

SECTION FIVE MITIGATION STRATEGY

This section of the US Virgin Islands Territorial Hazard Mitigation Plan describes the strategy for reducing the Territory's vulnerability to the effects of natural hazards. The Mitigation Strategy is built upon the traditional planning framework of goals, objectives and actions. It combines the contribution of the three Island Mitigation Committees, community input from a series of public information workshops, risk assessment data, and an assessment of technical and administrative capabilities.

Section Five is divided into the following five subsections:

- 5.1 Background
- 5.2 Guiding Principles
- 5.3 Mitigation Strategy
- 5.4 Mitigation Action
- 5.5 Mitigation Action Plan

5.1 BACKGROUND

The Project Planning Team reviewed all readily available multi-hazard and hazard specific mitigation plans prepared for the USVI as part of the Capability Assessment, including:

- *Phase 4 Report, Earthquake Hazards Reduction Plan, Geoscience Associates, for VITEMA, funded by FEMA grant EMA-K-86-0055 (1987)*
- *Natural Hazard Mitigation Plan for the US Virgin Islands, David Brower, Esq. and Timothy Beatley, Ph.D., for VITEMA (1988)*
- *Mitigating the Impacts of Natural Hazards in the US Virgin Islands, Island Resources Foundation, for VITEMA (1995)*
- *Mitigating the Impacts of Natural Hazards in the US Virgin Islands, Island Resources Foundation, for OMB (1999)*
- *Virgin Islands Flood Hazard Mitigation Plan, Island Resources Foundation for VITEMA, funded by FEMA FMA grant (2000)*

5.2 USVI TERRITORIAL GUIDING PRINCIPLES

There is a striking similarity among the broad goals and objectives developed for the above five plans – and for good reason. They have provided, and continue to provide, a sound set of guiding principles for developing and implementing hazard mitigation actions in the US Virgin Islands.

The following guiding principles and associated text have been abstracted from these planning documents. The VITEMA Project Planning Team considers it important to list them because they provide continuity with previous mitigation planning efforts and they offer an understanding of the justification for the public and private sectors to engage in hazard mitigation planning. These principles should be reaffirmed in future updates of the Territorial Hazard Mitigation Plan.

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Protect

- The Health and Safety of the General Public
- The Integrity of the Natural Environment of the Virgin Islands
- The Long Term Economic Prosperity of the US Virgin Islands

Reduce

- Damages to Existing Development in the Event of a Natural Disaster
- Damages to Public Facilities and Structures from Natural Disasters
- Damages to Future Development from Natural Disasters
- The Public Expense for Emergency and Recovery Services Required by Natural Disasters
- The Territory's Liability for Damages to People and Property from Natural Hazards

Ensure:

- An Equitable Distribution of the Risks of Natural Hazards and the Costs Associated with their Mitigation

First Territorial Guiding Principle: To Protect the Health and Safety of the General Public

The fundamental guiding principle of the Territory is to eliminate or reduce the human loss and suffering resulting from natural disasters. This protection extends to both residents of, and visitors to, the Islands. Other governmental disaster planning functions, not strictly considered mitigation, have a substantial role to play in protecting public health and safety. Examples are: warning, evacuation, sheltering, and emergency response functions.

From a mitigation perspective, citizens have the right to live and work in structures that will be structurally sound in the event of hurricanes, earthquakes, or other natural disasters. Moreover, they have the right to be out of harm's way, to the extent possible, during disaster events. This implies the need for public warning and evacuation programs. It further implies the need for planning development, regulating construction, and implementing growth management practices that discourage or prohibit the location of future development in high-hazard areas.

Second Territorial Guiding Principle: To Reduce Damages to Existing Development in the Event of a Natural Disaster

Much of the existing development in the US Virgin Islands is already at substantial risk to natural disasters. Developments are located in high-hazard prone areas along the coastline. Structures have been constructed in natural drainage guts. Many buildings have been constructed in hillside areas without adequate attention to the potential for severe earthquake damages.

The second guiding principle of the Territory is to reduce the vulnerability of existing development to the greatest extent possible, given the government's fiscal constraints. This principle suggests a range of potential actions, including among others: 1 retrofitting public and private structures to better withstand natural hazards, 2.undertaking certain structural improvements such as additional drainage channels, 3. providing better maintenance of the existing stormwater drainage system, and 4. in extreme cases, relocation of structures out of high hazard prone areas.

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Third Territorial Guiding Principle: To Reduce Damages to Future Development from Natural Disasters

The most cost effective way to implement hazard mitigation throughout the US Virgin Islands is to better integrate hazard mitigation in the subdivision and development review and the land use planning processes. Future growth and development in the Islands is inevitable and provides for a stronger local economy, but it need not occur in ways that place people and property at risk.

This intent of this guiding principle is that all new development be carefully managed and planned so that natural hazards are avoided – or where they cannot be avoided that their impacts are minimized. While it can be quite costly to correct past mistakes with respect to development in hazardous locations, there exists a broad range of opportunities to prevent future development from occurring in ways that make it vulnerable to natural hazards.

The Government of the US Virgin Islands is committed to implementing structural changes in its development review and long-range land use planning functions to reduce the vulnerability of future development to natural hazards.

