

NATURAL HAZARDS MANAGEMENT IN MONTEGO BAY

**Important Considerations in the Development
of a Local Hazards Management Programme**

Prepared by

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PREFACE

The Office of Disaster Preparedness has initiated a cooperative effort with the St. James Parish Council to develop a detailed programme for natural hazards management in Montego Bay. Research was conducted and a series of meetings held to identify the key factors affecting successful development of an effective local programme. A number of constraints to programme development were identified, but the need for such a programme was well documented and opportunities for programme development were also identified.

Although development of certain components of the overall programme will require the assistance of central government agencies, the principal responsibilities for programme development should rest with the Parish Council. There is a pressing need to improve intergovernmental coordination and clarify the division of responsibilities between national government and the Parish Council in the event of a disaster. Toward this end ODP has initiated a series of meetings involving central government officials and Parish representatives.

It is recommended that the overall programme for hazards management in Montego Bay contain two basic components: (1) an immediate action component focusing on preparedness, response, recovery and reconstruction measures; and (2) a longer-range mitigation component for reducing future risk and vulnerability to natural hazards.

The development of such a comprehensive programme will require a long term work effort and commitment on the part of those involved. The difficulties in developing such a programme are compounded by the limited resources currently available to the Parish Council and central government agencies. There are nevertheless certain programme elements which, with the aid of ODP, can be initiated at this time. For example, efforts to identify "critical" local facilities potentially at risk, to inventory local equipment and personnel available for emergency response, and to identify potential public shelters can and should be accomplished in the near future. There is also need and opportunity to initiate the involvement of the tourist industry in programme preparation and to assess fire hazard risks. Following further discussion of the findings and recommendations contained in this paper, local and central government officials may be able to identify other early action items as well.

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INTRODUCTION

As part of an effort to improve the effectiveness of local government in responding to emergencies caused by natural hazards, the Office of Disaster Preparedness and Emergency Relief Coordination has initiated a cooperative hazards management programme with the St. James Parish Council intended to accomplish three principal objectives:

1. To examine the institutional arrangements established by the Council for emergency preparedness and response, as well as for hazard mitigation planning;
2. To identify the high risk and damage-prone areas in Montego Bay, and the institutional and administrative constraints faced by local and central government agencies in responding to these problem situations; and
3. To recommend measures for improving the effectiveness of Parish government in disaster preparedness and hazard mitigation.

In pursuit of these objectives ODP staff and its consultants, Ralph M. Field Associates, Inc., held a series of meetings during 1984 with members of the Parish Disaster Committee. Several field trips were made to inspect high risk areas, and follow-up meetings were held with knowledgeable officials and professionals in the Montego Bay area to obtain the benefit of their experience and insights. As a result of these meetings and field trips, a number of key issues influencing the achievement of the three programme objectives emerged. In addition, specific local conditions highlighting the need for a comprehensive local programme for natural hazards management were identified.

This paper summarizes background conditions in Montego Bay; identifies known flood-prone areas (flooding being the principal natural hazard to affect the area); describes some current institutional problems in the Parish; and summarizes the key findings of the past year's meetings with Parish officials and local professionals relative to the achievement of programme objectives. The final section of this paper contains recommendations for the development of a comprehensive local programme for hazards management in Montego Bay.

EXISTING CONDITIONS IN MONTEGO BAY

Physical Features

Hydrology

Montego Bay is situated on a narrow plain which is dissected by a number of rivers and gully courses all flowing in a westerly direction. To the north, south and east of the city steep hills and rolling topography form several drainage basins.

Due to the topography of the surrounding hills, the preponderance of intersecting drainage systems, and the location of three rivers, the urban core of Montego Bay is subject to periodic flooding.

Geology

The geology of Montego Bay is composed mainly of reclaimed lands, marshes, swamps, alluvium, and intervalley deposits. Land has been reclaimed along the coast and between a number of offshore cays. Marshes and swamps are found along the coast and river estuaries; alluvium and intervalley deposits are located in Ironshore, Flankers and along the Airport Road.

Climate

Temperatures in Montego Bay range from approximately 21°C to 32°C with January and February being the coolest and July and August the warmest months. (Mines & Geology Report). Temperature is generally modified during the year by the prevailing trade winds which blow in a general easterly to southeasterly direction.

The average annual rainfall for the area is approximately 50 inches, with close to 70% occurring in the rainy season from May to June and September to October.

Growth and Development

Historical Development

Montego Bay's growth during the 18th and 19th centuries is attributable to its role as a major exporting centre. This role, coupled with Montego Bay's physical separation from both Kingston and Spanish Town enabled the town to exert some regional influence which stimulated its further development.

