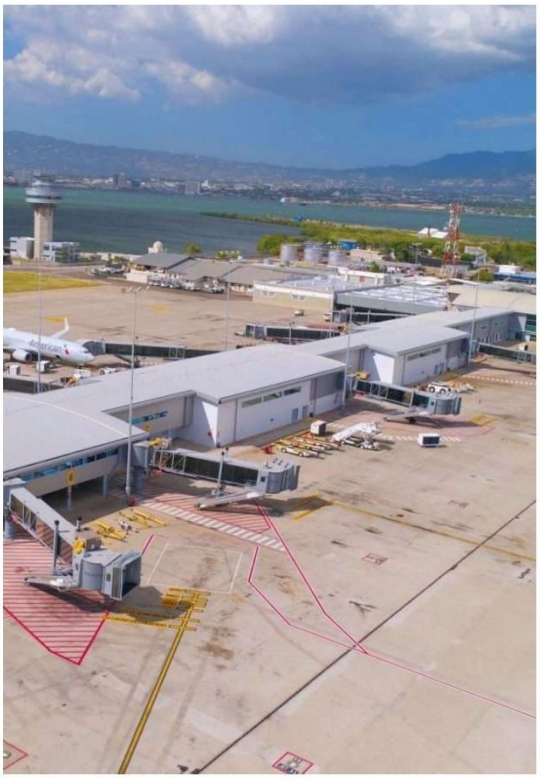
AIRPORT ZONING ANALYSIS

VARIOUS ENVIRONMENTAL, ZONING & OTHER BASELINE STUDIES FOR THE NORMAN MANLEY INTERNATIONAL AIRPORT



airports authority of jamaica

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September 2020

Executive Summary

This report presents an analysis of planning issues related to the NMIA zoning and proposes recommendations to address existing or potential issues which were identified from the study titled "Analysis of Current Situation" It covers the following topics as required in the Terms of Reference:

1. Compatible & incompatible land use assessment & land use plan
2. Review of Documents related to Impact of Airfields on Existing and Planned Communities
3. Review and Assess the KSAMC Transportation Master Plan
4. Analyze NMIA's Internal Transportation Network
5. Identify Opportunities for Improvement of Internal Transportation Network
6. Identify Potential Transportation Linkages between Airport and KSAMC Business Hubs
7. Develop Proposed Zoning Policy & Land Use Map

The planning proposals are:

1. To improve wayfinding instruments;
2. To improve circulation and parking facilities;
3. To integrate the airport plan with major regional development plans – creating Improved public transportation linkage to proposed nodes throughout the region;
4. To introduce of an airport zoning overlay district to integrate with parish development orders to ensure compatible and complimentary development beneficial to the growth of the NMIA.

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List of Abbreviations

AZO	Airport Zoning Ordinance
AAJ	Airports Authority of Jamaica
AGL	Above ground level
AMP	Airport Master Plan
AOA	Airport Operating Area
CFR	Code of Federal Regulations
CIP	Capital Investment Programmes
CLC	Cargo and Logistics Centre
DO	Development Order
EHU	Environmental Health Unit
EPM	Environmental Programme Manual
FAA	Federal Aviation Authority
ICAO	International Civil Aviation Authority
INM	Integrated Noise Model
JCAA	Jamaica Civil Aviation Authority
KCT	Kingston Container Terminal
KMTR	Kingston Metropolitan Transport Region
KSAC	Kingston & St. Andrew Corporation
LDN	Loudness Day Night
MSWLF	Municipal solid waste landfills
NEPA	National Environment & Planning Agency
NRCA	Natural Resource Conservation Authority
NMIA	Norman Manley International Airport
NSWMA	National Solid Waste Management Authority
NTSB	National Transport Safety Board
OLS	Obstacle Limitation Surface
OFA	Object Free Area
OFZ	Obstacle Free Zone
PPRA	Palisadoes & Port Royal Protected Area
RAMSAR	Wetland of International Significance – Ramsar Site No.1454
RESA	Runway End Safety Areas
RPZ	Runway Protection Zone
VOD	Vertical Operating Distance
TSS	Threshold Siting Surface
WHMP	Wildlife Hazard Management Plan

1 Introduction

1.1 General Approach

This report presents an analysis of planning issues related to the NMIA zoning and proposes recommendations to address existing or potential issues which were identified from the study titled "Analysis of Current Situation". It covered the following topics as required in the Terms of Reference:

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1.2 TOR Requirements: Airport Zoning Analysis

Activity 4.1: Compatible and incompatible land use assessment and land use plan

The goal of this activity is to determine the compatible and incompatible land use.

The Contractor will identify the types, location and size of compatible land (in and out the airport) and the development that is needed based on assumed demand, such as motels, restaurants, warehouses, shipping agencies, etc, as well industries that could benefit because they are located close to the airport.

The Contractor will also identify the incompatible land and the extent to which incompatible airport land would be an issue in rezoning exercises at NMIA.

Incompatible use includes:

- residential development
- schools
- community centers
- libraries
- hospitals
- religious service buildings
- tall structures
- other

To identify the incompatible land use, the Contract will also take account the hazard issues, such as smoke, birds, other wild-life, radio transmissions interference, dust storms, obstacles (obtained from activity 3.3- OSL) and buildings, particularly of specific height and location.

The impact of noise on immediate areas (present and future), obtained from activity 2.4- Noise Exposure Maps will also be taken in account.

In this last situation, it will study the opportunities for after-built noise restraints by homeowners, as an alternative to buy-outs of airport noise-impacted areas.

Finally, the Contract will develop a Land Use Plan to acquire the required easements in order to protect the future development of the airport. The Land Use Plan would be contained, at least, the following:

- Aviation easements required from landowners granting overflight rights and releasing the local government authorities from and against any nuisance, damage, or other claim arising from operation of the nearby airport, even if such aviation easements carry a price tag.
- Real property notice requirements pursuant to Town & Country laws that alert the buyer to the location of the airport and possible nuisance and damage that might follow.
- Airport runway and clear zone requirements over and above what any regulatory agency, such as JCAA, might otherwise mandate.
- Buy-out by the local government of real property in certain identified zones, either by agreement or by condemnation under "eminent domain powers"
- Identify specific planning boundaries for land-use within the proposed zone including the need if any to acquire lands for the sole use of the airport, as this is critical to planning.

2 Compatible & Incompatible Land Use Assessment and Land Use Plan

For an airport's operation, compatible and incompatible uses must be distinguished so they don't compromise the safe and efficient use of the airport. Zoning is the only mechanism that this can be effected thru. Zoning helps to define and govern the airport's requirement to function and then to control the proliferation and encroachment of incompatible land uses that can threaten the airport's viability and might restrict either its physical expansion or cause FAA/ICAO ratings downgrade that results in limited flights to the airport. Below, the types of compatible and incompatible uses can be easier defined than their limiting or favourable characteristcs, listed below:

2.1 Compatible Land Use

1. Land uses which are responsive to the demands created by the presence of the airport such as: motels, restaurants, warehouses, shipping agencies and aircraft related industries
2. Most commercial and industrial uses, especially those associated with airports
3. Large parks, conservatory areas and other open spaces
4. Forestry services and landscape services

The characteristics of compatible land use includes:

1. Uses which are not obstruct the aerial approaches of the airport
2. Uses which do not interfere with aircraft radio communications
3. Uses which do not affect the pilots' vision due to glare or bright lights
4. Buildings which are sound proofed to make them comfortable for occupants

2.2 Non-Compatible Land Use

1. Residential development, schools, community centres, libraries, hospitals, religious service buildings and tall structures
2. Wetland mitigation banking, retention ponds and landfills
3. Game preserves
4. Industries like pulp mills, steel mills, quarries, municipal or other incinerators, cement plants, sawmills and refineries.

The characteristics of incompatible land use includes:

1. Promote or encourage wildlife hazards
2. Interferes with obstruction surfaces, radio transmissions
3. Affect the pilots' vision due to glare or bright lights
4. Smoke from stacks that hinder visibility
5. industrial and manufacturing processes that generate dust or steam in sufficient volume to constitute a restriction to visibility
6. Activities that attract birds, such as landfills

The "Analysis of Current Situation" identified potential incompatible land uses within the airport's operational zones (See Figure 2.1: Regional Site Assessment). These included:

1. Mangrove forest near Caribbean Maritime University and within the Ramsar Site (for potentially supporting nesting of birds within the aircraft hazard zone)
2. Existing Structures throughout the KMR which have penetrated the OLS (for creating potential flight hazards)

3. Caribbean Maritime University (for performing training activities which may potentially create obstructive hazards such as pyrogenic exercises during firefighting training)
4. Squatting in the region of the Royal Jamaica Yacht Club (for potentially performing harmful activities such as burning of fires for charcoal or garbage disposal)
5. Soapberry Municipal Landfill- Riverton (for potentially supporting feeding of birds near the aircraft hazard zone)
6. Existing communities within the airport's approach and departure flight zone (for potential conflicts from noise, property value or health and safety issues)

Though these uses may not be affecting the airport immediately, their growth or any changes to their use must be monitored so they do not cause any major breach to the proper functioning of the airport. As such, it is imperative that the NMIA anticipates any land use changes within its locality.

Strategies to encourage compatible uses that are beneficial to the airport are to be developed and promoted, while corrective and mitigative strategies are to be developed to address existing and monitor or prevent potential incompatible uses. The following lists describes the characteristics of the major compatible and incompatible land uses that may positively or negatively affect or enhance an airport's operations, which the NMIA & CAA should be cognizant of.

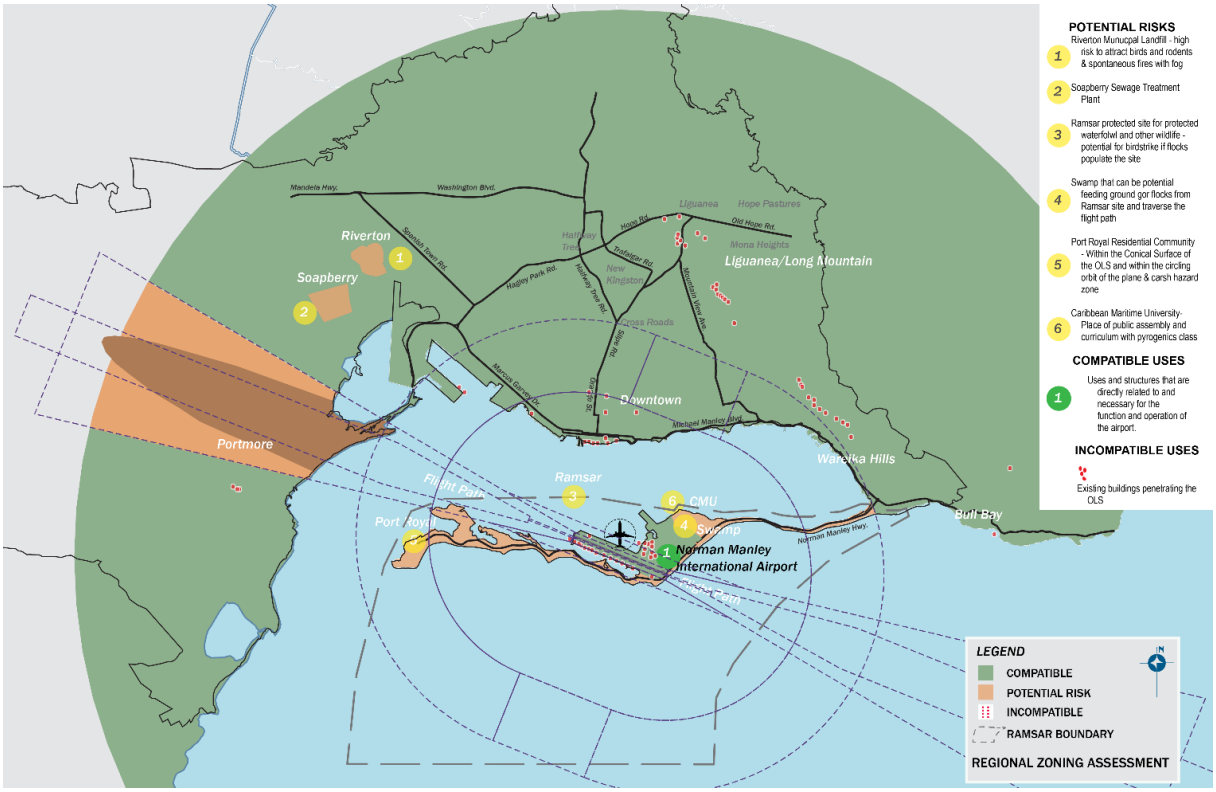

Figure 2.1: Regional Site Assessment

2.3 Strategies relating to Compatible Land Use Planning

Although the local planning authorities are mindful of protecting the airport from incompatible land use development, the existing Parish Sustainable Development Plans and Development Orders have only minimally recognized the implications of planning for the airport and off-site airport-related development. Land use planning, as a method of determining appropriate (and inappropriate) use of properties within the airport's operation zone should be an integral part of the land use policy and regulatory tools used by the regulatory authority.

Considering the foregoing, it is also necessary for the planning authorities (NEPA and the Parish Municipal Corporations) to educate existing and potential landowners as to the implications of the airport issues. In Table 2.1, it highlights two compatibility strategies that are useful in this regard. These strategies and recommendations are aimed at ensuring compatibility between airport operations and surrounding land uses in terms of safety to the public on the ground and to airplanes to mitigate against accidents. In all cases, the recommendations seek to protect the public health, safety, and welfare while preserving the operational capabilities of the valuable aviation system.

To include a specific airport area element in any comprehensive land use plan for the region, the plan should designate an airport zone overlay to encourage compatible industrial development and restrict high rise/ high density development or other incompatible uses in designated airport safety zones. The following strategies are recommended for consideration in the plan:

Table 2.1 Recommended strategies for the airport zoning plan

Strategies	Recommendations
Zoning Regulations	Adopt model zoning ordinance with an airport overlay district. Zoning map and ordinance amended to follow land use plan. Allow only airport-related uses or those that do not have high employee density. Restrict building heights and lighting Restrict residential development High-density, public assembly uses (schools, etc.) in airport vicinity.
Capital Investment	Infrastructure in targeted redevelopment areas upgraded to encourage compatible commercial and industrial infill Water/sewer lines and roads extended into airport industrial park; Targeted residential and commercial growth areas away from airport receive priority funding for infrastructure improvements.
Land Acquisition/ Easements	Within RPZ, acquire unused properties with the potential of incompatible uses and high-risk areas; Govt. purchases land for industrial development around airport; resells with restrictive easements Purchase land and easements in safety zone.
Incentives	Govt. agrees to help defend zoning challenges, in exchange for putting in place protective airport zoning
Education	Hold public meetings for plan; make staff available to explain airport land use issues. Require disclosure for purchasers of any existing or new residential uses in airport vicinity and affected overflight paths
Encourage tourism	To ensure visitors have a memorable and positive experience, spending a greater proportion of their money on cultural and leisure experiences than ever before. Connecting to unique and authentic destinations to meet expectations for valuable experiences, improving guest loyalty and increase airport revenue.

Avoiding incompatible land uses is easier and more cost effective than correcting them after the fact. Notwithstanding, there are two (2) proposed strategies (Preventive and Corrective Strategies) with recommendations aimed at ensuring compatibility between the airport operations and the surrounding land uses.

2.3.1 Preventive Strategies [1]

Preventive Strategies are useful for proposed land uses in order to prevent incompatible land uses around the airports that can hamper airport operations and create greater risks to people on the ground and in aircraft.

To enforce zoning, the authority should prepare long range comprehensive plans for their parish which includes a transportation element, and addresses land use and development around the airport. A strong and inclusive local plan lays the foundation for implementing preventive measures, including targeted acquisition or zoning regulations designed to prohibit incompatible uses.

It is recommended that the findings from this study be reviewed and included in any future development plan for the KSA region which the NMIA belongs to.

2.3.1.1 *Planning Strategies*

Strategy	Coordinated local land use planning and capital investment programs (CIP)
Through coordination and communication among local planners, aviation organizations, affected private property owners, and the Airports office, local government can review recommended airport development programs and adopt land use plans or plan elements that thoughtfully address future airport growth and include policies consistent with long range airport plans. Local CIPs should also be prepared to ensure infrastructure investment policies support and implement the comprehensive land use plan for the airport vicinity.	
Strategy	**Special management and mitigation plans**
Specialized plans, such as Wildlife Hazard Mitigation or Management Plans, focus on specific airport safety risks, and supplement comprehensive community land use plans. Focused area plans or special resource management plans ensure that specific issues are thoroughly identified, measured, and addressed. This allows airports and the local government to plan for and budget mitigation efforts. However, this is not immediately effective when wildlife hazards already exist on or near the airport	
Strategy	**Joint or regional planning and intergovernmental agreements**
This is airport compatible land use planning conducted jointly among affected communities or at a regional level because airport influence areas span several parishes. Intergovernmental agreements (IGAs) are binding contracts between two or more municipality intended to implement a joint or regional plan	

2.3.1.2 *Regulatory Actions*

Strategy	Local zoning, subdivision, and development control regulations
This involves zoning and other land development regulations that limit uses, height & density, and operations to prevent safety hazards on lands located in airport safety zones. It is proven to be an effective preventive tool if consistently administered and enforced and prevents and reduces hazards and incompatible land uses. To be most effective, regulations must be drafted in the context of an open, public, and inclusive process, including all relevant stakeholders. Though this is best if employed before growth pressures around an airport grow too heated, it is still appropriate in almost all circumstances as a preventive tool	

[1] Chapter 4: Preventive And Corrective Strategies For Airport Land Use Compatibility State of Minnesota Airport Compatibility Manual
Department of Transportation/Office of Aeronautics

2.3.1.3 *Property Disclosure Mechanisms*

Strategy	Real Estate Disclosures and Plain English Notices

Property disclosure mechanisms alert potential buyers to potentially adverse circumstances that might affect the value or usability of property near an airport. This allows a purchaser to avoid situations where they discover only after-the-fact that property is located in an airport safety zone.

Though this may meet with resistance from existing property owners seeking to sell their properties unencumbered, it will be effective if applied to all existing residential properties located in the safety zone. Legislation could make property disclosure mandatory in most instances when property is located in the Safety Zone.

2.3.1.4 *Property Acquisition*

Strategy	Acquisition of Fee Simple Interest

This allows the airport owner to acquire all the rights attached to the property, including buildings, structures, air and subsurface mineral rights, and gives the owner direct control over the property's use forever.

If the owner desires, additional revenue may be derived from the compatible land uses that could be developed on this acquired property, such as an airport business park.

This is very useful to further protect NMIA's critical Runway Protection Zones (RPZ's) and areas subject to high risks of safety impact like the lands directly parallel to the Norman Manley Highway that is under an existing lease (See Figure 2.2) . Additionally, its most effective for resolving existing problems and also used to avoid new problems

Strategy	Acquisition of Easements and Long-term lease

Easements are used to restrict use in a specified manner. Avigation easements grant rights for aircraft passage over a specific property, and identify the effects associated with aircraft operations, including noise and vibration. Easements can provide more positive control than zoning; is less expensive than outright acquisitions; and, the land often remains on active property tax rolls. Easements can also be used to compensate an affected landowner for substantial airport related impacts and can be used to gain the right to remove obstructions (i.e. trim trees).