Fourth Territorial Guiding Principle: To Reduce Damages to Public Facilities and Structures from Natural Disasters

Just as private development is subject to damage and destruction from natural hazards, so are public investments such as: schools, government buildings (whether owned or leased), public roads and streets, airports, port facilities, and other public infrastructure such as electrical power generation and distribution, and water and wastewater treatment plants.

These investments can be located, designed and constructed in ways that minimize their vulnerability. Public roads can be located outside of the floodplains, be designed to minimize impacts to the floodplain, or be elevated above predicted flood levels. Drainage systems can be designed to safely pass floodwaters downstream. Efforts can also be made to correct for past mistakes, for example, retrofitting critical public facilities so that they will better withstand high wind or earthquake events.

Fifth Territorial Guiding Principle: To Reduce the Public Expense for Emergency and Recovery Services Required by Natural Disasters

There is a direct correlation between hazardous development patterns and the post-disaster emergency and recovery expenses that must be assumed by the public sector. If buildings and infrastructure were not located in a flood hazard area, there would be little or no need to expend public funds to rebuild and restore them. The expense of sheltering, rescue and other emergency response functions would be greatly reduced if people and development were kept out of harm's way in the first place.

Sixth Territorial Guiding Principle: To Ensure an Equitable Distribution of the Risks of Natural Hazards and the Costs Associated with their Mitigation

Risk knows no social boundaries. Low-income residents are at greatest risk to flooding, earthquakes and other natural hazards as housing is often located in hazard prone areas. Some of the public housing projects in the USVI have been designed and constructed without adequate regard of the structure's vulnerability to earthquakes. Yet, in other cases, high-income property

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owners are allowed to build in hazard prone areas. The public then assumes some of the costs to help them recover following a disaster event.

This is not a sound fiscal policy. Once mitigation is contemplated, the issue of who should pay for it emerges. Does the principle of equity suggest that the costs of hazard mitigation requirements on new development should be assumed by those that benefiting (i.e., developers, builders, new residents)? This seems equitable because the mitigation costs are in fact created by the new development.

Seventh Territorial Guiding Principle: To Protect the Integrity of the Natural Environment of the Virgin Islands

The protection of the natural environment of the US Virgin Islands is consistent with and complimentary to natural hazard mitigation. Development pressures in recent years have substantially damaged many important elements of the natural environment. They further threaten continued destruction in the future. Preserving ecological integrity involves limiting the degradation of the environment and natural systems such as wetlands, floodplains, coral reefs, sea grass beds, and mangrove swamps.

Environmentally sensitive areas are frequently subject to the effects of natural hazards. Thus, by limiting development in these locations, environmental protection and risk reduction objectives are achieved simultaneously. Floodplains and wetlands serve as natural buffers. They absorb excess rainfall, thereby limiting the effects of floods on the built environment while filtering non-point source pollutants. Protecting, preserving and restoring these sensitive habitats will make the US Virgin Islands more resilient to natural disasters. It will also allow the Islands to recover more quickly from future hazard events.

Eighth Territorial Guiding Principle: To Protect and Enhance the Long Term Economic Prosperity of the US Virgin Islands

The USVI must protect and enhance the “golden goose”: the conditions under which the Islands will grow and prosper economically. Tourism is a key element of the local economy and hazard mitigation figures into it in several important ways. A healthy tourism economy cannot thrive and grow unless prospective tourists perceive the Islands as a safe place in which to visit and vacation. A hurricane or earthquake with tremendous damage, destruction or loss of life may create a long lasting image the US Virgin Islands are a dangerous and risky vacation setting.

Secondly, the continued viability of the tourist economy depends on the ability of the Territory to preserve the beauty and natural features that attract people in the first place. Obvious elements of this attraction include the beaches, green vegetated hills, the blue waters, and coral reefs. Many of the hazard mitigation actions proposed for the USVI in this Plan have the additional result of protecting these aesthetic and natural features. Consequently they are mutually supportive of economic objectives that sustain and enhance the tourist-based local economy.

Finally, the USVI, like many of the small, island nations in the Lesser Antilles, must create a more sustainable future that addresses environmental, social and economic health. The rising costs of energy, island economies that are dependent upon imports, and the increasing threat of global warming, all lead to this conclusion. The Caribbean Region, the United States, FEMA, and the

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global community are realizing that a fundamental component of sustainable communities is its resilience to natural disasters (for more information see FEMA document #364 *Planning for a Sustainable Future; The Link Between Hazard Mitigation and Sustainability*).

Ninth Territorial Guiding Principle: To Reduce the Territory's Liability for Damages to People and Property from Natural Hazards

This guiding principle deals with the need to reduce or eliminate the Territory's liability for private damages and loss of life. There has been some precedent in the USVI for holding the Territory financially liable for issuing permits for development in a flood hazard area (the Mon Bijou development on St. Croix). This precedent suggests that the Territory should be especially careful in evaluating the presence of hazards in the development review process and should insist (when it is within its regulatory authority to do so) that new development be located out of high hazard areas. This line of reasoning suggests the need for the Territory to assume a very conservative and cautious posture with respect to natural hazards, preventing where possible any unnecessary exposure.