The decrease in plantation type agriculture in the mid-nineteenth century, however, had an adverse effect on the town, and increased accessibility to Kingston from other regional areas served to further weaken Montego Bay's regional influence. The decline in the town's growth was partially arrested by the advent of the tourist industry which started in Portland in the mid-1920's. Montego Bay soon surpassed Portland, however, as the dominant tourist centre in the island, a role which is still maintained.

Today, Montego Bay contains approximately 50% of the island's tourist accommodations and is heavily dependent on the tourist industry. Efforts to broaden the economic base of the town have not shown any appreciable gains over the past years, and it is unlikely that its dependence on tourism will change in the near future.

Size and Density

The area of Montego Bay increased in size from 4 square miles (2,576 acres) in 1960 to approximately 21.4 square miles (13,720 acres) in 1970. Consequent with this increase in size (due to conurbation) was an increase in population from 23,600 in 1960 to 43,521 in 1970.

In 1970 Montego Bay had a population density of approximately 2,034 persons per square mile (3.2 persons per acre) and an urban mass of 931,349. This represents an increase over the 1960 level of 1,449 persons per square mile (2.3 persons per acre) and an urban mass of 94,400. Projections are for the growth of Montego Bay to be contained within the urban boundary identified by the Town Planning Department in 1977.

Although Montego Bay still retains its position as the second city in Jamaica it can no longer be considered as the second largest urban residential area, since its population of 59,614 in 1982 was surpassed by the populations of Portmore and Spanish Town, 80,000 and 81,000 respectively. Portmore, however, is not a self-contained urban center, since it lacks the basic infrastructure normally associated with such a center.

Accessibility

Montego Bay is easily reached by the A class highway which traverses the island but internal movement is restricted by the narrowness of the streets and high pedestrian volume. To counter this problem several streets have been changed to one-way traffic flow. These streets unfortunately are not clearly identified and movement is often several. In addition, due to poor storm water drainage, access between several sections of Montego Bay is often impeded during periods of heavy rain.

Development Plans

Both the Town Planning Department and the UDC have prepared physical plans for Montego Bay. The TPD plan was prepared in 1978 and covers the entire city. The more recent UDC plan (1984) addresses the UDC's designated area which covers the entire coastal strip from Freeport to the airport, thereby encompassing the principal tourist-related development in the city. Neither plan addresses potential risk to natural hazards.

The Ministry of Construction (Works) has a long-range plan for drainage work in the designated North Gully flood water control area. The incremental implementation of this plan has been slowed by a current lack of funds.

Socio/Economic Characteristics

Tourism

Montego Bay is a tourist city and as such is subject to the gyrations of the industry. In 1983 tourism provided 4,932 jobs in Montego Bay through direct employment. Using the Planning Institute of Jamaica's 1:2.25 ratio of direct to indirect employment, it can

be estimated that approximately 11,097 jobs were generated by tourism for 1983 in Montego Bay out of a total of 25,733 jobs generated islandwide by this sector.

Agriculture and Fishing

Apart from tourism, limited fishing is conducted at a subsistence level by fishermen operating from the Urban Development Corporation complex on the waterfront. Agricultural activities are carried on close to the borders of the town. These activities include the production of bananas and sugar cane on the 2,326 acre Barnett Estate.

Industry

Industrial activities are limited to small light industries located close to the railway track. These industries are not major contributors to the overall economy of the area.

In terms of economic performance Montego Bay contributed some 6.7% of the Gross Domestic Product in 1982. In the same year the Gross Regional Product (G.R.P.) for the area amounted to \$J377 million; 41.0% of this was generated by the tourism and commercial sector, with a 15.8% contribution from the agriculture, construction and manufacturing sectors; wholesale and retail added an additional 24.4% (UDC Montego Bay Development Project).

Employment

Employment in Montego Bay tends to be seasonal, a factor which is not often appreciated by persons conducting employment surveys. Possibly this factor was overlooked in a UDC survey conducted in 1982 which fixed the unemployment level within the town at 10.8%. This figure appears unrealistic when it is noted that a Town Planning Department (TPD) study in 1977 listed the unemployment rate at 38%. It is unlikely that an increase in jobs of 27.2% occurred in the period 1977 - 1982; a more likely explanation for the difference in rate is the seasonality of employment which is characteristic of tourist towns.

FLOODING: THE PRINCIPAL NATURAL HAZARD

A study conducted by the Mines and Geology Division of the Ministry of Mining and Natural Resources identified flooding as a major problem in Montego Bay. Flooding of the city was particularly intense in 1973 as Hurricane Flora produced heavy rain. This rain resulted in the washing out of sections of upper King Street and severe flooding in the North Gully and Creek Street area, which almost divided the city into three sections. (The Urban & Engineering Geology of Montego Bay).

