to increase likelihood of passengers/employees using these services. Although bus routes are structured around other pickup areas other than the airport, it would be worthwhile to engage in coordination regarding potential for changes.	X				X	2	Low	Low	Low	N/A	1	Long-Term

NFIA Sustainable Master Plan
Natural Resources Initiatives

ID	Primary Goal Category	Initiative	Description of Initiative	Which NFIA Sustainability Goals/Objective categories does this strategy contribute to meeting? (bold indicates primary goal area the objective helps meet)					Overall Relative Ability of Initiative to Advance Sustainability (1-5)	What are the costs to implement the initiative? (High, Medium, Low)	What are the annual costs to maintain the initiative? (High, Medium, Low)	What level of staff effort is required to maintain the initiative? (High, Medium, Low)	Return on Investment (if available) (years)	Overall Relative Cost/ Staff Level of Effort of Initiative (1-5)	Implementation Timeframe
				Natural Resources	Energy / Infrastructure	Waste	Economic Vitality	NFTA							
NR-13	Natural Resources	Consider Low Impact Design measures in future development projects	Low Impact Design measures seek to manage stormwater through preserving natural landscapes and minimizing impervious surfaces. Include language regarding consideration of low impact design principles in contract documents for design services.	X	X				3	Medium	Low	Low	N/A	2	Long-Term
NR-14	Natural Resources	Incorporate sustainability considerations into future planning, design, and construction projects at NFIA and BUF as eligible funding becomes available	Establish sustainable considerations or "design principles" for new buildings and construction to ensure consistent design and management of construction that minimize environmental impacts. These guiding principles could be incorporated into all contractor specifications. Guidelines could draw from, but not require certification through, programs such as the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) for New Construction rating system or the Institute for Sustainable Infrastructure's Envision™ rating system, as well as guidelines established for other airports. Guidelines could include, but are not limited to the following areas: materials selection, life cycle cost analysis, energy design/performance, water conservation, waste management of construction and demolition debris, and/or construction emissions minimization practices. Build on design guidelines implemented at BNIA, as referenced in the BNIA Master Plan recommendations.		X			X	4	Low	Low	Low	N/A	1	Long-Term
NR-15	Natural Resources	Recalculate and report GHG emissions when annual GA and commercial aircraft operations change by 10 percent or if significant energy efficiency initiatives are implemented	Either a 10 percent increase in aircraft operations or major energy efficiency improvements would warrant preparation of an airport-wide greenhouse gas emissions inventory to help the airport benchmark its emissions. This inventory would inform the county's GHG emissions inventory efforts, while maintaining more control over the contents of the inventory.	X					1	Medium	Low	Low	N/A	2	Long-Term
NR-16	Natural Resources	Install a charging station on the airside and encourage tenants to convert ground service equipment (GSE) to electric vehicles	Install a charging station and encourage tenants to replace existing GSE with electric vehicles, which will reduce fuel costs as well as reduce emissions. Although this initiative would be best implemented in conjunction with implementation at BNIA to enhance economies of scale and financial incentives for airlines, it's possible that low cost airlines will not be interested in replacing its GSE to electric vehicles.	X					2	Low	Low	Low	N/A	1	Long-Term

NFIA Sustainable Master Plan
Waste Management Initiatives

ID	Primary Goal Category	Initiative	Description of Initiative	Which NFIA Sustainability Goals/Objective categories does this strategy contribute to meeting? (bold indicates primary goal area the objective helps meet)					Overall Relative Ability of Initiative to Advance Sustainability (1-5)	What are the costs to implement the initiative? (High, Medium, Low)	What are the annual costs to maintain the initiative? (High, Medium, Low)	What level of staff effort is required to maintain the initiative? (High, Medium, Low)	Return on Investment (if available) (years)	Overall Relative Cost/ Staff Level of Effort of Initiative (1-5)	Implementation Timeframe
				Natural Resources	Energy / Infrastructure	Waste	Economic Vitality	NFTA							
W-1	Waste	Develop a passenger waste and recycling education program	Establish an airport recycling program. Utilize the current types and sources of waste identified in the Master Plan Update to develop a plan that works for NFIA, which should include establishing goals for the program. The recycling program may initially focus on the "big five" recyclables (paper, plastic, glass, cardboard, and aluminum). Review the existing collection bins and signage to ensure recycling efforts are maximized. Develop an educational display on the benefits of recycling for both staff and passengers. Measure performance, such as monitoring bins for contamination, and refine the program as necessary. Other recommended initiatives to improve waste management and recycling at NFIA will support this program.			X			3	Low	Low	Low	N/A	1	Short-Term Long-Term: 5+ years *denotes initiatives that depend on building replacement
W-2	Waste	Periodically monitor fullness of bins and adjust hauling schedule as applicable	By periodically monitoring fullness of waste and recycling bins before they are picked up by the hauler, NFIA will be able to adjust the pick up schedule, if necessary, to minimize cost of hauling waste.			X	X		1	Low	Low	Low	N/A	1	
W-3	Waste	Coordinate with airline tenants to increase recycling of deplaned waste	In collaboration with Airlines, determine strategies to facilitate improvements to their waste management systems. Work with airline employees to determine the best process to separate recyclable materials from trash during deplanement and office operations.			X			2	Low	Low	Low	N/A	1	
W-4	Waste	Improve signage for recycling receptacles	Increases understanding of what can be recycled by improving signage by recycling and trash receptacles in the Terminal using both words and symbols. Currently, bins at NFIA have two receptacles for trash, with one labeled as "Trash/Organics" - this may be confusing to passengers looking for organics-specific receptacles (which NFIA does not provide because it doesn't process organics separately from trash). NFIA should clearly communicate what it does and does not recycle			X			3	Low	Low	Low	N/A	1	
W-5	Waste	Increase the number of recycling bins; a recycling bin paired with every trash bin is desirable. Recycling bins should also be a different color than the trash bins.	Increase number of recycling receptacles such that there is one next to each trash receptacle, beginning with the heavy use areas that would potentially have a high impact on improving recycling rates, such as the gate waiting area and the baggage claim area. Improve visibility of recycling receptacles in the Terminal by equipping them with colorful lids.			X			3	Low	Low	Low	N/A	2	
W-6	Waste	Conduct a new waste audit periodically, based on increased passenger enplanements	Conduct a new waste audit when there is a 20% passenger increase from 2012 levels and compare benchmarks.			X			2	Low	0	Low	N/A	1	