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5.3.1 MITIGATION FRAMEWORK

The Mitigation Strategy is intended to be a clearly defined set of policies and projects. It stemmed from set goals and objectives that are the overarching hazard mitigation framework for the US Virgin Islands. Its hierarchy is as follows:

- **Goals:** Broad policy statements, to be achieved through the implementation of specific objectives, were expressed. They served as the framework for obtaining the desired results over the long-term planning horizon.
- **Objectives:** Specific steps were identified to support, correspond and define a path on how to attain the desired goals and lead to their implementation.
- **Mitigation Techniques:** Mitigation Techniques were identified in two major categories: (1) programmatic or "soft" mitigation measures, that are implemented through legislation, regulations or programs that operate on a Territory-wide level; (2) structural or "hard" projects that are designed and constructed to eliminate or reduce future disaster damages.

Mitigation techniques include: prevention, property protection, natural resource protection, structural projects, emergency services, and public information and awareness activities.

- **Mitigation Action Plan:** A Mitigation Action Plan consisting of short-term, specific actions was detailed in order to achieve the identified objectives. The Mitigation Action Plan provides, 1) general background information to justify the proposed actions; and, 2) measures to ensure their successful and timely implementation, including task assignments and appropriate funding sources.

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USVI Mitigation Action Plans

The USVI Territorial Hazard Mitigation Plan includes four separate but related Action Plans:

- (1) Programmatic mitigation actions applicable for the entire USVI Territory;
- (2) Prioritized mitigation actions for St. Croix;
- (3) Prioritized mitigation actions for St. Thomas;
- (4) Prioritized mitigation actions for St. John.

Approval Process

A simple voting technique was used by the Island Mitigation Committees to rank all of the proposed mitigation actions. First, VITEMA prepared a preliminary list of Territory-wide goals and objectives for consideration by the three Island Mitigation Committees. Each goal and objective was then presented to the respective Island Mitigation Committees. Following, there were discussions to add, delete, or modify the proposed language.

Each Island Mitigation Committee then formally approved the revised set of goals and objectives. The territory-wide goals and objectives were approved during Hazard Mitigation Committee meetings held in St. Croix, St. Thomas, and St. John on September 7, 8, and 9, 2004, respectively.

USVI Territory Mitigation Goals and Objectives

Goal 1: Reduce the impacts of natural hazards on residents and property

Objectives

- 1.1 Protect existing development from future disaster events
- 1.2 Reduce the vulnerability of future development
- 1.3 Increase the awareness and understanding of residents and the private sector to the principles of hazard mitigation

Goal 2: Integrate hazard mitigation and sustainable development principles into ongoing government operations and long term planning initiatives

Objectives

- 2.1 Ensure that hazard mitigation principles are incorporated into the development review process
- 2.2 Include hazard mitigation as a key element in long range planning efforts that address comprehensive land use, natural resource management, and socio-economic issues
- 2.3 Ensure that hazard mitigation design criteria are incorporated into the planning and engineering design for future infrastructure improvements and major public sector investment projects

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- 2.4. Preserve, enhance, and restore features of the natural environment that have hazard mitigation benefits

Goal 3 Rapidly restore essential infrastructure, with uninterrupted operation of critical facilities and continuity of government services following a natural disaster

Objectives

- 3.1 Enhance capabilities of public agencies to ensure the continuity of government services following a natural disaster
- 3.2 Reduce the vulnerability of essential infrastructure and critical facilities

Goal 4 Enhance the capabilities of VITEMA and the GAR's Office to effectively administer FEMA mitigation programs

Objectives

- 4.1 Strengthen project implementation capabilities
- 4.2 Refine program administrative procedures
- 4.3 Demonstrated improvement in management of FEMA grants through application of established performance standards

Mitigation Techniques

A range of Mitigation Techniques were presented to the Island Hazard Mitigation Committees for consideration in implementing the goals and objectives. The Techniques may be added or subtracted as this Plan evolves, taking into account the effectiveness of chosen actions, their completion, or in response to the changing vulnerabilities found in the USVI.

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Range of Available Mitigation Techniques

Prevention

Preventative activities are intended to keep hazard-related problems from getting worse. They are particularly effective in reducing a community's vulnerability, especially in areas where development has not occurred or capital improvements have not been substantial. Many of the programmatic mitigation actions proposed for implementation at the Territorial level are preventative activities. Examples of preventative activities include:

- Planning and zoning
- Open space preservation
- Stormwater management
- Drainage system maintenance
- Capital improvements programming
- Coastal and riverine setbacks

Property Protection

Property protection measures "harden" existing structures to better withstand hazard events, remove them from hazard prone areas, or provide insurance to cover potential losses. A number of the Island specific mitigation actions proposed in the Plan are property protection measures, especially critical facilities retrofit projects. Examples include:

- Acquisition
- Relocation
- Building Elevation
- Critical facilities protection or "hardening"
- Insurance
- Retrofitting (i.e., windproofing, floodproofing, seismic retrofits)

Natural Resource Protection

Natural resource protection activities reduce the impact of hazards by preserving or restoring the function of environmental systems such as floodplains and wetlands. In many cases, environmentally sensitive areas are also high hazard areas. Thus, natural resource protection measures can serve the dual purpose of protecting lives and property while enhancing environmental goals such as improved water quality or enhancing recreational opportunities. Parks, recreation or conservation agencies and organizations often implement these measures. Examples include:

- Floodplain protection
- Riparian buffers (establishing no disturbance, no development zoning setbacks along streams, rivers or coastline)
- Fire resistant landscaping
- Erosion and sediment controls
- Wetland preservation and restoration
- Habitat preservation and restoration
- Slope stabilization