Long term lease [example for 99 years] precludes future, incompatible development of a property, in perpetuity.

Unfortunately, easements do not alter existing incompatible land uses

2.3.1.5 *Public Education and Outreach*

Strategy	Information dissemination / exchange

One-way flow of information to targeted audiences or the community-at-large, or

Two-way dialogue between interested or affected parties and the airport and/or local planning agencies

Figure 2.2: High Risk Safety Zone

2.3.2 Corrective Strategies[2]

In the Obstacle Limitation Survey (Figure 2.3), a total of 91 objects were identified as penetrating the OLS. Special measures to mitigate this OLS issue was generated by CEAC in another chapter of the baseline study.

Obstacle Verification Surveys:

- A total of 91 objects were identified as possible obstacles.
- Currently 89% completed, where 79 out of 91 objects have been observed.

Figure 2.3 Obstacles penetrating the OLS[3]

[2] Chapter 4: Preventive And Corrective Strategies For Airport Land Use Compatibility State of Minnesota Airport Compatibility Manual
Department of Transportation/Office of Aeronautics

[3] *Obstacle Verification Survey. Various Environmental Studies – CEAC. July 2020*

2.4 Actions to Establish and Maintain Compatible Land Uses Around Airports.

Table 2.2 Actions to Establish and Maintain Compatible Land Uses Around Airports

Action	Responsibility	Timeline
a. Establish a National Noise Policy that phases out noisier (Stage 1 and Stage 2) aircraft while phasing in quieter (Phase 3) aircraft according to a specified time frame.	NEPA to add this layer to the National Noise Policy	Ongoing
b. Study the environmental effects (including noise) of a proposed action such as the proposed runway extension.	Environmentalist in this Baseline Study[4]	Ongoing
c. Establish mitigation measures, which minimize impacts to water, wetlands, and endangered species and protect the historical and cultural environment.	Environmentalist in this Baseline Study[5]	Ongoing
d. Establish avigation easements and real estate transaction disclosures of airport proximity and flight paths are important tools for reducing compatibility conflicts. These provisions, however, do not always appear in AZOs.	Planners in this Baseline Study	Ongoing

2.5 Summary for Compatible & Incompatible Land Use Planning

For an airport's operation, compatible and incompatible uses must be distinguished so they don't compromise the safe and efficient use of the airport. Avoiding incompatible land uses is easier and more cost effective than correcting them after the fact. Though these uses may not be affecting the airport immediately, their growth or any changes to their use have to be monitored so as not to cause any major breach to the proper functioning of the airport, either thru Preventive and Corrective Strategies.

The corrective strategies address and monitor existing incompatible uses and seek to reduce the impacts of the incompatible land uses, either thru limitations on their right to expand, alter, or change; or acquisition of/ easement over the subject property that precludes future, incompatible development in perpetuity; or negotiation between airport and land owners; and/or public education and outreach. The preventive strategies are useful for proposed land uses in order to prevent incompatible land uses around the airports. Preventive strategies can only be employed/ enforced thru zoning if long range comprehensive plans are enacted which includes a transportation element, and addresses land use and development around the airport. To include a specific airport area element in any comprehensive land use plan, the plan should designate an airport zone overlay to encourage compatible industrial development and restrict high rise/ high density development or other incompatible uses in designated airport safety zones.

The potential incompatible land uses within the airport's operational zones identified were:

1. Mangrove forest near Caribbean Maritime University and within the Ramsar Site (for potentially supporting nesting of birds within the aircraft hazard zone)

[4] Various Environmental, Zoning & other baseline studies for the NMIA
[5] Various Environmental, Zoning & other baseline studies for the NMIA

2. Existing Structures throughout the KMR which have penetrated the OLS (for creating potential flight hazards)
3. Caribbean Maritime University (for performing training activities which may potentially create obstructive hazards such as pyrogenic exercises during firefighting training)
4. Squatting in the region of the Royal Jamaica Yacht Club (for potentially performing harmful activities such as burning of fires for charcoal or garbage disposal)
5. Soapberry Municipal Landfill- Riverton (for potentially supporting feeding of birds near the aircraft hazard zone)
6. Existing communities within the airport's approach and departure flight zone (for potential conflicts from noise, property value or health and safety issues).
7. From the Obstacle Limitation Survey, a total of 91 objects were identified as penetrating the OLS. [Special measures to mitigate this OLS issue will be dealt with by CEAC in another chapter of the baseline]

3 Impact of Airfields on Existing and Planned Communities

The negative impacts of airports and aviation include land take, noise, air pollution, climate change, water use, and effects on the social structures of local communities. Positive impacts include direct and indirect employment, and social and economic benefits to the flying public. Both impacts can affect the community either through construction or operation of the airport. For Planners, these factors include:

1. airport terminal and ground operations,
2. flights,
3. access to the airport (cars, buses, trains, parking etc.) and
4. associated projects such as hotels and airport related office developments. [6]

The impacts to the environment, intrinsically related to Planning, is discussed in the environmental report from this project.

Table 3.1 The impacts to the environment, intrinsically related to Planning

Key Impacts --- Negative Impact +++ Positive Impact	Flights	Terminal & Ground Operations		Airport Access		Associated Projects	
	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Employment & Economic Benefits	+++	+++	+++			+++	+++
Heritage	---	---		---	---	---	
Land Take		---		---		---	
Landscape		---	---	---		---	---
Noise	---						
Risk and Public Safety Zones	---	---	---		---		
Social Costs to Nearby Communities		---	---		---		
Traffic		---	---	---	---	---	---
Water Use			---				---

[6] https://www.aef.org.uk/uploads/PlanningGuide2.pdf

3.1 Employment and economic benefits

Airports and aviation often generate much employment and many economic benefits. However, they can also have economic costs. The employment generated by airports and aviation can be split into direct, indirect, induced and catalytic employment, as shown in Table 3.2.

Table 3.2 Types of employment generated by airports and aviation

Impact Category	Definition	Examples
Direct	Employment wholly or largely related to the operation of airports or airlines	Airport operator, airlines, handling agents, control authorities, concessions, freight agents, flight caterers, hotels, car parking, aircraft servicing, fuel storage
Indirect	Employment supported in the chain of suppliers of goods and services to the direct activities	Utilities, retailing, advertising, cleaning, food, construction, IT, fuel
Induced	Employment supported by the spending of incomes earned in the direct and indirect activities	Retailing, restaurants, entertainment
Catalytic	Employment supported by the attraction, retention or expansion of economic activity as a result of access by air	Inward investors, exporting companies, visitor attractions

Aviation supports the large and growing tourism industry, which in turn directly employs 170,000 [7] workers in 2019; and contributed US$3.64 billion to the Gross National Product. If passenger numbers were not allowed to increase beyond 2019, there would be a loss to the economy by 2022. These figures justify the need for the continued growth of aviation. Airports can act as a focal point for 'clusters' of business development and thus act as a focus for the development of local and regional economies.

Jobs directly and indirectly related to aviation are typically relatively low-paid. Airlines are cutting back jobs where possible, for instance by promoting e-ticketing and getting passengers to carry their own luggage to the aircraft. Catalytic jobs are typically a mixture of relatively poorly paid (e.g. tourism industry) and well-paid (many of the knowledge-intensive industries that rely on air travel).

Aviation also has significant economic costs. Air passenger duty – essentially a tax on flying - does not make up for the tax breaks that the aviation sector benefits from. Airlines do not need to pay taxes on jet fuel: if such taxes were paid at the same level as those paid on petrol, they would have raised billions in revenue. These savings, which could be spent on other services such as education and hospitals, will increase further as air passenger numbers rise.

7 JIS website. STATIN data. Jamaica Earned US$3.64 Billion From Tourism In 2019, Welcomed 4.3 Million Visitors. June 25, 2020

Aviation also imposes external costs on society which it does not pay for. These include the reduction in home values due to airport noise; the costs of treating respiratory diseases caused by increased particulates; and the cost of cleaning buildings eroded by air pollution.

3.2 Heritage / culture

Ideally, heritage assets should be preserved in their context, including the wider landscape in which they are seen. Mitigation (as opposed to avoidance) measures include digging up archaeological artefacts, recording them, and moving them to a museum; preserving buildings or archaeological remains in a different setting and taking them apart and moving them to a different location. However, it is impossible to replace the sheer age of heritage assets. Often it will not be possible to mitigate impacts on them.

1. Heritage assets can be affected by aviation and airports in several ways:
2. They can be razed or built over to make way for airport-related development.
3. Their structure can be affected by vibrations from aircraft or road traffic. (Port Royal)
4. Their building materials can weather faster due to air pollution; The vegetation of historic landscapes can be harmed by air pollution.
5. Their curtilage (the enclosed area of land surrounding a structure) or general landscape setting can be eroded, so that one can no longer view them in context.

3.3 Land take and urbanisation

Land take refers to how much new land is required for a project. Depending on the type of land that is built on or fenced in, land take can lead to:

1. Wildlife habitat loss and fragmentation. (Ramsar protected waterfowl habitat)
2. Loss of land that could otherwise be used for community facilities, open space and playing fields etc.
3. More generally, land take for airport-related development can add to a drip-feed of development in an area which adds up to a change from a rural to a more urban atmosphere.
4. Where farmlands are nearby, the re-organisation of farm units has been proposed in airport masterplans and environmental statements for the use of land that would otherwise have been used for farming.

Figure 3.1: Ramsar protected wildlife site

3.4 Landscape and visual impacts

The less developed and more attractive the original landscape was, the bigger the landscape impacts of an airport or airport-related development is likely to be. The following components of the *landscape* can be affected by development:

1. Airports and airport-related development can change the overall character of an area to make it look harder and more urban.
2. Airports and airport-related developments affect the landscape by removing existing landscape features and replacing them with buildings and tarmac.
3. At night, the lights of the runways, aircraft and terminals increase light pollution.

Physical factors: landform: the runway extension required landfill into the Kington harbour, [See Figure 3.2 Runway expansion into the Kingston Harbour]

Human factor: the landform history of the Palisadoes spit to accommodate runway expansion has altered the coastline as well as the memory of the long narrow Spit itself.

Airports and airport-related developments can also have *visual* impacts. These refer to the impacts of landscape change on people:

1. On the views that people have from their cars as they drive along the Palisadoes Spit. All developments have a 'zone of visual intrusion' from which they can be seen. The more people can see the development, (rather than, say, their views being blocked by high trees), the bigger the visual impact will be.
2. Landscape and visual impacts are closely related to other impacts, particularly noise. For instance, people tend to think that the noise from a development is louder if they can also see the development.
3. Some buildings, particularly airport terminals, can be very attractive, and many people prefer the aesthetics of a well-designed and well-managed development to those of outdated areas that need a facelift. In such cases, the development is a visual improvement. The dramatic improvement of the airport departure terminal, and the added national symbols along with the "follow the hummingbird route to the airport" was particularly significant and an immense boast for our 'little' country.

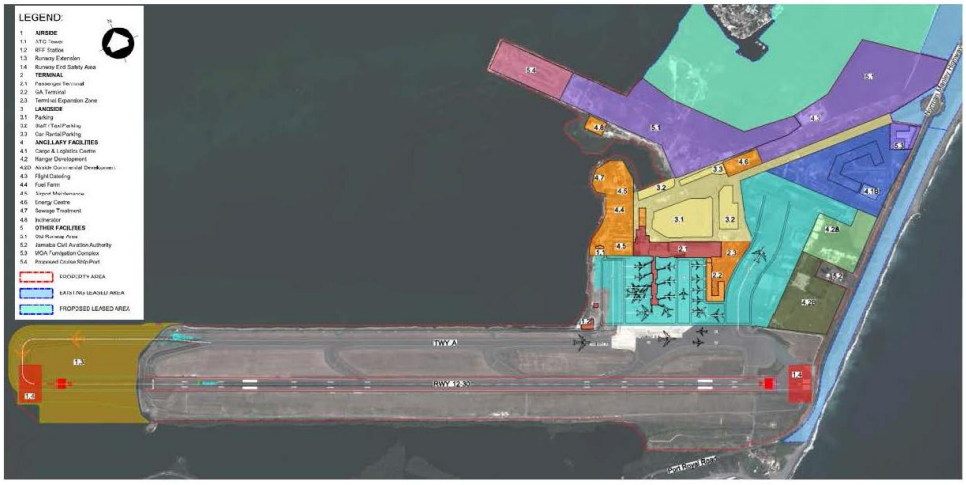

Figure 3.2 Runway expansion into the Kingston Harbour[8]

[8] International Finance Corporation. Norman Manley International Airport PPP. Master Plan – Final. May 24, 2013

3.5 Noise

The significance of noise impact depends on a variety of factors such as volume, duration, time of the day and frequency of noise (deep low noise travels longer distances and can be felt in buildings)

Noise from aircraft and from traffic going to and from airports is probably the most obvious environmental impact of the aviation industry because it is easily perceived and annoying, especially where this occurs frequently. Aircraft noise is generated by both the engine and the airframe and is most evident during landing and take-off and under frequently used flightpaths. Other sources of noise include noise generated from taxiing aircrafts, the application of reverse-thrust (an optional braking aid on landing), engine tests and on-site vehicular traffic. Also, noise impacts can extend to vehicular traffic to and from the airport, and construction noise.

As with emissions, the industry has been successful in developing relatively quieter aircraft – the noise footprint of a modern jet is a fraction of that made by the first generation of jet aircraft. Every new aircraft must comply with noise standards developed by the International Civil Aviation Organisation (ICAO). But while aircraft have become less noisy, noise around many airports is getting worse due to an increase in the number of flights.

Noise also affects the breeding and feeding habits of birds and encourages unnecessary expenditure of energy as the birds move towards or away from the sound source, thereby exposing them to predators.

The effects of noise pollution include:

1. Loss of concentration
2. Sleep disturbance
3. Anger, frustration and powerlessness to control the noise
4. Fear of accidents and of potential increase in frequency of noise
5. Diminished educational achievement (due to either direct effect or loss of teaching time due to noise disruptions)
6. Prolonged or excessive exposure to noise can cause hypertension and ischaemic heart disease.
7. Noise above 80dB may increase aggressive behaviour.
8. The main social consequence of hearing impairment is the inability to understand speech in normal conditions, which is considered a severe social handicap

3.6 Risk to third parties

Airport-related development and aviation pose risks to air passengers and others ('third party risk'). These include airplane crashes, terrorism threats, the effects of wake turbulence from aircraft, and health problems of flying for passengers and airline staff.

3.6.1 Airplane crashes

Flying is a particularly safe form of travel. Someone is probably more likely to be involved in an accident when driving to an airport than during the subsequent flight. That said, take-off and landing are the most dangerous phases of aircraft operations, so most crashes occur at or near the ends of runways. Government has responded to this risk by designating Public Safety Zones (PSZs) at the airport, which restrict what new development can be located in these zones.

PSZs are usually triangular-shaped, pointing away from the end of the runway. Their shape and size is determined based on the number of flights at the airport, the likelihood of a crash, where the crash might occur, and the likely consequences of a crash. PSZs have two contours:

1. 1 in 10,000 individual risk: nobody should live or work all day in these zones; and
2. 1 in 100,000 individual risk: new development in this contour is restricted and existing development should be removed if suitable opportunities arise

3.6.2 Terrorism at airports and on aircraft.

The tragedy of 9/11 and subsequent attempted terrorist threats have highlighted the vulnerability of airports and aircraft to terrorist activity. This could directly affect communities living near airports if a terrorism attempt succeeds. It could also affect them indirectly in the form of increased police activity, congestion when there are roadblocks, etc.

3.6.3 Effects of wake turbulence from aircraft.

Flying aircraft produce wake turbulence as a result of Newton's Third Law: for every action there is an equal and opposite reaction. Wake turbulence is caused by the 'downwash' caused as aircraft rise in the air, and the vortices (whirlwind) caused at the aircraft's wing tips as the vacuum above the aircraft wing and the pressure below the wing meet. The strength of the wing tip vortices is proportional to aircraft weight, and inversely proportional to aircraft speed, wingspan and air density. At ground level, wake turbulence causes unusual wind currents, and sometimes small whirlwinds. Wake turbulence may cause tiles to come off roofs.

3.7 Social/community and equity impacts

Whilst air travellers gain benefits from airport-related development and aviation, residents of nearby communities bear the brunt of the negative impacts. Airport-related development can affect community cohesion in a number of interconnected ways.

Airport operators may buy up local properties as a compensation for noise or other impacts.

Property values may fall due to noise, landscape and other impacts from the airport. Residents may find it difficult to sell their properties at a time and price that they have control over. Airport operators' buy-up schemes may be restricted and divisive.

This drip-feed of factors could result in a greater proportion of empty and neglected properties, further reducing the value of remaining local properties. This could lead to a negative spiral of increased uncertainty about the future of the community, causing more people moving out of the area,

Neighbourhood watch schemes could be more difficult to run in areas with a high turnaround of population. Local residents that were previously active in Scouts, church activities or sports may need to divert their time from community activities to fighting against airport expansion. The local planning department may need to put so much time into dealing with the airport expansion that it has difficulty responding to other issues, such as enforcement of planning conditions on other developments.

Although many local residents will benefit from the improved access to overseas destinations that airport development will bring, people with larger disposable income will generally benefit more than people with less income.

3.8 Traffic

Airports and airport-related development generate traffic on nearby roads from:

1. construction workers travelling to and from the site, and haulage of construction and waste materials;
2. operational workers travelling to and from the site;
3. cargo/freight deliveries and pick up; and
4. travellers arriving and departing from the airport.

Within the airport boundary, additional traffic can be caused by airport vehicles such as tugs, fuel lorries, and buses and vans that transport passengers around the site.

3.9 Summary for Impact of Airfields on existing and planned communities

A very major positive impact of aviation on the country is that they provide significant employment and economic benefits to communities through the movement of people and goods, promotion of tourism and trade, stimulation of business development, and the opportunity for a wide variety of jobs. The flying public and local communities do not readily discern the huge size and scale of economic development that airports provide and stimulate.

Instead, a lot of the focus has been about the negative impacts on immediate communities. Some are

1. Damage to heritage assets whereby, the asset can be razed or built over to make way for airport-related development or their curtilage or general landscape setting can be eroded, so that one can no longer view them in context
2. Land take and urbanisation impacts, whereby lands that could be used for community purposes may be absorbed by the airport or even the loss and fragmentation of wildlife habitat (Ramsar protected water fowl habitat).
3. Landscapes are likely to change when airports and airport-related development remove existing natural features and replace them with buildings and tarmac. Even at nights, the lights of the runways, aircraft and terminals increase light pollution.
4. Noise from aircraft is probably the most obvious environmental impact of the aviation industry because it is easily perceived and annoying.
5. Risks like airplane crashes, terrorism threats, the effects of wake turbulence from aircraft, and health problems of flying for passengers and airline staff
6. Social costs to nearby communities whereby residents of nearby communities bear the brunt of the negative impacts of airport activities
7. Traffic on the route to the airport

4 KSAMC Transportation Master Plan

From research, it was determined that there is no document titled "KSAMC Transportation Master Plan". The closest to this document would be the [undated] Draft National Transport Policy, purportedly written between 2007 and 2011 by the Ministry of Transport and Works. The review and assessment will thus be about the contents of the National Transport Policy. The Ministry of Transport advised they're currently in the process of upgrading the Transport Policy to include a Strategic Plan as part of the new report. There is no set timeline for the Policy's completion.