ID	Primary Goal Category	Initiative	Description of Initiative	Which NFIA Sustainability Goals/Objective categories does this strategy contribute to meeting? (bold indicates primary goal area the objective helps meet)					Overall Relative Ability of Initiative to Advance Sustainability (1-5)	What are the costs to implement the initiative? (High, Medium, Low)	What are the annual costs to maintain the initiative? (High, Medium, Low)	What level of staff effort is required to maintain the initiative? (High, Medium, Low)	Return on Investment (if available) (years)	Overall Relative Cost/ Staff Level of Effort of Initiative (1-5)	Implementation Timeframe
				Natural Resources	Energy / Infrastructure	Waste	Economic Vitality	NFTA							
Ec-1	Economic	Enhance business diversity development	Develop a program to stimulate business diversity, to increase involvement of small, minority, and woman-owned businesses enterprises (SMWBEs) and disadvantaged business enterprises (DBEs) on NFIA projects. Consider providing guidance about contracting opportunities at both NFTA airports (or NFTA-wide), and offer technical expertise to small businesses through Mentor-Protégée and Emerging Contractor Programs.				X	X	2	Low	Low	Low	N/A	1	Short-Term *denotes initiatives that depend on building replacement
Ec-2	Economic	Assess opportunities and promote non-aeronautical development	With the understanding that there are limited opportunities for non-aeronautical development based on the Airport's configuration, assess opportunities for non-aeronautical land use development, which would diversify airport revenue streams. ACRP Synthesis 19: Airport Revenue Diversification details options and plans for airports to diversify revenue activity. Examples of non-aeronautical development provided in ACRP Synthesis 19 include convenience store, gas station, hotels, pet kennels, recreational facilities (special consideration to avoid constraints to future development associated with DOT Act Section 4(f)), self-storage, and more.				X		3	High	Low	Low	Revenue generation	1	
Ec-3	Economic	Apply for New York State Energy Research and Development Authority's (NYSERDA) Funding Opportunities	NYSERDA offers many different funding options for energy-related improvements that could be implemented at NFIA. Examples of these programs include: <ul style="list-style-type: none"> • PON 1219 - Existing Facilities Program; offers incentives for a variety of energy projects including Pre-Qualified Measures and Performance-Based Incentives. • PON 1746 - FlexTech Program; cost-shared analysis of energy efficiency technical evaluations, process improvement analysis, energy master plans, retrocommissioning, and development of peak-load curtailment plans (PLCPs) of their existing facilities as well as combined heat & power (CHP) feasibility studies for implementation within existing facilities. • PON 1601 - New Construction Program; conduct technical assessments of energy efficiency improvements in building designs and to offset a portion of the incremental capital costs to purchase and install energy-efficient equipment in these buildings to reduce energy consumption. • PON 2112 - Solar PV Program Financial Incentives; cash incentives for the installation by Eligible Installers of new grid-connected Solar Electric or Photovoltaic (PV) systems that are 200 kW or less for commercial sites. 	X	X		X		4	Low	Low	Low	Savings	1	

NFIA Sustainable Master Plan
Economic Initiatives

ID	Primary Goal Category	Initiative	Description of Initiative	Which NFIA Sustainability Goals/Objective categories does this strategy contribute to meeting? (bold indicates primary goal area the objective helps meet)					Overall Relative Ability of Initiative to Advance Sustainability (1-5)	What are the costs to implement the initiative? (High, Medium, Low)	What are the annual costs to maintain the initiative? (High, Medium, Low)	What level of staff effort is required to maintain the initiative? (High, Medium, Low)	Return on Investment (if available) (years)	Overall Relative Cost/ Staff Level of Effort of Initiative (1-5)	Implementation Timeframe
				Natural Resources	Energy / Infrastructure	Waste	Economic Vitality	NFTA							
Ec-4	Economic	Allocate space in the museum for cultural/locally-sponsored exhibits, and advertise the museum's existence.	Increase advertisement of the Aerospace Museum at NFIA. Advertisement could include posters throughout the terminal and information on NFIA's website, including a link to the museum's website. Allocate space in the museum for locally-sponsored or cultural exhibits. This initiative is contingent upon long term redevelopment plans for this area of the airport.				X		Low	Low	Low	N/A	1	Long-Term	

Appendix I

Public Participation



SUSTAINABLE

Master Plan

UPDATE

The McFarland Johnson Team

& Innovation
EXPERIENCE

What is an Airport Master Plan?

SUSTAINABLE
Master Plan
UPDATE

- **Official FAA and NYSDOT Airport Planning Document**
- **Required by FAA Compliance Regulations**
- **Reflects Sponsor's (NFTA) Goals for the Airport**
- **Depicts Future Airport Development Covering 10-20 Years**
- **Future Projects Contingent on Funding (FAA/Other) & Environmental Approval**