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Structural Projects

Structural mitigation projects are intended to lessen the impact of a hazard by physically modifying the environment. They are usually designed by engineers and managed or maintained by public works staff. Many of the Island specific mitigation actions proposed in the Plan are structural projects. Examples include:

- Flood control reservoirs
- Levees/dikes/floodwalls
- Storm water management ponds
- Channel modification
- Storm drains and culverts

Emergency Services

Although not typically considered a “mitigation technique,” emergency services minimize the impact of a hazard event on people and property. These actions are typically taken immediately prior to, during, or in response to a hazard event. Examples include:

- Search and rescue
- Evacuation planning and management
- Flood “fighting” methods (i.e., sandbagging, use of temporary flood walls, etc.)
- Warning systems
- Emergency Operation Center (EOC)
- Retrofitting critical facilities to better withstand disaster events

Public Information and Awareness

Public information and awareness activities are used to advise residents, business owners, potential property buyers and visitors about hazards, hazardous areas and mitigation techniques they can use to protect themselves and their property. Examples of measures to educate and inform the public include:

- Outreach
- Speaker series/demonstration events
- Hazard map information
- Real estate disclosure
- Education
- Training

Mitigation Techniques Applicable to the US Virgin Islands

The findings of the capability and risk and assessments were presented to the Island Hazard Mitigation Committees to provide the framework for identifying and evaluating mitigation actions. Key findings of the capability assessment that were emphasized to the Committee members included: weaknesses and strengths in existing programs, fiscal limitations, seeking cost effective solutions to hazards, considering both short term and long term measures and identifying actions that achieve multiple objectives.

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Section 4.7 of the Plan provides a summary of the loss estimations on an island basis. The following natural hazards evaluated in the risk assessment are presented in descending order of estimated disaster damages (highest loss estimate to the lowest) for each Island and then the damage estimates were combined for the entire Territory. The damage estimates for each Island and for the Territory reflect the summation of estimated losses to residential, commercial and manufacturing sectors.

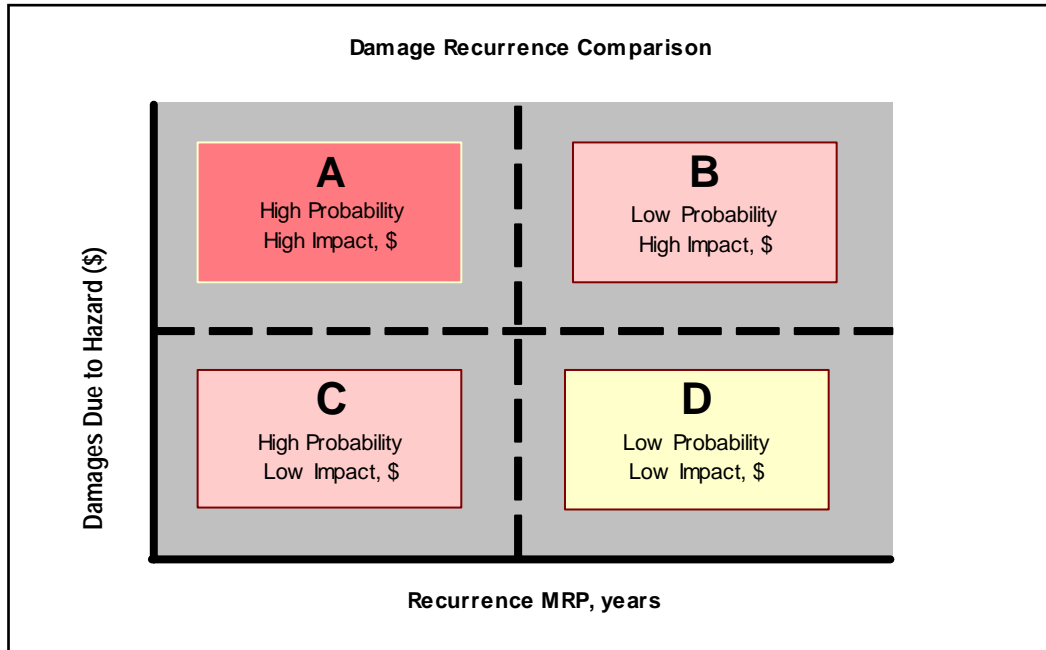
Natural Hazard	St. Thomas	St. Croix	St. John	USVI Territory
Earthquake Ground Shaking	1	1	1	1
Hurricane (high wind damage)	2	2	2	2
Tsunami (tidal wave)	3	3	3	3
Riverine Flooding	4	4	5	4
Coastal Flooding	5	5	4	5

The priority ranking for hazards using potential loss estimations reveals that the individual Islands and the Territory as a whole are very similar; only St. John differs from the others in that there is less vulnerability due to its limited 100-year floodplain and a greater proportion of damages due to coastal flooding than in St. Thomas and St. Croix.