4.1 Introduction

The National Transport Policy prepared in 1993 by the then Ministry of Public Utilities and Transport was never completed and promulgated and omitted the critical issue of maintenance. Based on this, the former Ministry of Transport and Works embarked on developing and completing a National Transport Policy Document in 1998 with assistance from Transport Canada. Subsequently a Needs Assessment for the National Transport Policy was completed in 2000. The document was partially based on the National Industrial Policy (A Strategic Plan for Growth and Development), which was published in April 1996.[9]

One of the fundamental aims of this dated Transport Policy was to "ensure compliance of the transport sector with international security and safety standards".

Some Key Issues Addressed in the Policy regarding Air Transport, that are still valid, were:

1. Promoting the expansion and development of the air transport infrastructure
2. Ensuring the promulgation of adequate legislation, which will provide the legal framework for national aviation activities, in keeping with international practices
3. Promoting an efficient and productive aviation industry which will effectively compete in the market place, while providing world class service
4. Ensuring that our skies and airport system are safe and secure – consistent with locally and internationally accepted standards
5. Encouraging the development of new and existing aviation services in order to enhance the viability of the aviation sector and the related industries
6. Promoting relations with other countries, groups and subgroups of countries and international and regional organizations involved in aviation
7. Engendering sustainable environmental practices that are consistent with nationally and internationally accepted standards

A major theme of the National Transport Policy was "integration across modes" with the intent to rigorously pursue this in subsequent Government actions. With regards to the Aviation Industry the vision, strategic objectives and policy statements are outlined below.

4.1.1 Vision

A competitive, environmentally friendly aviation system, that ensures safety in accordance with international standards, meeting current and future demands, and provides low cost services in a reliable and efficient manner while contributing to the social and economic development of the country.

[9] Final Draft National Transport Policy

4.1.2 Strategic Objectives

The strategic objectives for the air transport sector are to:

1. encourage public/private partnerships for the international airports;
2. enhance the safety of our skies by improving air navigation, surveillance and traffic control systems;
3. promote an efficient and productive aviation industry which will compete domestically and internationally;
4. facilitate the development and commercialisation of the domestic aerodromes;
5. promote the use of, and develop the capacity for international air cargo services;
6. maintain internationally accepted standards for safety and environmental protection.

4.2 Policy Statements

4.2.1 To encourage public/private partnerships for the island's aerodromes

4.2.1.1 *Issue*

1. The Government wants to see the private sector play a greater role in the expansion and operation of the island's aerodromes.

4.2.1.2 *Policy*

1. The Government will encourage participation in the aviation industry by allowing investors to realize adequate returns.
2. The Government will encourage private enterprise to perform functions that Government is not obligated to provide and which can be done as well or better by a private entity (i.e. SIA divestment);
3. The Government will seek concessions for the international airports and domestic aerodromes to secure greater investment in them and to use internationally reputable managers with a mandate to expand airport facilities
4. The Government will ensure that private investors have a clear understanding of their roles and responsibilities, as well as their rights and entitlements.

4.2.2 To enhance the safety of our skies by improving air navigation, surveillance and traffic control systems

4.2.2.1 *Issue*

1. Safety and security of the air navigation, surveillance and traffic control systems are of paramount importance and should be enhanced.
2. The air navigation system depends heavily on a variety of advanced technologies for communication, navigation, surveillance and air traffic management.

4.2.2.2 *Policy*

1. Jamaica's radar system will be upgraded to meet present and future control requirements and international standards.

2. The Government will develop a state of the art surveillance system designed to protect passengers and staff from terrorist threats.
3. The Government will use new technologies, and through structural changes to air traffic services will develop an effective, efficient and up-to-date air navigation system with high safety standards. (Refer to Appendix 1 – New ATC Towers)
4. The Government, through the Jamaica Civil Aviation Authority, will ensure training is provided for all staff complying with international standards.
5. The Government will improve the air navigation and air traffic control systems through the Airport Reform & Improvement Project (ARIP), and other projects.
6. The implementation of a global air
7. Traffic management system, which will cope with worldwide growth in air traffic, will be encouraged.

4.2.3 Promote an efficient and productive aviation industry which will compete domestically and internationally.

4.2.3.1 *Issue*

1. Approximately 60% of the island's 2.2 million visitors use the international airports as a point of entry. In addition, more than 200,000 Jamaicans and visitors annually use the four domestic aerodromes for intra-island travel. However, in recent years facilities have become inadequate.
2. International Air Transport volumes are increasing, and it is vital to the country's Tourism and Trade sectors that scheduled air transport linkages are established throughout the world to increase the attractiveness of the country as tourism and trade hub.

4.2.3.2 *Policy*

1. The Government through the Air Policy Committee will continue on the path of gradual liberalization of air services agreements to increase the volumes of scheduled air services to the country. **(App. 3 – Summary of Bilateral Agreements)**
2. Recognizing that this sector is important to the country's development, especially tourism, the Government will improve general aviation facilities. The end product will be comfortable customs, immigration and airport services, and efficient processing of general aviation traffic.
3. The Government will promote the continued upgrading and modernisation of airport infrastructure under the Airport Reform and Improvement Project (ARIP) and other projects. (App. 1 – Capital Development Programmes at SIA and NMIA)
4. Economic decisions will be subject to general competitive principles applicable to all industries, aimed at maximising consumer choice and satisfaction.
5. The Government will structure the air transport system so as to support and promote Jamaica's competitiveness in the international and regional marketplace.

6. Jamaica will meet its international aviation obligations as promulgated by the International Civil Aviation Authority (ICAO) and will maintain its Category 1 rating by the Federal Aviation Administration (FAA).

4.2.4 To facilitate the development and commercialization of domestic aerodromes

4.2.4.1 *Issue*

1. The Government manages and operates four domestic aerodromes which must be adequate for future growth.
2. In order to improve efficiency and achieve long-term savings, the Government, in consultation with the aviation community, is examining options for commercialising the domestic aerodromes.
3. The development of the General Aviation Facilities will be dependent on the market driven forces and developments in other sector such as home-porting for Cruise ships, hotel developments, and Marina operations.

4.2.4.2 *Policy*

1. The Government will promote private sector participation to encourage enterprise and efficiency in operation, as well as the development of aerodromes throughout the island to facilitate intra-island transport.
2. The Government of Jamaica will seek to develop the General Aviation Facilities within the Jamaican Aviation Sector to promote the growth in domestic air transport.
3. Where the need arises through increased traffic, the Government will consider converting domestic aerodromes into international ports of entry. Appropriate improvements will be made to accommodate the increase in air traffic.
4. The Government will ensure that all participants in the domestic air transport market are treated equally and can expect a reasonable return on investment.

4.2.5 To promote the use of, and develop the capacity for international air cargo services

4.2.5.1 *Issue*

1. International air cargo volumes are increasing, and it is important to ensure that this traffic, which is increasingly important in the global world economy, can be handled in an effective manner.
2. Jamaica negotiated an all-cargo open skies agreement with the US. It creates important new opportunities to strengthen U.S.-Jamaican economic relations through closer air links in tourism and trade.

4.2.5.2 *Policy*

1. The Government will ensure that all international airports have adequate capacity to handle international air cargo services in an effective and efficient manner.
2. The Government believes ground-handling services are crucial to quality service. These will be improved.
3. Economic and competitive freight rates with the safe and secure handling of cargo will be promoted.
4. Jamaica will seek to assist other members of the Caribbean Community (CARICOM) to reap the benefits of an open skies agreement recently reached with the United States by exploring how the idea can be expanded into a regional arrangement.

4.2.6 Maintain internationally accepted standards for safety and environmental protection.

4.2.6.1 *Issue*

1. Jamaica boasts a very high level of aviation safety. However, the continuous increase in air traffic means that we must constantly improve safety systems.

4.2.6.2 *Policy*

1. The Government will enforce aviation safety policies, within the ICAO framework and will ensure that aviation legislation is consistent with ICAO requirements. (ICAO Convention, Annex 17 – Security)
2. The Government will ensure that internationally mandated annual and triennial follow-up inspections are conducted, and deficiencies are promptly corrected.
3. The Government will maintain the highest possible safety standards for aircraft, passengers and airport staff through the Airport Authority regulations, ICAO requirements, the Health and Industrial Safety Policy and other relevant legislation.
4. The Government will participate (through the JCAA and AAJ) in multi-lateral investment fund projects to strengthen airport security.
5. The Government will promote cooperation in safety oversight within the CARICOM region. The Regional Aviation Safety Oversight System (RASOS) was established throughout CARICOM and is the first multi-lateral alliance of its kind in Caribbean Aviation and aims at facilitating multifaceted and widespread problem solving to issues of safety oversight and infrastructure.
6. The Government will promote safety awareness by facilitating the effective sharing and use of aviation safety data and information.

4.2.6.3 *Issue*

1. Increase in air traffic brings potentially serious environmental problems.

4.2.6.4 *Policy*

1. The Government will manage the impact of aviation activities on the environment by promoting sustainable management of natural and physical resources and taking appropriate action to avoid, alleviate or correct the adverse effects on the natural and physical environment.
2. The Government will reduce the environmental impact of air traffic (noise, pollution).
3. The Government will provide a healthy operating environment at its airports, aerodromes and offices for its employees, users and neighbouring communities.
4. Environmental Impact Assessment Studies will be undertaken for all new projects.
5. The Government will encourage investment in air transport technology and infrastructure aimed at improving environmental performance.
6. The government will maintain its International Environmental programme through continued involvement with the Airports Council International World Environmental Standing Committee which aims to:
    a. establish energy consumption targets;
    b. implement the Environmental Management System;

c. put in place an Environmental Action Plan;

d. put in place an Environmental Stewardship Programme.

4.3 Assessment

The Policy document mainly dealt with the development of a set of concepts and propositions in order to achieve specific objectives relating to social, economic, and environmental conditions, and the functioning and performance of the transport system. The report includes transportation improvement and capital projects that would have dealt with the preparation and implementation of actions designed to address specific problems within the transport system. The Policy also highlights government's goal to make decisions concerning the allocation of transport resources, including the management and regulation of existing transportation activities.

Additionally, the Vision 2030 had a Transport Sector Plan that included a situational analysis of aviation. This was done by the Transport Task Force in 2009. The Sector report also included the SWOT analysis below.

4.3.1.1 *SWOT Analysis of Air Transport*

Dimension	**STRATEGIC LOCATION**	
	Strength	Jamaica is ideally located along strategic north-south shipping lanes and air routes with a major port facility and other potential port facilities on the south coast
	Weakness	Inadequate strategic route development plan to utilize Jamaica's location Inadequate data to conduct proper planning for air transport
	Opportunities	The establishment of Jamaica as a major logistics hub for the hemisphere and a multimodal cargo sub-hub to Miami To develop strategic route development plan
	Threats	Small islands are particularly vulnerable to climate change Location in region prone to natural hazards including hurricane
Dimension	**REGULATION**	
	Strength	Jamaica's CAA is rated as Category 1 by the US FAA and conforms to all international standards.
	Weakness	Lack of integrated approach to planning and development Air traffic services are subject to frequent threats of industrial action No Security Regulated Agent
	Opportunities	
	Threats	Jamaica not maintaining the 26 category 1 rating by the US FAA High crime rate Terrorism.
Dimension	**FACILITATION**	

	Strength	Jamaica is a world brand tourist and music destination promoting air travel to and from the island Scheduled flights to international hubs
	Weakness	Some highly bureaucratic systems Poor quality service by some public service entities Lack of active involvement and commitment by some industry leaders Complicated fee structure Tedious immigration and customs procedures Restricted open skies policy US passport requirements No regional carrier Declining domestic general aviation industry
	Opportunities	Potential for increased use of very light jet Global growth and expansion in adventure and nature tourism Gradual liberalization of open air policy/open skies. Potential for cruise ship homeporting contributing to combined sea and air transport demand
	Threats	Customs and Immigration Procedures not revised Maintenance of restricted open sky agreements Dominance of visitors from the US Possible downsizing of Air Jamaica affecting air transport capacity Regional crises to discourage tourism Mergers of US Legacy carriers High cost of regional travel.
Dimension	**ECONOMIC**	
	Strength	A strong financial sector with first world legislation
	Weakness	Jamaica suffers from low economies of scale in its aviation industry High cost of doing business
	Opportunities	The introduction of new technologies in reducing the cost of providing air navigation and air traffic services Liberalization of the air transport sector for economic benefit New income generating landside non-aeronautical developments International aviation industry improving
	Threats	Emissions Charges Escalating cost of doing business in Jamaica Incentives given to tourism sector compared with other sectors such as aviation
Dimension	**EDUCATION AND HUMAN RESOURCES**	
	Strength	The Jamaica Defence Force provides a supply of highly qualified pilots, mechanics and other skills for the aviation industry Jamaica has the largest English-speaking workforce in the region
	Weakness	Poor consultation culture

		Although there are a number of education and training institutions, curricula with regard to aviation are generally not present.
	Opportunities	To build consultative culture and integrated approach to development Existing educational institutions as potential partners to design education for the future of the sector workforce
	Threats	Lack of training for future development for airport hub 27
Dimension	**FACILITIES**	
	Strength	Jamaica has two ICAO Category D international airports Airport infrastructure being expanded Extensive road network linked to airports Growth in hotel room stock generating increased arrivals
	Weakness	Existing airports do not have the capacity to extend runways to support long stage lengths Peak hour congestion Insufficient air cargo facilities Limited domestic aerodrome infrastructure.
	Opportunities	New landside non-aeronautical developments Potential for responsive infrastructure for international air traffic growth and future aircraft
	Threats	

In the Transport Policy, the Urban Transport project was recommended but never came to fruition and is still pending. This project would have involved the "execution of a comprehensive transport study for the KMTR and to allow for the preparation of a 25- year transport development plan for the Kingston Metropolitan Transport Region (KMTR)".

Another project of import to the airport was the Proposed East-West Coast Road Link (Kingston) that would have seen the Extension of Michael Manley Boulevard from Lower South Camp Road to Marcus Garvey Drive. This has been put on hold indefinitely.

Both projects, namely, Urban Transport and the Proposed East-West Coast Road Link, would serve to provide road improvements along routes to the airport to enhance transportation access to and from western and southern parishes. In this way, the airport can become the gateway access to Jamaica for new attractions and resort projects that will improve the Tourism sector.

Other projects specifically related to the NMIA are listed below in the five-year infrastructure development.

Table 4.1: Transportation: Five Year Infrastructure Development Programme 2004 - 2009

Description	Timeline	Entity Responsible	Remarks
Programme 2004 to 2009 – Completed Projects [Norman Manley International Airport Development]			
Airport Terminal Expansion Project J$51.0M	2006 January - 2007 July	Airports Authority of Jamaica	This is part of a 20-year Capital Development Programme.

Construction of the Cargo Village 3.5M	2005 March – 2005 December		Project is underway
Construction of new Air Traffic control Towers- US$5,000,000.00	2007 March- 2008 March	Jamaica Civil Aviation Authority	Project completed
Airport Terminal Expansion Project (Interim Works) J$3.5M **Additions/Alterations to Departure Concourse J$2.5M**	2005 June - 2006 February 2004 February – 2005 October	Airports Authority of Jamaica	This is part of a 20-year Capital Development Programme. Interim works completed.

Since this Policy was drafted, there has been several projects to the benefit of the airport

1. Improvement in access to the airport, via the Michael Manley Boulevard from Harbour Street [downtown] to the Rockfort main road. The entire strip is now completed.
2. The Mountain View/ Windward Road combo were oftentimes impassable due to political and criminal unrest. During the past 5 years, there has been improvement on the Windward Road corridor to provide a clear traffic path for vehicles as well as to reduce the pedestrian/vehicular conflicts that hampered efficient movement thru Windward Road.
3. Currently, the Planning Institute of Jamaica through the World Bank has commissioned a study titled Downtown Kingston Redevelopment (Market and Commercial District) Implementation Plan. In that Plan, there is a proposal to re-start the rail service from West Kingston and the Bus Park to provide linkage from the pier at Ocean Boulevard to Port Royal and The Caribbean Maritime Institute.
4. Previously along the Norman Manley Highway, storm surges were powerful enough to wash boulders and sand onto the roadway and make the entire highway impassable to the airport. Project Improvements in the last 10 years have resulted in the construction of massive storm surge barriers to the southern side of the highway, where the coast is unprotected from storm surges and hurricanes. The roadway has also been upgraded and repaired to highway standards and has been renamed from Palisadoes Road to Norman Manley Highway

4.4 Summary for Review and Assess the KSAMC Transportation Master Plan

The Policy document mainly dealt with the development of a set of concepts and propositions in order to achieve specific objectives relating to social, economic, and environmental conditions, and the functioning and performance of the transport system. The report includes transportation improvement and capital projects that would have dealt with the preparation and implementation of actions designed to address specific problems within the transport system. The major capital projects were:

1. Airport Terminal Expansion Project J$51.0M
2. Construction of the Cargo Village 3.5M
3. Construction of new Air Traffic control Towers- US$5,000,000.00
4. Airport Terminal Expansion Project (Interim Works) J$3.5M

5. Additions/Alterations to Departure Concourse J$2.5M

One of the fundamental aims of this dated Transport Policy was to "ensure compliance of the transport sector with international security and safety standards, thru the investigation of issues affecting the aviation sector as well as policies to address these issues". The Policy also highlights government's goal to make decisions concerning the allocation of transport resources, including the management and regulation of existing transportation activities.

Since this Policy was drafted, there has been several projects to the benefit of the airport. These include: completion of the Michael Manley boulevard; upgrade and resurfacing of the Mountain View/Windward road corridor; storm surge protection of the Norman Manley Highway (Palisadoes Road); and the Planning Institute of Jamaica / World Bank commissioning of a study to re-start the rail service from West Kingston and the Bus Park to provide linkage from the pier at Ocean Boulevard to Port Royal and Palisadoes Road [possibly Caribbean Maritime Institute]

5 NMIA's Internal Transportation Network

5.1 Introduction

The ground transportation network of the Norman Manley International Airport is comprised of a series of roadways and connections which can be categorized into two broad classes. Those providing access to land side facilities and those providing access to airside facilities. The land side class of roads provide connections and access to the various airport facilities, parking lots and public transportation. The airside roads are limited access corridors that provide direct access to the airside facilities.