One could interpret this hazard ranking to suggest that the USVI should focus most of its available resources to address earthquake ground shaking because this hazard results in the greatest losses. However, this interpretation is far too simplistic. To evaluate the relative risk between hazards facing the USVI, one must understand that the risk from a hazard is relative to its return period. Section 4.7 explains that a framework for relative risk evaluation must relate damages to recurrence. Hazards with high probability and high impact (Quadrant A) should be of greatest concern followed by hazards located in Quadrants B and C (see Figure 5.1 below)

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Figure 5.1 Framework for Relative Risk Evaluation



Section 4.7 presents a simple ranking methodology based upon a comparison of annualized losses and expected recovery periods. This ranking methodology was broken down into short term and long term priorities. The short term ranking of hazards was presented on an island-by-island basis and reflects the annualized damages for each hazard. The short term ranking best addresses those hazards that need to be addressed in the short term by addressing structural solutions such as flood control improvements or installing hurricane shutters to reduce high wind damages.

The long term ranking reflects a priority hazard ranking with lower probability, higher damage levels, and longer recovery periods. Long term ranking was presented in Section 4.7 on an island-by-island basis. The earthquake hazard is the best example of a hazard that ranks high in the long term ranking. It is, in most cases, prohibitively expensive to retrofit critical facilities; however, it is very cost effective in the long term to improve the quality of disaster-resistant construction by improving building code, development and site plan review, and comprehensive land use planning.

These considerations are reflected in the programmatic and island-specific mitigation actions that follow. These hazard ranking considerations should be considered in both yearly evaluations of the Plan process and when preparing updates of the Plan. In addition, they provide adequate resolution to be applied on an island-by-island basis.

5.4 MITIGATION ACTIONS

5.4.1 IDENTIFICATION OF PROGRAMMATIC MITIGATION ACTIONS

VITEMA prepared a preliminary list of programmatic mitigation actions for implementation at the Territorial level. The list of preliminary programmatic mitigation actions were presented for consideration to the three Island Mitigation Committees. Each proposed mitigation action was reviewed and, where necessary, amended, deleted from consideration, and in several instances alternative mitigation actions were developed by Committee members.

Each mitigation action that successfully made it through the identification phase described above was then evaluated by utilizing the **STAPLEE** Criteria. This technique employs the consideration of the following seven project evaluation criteria:

- **S** for Social; the mitigation strategy must be socially acceptable.
- **T** for Technical; the proposed action must be technically feasible.
- **A** for Administrative; the community must have the capability to implement the action (i.e., whether the agency that should logically be the lead is capable of carrying out oversight of the project).
- **P** for Political; mitigation actions must be politically acceptable.
- **L** for Legal; the community must have the authority to implement the proposed measure.
- **E** for Economic; economic considerations must include the present economic base, projected growth and opportunity costs.
- **E** for Environmental; the impact on the environment must be considered because of statutory considerations and the public's desire for sustainable and environmentally healthy communities.

The evaluation of each identified mitigation action by use of the STAPLEE criteria is summarized under each prioritized action in Appendix L.

5.4.2 TERRITORY-WIDE PROGRAMMATIC MITIGATION ACTIONS

The programmatic mitigation actions listed below are grouped by the Territorial goals and objectives. The first integer in numbering system for the Territorial Objectives refers to the four broad territorial goals; the second integer sequentially identifies the objective with no priority intended. The mitigation actions for each objective follow and are numbered sequentially from 1 to 34.

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Objective 1.1 Protect Existing Development from Future Disaster Events

1. Develop a program and provide adequate annual budget to remove built up sediment, debris and maintain natural guts, roadside ditches, drainage channels and storm drains.
2. Support and implement the FEMA Map Moderation Program in the Virgin Islands to provide more accurate Flood Insurance Rate Maps (FIRMs), improve program management, reduce repetitive losses, and develop more effective floodplain management tools.
3. Strengthen sediment and erosion control enforcement.

Objective 1.2 Reduce the Vulnerability of Future Development

4. Prohibit development or new construction in V-Zones unless it serves a clearly defined water dependant use.
5. Expedite legislation to adopt the new IBC Building Code.
6. Adopt Stormwater Management regulations, adequately train and assign staff to review stormwater management plans for public and private sector developments.
7. Amend subdivision regulations to incorporate current floodplain management techniques and create a formal administrative review process that addresses potential stormwater management, environmental protection, coastal zone, and flooding concerns.

Objective 1.3 Increase the Awareness and Understanding of Residents and the Private Sector to the Principles and Need for Hazard Mitigation

8. Strengthen partnerships with the US Department of Agriculture, DPNR, Cooperative Extension Service, University of the Virgin Islands, and media to disseminate information to the general public on hazard mitigation and sustainable development concepts.
9. Publicize the availability of web-based and print material on hazard data and hazard mitigation tools to professional associations, interest groups, and the private sector.

Objective 2.1 Ensure that Hazard Mitigation Principles are Incorporated into the Development Review Process

10. Amend administrative provisions in the Zoning Law to transfer enforcement provisions from the Attorney General and bring them under the authority of the DPNR Commissioner.

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11. Enact legislation that delegates the authority to approve zoning change requests from the legislature to an appointed Zoning Review Board with the opportunity of appeal to the civil court system.
12. Amend coastal zone legislation to extend the coastal zone inland to include contiguous areas of Special Flood Hazard Areas (SFHAs) and other designated hazard prone areas.

Objective 2.2 Include Hazard Mitigation as a Key Element in Long Range Planning Efforts that Address Comprehensive Land Use, Natural Resource Management, and Socio-economic Issues

13. Incorporate a hazard mitigation perspective in the revisions currently being considered to the draft Comprehensive Land & Water Use Plan (see Appendix XX for specific recommendations).
14. Evaluate development densities which are currently permissible in natural hazard areas and amend the zoning ordinance to reduce these densities where they are too high.
15. Include hazard mitigation as one evaluation criterion when preparing and adopting Capital Improvement Plans.