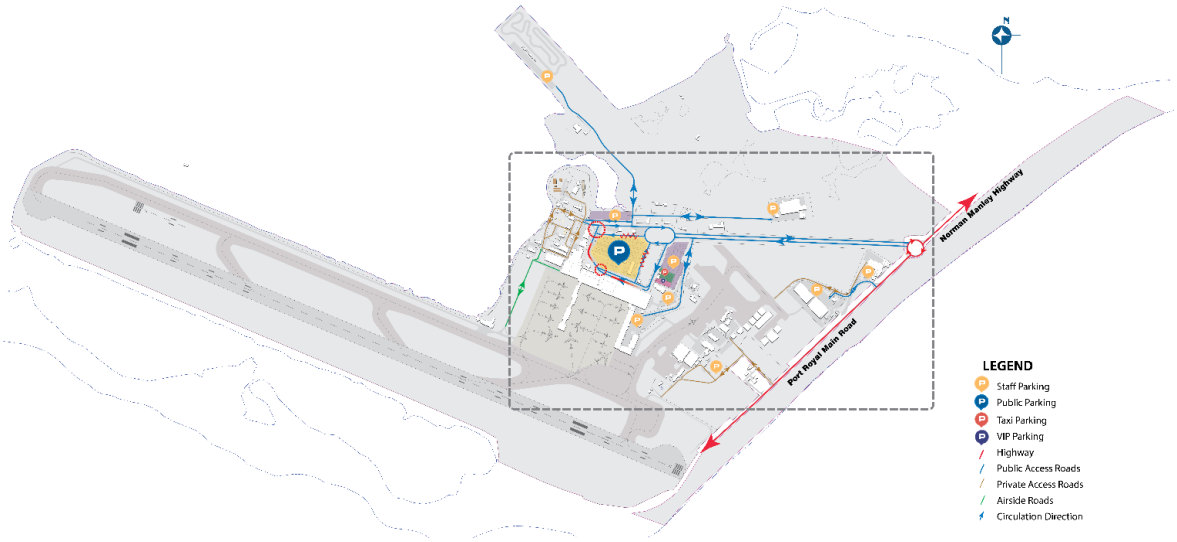

Figure 5.1: NMIA Existing Internal Transportation Network Analysis

5.2 Circulation

The NMIA is accessed directly from the Norman Manley Boulevard via a roundabout. The entrance road is a four-lane divided corridor which connects directly to another roundabout, within the airport which has a total of five exits. The roundabout provides direct connections to the terminal building for departures and arrivals, the public car park, the technical services road and the road exiting the airport. The roads leading to the terminal and the public car park, run parallel to each other in a southerly direction. The terminal road is a two lane, one-way road running in a southerly direction where it provides direct access to both the departures and arrivals curbs at the terminal. At the front of the terminal, the lanes diverge to serve the departures area and the arrivals area.

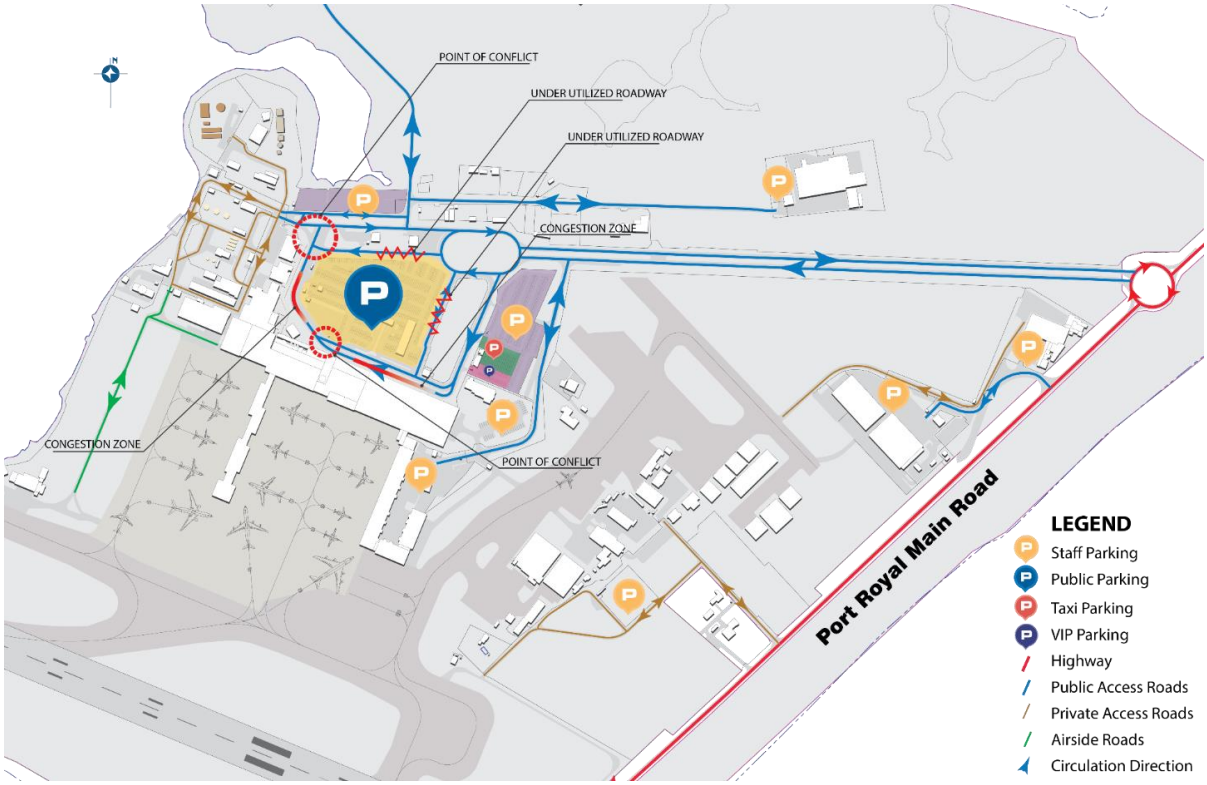

Figure 5.2: Enlarged NMIA Existing Internal Transportation Network Analysis

Three lanes directly serve the departures curb, with the curbside lane reserved for parking /stopping, the middle lane for through traffic and the outside lane designated for temporary stopping. These lanes are separated from an additional two lanes, which provide ingress and egress to the public car park and direct access to arrivals curb, by a raised median. One of the car parks primary exit points exits directly along the arrival lane, approximately 37m before the start of the arrivals curb. At this point, the traffic exiting the departures curb also merges, creating a potential point of conflict with traffic heading to the arrivals curb, exiting the car park or just directly exiting the airport. The arrivals curb is approximately 100m long. It is served by a wide roadway with no painted line markings. However, it is possible for three lanes of traffic to pass the curb while vehicles are parked.

The public car park road is a two-lane two-way road which when traversed in a southerly direction provides access to the public car park, overflow car park and the arrivals lane. If traversed in a northerly direction, the public car park road provides access to the parking areas mentioned previously and back to the roundabout from which any of the other four exits can be taken. It should be noted that while this road runs adjacent to the public car park, direct access to the car park is prohibited by a locked gate. Hence, access to the public car park is via a service road, which runs parallel to the arrivals lanes, separated by a median. Currently, access to the overflow car park is solely from the public car park road.

The technical services road is a two-lane one-way road which provides access to the airside zone, fuel farm, utilities and maintenance area, employee parking lots, as well as, JCAA's air traffic control tower premises. This road intersects with the four lanes exiting the airport from the terminal and public car parking zones. There are additional private access roadways which provide land side access to various facilities located within the airport property such as the Cargo Pier, Cargo and Logistics Centre, JDF Facilities and private hangars.

Airside roads provide restricted access to the airside facilities and are utilized by vehicles such as catering trucks, emergency equipment, ground service equipment as well as maintenance personnel and equipment. Currently, airside access and the NMIA is possible via three restricted access entry ways, two of which are located within the airport facility and one off the Port Royal Main Road.

5.3 Parking

There are several car parking facilities located within the Norman Manley International Airport property, ranging from public, employee, taxi and VIP. The main and most central parking lot located north of the terminal building serves as the public car parking lot. It is an automated car park housing 652 car parking spaces. Directly east of the main car park is an overflow car park which adds additional capacity. There are various employee parking lots located across the airport premises which in some cases directly serve the facilities with which they are associated, such as the Cargo and Logistics Centre and the Learning and Development Centre. It is approximated that there are currently over 400 employee car parking spaces located at the NMIA. The airport also houses dedicated parking lots for VIP travelers and for Jamaica Urban Transit Authority (JUTA) public passenger vehicles. The VIP parking facility currently has a 38 car capacity while the JUTA parking facility houses a combined capacity of approximately 150 spaces for buses and taxis.

It should be noted that two site visits to the airport were completed during the COVID-19 induced shutdown and hence, at this reduced capacity it was impossible to undertake any true assessment of the parking facilities. However, through a combination of information garnered from conversations with staff members and findings by Arup, (2013) it has been assessed that the current public parking provision is inadequate for the passenger capacity at the time. Utilizing a very rudimentary analysis it was projected by the Arup team that a total of at least 1,040 car parking spaces would be needed to meet the forecasted vision 2030 passenger capacity.

5.4 Points of Conflict and Potential Congestion

There are two points of conflict which have been identified within the circulation network of the public access roads at the NMIA. The current arrival/departure road configuration is one of the potential conflict points. At the merge point where several lanes of traffic converge, this presents a potential bottleneck point. This is further exacerbated by the fact that traffic heading to the arrivals curb needs to cross approximately three lanes to do so. This situation can also lead to traffic congestion in the departures lane as vehicles wait to merge.

The length of the arrivals curb and the fact that there is only one parking lane are also contributory factors to traffic congestion as this provides limited pick up slots, leading to circling and waiting, slowing down on each pass to try to find a slot or parking and waiting, then merging into traffic heading to the arrivals curb.

A second point of conflict has been identified at the intersection of the technical services road with arrivals curbside exit road. This intersection creates a situation where vehicles utilizing the technical services roadway to access the airside zone, fuel farm, utilities and maintenance area or any of the other facilities on that side of the premises, are required to cross the four lanes of traffic which are exiting the airport. This includes heavy equipment such as fuel tankers which utilize this road to access the fuel farm. This not only presents a dangerous situation but can also cause significant delays in movement.

5.5 Under-utilized Roadways

Two under-utilized roadways were identified during an analysis of the existing transportation network at the NMIA. These roadways have been described as the “public car park roadway” and the “technical services roadway”. The utility these roads provide appears to be redundant, as the areas they provide access to can already be accessed by alternative routes. Specifically, the public car park road appears under-utilized as outside of providing access to the overflow car park and

serving as a road to bypass the departures/arrival curb and the public car park, this road appears to provide very little function.

While it is acknowledged that the technical services road enables staff and other service providers, such as fuel tankers to bypass the terminal facility, minimizing the congestion and risk of conflicts within that zone and provides an additional safety buffer by diverting the fuel tankers away from the terminal area, the road is still considered to be under-utilized. This is since the intersection with the curbside exits reduces the effectiveness of the roadway, thereby reducing capacity.

5.6 Summary for analyze NMIA's Internal Transportation Network

The transport network comprises two broad classes of roadways and connections - those providing access to land side facilities and those providing access to airside facilities. The land side class of roads provide connections and access to the various airport facilities, parking lots and public transportation. The airside roads are limited access corridors that provide direct access to the airside facilities.

ACCESS/EGRESS: The airport is accessed directly from the Norman Manley Boulevard and Port Royal Road roundabout (1st) onto a four-lane divided corridor, then directly to another roundabout (2nd) on the airport's property.

CIRCULATION: This 2nd roundabout provides circulation throughout the airport's landside facilities like the departures / arrival terminal building, the paid-public car park, the technical services road and the airport exit road. The connection leading to the terminal and the public car park, run parallel to each other in a southerly direction. The terminal road is a two lane, one-way road running in a southerly direction where it provides direct access to both the departures and arrivals curbs at the terminal. To the front of the terminal, the lanes diverge to serve the departures area and the arrivals area.

PARKING: There are several car parking facilities ranging from public, employee, taxi and VIP. The public and most central parking lot is located north of the terminal building. It is an automated car park housing 652 car parking spaces. Directly east of the main car park is an overflow car park. Some employee parking lots directly serve the facilities with which they are associated, such as the Cargo and Logistics Centre and the Learning and Development Centre. It is approximated that there are currently over 400 employee car parking. The airport also houses dedicated parking lots for VIP travellers and for Jamaica Urban Transit Authority (JUTA) public passenger vehicles. The VIP parking facility has a 38-car capacity while the JUTA parking facility houses a combined capacity of approximately 150 spaces for buses and taxis.

UNDER-UTILIZED ROADWAYS: Two under-utilized roadways were identified during an analysis of the existing transportation network at the NMIA. These roadways have been described as the "public car park roadway" and the "technical services roadway". The utility these roads provide appears to be redundant, as the areas they provide access to can already be accessed by alternative routes. Specifically, the public car park road appears under-utilized as outside of providing access to the overflow car park and serving as a road to bypass the departures/arrival curb and the public car park, this road appears to provide very little function.

While it is acknowledged that the technical services road enables staff and other service providers, such as fuel tankers to bypass the terminal facility, minimizing the congestion and risk of conflicts within that zone and provides an additional safety buffer by diverting the fuel tankers away from the terminal area, the road is still considered to be under-utilized. This is due to the fact that the intersection with the curbside exits reduces the effectiveness of the roadway, thereby reducing capacity

ANALYSIS: There are two points of conflict identified within the circulation network of the public access roads at the NMIA.

The current arrival/departure road configuration is one of the potential conflict points. At the merge point where several lanes of traffic converge, this presents a potential bottleneck point. This is further exacerbated by the fact that traffic heading to the arrivals curb needs to cross approximately three lanes to do so. This situation can also lead to traffic congestion in the departures lane as vehicles wait to merge. The length of the arrivals curb and the fact that there is only one parking lane are also contributory factors to traffic congestion as this provides limited pick up slots, leading to circling and waiting, slowing down on each pass to try to find a slot or parking and waiting, then merging into traffic heading to the arrivals curb.

A second point of conflict has been identified at the intersection of the technical services road with arrivals curbside exit road. This intersection creates a situation where vehicles utilizing the technical services roadway to access the airside zone, fuel farm, utilities and maintenance area or any of the other facilities on that side of the premises, are required to cross the four lanes of traffic which are exiting the airport. This includes heavy equipment such as fuel tankers which utilize this road to access the fuel farm. This not only presents a dangerous situation but can also cause significant delays in movement.

6 Opportunities for Improvement of Internal Transportation Network

6.1 Introduction

The operation and efficiency of the existing ground transportation network can be enhanced through the improvement of existing facilities or the introduction of measures aimed at eliminating shortcomings highlighted in the previous chapter. To this end, proposals were presented which seek to improve the capacity, efficiency and operation of the public car park and surrounding roadways, as well as to reexamine the fuel delivery method currently in operation for the provision of aviation fuel to the airport facility.

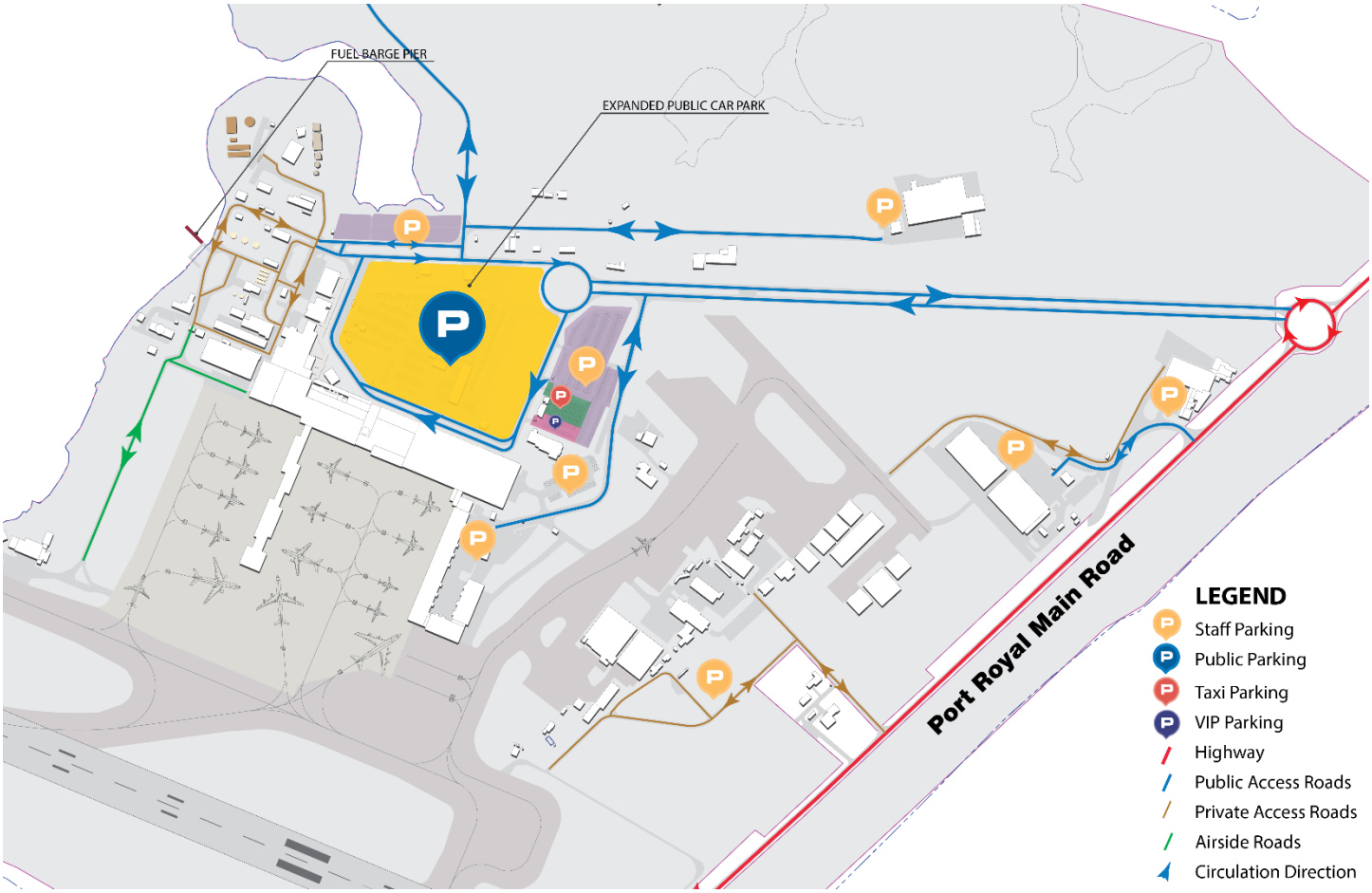

Figure 6.1 Internal Transportation Network

6.2 Public Car Parking Lot

It is being proposed to increase the capacity of the public car park by expanding it eastward. This can be achieved by absorbing the "public car park roadway" as well as the entire grassed area surrounding the overflow car park. This will provide an additional approximately two acres of land to be used for parking. This could result in up to 500 additional car parking spaces.