Objective 2.3 Ensure that Hazard Mitigation Design Criteria are incorporated into the Planning and Engineering Design for Future Infrastructure Improvements and Major Public Sector Investment Projects

16. Develop bid specifications that require the design consultant to address hazard mitigation concerns for new public facility construction projects.
17. Establish conservative design specifications that address hazard risk reduction in the design and construction of public and private roads, particularly standards relating to conveyance of stormwater in culverts, roadside ditches and under bridges.
18. Establish an Inter-departmental Hazard Assessment Working Group to ensure that hazard mitigation concerns are addressed in the siting, design, and engineering for all future public sector investment and construction projects.

Objective 2.4 Preserve, Enhance, and Restore features of the natural environment that have Hazard Mitigation Benefits

19. Develop maps delineating natural drainageways (guts) that exceed a specified cross-section or flow in cubic feet per second. Distribute maps identifying natural guts to appropriate DPNR and DPW staff responsible for development review or engineering design. Prevent encroachment of new development or alteration of natural guts unless necessary for the correction of existing flooding problems. Enforce existing VI code requirement restricting the cutting of trees or vegetation within 30 feet of the center of any

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- natural watercourse, or within 25 feet of the edge of the watercourse, whichever is greater, unless special permission is obtained from the Commissioner of DPNR.
20. Integrate and strengthen environmental programs such as the Sediment Reduction Program, Unified Watershed Assessment and Restoration Priorities Program and the Non-point Source Pollution Program to help achieve flood hazard risk reduction.
 21. Strengthen preservation and restoration programs of the natural coastline, wetlands, and sensitive environments that provide a natural buffer to the impacts of natural hazards (34).

Objective 3.1 The Rapid Restoration of Essential Infrastructure, Uninterrupted Operation of Critical Facilities and Continuity of Government Services following a Natural Disaster

22. By Executive Order, require that each executive agency and department prepare or update an emergency management plan which outlines specific measures the agency will take to prepare, respond, and recover from natural disasters. The plan shall include cost-effective measures that the agency can implement to ensure the continuity of services following a disaster event. Emergency management plans should be reviewed and updated annually, prior to the start of the hurricane season.

Objective 3.2 Reduce the Vulnerability of Essential Infrastructure and Critical Facilities

23. Conduct structural engineering assessments and prepare concept designs and cost estimates to retrofit top priority critical facilities, and identify pre-disaster funding sources such as FEMA PDM, CDBG, among other potential Federal funding sources.
24. Develop conceptual retrofit or relocation mitigation projects, including preliminary cost estimates, for retrofitting or relocating essential infrastructure and critical facilities that can be undertaken following a future disaster event (primarily HMGP funding).

Objective 4.1 Enhance the Capabilities of VITEMA and the GAR's Office to Effectively Administer FEMA Mitigation Programs

25. Refine eligibility criteria for hazard specific and multi-hazard mitigation projects.
26. Institutionalize cost effectiveness methodology for HMGP project reviews that are consistent with OMB Circular A-94 and current FEMA guidance.
27. Strengthen VITEMA/GAR capabilities to conduct National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance for HMGP projects.

Objective 4.2 Refine Program Administrative Procedures

28. Construct a database management program and develop procedures to track mitigation project progress from project award to project completion.

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29. Create a permanent record of project effectiveness in order to periodically aggregate actual costs avoided due to the completion of specific hazard mitigation projects in the Virgin Islands.
30. Create a methodology and formal reporting procedures to be provided to HMGP or other mitigation grant recipients in order to calculate the actual loss avoided for each mitigation project.

Objective 4.3 Demonstrated Improvement in Management of FEMA Grants

31. Establish defined goals for improving timeframes for submitting complete and technically feasible HMGP, FMA, and PDM grant applications.
32. Improve the quality and timeliness of quarterly progress and financial reports.
33. Identify, assign and train VI government staff, through cooperative agreements with other departments, to provide accurate and defensible environmental reviews and benefit-cost analyses.
34. Assign responsibilities to VITEMA/GAR staff to provide necessary oversight to complete HMGP and other mitigation grant projects within established performance periods and within established budgets.

5.4.3 IDENTIFICATION OF ISLAND-SPECIFIC MITIGATION ACTIONS

Following the identification and evaluation of programmatic mitigation actions, each Island Hazard Mitigation Committee focused on developing a series of mitigation actions that are specific to the three major Islands. A similar identification, review and evaluation process used for the programmatic actions was conducted for Island Specific mitigation actions. The evaluation of each identified mitigation action by use of the STAPLEE criteria is summarized under each prioritized action under subheadings for St. Croix, St. Thomas, and St. John (Appendix L).

The three island mitigation actions lists presented below are also referenced to the Territorial goals and objectives. The first integer in numbering system for island-specific mitigation actions refers to the four broad territorial goals and the second integer refers to the objective that the mitigation action is intended to achieve.

St. John Mitigation Actions

Objective 1.1 Protect Existing Development from Future Disaster Events

- 1.1 Public/Private Sector initiative to resolve localized flooding problem on Westin Hotel property and adjacent public road. Several new, properly-sized culverts are required.
- 1.1 Drainage improvements to eliminate localized flooding at Voyagers Restaurant where natural storm flows in the catchment area have been altered by construction and improper siting of structures.

Objective 3.2 Reduce the vulnerability of essential infrastructure and critical facilities

- 3.2. Drainage improvements to eliminate localized flooding along Emmaus Gut that causes localized flooding problems at the Fire Station and Guy Benjamin School; both designated critical facilities.
- 3.2 Alternate Transmission Feeder to St. John Substation. Installation and termination of an underground transmission system with approximately three miles of duct banks and underground 35kV, 750 Kcmil underground power cables from the East End Substation to alternate submarine cable at Red Hook. Loop underground transmission feed for St. John. Benefits include the rapid restoration to normal services and economic recovery for all public services and critical facilities on St. John.
- 3.2 Resolve localized flooding at WAPA building and treatment plant, while addressing potential secondary impacts to wetlands.
- 3.2 Federal Highways/DPW mitigation project to eliminate slope failures along Centerline Road that periodically close road during major storm events

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- 3.2 Drainage improvements to eliminate localized flooding along Route 107 southbound at Coral Bay. A hydrological study of the catchment area is necessary to determine technically feasible and cost effective structural solutions to the flooding problem.

St. Thomas Mitigation Actions

Objective 1.1 Protect Existing Development from Future Disaster Events

- 1.1 Lindberg Estates, Phase III Drainage Project, Department of Public Works (Goal 1, Objective 1).
- 1.1 Road reconstruction and drainage improvements to Main Street in the Waterfront District of Charlotte Amalie to resolve recurrent shallow flooding events that primarily affect businesses and some residences. Project should be done in conjunction with streetscape enhancement project.
- 1.1 Drainage improvements on Route 30 adjacent to Bolongo Bay.

Objective 3.2 Reduce the vulnerability of essential infrastructure and critical facilities

- 3.2 Enlargement of culverts, stormdrains, and improvements to open channels from Veterans Drive to the Bay along the east edge of Frenchtown in southwest Charlotte Amalie, in order to resolve flooding, traffic access and business interruption, by providing 100-year flood protection.
- 3.2 Enlargements of culverts under Coki Point and Smith Bay Roads, and, improvements to open channels draining through the Stouffer Resort Complex into Water Bay to resolve localized flooding problems that periodically close roads, create traffic hazards, prevent emergency vehicle and public access, and cause damage to adjacent businesses and road pavement.
- 3.2 Hardening WAPA high-voltage transmission lines by placing them underground (Goal 3, Objective 2). Installation of an underground transmission system using duct banks or underground power cables and the use of pad-mounted transformers in the business district. WAPA has proposed four separate segments in St. Thomas, including Main Street, Long Bay Road, and Feeder 9A and 10A Distribution.
- 3.2 Drainage improvements to secondary road that provides access to Caret Bay West (Goal 3, Objective 2). Improvements could include paving and/or providing proper roadside drainage and properly-sized culverts where appropriate to carry stormwater across the road to minimize erosion of the road surface.

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- 3.2 Design and Installation of new, parallel underway pipeline carrying electric, water and communications service from Charlotte Amalie waterfront to Water Island (Goal 3, Objective 2).
- 3.2 Airport Drainage Project, Phase IV, Department of Public Works (Goal 3, Objective 2).
- 3.2 Hardening WAPA Substations. Design and construction of hardened switchgear buildings at the East End and Tutu Substations.
- 3.2 Resolve flooding problems at Subbase Entrance. Phase I of drainage improvements completed. Phase II drainage improvements include installation of properly-sized culverts from Veterans Drive near the Subbase Entrance.
- 3.2 Install Hurricane Shutters at main police station in Charlotte Amalie.
- 3.2 Construct or retrofit existing building to provide a emergency evacuation shelter for RLS Hospital, equipped with a “medically ready” ward with the proper electrical, gas, oxygen, and other capabilities.

St. Croix Mitigation Actions

Objective 1.1 Protect Existing Development from Future Disaster Events

- 1.1 Christiansted Gut USACE Section 205 Project. Preliminary feasibility phase currently underway by the Corps to determine whether technically feasible and cost effective solutions exist to reduce flood damages in residential and business areas adjacent to King Cross Street. The Corps will prepare a Detailed Project Report describing their findings and can provide up to 50 percent funding for structural solutions and up to 65 percent for nonstructural control measures.
- 1.1 Acquisition and/or relocation of residential homes along the coast in Estate Prosperity and Estate William that are affected by storm surges.
- 1.1 Assessment of flooding problems within La Grande Princess Estate. Approximately 50 of 250 NFIP-insured losses in St. Croix (one in five repetitive losses) occur in La Grande Princess. Assess potential for acquisition, structural solutions, and nonstructural control measures to reduce repetitive losses to residences and businesses.