Additionally, it is being proposed to also absorb the technical services roadway as well as the land area behind the petrol station, including the area currently being used as a garbage skip. This area will also form part of the public car park in order to provide additional utility, including the relocation of the rental cars from the areas they now occupy along the food catering facility roadway into a more structured, purpose built area, easily assessed by passengers.

The proposed expansion of the public car parking lot would also see the reduction in size of the current roundabout to a more conventional roundabout shape, that of a circle, instead of the present oval shape. The recovered space will also be absorbed by the public car park.

6.3 Aviation Fuel Delivery

As noted in chapter 4 of this document, fuel tankers responsible for delivering aviation fuel to the NMIA's fuel farm facility utilize the same roadways as do members of the general public visiting the airport for different reasons. Additionally, the roadways and access points traversed by these tankers have been identified as potential points of conflict. Arup, (2013) noted that at the time of completion of the Masterplan, there were approximately 15 fuel tanker deliveries per day, four days per week being undertaken to the fuel farm. That equates to approximately 60 fuel tanker deliveries weekly, representing a high degree of risk. This is a situation which will worsen as passenger and/or cargo demand increases and additional flights are added.

To this end it is being proposed that an alternative mode of fuel delivery be instituted which reduces or eliminates the potential for conflict between fuel delivery tankers and the general public accessing the airport facility. One such alternative is the introduction of a fuel barge across the harbour from Petrojam to the NMIA facility.

6.4 Wayfinding

It is recommended that additional wayfinding instruments be developed within the NMIA to ensure guests needs for additional transport connections are accommodated from within the airport. Wayfinding enhancements will enable unfamiliar guests to intuitively orientate, navigate, and interpret their surroundings without personal interaction. The use of additional legible and intuitive maps upon exiting the customs hall would improve guest understanding, creating confidence and reduced anxiety to explore the connections to other modes of transportation to complete the journey. The use of additional technology, such as phone apps could also provide information wayfinding tools to assist in navigating the experience, improving control and independence throughout the journey.

6.5 Improved Bus Facility

It is recommended that an improved drop-off and pick-up facility be designed and constructed which can better accommodate visitors utilizing the public transportation service. The facility should provide adequate shelter from the weather, comfortable lounge seating, accessibility to luggage movement and near to other conveniences. This facility should be developed in conjunction to the development of the additional improvements to the integrated regional transportation service being proposed.

6.6 Summary for identify Opportunities for Improvement of Internal Transportation Network

The operation and efficiency of the existing ground transportation network can be enhanced through the improvement of existing facilities or the introduction of measures aimed at eliminating shortcomings highlighted in the chapter "Analyse NMIA's Internal Transportation Network". These improvements would target

Public car parking lot: increase capacity to an additional 500 spaces by extending it eastward onto the parking roadway, adjacent open field, technical services roadway, land area behind the petrol station and garbage skip facility. Also, resizing the 2nd roundabout would also provide additional space.

Rental car park: relocate them to a purpose-built facility.

Aviation fuel delivery: institute a fuel barge delivery system across the Kingston Harbour from Petrojam to the NMIA facility to reduce / eliminate the potential for conflict between fuel tankers and the general public accessing the airport facility. One such alternative is the introduction of a fuel barge across the harbour from Petrojam to the NMIA facility.

Wayfinding: NMIA should install wayfinding instruments for transport connections and customs hall exit to communicate to new passengers and tourists, especially.

Bus facility: all public transport should provide shelter from the elements, comfortable lounge seating, accessibility to luggage movement and be located near to other conveniences, so that airport users can understand buses to be a provision of the airport service.

7 Potential Transportation Linkages between Airport and KSAMC Business Hubs

7.1 Introduction

The proposal recommends the preparation of a multi-modal transportation plan for the region to ensure a seamless travel experience for users of the NMIA to the final destination in the broadest, most connected sense. The design of an integrated transportation system will create efficient journeys and enriching the guest experience. An integrated approach to provide optional modes of travel for reliable, efficient, and convenient service across the different services that is required throughout the sequence of steps in the journey.

It is important that the airport have adequate ground connections to all major nodes throughout the entire region it serves. These connections facilitate ease of movement for passengers and cargo to and from the airport.

Enhancement to the ground transportation service will improve the experience of visitors by providing reliable, convenient service connections and improve time saving. This will make the visit more enjoyable, meeting and exceeding guest needs to improve overall enjoyment and satisfaction, and thereby increased loyalty and return visits.

7.2 Primary Linkages

The NMIA serves the entire Kingston Metropolitan Region (KMR) which is the central business hub for the entire island. The KMR is also the most populated region in the island with over one million residents and as such, the NMIA is critical for business and casual travel. There are plans to develop locations in the region and neighbouring parish of St Thomas into a tourist destination[10] which, if successful, will make the NMIA an important tourism hub as well.

It is therefore important to ensure visitors have a memorable and positive experience, spending a greater proportion of their money on cultural and leisure experiences than ever before. Connections to unique and authentic destinations to meet expectations for valuable experiences improves guest loyalty and increases revenue to the airport.

Several nodes have been identified within the KMR hub as the origin of most trips to the NMIA or as the destination of ground transportation trips from the airport. These nodes also serve as transition points for trips which originate or terminate in other neighbouring regions as well. The primary nodes which have been identified are:

1. New Kingston
2. Half Way Tree
3. Liguanea
4. Cross Roads
5. Spanish Town
6. Portmore
7. Down Town Kingston to other regional connections

At present, access to the NMIA is only possible via roadway, by motor vehicle (private, rentals or taxi), or by a public bus service (JUTC- Route 98). The bus service currently provides an essential service for the airport's workforce which connects NMIA to Port Royal and Down Town Kingston (with a 20-minute service interval between 5:30am to 10pm on weekdays, and a 30-minute interval between 5:30am to 10pm on weekends). This service is not currently seen as a viable transportation option for travelers due to the inconvenient and unsafe connection points of bus stops along the roadways, as well as the busses not being equipped to comfortably store luggage.

[10] St Thomas Tourism Destination Plan (2019) & the UDC Master Plan for Port Royal(2012).

7.3 Proposed Linkages

It is being proposed to augment the existing public bus transportation service to connect the NMIA with a more appropriate transportation hub and with more appropriate vehicles. The proposed Central Transportation Hub[11] is currently being planned for Downtown Kingston and anticipates a multi-modal station which has additional bus and overhead rail connections to all major nodes within the KMR.

The stations at each of these nodes will be equipped with car parks, lounge areas with security, shopping and other conveniences, as well as connections to other bus and taxi services. More appropriate vehicles for an express bus service would have more cargo storage facilities, and more comfortable seating to create a convenient and relaxing experience for travelers.

The proposal also anticipates the integration of the Tourism Destination Plan which will see the connection of the nodes to a possible cruise ship hub. The plan would be to attract new visitors from across the world through the NMIA to new tourist destinations in the region, and connect to possible island-hopping cruise tours throughout the Caribbean. This cruise hub proposal is seen as a viable and competitive alternative to existing Caribbean hubs which originates in the USA because of the less stringent requirements to obtain a visa and could provide a crucial link to untapped tourism markets.

There is therefore an overarching need to develop the NMIA to accommodate the expected increase in passenger traffic and provide a seamless connection to the additional transportation modes, for the integrated plan to be successful. If successful, the integrated development plan will provide a major boost to the economic growth of the region and create significant employment opportunities, of which the NMIA will play a crucial role.

A proposed ferry service connection is also seen as an additional long-term potential mode of transportation which could connect NMIA travelers to Downtown Kingston and Port Royal. This is not seen as a viable service in the immediate future but may serve as a potential alternative if all the major development plans have proven successful and there is a significant increase in the travelling population out of the NMIA.

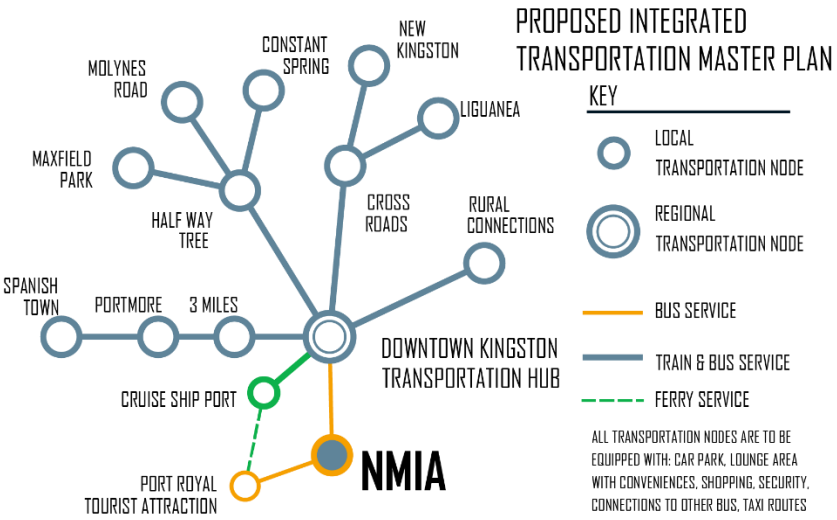

Figure 7.1 Proposed Transportation Linkages

[11] Downtown Market & Commercial District Implementation Plan

7.4 Summary for Identify Potential Transportation Linkages between Airport and KSAMC Business Hubs

There is an overarching need to develop the NMIA to accommodate the expected increase in passenger traffic and provide a seamless connection to additional transportation modes. Transportation to the NMIA is only possible by private motor vehicle or by a public bus service for staff (JUTC- Route 98). NMIA can capitalise on the KMR's population size and proximity to other proposed developments [like the St. Thomas tourist destination and Port Royal], to create efficient transport links, sequences and nodes in the whole travel event thru the proposed recommendation of a multi-modal transportation plan for the region to ensure a seamless travel experience for airport users.

The primary nodes identified are: New Kingston, Half Way Tree, Liguanea, Cross Roads, Spanish Town, Portmore and Down Town Kingston to other regional connections.

The proposed Central Transportation Hub[12] for Downtown Kingston is currently being planned and anticipates a multi-modal station which has additional bus and overhead rail connections to all major nodes within the KMR. The proposal also anticipates the integration of the Tourism Destination Plan which will see the connection of the nodes to a possible cruise ship hub.

[12] Downtown Market & Commercial District Implementation Plan

8 Recommended Zoning Policy & Land Use Overlay Map

8.1 Airport Zoning Overlay District

The most common form of ordinance found during the research was an overlay zone in which an airport influence area was delineated and overlaid on a base zoning district, typically an industrial or airport district. The special restrictions detailed in the overlay provide an additional regulatory layer to the base zoning requirements. In general, uses allowed in the underlying district are permitted to the extent they are not restricted by the specific requirements of the overlay zone.

The overlay district is a more succinct set of rules specifically related to the NMIA which can be put into effect via Development Orders of the 3 Municipalities which the NMIA Airport Zone relates to namely, Kingston &St Andrew, Portmore and St. Thomas.

The purpose for this approach relates to the process for its adoption. A national set of ordinances should first be adopted by the AAJ, to establish a standard framework for individual airport policies to adhere to. This will ensure uniformity of policies, reducing time to enact laws to apply to other Airport Zones (drafting, review, stakeholder hearings, establishing consensus through debates for final adoption), as well as for the training of staff at the approval agencies to become familiar with airport issues to be able to administer the proposed Ordinances.

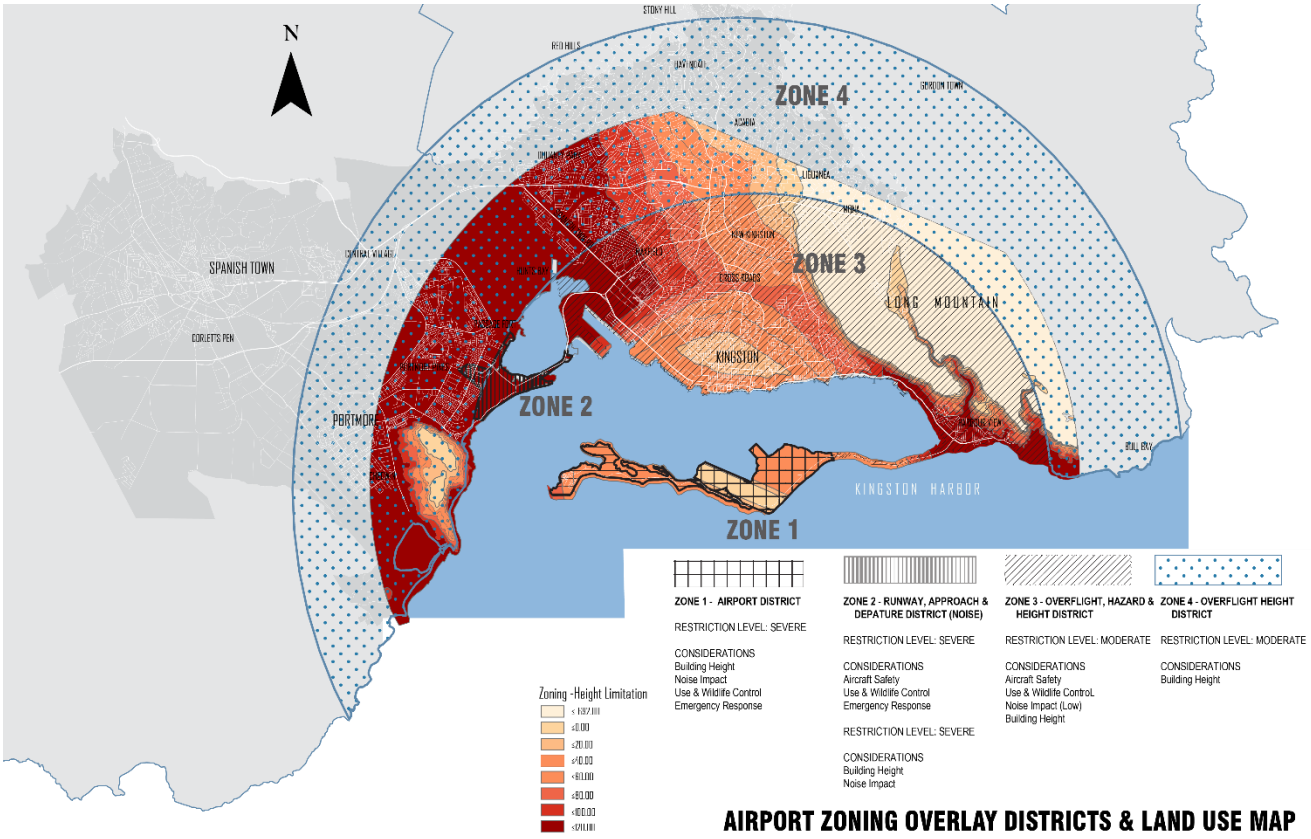

Figure 8.1: NMIA Proposed Airport Overlay Zoning

Certain dimensions [1-] and the designation of duties [2-] will be left to the aviation expertise of the AAJ/JCAA to determine measurements as well as to allocate resources/personnel where needed. It is for this reason, the ordinances have variables that have not been stated and emphasized in blue text like this: [dimensions, designation of duties and dollar amounts]]

8.1.1 Application.

The regulations and standards contained in this chapter shall apply to all applications to:

1. Erect a new structure.
2. Add to or increase the height of an existing structure; and
3. Establish, erect, and/or maintain any use, structure, or object (natural or man-made) within the NMIA Airport Zoning Overlay District.

8.1.2 Purpose and Intent

The purpose and intent of the Airport Zoning Overlay District is to:

1. Create a district zone that considers safety issues around the NMIA which is read in conjunction with (overlaid on top of) other development controls;
2. Regulate and restrict the heights of established uses, constructed structures, and objects of natural growth;
3. Create a permitting process for certain uses, structures, and objects within said related zones.

8.1.3 Relation to other zoning districts

The Airport Zoning Overlay District shall not modify the boundaries of any other overlay zoning district. Where identified, the Airport Zoning Overlay District shall impose certain requirements on land use, construction and development in addition to those contained in the applicable underlying zoning district and/or applicable overlay zoning district for the same area.

8.1.4 General Provisions

1. Use Restrictions: Notwithstanding any other provision of this chapter, the following standards shall be in full force and effect within the airport overlay zoning district:
    a. No glare producing materials shall be used on the exterior of any structure, including any metal building, which are hazardous to aviation, or result in glare in the eyes of pilots using the airport (zone 1).

There shall be neither display of signs which produce a flashing or blinking effect that would interfere with aircraft or a pilot's ability to identify airport lights, nor any lighting projecting upward that would interfere with aircraft or a pilot's ability to identify airport lights (zones 1 and 2).

No structure or use on land or water shall create electrical or electronic interference with navigational signals, or radio or radar communications between the aircraft and a ground station (all zones).

No structure or use shall impair the visibility in the vicinity of the airport, or otherwise endanger or interfere with the landing, taking off, or maneuvering of aircraft intending to use the airport, including the emission or discharge of smoke, steam or other obscuring phenomena which would interfere with the health and safety of pilots and the public in the use of the airport, or which would otherwise be detrimental or injurious to the health, safety, and general welfare of the public in the use of the airport (zones 1 and 2).

1. Notify Persons of Adverse Impacts; Non-liability of the Municipality: Persons constructing a structure or structural alteration within zones 1 and 2, shall be advised that such structure or structural alteration is situated in the area of the airport and may be subject to noise, dust, lights, and the arrival and departure of aircraft, which may cause damage to dwellings or other structures, or may adversely impact the health of animals. The municipality, its officers, agents, or employees will not be responsible for any adverse impacts of any description whatsoever as a result of aircraft or airport operations.

2. Airport Zones: All airport zones established by this chapter are shown on the airport zoning map on file with the municipality and adopted as part of this chapter.
3. Height Zones: All height zones previously established by the NMIA height limitation zoning ordinance are now included in this chapter and shown on the airport zoning map Figure 8.2: NMIA Proposed Airport Overlay Zoning.
4. Height Limitations: Except as otherwise provided in this chapter, no structure, tree or growth shall be erected, altered, allowed to grow, or be maintained within any of the four (4) airport zones established by this chapter to an elevation in excess of the applicable elevation limitations as shown on the airport zoning map. The permitted elevation shall not exceed the elevation limitation numbers shown within the various zones/districts encompassed by this chapter.

8.1.5 District Boundaries:

1. District boundary lines are centerlines of highways, roads or pavements, section, division of section, tract, or lot lines, or extensions of such lines, as applicable, or as otherwise indicated.
2. When a district line divides a lot/parcel of record existing prior to the effective date hereof, in such a manner that a use is not permitted in the most restrictive district of such lot, but is permitted on that portion of such lot in the lesser restrictive district, then a permitted use may be developed only on that portion of the lot/parcel where it is permitted, provided:
    a. The proposed use meets the underlying municipal zoning requirements;
    b. The use complies with all applicable setback requirements;
    c. A site plan, drawn to scale showing the location of the use and the district line on that lot/parcel, is submitted to the municipality and is reviewed and approved pursuant to the procedure contained herein.

Zone 1 shall be considered the most restrictive, and zone 4 shall be considered the least restrictive.