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Objective 3.2 Reduce the vulnerability of essential infrastructure and critical facilities

- 3.2 Installation of storm shutters at the Henry Rohlsen Airport.
- 3.2 Large Pad Mount Transformers. Replace the 75kVA, 100 kVA and 250kVA pole mounted transformers to pad mounted transformers to mitigate damages from hurricanes and ensure rapid recovery and return to normal service.
- 3.2 Feeders 1, 2, 3, 4, 6, 9 & 10. Underground feeders from Richmond Substation to various termination points to mitigate damages from hurricanes and ensure rapid recovery and return to normal service.
- 3.2 Richmond Substation 24.9 kV Switchgear Building. Design and construction of new switchgear and relocation of feeders connection from present switch yard to new low profile high voltage enclosed switchgear, and removal of existing substation. The 24.9 kV distribution system supplies the western portion of the island including numerous critical facilities. Benefits include providing all hazards protection including transportation and port security to this critical substation.
- 3.2 Equipment anchoring program for the Richmond Electrical Generating Plant. Anchor critical equipment in the Plant to mitigate damages caused by earthquake, hurricane-strength winds, tsunami and storm surge.
- 3.2 Drainage improvements at the Ricardo Richards Elementary School at Estate Barren Spot near Melvin H. Evans Highway (Route 66).
- 3.2 Water Distribution Pump Stations at Concordia and Adventure. Provide emergency power supply by constructing flood-proof buildings and installing emergency generator units.
- 3.2 Richmond and Recovery Hill Water Storage Tanks. Install wind girders to reinforce against hurricane storm winds.
- 3.2.1 Various Water Storage Tanks. Install flexible connectors at multiple water storage tanks to permit pipe flexibility during earthquake events and ensure rapid recovery and normal service.

5.5 MITIGATION ACTION PLAN

The effective implementation of mitigation actions is dependent upon: identifying appropriate agency or department roles, projected timeframes, necessary resources, and determining the prioritization for each action. Lead and supporting agency roles, projected timeframes, and potential funding sources were prepared for each action, along with an assessment of anticipated constraints and opportunities for their implementation.

Following the identification and evaluation of each proposed programmatic and island-specific mitigation action, the Island Hazard Mitigation Committees prioritized them using a simple voting technique. Each member of respective Committees was given approximately one third of number of actions being prioritized. This was done for both the USVI Territorial actions and for island-specific actions. Each individual vote was then counted by the Committee member by placing a colored self-adhesive dot on a flip chart containing the list of territorial or island-specific actions.

For example, when prioritizing (34) USVI Territorial Mitigation Actions each member of the St. Thomas Committee was given 10 votes, or nearly one third. For prioritizing the 12 St. Thomas specific actions, each member was given 4 votes. The dots (votes) were tallied for both the territorial and island-specific actions.

Appendix L presents the programmatic and island-specific actions in a matrix format that depicts the prioritization and strategic planning conducted necessary to lead to effective implementation. A separate matrix is provided for each programmatic or island-specific action that includes the following information:

- Description of the mitigation action,
- Priority ranking,
- The goal and objective that the action is intended to achieve,
- The specific hazard the action is intended to achieve (or all hazard),
- Responsible agency, department or division,
- Projected timeframe,
- Projected resources,
- Comments on rationale for action, contribution to goal, or other comment, and
- STAPLEE criteria evaluation, by individual criterion and total score.

NOTE: STAPLEE criteria were weighted by the following scoring formula:

- S high (3); moderate (2); low (1); and neutral or unknown (0)
- T feasible (1); not applicable or unknown (0)
- A existing capability (3); training needed (2); staff needed (1); NA
- P high (3); moderate (2); low (1); NA or neutral (0)
- L yes (1); no (0)
- E weighted at high (6); moderate (4); low (2); neutral or unknown (0)
- E high adverse (-3); moderate (-2); minor (-1); NA or unknown (0); and beneficial (2)

SECTION FIVE MITIGATION STRATEGY

5.5.1 ADMINISTRATION AND OVERSIGHT

Following Plan adoption, VITEMA intends to maintain but refine the role of the existing Island Hazard Mitigation Committees. It will also establish a Territorial Mitigation Steering Committee to provide administration and oversight for the implementation of territorial and island-specific mitigation actions. The Territorial Mitigation Steering Committee will include six USVI agency representatives from VITEMA: one VITEMA representative from each island, and one representative each from OMB, GAR's Office, DPNR and DPW.

The Island Mitigation Committees will have the lead oversight role for monitoring and ensuring progress in implementing the island-specific mitigation actions. They will also support the necessary programmatic changes to implement the Territorial mitigation actions. Additional details on the formation and continuance of the Mitigation Committees is provided in the Plan Maintenance Section of this Plan (Section 6.0).

The Hazard Mitigation Committees will be responsible for overseeing the progress made on the implementation of action items and for updating the Plan as needed to reflect changing conditions. It will also be responsible for identifying opportunities to better integrate the Plan findings into the day-to-day operations of the USVI government and for contributing to relevant USVI long-range planning initiatives.

5.5.2 ASSESSING COST EFFECTIVENESS OF MITIGATION ACTIONS

The Island Hazard Mitigation Committees considered cost effectiveness during the development and prioritization of the mitigation actions presented in this section. Although a formal Benefit-Cost Analysis was not performed for each mitigation action for the submission of this Plan, actions were identified based on the administrative, technical and financial capabilities of USVI government.

Committee members considered cost effectiveness as a general exercise during the development and prioritization of the mitigation actions. Economic consideration is a key component of the STAPLEE criteria and cost-effectiveness considerations were given a 2x weighting in the scoring formula.

A formal Benefit-Cost Analysis, including the calculation of a benefit/cost ratio, would be performed at a future date for any projects sent forward for funding consideration under Federal programs such as the Hazard Mitigation Grant (HMGP) or the Pre-Disaster Mitigation (PDM) programs.