1. **Buildings to Conform With Regulations:** Except as otherwise provided in this chapter, no land, building, or structure shall hereafter be used or occupied, and no building, structure or part thereof shall hereafter be erected, constructed, reconstructed, moved or structurally altered, except in conformity with all the regulations herein.
2. **Conflict:** The provisions of this chapter shall prevail over the zoning districts and regulations of the parish of Kingston & St. Andrew. However, the provisions of this chapter shall be considered minimum requirements. In zones 2, 3 and 4, where a conflict exists between any of these zoning regulations and any other regulations or ordinances applicable to the same site, whether the conflict is with respect to the height of structures, or growths, the use of land, or any other matter, the more stringent regulations or ordinances shall govern and prevail.

8.2 Definitions.

The terms that follow shall have the definitions indicated:

AIRPORT ELEVATION — The highest point of an airport's usable landing area measured in feet above sea level. The airport elevation for NMIA is 3 metres.

AIRPORT HAZARD — Any structure or object, natural or man-made, or use of land which obstructs the airspace required for flight or aircraft in landing or taking off at an airport or is otherwise hazardous.

AIRPORT HAZARD AREA — Any area of land or water upon which an airport hazard might be established if not prevented as provided

NMIA — Any area of land or water which is used, or intended to be used, for the landing and takeoff of aircraft and any appurtenant areas which are used, or intended to be used, for airport buildings or air navigation facilities for rights-of-way, together with all airport buildings and facilities thereon. The term "airport" includes public airports but excludes private airports and heliports. Public and private airports are defined separately in this section.

APPROACH SURFACE (ZONE) — An imaginary surface longitudinally centered on the extended runway center line and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of the runway based on the planned approach. The inner edge of the approach surface is the same width as the primary surface and expands uniformly depending on the planned approach.

CONICAL SURFACE (ZONE) — An imaginary surface extending outward and upward from the periphery of the horizontal surface at a slope of 20 feet horizontally to one foot vertically for a horizontal distance of 4,000 feet.

HEIGHT — To determine the height limits in all zones shown on the Zoning Map, the datum shall be mean sea level elevation unless otherwise specified.

HORIZONTAL SURFACE (ZONE) — An imaginary plane 150 feet above the established airport elevation that is constructed by swinging arcs of various radii from the center of the end of the primary surface and then connecting the adjacent arc by tangent lines. The radius of each arc is based on the planned approach. The horizontal surface zone is derived from the horizontal surface.

LARGER THAN UTILITY RUNWAY — A runway that is constructed for and intended to be used by propeller driven aircraft of greater than 12,500 pounds maximum gross weight and jet powered aircraft.

NONCONFORMING USE — Any preexisting structure, object of natural growth, or use of land which is inconsistent with the provisions of airport zoning overlay.

NONPRECISION INSTRUMENT RUNWAY — A runway having an existing instrument approach procedure utilizing air navigation facilities with only horizontal guidance, or area type navigation equipment, for which a straight-in non-precision instrument approach procedure has been approved or planned.

OBSTRUCTION — Any structure, growth, or other object, including a mobile object, which exceeds a limiting height.

PRECISION INSTRUMENT RUNWAY — A runway having an existing instrument approach procedure utilizing an instrument landing system (ILS) or a precisions approach radar (PAR). It also means a runway for which a precision approach system is planned and is so indicated on an approved airport layout plan or any other planning document.

PRIMARY SURFACE (ZONE) — An imaginary surface longitudinally centered on the runway, extending 200 feet beyond the end of paved runways or ending at each end of turf runways. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway center line.

RUNWAY — A defined area of an airport prepared for landing and takeoff of aircraft along its length.

STRUCTURE — An object, including a mobile object, constructed or installed by man, including, but without limitation, buildings, towers, cranes, smokestacks, earth formation and overhead transmission lines.

TRANSITIONAL SURFACE (ZONE) — An imaginary surface that extends outward and upward from the edge of the primary surface to the horizontal surface at a slope of seven feet horizontally to one foot vertically.

TREE — Any object of natural growth.

UTILITY RUNWAY — A runway that is constructed for and intended to be used by propeller driven aircraft of 12,500 pounds maximum gross weight or less.

VISUAL RUNWAY — A runway intended solely for the operation of aircraft using visual approach procedures.

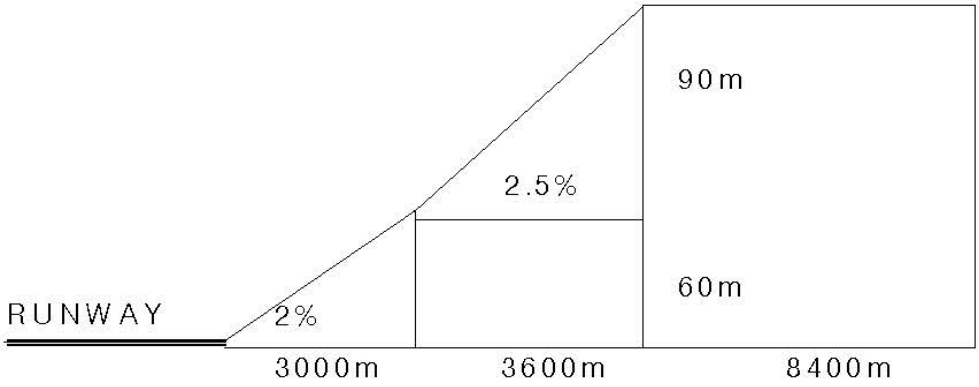

Figure 8.3: Approach Obstacle Limitation:[13]

Sketch showing elevation of the approach obstacle limitation. Source: Airport Authority of Jamaica

[13] International Finance Corporation. Norman Manley International Airport PPP. Master Plan – Final. May 24, 2013

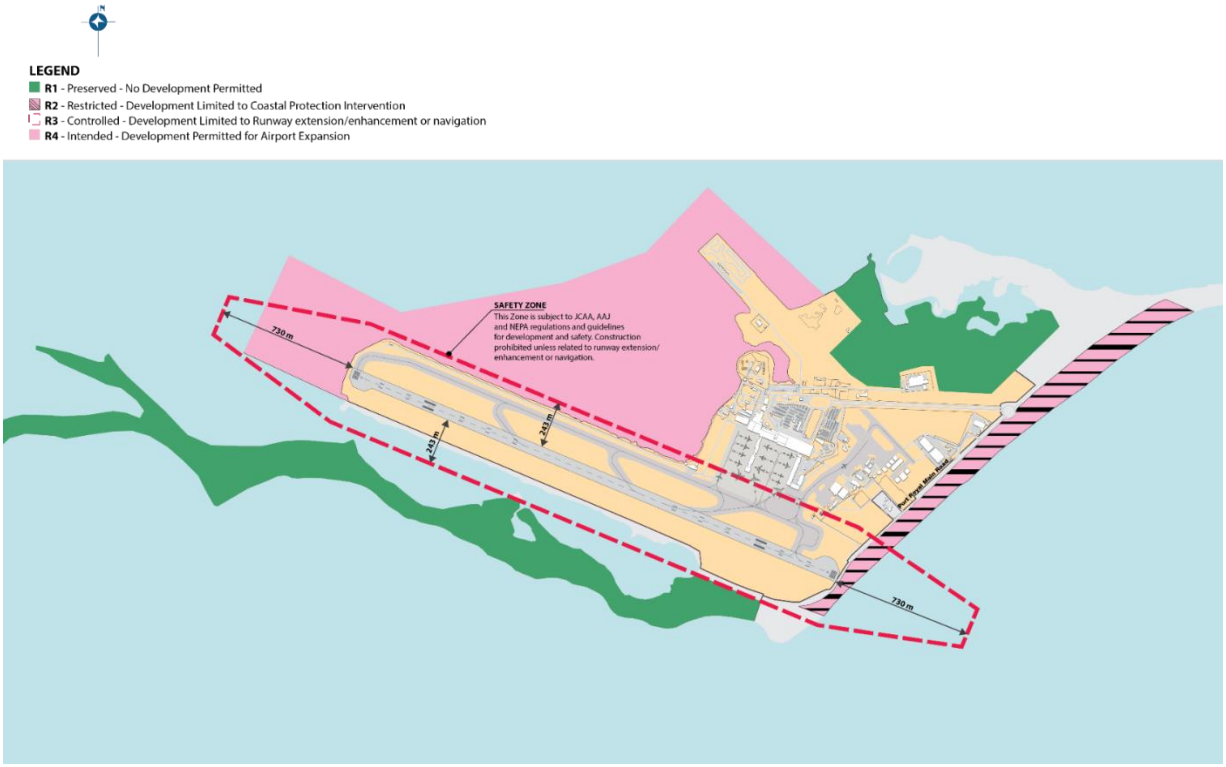

Figure 8.4: NMIA Development Zone Map

Table 8.1: Dimensions and slopes of OLS[14] (abridged)

Runway Classification: Precision approach category	
Approach Runways	II or III Code Number
Surface and dimensions [a]	3,4
First section	
Length	3 000 m
Slope	2%
Second section	
Length	3 600 m [b]
Slope	2.5%
Horizontal section	

[14] *Aerodrome Design and Operations. International Standards and Recommended Practices. 5th Edition. July 2009. ICAO. Annex 14 Vol. 1*

Length	8 400 m [b]
Total length	15 000 m

[a] All dimensions are measured horizontally unless specified otherwise.

[b] Variable length.

Table 8.2: Dimensions and slopes of obstacle limitation surfaces[15]

Runways meant for take-off			
	Runway Classification		
Surface and dimensions [a]	Code 1	Code 2	Code 3 or 4
TAKE-OFF CLIMB	•	•	•
Length of inner edge	60 m	80 m	180 m
Distance from runway end[b]	30 m	60 m	60 m
Divergence (each side)	10%	10%	12.5%
Final width	380 m	580 m	1 200 m, 1 800 m [c]
Length	1 600 m	2,500 m	15 000 m
Slope	5%	4%	2%

[a] All dimensions are measured horizontally unless specified otherwise.

[b] The take-off climb surface starts at the end of the clearway if the clearway length exceeds the specified distance.

[c] 1,800 m when the intended track includes changes of heading greater than 15° for operations conducted in IMC, VMC by night.

[15] *Aerodrome Design and Operations. International Standards and Recommended Practices. 5th Edition. July 2009. ICAO. Annex 14 Vol. 1*

8.3 Zones and Surfaces

8.3.1 Establishment of Surface Zones.

There are hereby created and established certain [imaginary] surface zones within the Airport Zoning Overlay District, depicted on, Figure 8.5 and illustrated on Airport Zoning Overlay District Map" as follows:

1. Take off Surface
2. Approach Surface.
3. Conical Surface.
4. Inner/Outer Horizontal Surface
5. Transitional Surface

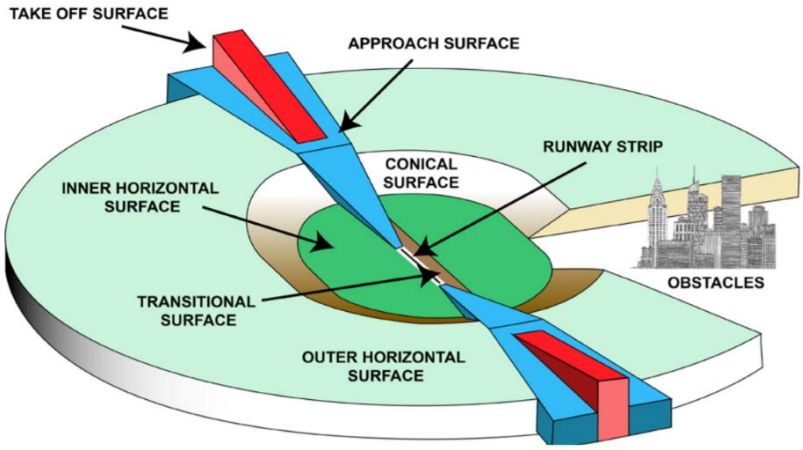

Figure 8.5: OLS Surfaces Layout:[16]

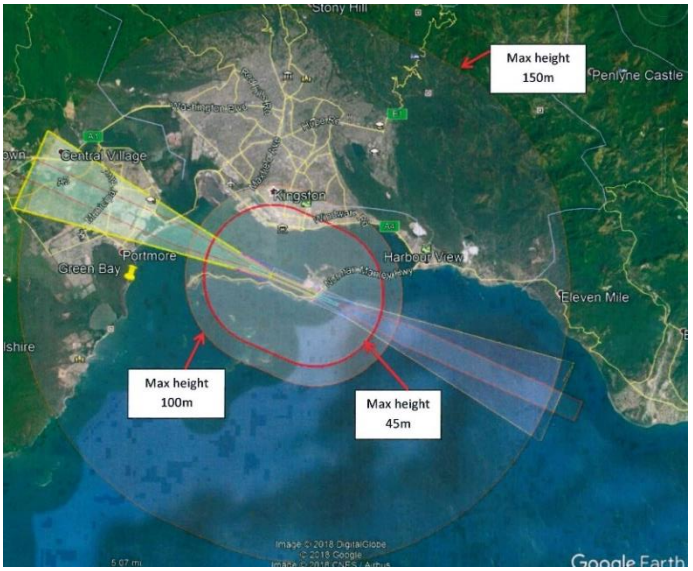

Figure 8.6: Airport Restricted Zones to establish Locality[17]

8.3.2 Airport Zones and District Regulations:

The regional site Assessment Map highlights the different issues that the airport is subjected to. From this assessment, the zoning map was created. In order to carry out the provisions of this chapter, there are hereby created and established four (4) zones as shown on the airport zoning map, consisting of one sheet, and made a part of this chapter by reference. For the purpose of this chapter, the lands and waters within three (3) statute miles from the boundaries of the airport are divided into four (4) districts defined as follows:

[16] Aerodrome Safeguarding Workshop (Cairo, Egypt, 4-6 December 2017). Development of Sharm El Sheikh International Airport Obstacle Limitation Surfaces Consultancy Studies

[17] International Finance Corporation. Norman Manley International Airport PPP. Master Plan – Final. May 24, 2013

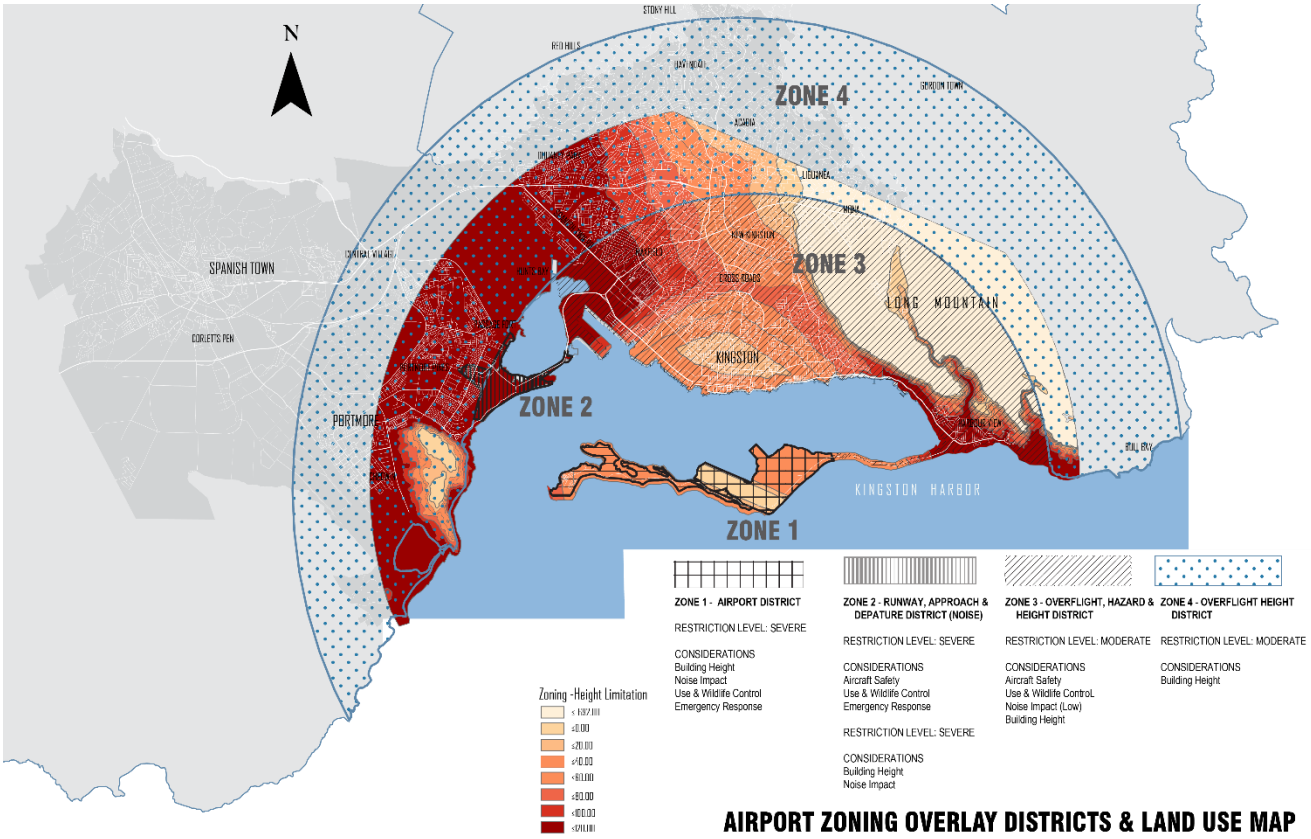

Figure 8.7: NMIA Proposed Airport Overlay Zoning

8.3.2.1 *Zone 1 - Airport District:*

The "airport district" is defined as all those lands controlled by the airport, either by fee ownership or by an easement, and intended to be used for airport purposes. The airport district is created to encompass areas that, due to the operation of aircraft, could be exposed to excessive noise, are within the aircraft approach and departure areas, or are in areas which are exposed to a greater risk of aircraft crashes (crash hazard area). The airport district is established to protect the approaches to the airport from incompatible land uses, and to preserve the airport's ability to serve its present and future air transportation needs. Any new building, or expansion, alteration, or enlargement of any existing building, structure, or property within this zone must be approved by the Municipality and the AAJ. Any construction, expansion, alteration, or enlargement must receive a favorable airspace review from the AAJ. The boundaries of the airport district are shown on the airport zoning map.

8.3.2.1.1 Permitted Uses and Structures:

ONLY uses and structures that are directly related to and necessary for the function and operation of the airport.

a. Air cargo facilities. Air terminals. Aircraft hangars.
b. Aircraft repair and maintenance buildings and facilities.
c. Airport administration and maintenance buildings and facilities. Airport security, rescue, and firefighting buildings and facilities. Commercial uses directly related to airport operations.

d. Fuel storage facilities and pumps. Intermodal facilities.
e. Emergency response facilities.
f. Public gatherings in conjunction with an airport related activity sponsored or approved by the airport.
g. Runways, taxiways, aprons, and related lighting and air support apparatus. Other related airport uses and structures.

8.3.2.1.2 Dimensional Requirements:

The size, height, location, and placement of structures or objects shall comply with FAA design standards associated with critical aircraft data presented on the latest approved airport layout plan, and shall comply with FAA federal air regulation part 77.25, "Objects Affecting Navigable Airspace - Civil Airport Imaginary Surfaces", by not penetrating any of the design or imaginary surfaces.

8.3.2.2 *Zone 2 - Runway Approach and Departure District (Noise Control):*

The purpose of this district is to establish land use requirements in areas that are typically overflown by aircraft during takeoff and landing maneuvers, and hence could be subjected to excessive noise and greater risk of aircraft crashes.

8.3.2.2.1 Permitted Uses:

1. Agriculture, including essential non-residential facilities.
2. Airport owned or operated facilities.
3. Commercial and governmental uses that are not places of public assembly.
4. Floriculture, horticulture, orchards, hatcheries, game farms - except aviaries.
5. Industrial.
6. Light recreational (non-spectator).
7. Mining and excavation.
8. Open space.
9. Parking lots and parking facilities with downlit lights.
10. Transportation routes, including roads and rail lines.

8.3.2.2.2 Prohibited Uses:

1. Any construction or activity that would encourage the concentration of bird or waterfowl populations.
2. Any detention/retention ponds, or any other body of water, either natural or artificial, without the expressed written approval of the AAJ/Municipality.
3. Any facility that, when ignited, would discharge smoke that would be a hazard to air navigation of aircraft in taking off and landing at the airport.
4. Any use that may be susceptible to being adversely affected by loud and extensive noise or would interfere with the safe operation of the airport.
5. Hospitals, churches, schools, theaters, amphitheaters, stadiums, athletic fields, and campgrounds, or other places of public assembly.

6. Landfills, garbage dumps, offal dump sites, and other similarly licensed or titled facilities used to process, bury, store, or otherwise dispose of waste, trash, refuse, or dredge material that would attract birds or rodents.
7. Poultry production.
8. Residential uses.

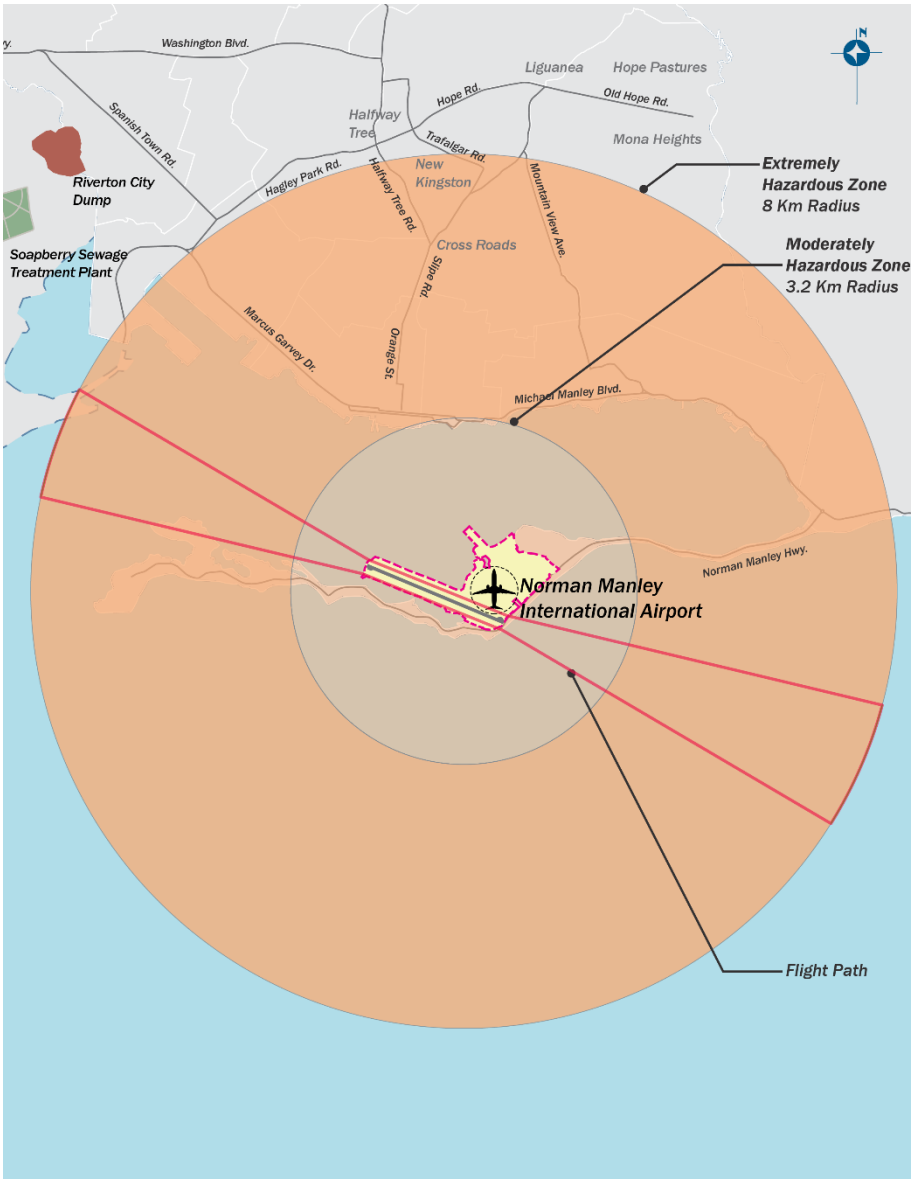

Figure 8.8:Wildlife Hazard Restriction Zones

8.3.2.2.3 Dimensional Requirements:

1. Height Regulations: No structure or growth shall exceed the height permitted by the airport zoning map.
2. Setback Regulations: The setback requirements shall meet the municipal setback requirements of the applicable municipal zoning code.
3. Lot Density: The maximum lot coverage allowed is fifty percent (50%) or as allowed by the underlying municipal zoning, whichever is more restrictive

8.3.2.2.4 Zone 3 - Overflight, Height and Wildlife Limitation District:

The purpose of this district is to minimize the conflict between allowed uses and the aircraft noise generated in this zone.

8.3.2.2.5 Permitted Uses:

All uses are allowed; provided, that the proposed development meets the following requirements:

1. No structures may exceed the height permitted by the airport zoning map.
2. The proposed use meets the underlying municipal zoning requirements.

8.3.2.2.6 Prohibited Uses:

Parcels falling within this district shall be prohibited from the construction or establishment of the following, in accordance with FAA advisory circular 150/5200-33A, relating to hazardous wildlife attractants on or near airports:

a. Landfills, garbage dumps, offal dump sites, and other similarly licensed or titled facilities used to process, bury, store, or otherwise dispose of waste, trash, refuse, or dredge material that would attract birds or rodents.

8.3.2.2.7 Dimensional Requirements:

a. Height Regulations: No structure or growth shall exceed the height permitted by the airport zoning map.
b. Setback Regulations: The setback requirements shall meet the municipal setback requirements of the applicable municipal zoning code.

8.3.2.3 *Zone 4 – Overflight and Height Limitation District:*

The purpose of this district is to protect the approaches to the airport from the construction or erection of structures that would constitute a hazard to air navigation, and from incompatible land uses.

8.3.2.3.1 Permitted Uses:

All uses are allowed provided that the proposed development meets all uses allowed by the underlying municipal zoning requirements.

8.3.2.3.2 Prohibited Uses:

Parcels falling within ten thousand feet (10,000') of the nearest point on the nearest runway shall be prohibited from the construction or establishment of the following, in accordance with FAA advisory circular 150/5200-33A relating to hazardous wildlife attractants on or near airports:

a. Landfills, garbage dumps, offal dump sites, and other similarly licensed or titled facilities used to process, bury, store, or otherwise dispose of waste, trash, refuse, or dredge material that would attract birds or rodents.

8.3.2.3.3 Dimensional Requirements:

a. Height Regulations: No structure or growth shall exceed the height permitted by the airport zoning map.
b. Setback Regulations: The setback requirements shall meet the municipal setback requirements of the applicable municipal zoning code.

8.4 Use Restrictions

Notwithstanding any other provisions of this overlay district, no use shall be made of land or water within the Airport Zoning Overlay District in such a manner as to:

1. Create electrical interference with navigational signals or radio communications between the airport and aircraft;
2. Make it difficult for pilots to distinguish between airport lights and others;
3. Impair visibility in the vicinity of the airport;
4. Create bird strike hazards; or
5. Otherwise endanger or interfere with the landing, takeoff or maneuvering of aircraft utilizing the airport(s).

8.4.1 Pre-Existing Non-Conforming Uses.

1. The regulations prescribed by Overlay Zoning District shall not be construed to require the removal, lowering, or other change or alteration of any structure or tree not conforming to the regulations as of the effective date of this Zoning, or otherwise interfere with the continuance of a nonconforming use.
2. No nonconforming use shall be structurally altered or permitted to grow higher, so as to increase the nonconformity, and a nonconforming use, once reverted to a conforming use, subject to the provisions of the Zoning Ordinance, may only be re-established consistent with the provisions of the Overlay Zone.

8.4.2 Pre-Existing Permitted Use:

1. Nothing contained herein shall require any change in the construction or alteration of any structure, if the construction or alteration of such was begun prior to the effective date of this chapter, and if such is diligently prosecuted.
2. Because of the special nature of this district with its unique purpose and justification, the owner of any preexisting permitted use which, as a result of fire, explosion, or other casualty, is damaged or destroyed, shall be allowed to rebuild, reconstruct or rehabilitate the same preexisting permitted use of the same parcel, provided all of the following requirements are met:
    1. The preexisting permitted use complies with the height limitation imposed by this chapter, and a statement showing such compliance is approved by the municipality prior to any rebuilding, reconstruction, or rehabilitation.
    2. The preexisting permitted use shall not be rebuilt, reconstructed, or rehabilitated unless it conforms to the size, location, and use that existed immediately prior to its destruction.
3. Because of the special nature of this district with its unique purpose and justification, any preexisting permitted use, as described in this section, may be expanded, altered, or otherwise enlarged as long as all of the following requirements are met:
    1. The expansion, alteration, or enlargement meets the requirements of height limitation zoning, and a statement showing such compliance is approved by the municipality prior to the expansion, alteration, or enlargement.

2. The expansion, alteration, or enlargement in no way increases or creates any hazard within the airspace required for the flight of aircraft in landing or taking off or creates or increases any potential hazard to any persons on the ground.
3. The expansion, alteration, or enlargement shall not exceed twenty five percent (25%) of the gross floor area of the structure in existence as of the effective date hereof.

8.4.3 Obstruction Marking and Lighting.

Any permit or variance granted pursuant to the provisions of this Overlay Zoning may be conditioned according to the process described in Variances to require the owner of the structure or object of natural growth in question to permit the municipality, at its own expense, or require the person requesting the permit or variance, to install, operate, and maintain such marking or lighting as deemed necessary to assure both ground and air safety.

8.5 Approvals and Permits

8.5.1 Permit Applications.

1. Applicants for a permit in the Airport Zoning Overlay District to:

a. Erect a new structure whose height surpasses that of surrounding structures;

Add to or increase the height of an existing structure; or

Establish, erect, and/or maintain any use, structure, or object (natural or man-made), in the Airport Zoning Overlay District:

shall first notify the AAJ by submitting Notice of Proposed Construction or Alteration Form to obtain an obstruction review of the proposal at least amount of days prior to applying for a permit. The AAJ's response must be included with this permit application for it to be considered complete. If the AAJ returns a determination of no penetration of airspace, the permit request should be considered in compliance with the intent of this Overlay Ordinance. If the AAJ returns a determination of a penetration of airspace, the permit shall be denied, and the project sponsor may seek a variance from such regulations as outlined in the Section on Variances.

2. Exceptions. In the following circumstances, notification of a permit and submission of Notice of Proposed Construction or Alteration Form shall not be required:
    1. In areas lying within the overlay zone for the NMIA, as depicted on the Airport Zoning Overlay District Map, no approval shall be required for any tree or structure less than 200 feet of vertical height above the ground, except when, because of terrain, land contour or topographic features, such tree or structure would extend above the height limit prescribed for such zones.
    4. In areas lying within the overlay zone for the NMIA, as depicted on the Airport Zoning Overlay District Map, no approval shall be required for any tree or structure less than 100 feet of vertical height above the ground, except when, because of terrain, land contour or topographic features, such tree or structure would extend above the height limit prescribed for such zones.
    5. Applications to make maintenance repairs to or to replace parts of existing structures which do not enlarge or increase the height of an existing structure.

8.5.2 Variances

1. In addition to the provisions set forth in the Zoning Code relating to variances, any request for a variance shall include documentation in compliance with the Notice of Proposed Construction or Alteration Form. Determinations of whether to grant a variance will depend on the determinations made by the AAJ as to the effect of the proposal on the operation of air navigation facilities and the safe, efficient use of navigable air space. In particular, the request for a variance shall consider which of the following categories the AAJ has placed the proposed construction in:
    a. **No objection**. The subject construction is determined to not exceed obstruction standards and marking/lighting is not required to mitigate potential hazard. Under this determination a variance shall be granted.
    b. **Conditional determination**. The proposed construction/alteration is determined to create some level of encroachment into an airport hazard area which can be effectively mitigated. Under this determination, a variance shall be granted contingent upon implementation of mitigating measures with regards to Obstruction marking and lighting.
    c. **Objectionable**. The proposed construction/alteration is determined to be a hazard and is thus objectionable. A variance shall be denied and the reasons for this determination shall be outlined to the applicant.
2. Such requests for variances shall be granted where it is duly found that a literal application or enforcement of the regulations will result in unnecessary hardship and that relief granted will not be contrary to the public interest, will not create a hazard to air navigation, will do substantial justice, and will be in accordance with the intent of this overlay district.

8.5.3 Administration:

1. Regardless of the municipality in which this chapter is in effect, administration of this chapter shall be the **responsibility of the municipality**, unless otherwise specified.
2. The administration of this chapter requires the approval of the Municipality. The Municipality shall, **within amount of working days**, either approve or disapprove the proposed "development" as defined under **Permits Applications** of this chapter, based upon the provisions, standards, and requirements of this chapter.
3. If the proposed development is approved by the Municipality and meets the building requirements of the affected municipality, a building permit shall be issued by the municipality. If the proposed development is not approved by the Municipality, no building permit shall be issued by the affected municipality.
4. The Municipality shall have the right to remove, at the owner's expense, any use, object, or structure which was developed, constructed, placed or planted after the adoption of this chapter and found to be in violation of this chapter.

8.5.4 Appeals and Review:

Any person aggrieved or affected by a decision or action of the department made in the administration of this chapter may appeal such decision or action to the **Appeals Board**, provided:

1. Such appeals are filed with the Appeals Board within thirty (30) calendar days following the administrative decision.

2. The appeal specifies the exact location of the parcel of land affected by the decision and the reason(s) for the appeal.

8.5.5 Penalties:

In case of any violation of any provision of this chapter, the department may institute appropriate legal action or proceeding to enjoin a violation of this chapter.

1. Each violation of these regulations, or of any regulation, order, or ruling promulgated hereunder, shall constitute an airport hazard, and such hazard shall be removed by proper legal proceedings. In addition, the Municipality may institute in the Circuit Court an action to prevent and restrain, correct or abate any violation of these zoning regulations, or any regulation, order, or ruling made in connection with their injunction (which may be mandatory), or otherwise, as may be proper under all the facts and circumstances of the case, in order to fully effectuate the purposes of these zoning regulations as adopted, and orders and rulings made pursuant thereto.
2. Any person, firm, or corporation found guilty of violating any provision(s) of this chapter shall, upon conviction thereof, forfeit not less than amount of dollars nor more than amount of dollars for such offense, together with the costs of prosecution. Each day that a violation continues to exist shall constitute a separate offense.

8.5.6 Severability:

If any of the provisions of this chapter, or the application thereof to any persons or circumstances, is held invalid, such invalidity shall not affect other provisions or applications of this chapter which can be given effect without the invalid provisions or application, and to this end the provisions of this chapter are declared to be severable.

8.6 Summary for Develop Proposed Zoning Policy & Land Use Map

The most commonly used form of ordinance found during the research was an overlay zone in which an airport influence area was delineated and overlaid on a base zoning district, typically an industrial or airport district. The special restrictions detailed in the overlay provide an additional regulatory layer to the base zoning requirements. In general, uses allowed in the underlying district are permitted to the extent they are not restricted by the specific requirements of the overlay zone. The overlay district is a more succinct set of rules specifically related to the NMIA which can be put into effect via Development Orders of the 3 Municipalities which the NMIA Airport Zone relates to (namely: Kingston &St Andrew, Portmore and St. Thomas).

The overlay zoning divides the airport's imaginary and land surfaces into 4 zoning districts, namely,

1. Airport district
2. Runway Approach and Departure District (Noise Control):
3. Overflight, Height and Wildlife Limitation District
4. Overflight and Height Limitation District

These 4 zones outlines specific ordinances, their purpose/intent, relation to other zoned areas, permitted and prohibited uses; use restrictions; approvals and permits; administration; appeals and review; penalties and severability.

9 Summary

9.1 Compatible & incompatible land use assessment & land use plan

For an airport's operation, compatible and incompatible uses must be distinguished so they don't compromise the safe and efficient use of the airport. Avoiding incompatible land uses is easier and more cost effective than correcting them after the fact. Though these uses may not be affecting the airport immediately, their growth or any changes to their use have to be monitored so as not to cause any major breach to the proper functioning of the airport, either thru Preventive and Corrective Strategies.

The corrective strategies address and monitor existing incompatible uses and seek to reduce the impacts of the incompatible land uses, either thru limitations on their right to expand, alter, or change; or acquisition of/ easement over the subject property that precludes future, incompatible development in perpetuity; or negotiation between airport and land owners; and/or public education and outreach. The preventive strategies are useful for proposed land uses in order to prevent incompatible land uses around the airports. Preventive strategies can only be employed/ enforced thru zoning if long range comprehensive plans are enacted which includes a transportation element, and addresses land use and development around the airport. To include a specific airport area element in any comprehensive land use plan, the plan should designate an airport zone overlay to encourage compatible industrial development and restrict high rise/ high density development or other incompatible uses in designated airport safety zones.

The potential incompatible land uses within the airport's operational zones identified were:

1. Mangrove forest near Caribbean Maritime University and within the Ramsar Site (for potentially supporting nesting of birds within the aircraft hazard zone)
2. Existing Structures throughout the KMR which have penetrated the OLS (for creating potential flight hazards)
3. Caribbean Maritime University (for performing training activities which may potentially create obstructive hazards such as pyrogenic exercises during firefighting training)
4. Squatting in the region of the Royal Jamaica Yacht Club (for potentially performing harmful activities such as burning of fires for charcoal or garbage disposal)
5. Soapberry Municipal Landfill- Riverton (for potentially supporting feeding of birds near the aircraft hazard zone)
6. Existing communities within the airport's approach and departure flight zone (for potential conflicts from noise, property value or health and safety issues).
7. From the Obstacle Limitation Survey, a total of 91 objects were identified as penetrating the OLS. [Special measures to mitigate this OLS issue will be dealt with by CEAC in another chapter of the baseline]

9.2 Review of Documents related to Impact of Airfields on Existing and Planned Communities

A very major positive impact of aviation on the country is that they provide significant employment and economic benefits to communities through the movement of people and goods, promotion of tourism and trade, stimulation of business development, and the opportunity for a wide variety of jobs. The flying public and local communities do not readily discern the huge size and scale of economic development that airports provide and stimulate.

Instead, a lot of the focus has been about the negative impacts on immediate communities. Some are

1. Damage to heritage assets whereby, the asset can be razed or built over to make way for airport-related development or their curtilage or general landscape setting can be eroded, so that one can no longer view them in context
2. Land take and urbanisation impacts, whereby lands that could be used for community purposes may be absorbed by the airport or even the loss and fragmentation of wildlife habitat (Ramsar protected water fowl habitat).
3. Landscapes are likely to change when airports and airport-related development remove existing natural features and replace them with buildings and tarmac. Even at nights, the lights of the runways, aircraft and terminals increase light pollution.

4. Noise from aircraft is probably the most obvious environmental impact of the aviation industry because it is easily perceived and annoying.
5. Risks like airplane crashes, terrorism threats, the effects of wake turbulence from aircraft, and health problems of flying for passengers and airline staff
6. Social costs to nearby communities whereby residents of nearby communities bear the brunt of the negative impacts of airport activities
7. Traffic on the route to the airport

9.3 Review and Assess the KSAMC Transportation Master Plan

The Policy document mainly dealt with the development of a set of concepts and propositions in order to achieve specific objectives relating to social, economic, and environmental conditions, and the functioning and performance of the transport system. The report includes transportation improvement and capital projects that would have dealt with the preparation and implementation of actions designed to address specific problems within the transport system. The major capital projects were:

1. Airport Terminal Expansion Project J$51.0M
2. Construction of the Cargo Village 3.5M
3. Construction of new Air Traffic control Towers- US$5,000,000.00
4. Airport Terminal Expansion Project (Interim Works) J$3.5M
5. Additions/Alterations to Departure Concourse J$2.5M

One of the fundamental aims of this dated Transport Policy was to "ensure compliance of the transport sector with international security and safety standards, thru the investigation of issues affecting the aviation sector as well as policies to address these issues". The Policy also highlights government's goal to make decisions concerning the allocation of transport resources, including the management and regulation of existing transportation activities.

Since this Policy was drafted, there has been several projects to the benefit of the airport. These include: completion of the Michael Manley boulevard; upgrade and resurfacing of the Mountain View/Windward road corridor; storm surge protection of the Norman Manley Highway (Palisadoes Road); and the Planning Institute of Jamaica / World Bank commissioning of a study to re-start the rail service from West Kingston and the Bus Park to provide linkage from the pier at Ocean Boulevard to Port Royal and Palisadoes Road [possibly Caribbean Maritime Institute]

9.4 Analyze NMIA's Internal Transportation Network

The transport network comprises two broad classes of roadways and connections - those providing access to land side facilities and those providing access to airside facilities. The land side class of roads provide connections and access to the various airport facilities, parking lots and public transportation. The airside roads are limited access corridors that provide direct access to the airside facilities.

ACCESS/EGRESS: The airport is accessed directly from the Norman Manley Boulevard and Port Royal Road roundabout (1st) onto a four-lane divided corridor, then directly to another roundabout (2nd) on the airport's property.

CIRCULATION: This 2nd roundabout provides circulation throughout the airport's landside facilities like the departures / arrival terminal building, the paid-public car park, the technical services road and the airport exit road. The connection leading to the terminal and the public car park, run parallel to each other in a southerly direction. The terminal road is a two lane, one-way road running in a southerly direction where it provides direct access to both the departures and arrivals curbs at the terminal. To the front of the terminal, the lanes diverge to serve the departures area and the arrivals area.

PARKING: There are several car parking facilities ranging from public, employee, taxi and VIP. The public and most central parking lot is located north of the terminal building. It is an automated car park housing 652 car parking spaces. Directly east of the main car park is an overflow car park. Some employee parking lots directly serve the facilities with which they are associated, such as the Cargo and Logistics Centre and the Learning and Development Centre. It is approximated that there are currently over 400 employee car parking. The airport also houses dedicated parking lots for VIP travellers and for Jamaica Urban Transit Authority (JUTA) public passenger vehicles. The VIP parking facility has a 38-car capacity while the JUTA parking facility houses a combined capacity of approximately 150 spaces for buses and taxis.

UNDER-UTILIZED ROADWAYS: Two under-utilized roadways were identified during an analysis of the existing transportation network at the NMIA. These roadways have been described as the "public car park roadway" and the "technical services roadway". The utility these roads provide appears to be redundant, as the areas they provide access to can already be accessed by alternative routes. Specifically, the public car park road appears under-utilized as outside of providing access to the overflow car park and serving as a road to bypass the departures/arrival curb and the public car park, this road appears to provide very little function.

While it is acknowledged that the technical services road enables staff and other service providers, such as fuel tankers to bypass the terminal facility, minimizing the congestion and risk of conflicts within that zone and provides an additional safety buffer by diverting the fuel tankers away from the terminal area, the road is still considered to be under-utilized. This is due to the fact that the intersection with the curbside exits reduces the effectiveness of the roadway, thereby reducing capacity

ANALYSIS: There are two points of conflict identified within the circulation network of the public access roads at the NMIA.

The current arrival/departure road configuration is one of the potential conflict points. At the merge point where several lanes of traffic converge, this presents a potential bottleneck point. This is further exacerbated by the fact that traffic heading to the arrivals curb needs to cross approximately three lanes to do so. This situation can also lead to traffic congestion in the departures lane as vehicles wait to merge. The length of the arrivals curb and the fact that there is only one parking lane are also contributory factors to traffic congestion as this provides limited pick up slots, leading to circling and waiting, slowing down on each pass to try to find a slot or parking and waiting, then merging into traffic heading to the arrivals curb.

A second point of conflict has been identified at the intersection of the technical services road with arrivals curbside exit road. This intersection creates a situation where vehicles utilizing the technical services roadway to access the airside zone, fuel farm, utilities and maintenance area or any of the other facilities on that side of the premises, are required to cross the four lanes of traffic which are exiting the airport. This includes heavy equipment such as fuel tankers which utilize this road to access the fuel farm. This not only presents a dangerous situation but can also cause significant delays in movement.

9.5 Identify Opportunities for Improvement of Internal Transportation Network

The operation and efficiency of the existing ground transportation network can be enhanced through the improvement of existing facilities or the introduction of measures aimed at eliminating shortcomings highlighted in the chapter "Analyse NMIA's Internal Transportation Network". These improvements would target

Public car parking lot: increase capacity to an additional 500 spaces by extending it eastward onto the parking roadway, adjacent open field, technical services roadway, land area behind the petrol station and garbage skip facility. Also, resizing the 2nd roundabout would also provide additional space.

Rental car park: relocate them to a purpose-built facility.

Aviation fuel delivery: institute a fuel barge delivery system across the Kingston Harbour from Petrojam to the NMIA facility to reduce / eliminate the potential for conflict between fuel tankers and the general public accessing the airport facility. One such alternative is the introduction of a fuel barge across the harbour from Petrojam to the NMIA facility.

Wayfinding: NMIA should install wayfinding instruments for transport connections and customs hall exit to communicate to new passengers and tourists, especially.

Bus facility: all public transport should provide shelter from the elements, comfortable lounge seating, accessibility to luggage movement and be located near to other conveniences, so that airport users can understand buses to be a provision of the airport service.

9.6 Identify Potential Transportation Linkages between Airport and KSAMC Business Hubs

There is an overarching need to develop the NMIA to accommodate the expected increase in passenger traffic and provide a seamless connection to additional transportation modes. Transportation to the NMIA is only possible by private motor vehicle or by a public bus service for staff (JUTC- Route 98). NMIA can capitalise on the KMR's population size and proximity to other proposed developments [like the St. Thomas tourist destination and Port Royal], to create efficient transport links, sequences and nodes in the whole travel event thru the proposed recommendation of a multi-modal transportation plan for the region to ensure a seamless travel experience for airport users.

The primary nodes identified are: New Kingston, Half Way Tree, Liguanea, Cross Roads, Spanish Town, Portmore and Down Town Kingston to other regional connections.

The proposed Central Transportation Hub[18] for Downtown Kingston is currently being planned and anticipates a multi-modal station which has additional bus and overhead rail connections to all major nodes within the KMR. The proposal also anticipates the integration of the Tourism Destination Plan which will see the connection of the nodes to a possible cruise ship hub.

9.7 Develop Proposed Zoning Policy & Land Use Map

The most commonly used form of ordinance found during the research was an overlay zone in which an airport influence area was delineated and overlaid on a base zoning district, typically an industrial or airport district. The special restrictions detailed in the overlay provide an additional regulatory layer to the base zoning requirements. In general, uses allowed in the underlying district are permitted to the extent they are not restricted by the specific requirements of the overlay zone. The overlay district is a more succinct set of rules specifically related to the NMIA which can be put into effect via Development Orders of the 3 Municipalities which the NMIA Airport Zone relates to (namely: Kingston &St Andrew, Portmore and St. Thomas).

The overlay zoning divides the airport's imaginary and land surfaces into 4 zoning districts, namely,

1. Airport district
2. Runway Approach and Departure District (Noise Control):
3. Overflight, Height and Wildlife Limitation District
4. Overflight and Height Limitation District

These 4 zones outlines specific ordinances, their purpose/intent, relation to other zoned areas, permitted and prohibited uses; use restrictions; approvals and permits; administration; appeals and review; penalties and severability.

[18] Downtown Market & Commercial District Implementation Plan

10 References

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11 Appendices

11.1 Sample Application Form

Please Type or Print on This Form

Prototype of FAA Form 7460-1, edited for NMIA Baseline Studies

Failure To Provide All Requested Information May Delay Processing of Your Notice

FOR AAJ USE ONLY

Aeronautical Study Number

1. Sponsor *(person, company, etc. proposing this action)*:

Attn. of:

Name:

Address:

Telephone: Fax:

2. Sponsor's Representative *(if other than #1)*:

Attn.of:

Name:

Address:

Telephone: Fax:

3. Notice of: ☐ New Construction ☐ Alteration ☐ Existing

4. Duration: ☐ Permanent ☐ Temporary (___months,_____days)

5. Work Schedule: Beginning End

6. Type: ☐ Antenna Tower ☐ Crane ☐ Building ☐ Power Line ☐ Landfill ☐ Water Tank ☐ Other

7. Marking/Painting and/or Lighting Preferred:

☐ Red Lights and Paint ☐ Dual - Red and Medium

☐ Intensity White-Medium Intensity ☐ Dual - Red and high Intensity

☐ White -High Intensity ☐ Other

8. NEPA Antenna Structure Approval Number *(if applicable)*:

9. Latitude:

10. Longitude: ☐ ☐ ☐

11. Datum: NAD 83 NAD 27 Other

12. Nearest: Community

13. Nearest *Public-use* *(not private-use)* or Military Airport or Heliport:

14. Distance from #13. to Structure:

15. Direction from #13. to Structure:

16. Site Elevation *(AMSL)*: ft.

17. Total Structure Height *(AGL)*: ft.

18. Overall Height (#16 + #17) *(AMSL)*: ft.

19. Previous FAA Aeronautical Study Number *(if applicable)*:

-OE

20. Description of Location: *(Attach a USGS 7.5 minute Quadrangle Map with the precise site marked and any certified survey)*

21. Complete Description of Proposal:

Frequency/Power (kW)	

Persons who knowingly and willingly violate the notice requirements of part 77 are subject to a civil penalty of $1,000 per day until the notice is received,

I hereby certify that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to mark and/or light the structure in accordance with established marking & lighting standards as necessary.

Date	Typed or Printed Name and Title of Person Filing Notice	Signature

Example of Notice of Proposed Construction or Alteration Form (Source FAA)

Prototype of FAA Form 7460-1, edited for NMIA Baseline Studies

NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

Form and time of notice.

(a) If you are required to file Notice of Proposed Construction or Alteration. AAJ Form 7460–1 is available at AAJ regional offices and on the Internet.

(b) You must submit this form at least *45 days* before the start date of the proposed construction or alteration or the date an application for a construction approval/permit is filed, whichever is earliest.

(c) If you propose construction or alteration that is also subject to the permit requirements of the National Environment & Planning Agency (NEPA), you must submit notice to the AAJ on or before the date that the application is filed with the NEPA.

(d) If you propose construction or alteration to an existing structure that *exceeds 2,000 ft. in height above ground level (AGL)*, the AAJ presumes it to be a hazard to air navigation that results in an inefficient use of airspace. You must include details explaining both why the proposal would not constitute a hazard to air navigation and why it would not cause an inefficient use of airspace.

(e) The *45-day advance* notice requirement is waived if immediate construction or alteration is required because of an emergency involving essential public services, public health, or public safety. You may provide notice to the AAJ by any available, expeditious means. You must file a completed Form 7460–1 within *5 days* of the initial notice to the AAJ..

§ 77.9 Construction or alteration requiring notice.

If requested by the AAJ, or if you propose any of the following types of construction or alteration, you must file notice with the AAJ of:

(a) Any construction or alteration that is more than *200 ft. AGL at its site*.

(b) Any construction or alteration that exceeds an imaginary surface extending outward and upward at any of the following slopes:

(1) 100 to 1 for a horizontal distance of 20,000 ft. from the nearest point of the nearest runway of each airport described in paragraph (d) of this section with its longest runway more than 3,200 ft. in actual length, excluding heliports.

(2) 50 to 1 for a horizontal distance of 10,000 ft. from the nearest point of the nearest runway of each airport described in paragraph (d) of this section with its longest runway no more than 3,200 ft. in actual length, excluding heliports.

(3) 25 to 1 for a horizontal distance of 5,000 ft. from the nearest point of the nearest landing and takeoff area of each heliport described in paragraph (d) of this section.

(c) Any highway, *railroad*, or other traverse way for mobile objects, of a height which, if adjusted upward 17 feet for a Highway, 15 feet for any other public roadway, 10 feet or the height of the highest mobile object that would normally traverse the road, whichever is greater, for a private road, *23 feet for a railroad*, and for a waterway or any other traverse way not previously mentioned, an amount equal to the height of the highest mobile object that would normally traverse it, would exceed a standard of paragraph (a) or (b) of this section.

(d) You do not need to file notice for construction or alteration of:

(1) Any object that will be shielded by existing structures of a permanent and substantial nature or by natural terrain or topographic features of equal or greater height, and will be located in the congested area of a city, town, or settlement where the shielded structure will not adversely affect safety in air navigation;

(2) Any air navigation facility, airport visual approach or landing aid, aircraft arresting device, or meteorological device meeting AAJ - approved siting criteria, the location and height of which are fixed by its functional purpose;

(3) Any construction or alteration for which notice is required by any other AAJ regulation.

(4) Any antenna structure of 20 feet or less in height, except one that would increase the height of another antenna structure.

INSTRUCTIONS FOR COMPLETING FAA FORM 7460-1

PLEASE TYPE or PRINT

ITEM #1. Please include the name, address and phone number of a personal contact point as well as the company name.

ITEM #2. Please include the name, address and phone number of a personal contact point as well as the company name.

ITEM #3. New Construction would be a structure that has not yet been built.

Alteration is a change to an existing structure such as the addition of a side mounted antenna, a change to the marking and lighting, a change to power and/or frequency, or a change to the height. The nature of the alteration shall be included in ITEM #21 "Complete Description of Proposal".

Existing would be a correction to the latitude and/or longitude, a correction to the height, or if filing on an existing structure which has never been studied by the AAJ. The reason for the notice shall be included in ITEM #21 "Complete Description of Proposal".

ITEM #4. If Permanent, so indicate. If Temporary, such as a crane or drilling derrick, enter the estimated length of time the temporary structure will be up.

ITEM #5. Enter the date that construction is expected to start and the date that construction should be completed.

ITEM #6. Please indicate the type of structure. DO NOT LEAVE BLANK.

ITEM #7. In the event that obstruction marking and lighting is required, please indicate type desired. If no preference, check "other" and indicate "no preference" DO NOT LEAVE BLANK. NOTE: High Intensity lighting shall be used only for structures over 500' AGL. In the absence of high intensity lighting for structures over 500' AGL, marking is also required.

ITEM #8. If this is an existing tower that has been approved by NEPA, enter the Approval number here.

ITEM #9 and #10. Latitude and longitude must be geographic coordinates, accurate to within the nearest second or to the nearest hundredth of a second if known. Latitude and longitude derived solely from a hand-held G P S instrument is NOT acceptable. A hand-held GPS is only accurate to within 100 meters (328 feet) 95 percent of the time. This data, when plotted, should match the site depiction submitted under ITEM #20.

ITEM #11. NAD 83 is preferred; however, latitude and longitude may be submitted in NAD 27. Also, in some geographic areas where NAD 27 and NAD 83 are not available other datum may be used. It is important to know which datum is used. DO NOT LEAVE BLANK.

ITEM #12. Enter the name of the nearest community to the site.

ITEM #13. Enter the full name of the nearest public-use (not private-use) airport or heliport or military airport or heliport to the site.

ITEM #14. Enter the distance from the airport or heliport listed in #13 to the structure.

ITEM #15. Enter the direction from the airport or heliport listed in #13 to the structure.

ITEM #16. Enter the site elevation above mean sea level and expressed in whole feet rounded to the nearest foot (e.g. 17'3" rounds to 17', 17'6" rounds to 18'). This data should match the ground contour elevations for site depiction submitted under ITEM #20.

ITEM #17. Enter the total structure height above ground level in whole feet rounded to the next highest foot (e.g. 17'3" rounds to 18'). The total structure height shall include anything mounted on top of the structure, such as antennas, obstruction lights, lightning rods, etc.

ITEM #18. Enter the overall height above mean sea level and expressed in whole feet. This will be the total of ITEM #16 + ITEM #17.

ITEM #19. If an AAJ aeronautical study was previously conducted, make reference to it.

ITEM #20. Enter the relationship of the structure to roads, airports, prominent terrain, existing structures. If available, attach a copy of a documented site survey with the surveyor's certification stating the amount of vertical and horizontal accuracy in feet.

ITEM #21.

- For transmitting stations, include maximum effective radiated power (ERP) and all frequencies.
- For antennas, include the type of antenna and center of radiation (Attach the antenna pattern, if available).
- For microwave, include azimuth relative to true north.
- For overhead wires or transmission lines, include size and configuration of wires and their supporting structures (Attach depiction).
- For each pole/support, include coordinates, site elevation, and structure height above ground level or water.
- For buildings, include site orientation, coordinates of each corner, dimensions, and construction materials.
- For alterations, explain the alteration thoroughly.
- For existing structures, thoroughly explain the reason for notifying the AAJ (e.g. corrections, no record or previous study, etc.).

Filing this information with the AAJ does not relieve the sponsor of this construction or alteration from complying with any other regulations. If you are not sure what other rules or regulations apply to your proposal, contact NEPA or the Municipality

Prototype of FAA Form 7460-1, edited for NMIA Baseline Studies