Hazard-Prone Areas

From a survey conducted in Montego Bay in early 1984 (Economic and Social Survey Jamaica, 1983, PIOJ) the following were identified as high risk areas due to the presence of major drainage problems and a high population concentration:

Canterbury

Catherine Hall

South Gully/The Creek/Dome Street

Flankers

The Waterfront

With the exception of the Waterfront which is subject to damage from wave action all other areas are prone to flooding from riverine or gully sources. Of these areas it is possible that the three most highly vulnerable are Canterbury, Catherine Hall and the Creek in the Dome Street area. For purposes of this discussion, the Freeport area is also included as a potential risk area because of its low elevation.

Canterbury

Located on the banks of the North Gully, Canterbury is a dense, low income area of over five thousand residents. The area is inaccessible from the north during inclement weather due to flooding of the roadway where the gully crosses the major access route. Overtopping of the gully wall is also possible in severe weather, a situation which would endanger residents on the lower slope. This problem would be further compounded by

the fact that while a major roadway parallels the Canterbury area there are no feeder roads into the Canterbury area itself. Vehicular traffic is therefore incapable of entering the area to render any assistance.

Sanitation and water quality degradation are major problems. Of the approximately five thousand residents of this area, it is estimated that over eighty percent (80%) share toilet facilities, usually an outdoor pit latrine. The overflowing of these latrines in the event of severe weather and the possible contamination of water bodies cannot be ignored.

Catherine Hall

Located on the floodplain of the Montego River (formerly prime agricultural land), Catherine Hall was originally conceived of as a low income housing scheme which, when fully developed, was to contain about 5,000 dwellings housing about 20,000 people. Construction began in 1974, but rapid escalation of building costs soon placed the housing beyond the reach of low income families. Today, it is regarded as a lower-middle class housing area. The first group of houses in West Green were constructed by UDC. A second group was built by Sites and Services (M. of Housing) through a World Bank loan. About 1,768 homes have been constructed to date.

The housing development is paralleled by a dike approximately 7'-8' high designed to protect it from flooding. (The highest recorded elevation of historical flooding from the sea in this area was +8'.) Some officials, however, consider the existing level of protection to be inadequate since minor flooding of the area has already occurred. There is also some confusion regarding maintenance of this dike. One frequently heard view is that, due to its location, maintenance is the responsibility of the Natural Resources Conservation Department. Currently, neither UDC (which built the dike) nor the Parish Roads and Works Department, maintains it. No flood warning procedures have been instituted for this area.

The Creek/Dome Street

The Creek/Dome Street area is actually the lower section of the South Gully. The area consists of mixed land-use with low income dwellings radiating from the intersection of Creek and Dome Street in a north/easterly pattern. This area is perhaps most prone

to flash flooding which is a perennial problem for residents and businesses located in the downtown area. Fortunately, due to the gradient of the area, ponding is not a major problem.

Flankers

Flankers is a low-income residential area located on relatively high, sloping ground to the south of the international airport. The housing is deteriorating and similar in character to that in the Canterbury area. It is estimated that approximately 5,000 people live in the area. Flood-related problems are caused by overland runoff and an inadequate internal drainage system. Some of the internal drains appear to cut across the natural drainage flow of the area. Construction of some remedial drainage works was started by the Ministry of Construction (Works) but not completed due to a lack of funds.

The Waterfront

The area of the waterfront by Doctors Cave Beach and the Half-moon Bay area was affected by heavy seas during hurricane Allen. Sea walls constructed in these areas were seriously undermined and several gyrones destroyed. The undermining of the seawall along the Doctors Cave Beach continues to be a problem during heavy seas. If sections of the seawall were to give way during coastal flooding, a number of hotels and restaurants would be marooned, since the road behind the sea wall provides the only access to the area.

Montego Freeport

Because of the low elevation of the Freeport Area, it is potentially subject to flooding from storm surge. The area is filled land. Buildings are reported to be at an elevation of 7' above mean sea level. Surface drainage appears to be a problem during periods of heavy rains.

- | | | | |
|----|-------------------|----|-------------------------|
| 1 | Water | 11 | Public Works Department |
| 2 | Highway | 12 | Police Station |
| 3 | Public Buildings | 13 | Fire Station |
| 4 | Church | 14 | Public School |
| 5 | Public Office | 15 | Public House |
| 6 | Public Hall | 16 | Public Club |
| 7 | Public Shop | 17 | Public Bar |
| 8 | Public Restaurant | 18 | Public Hotel |
| 9 | Public Office | 19 | Public Office |
| 10 | Public Office | 20 | Public Office |
| 11 | Public Office | 21 | Public Office |
| 12 | Public Office | 22 | Public Office |
| 13 | Public Office | 23 | Public Office |
| 14 | Public Office | 24 | Public Office |
| 15 | Public Office | 25 | Public Office |
| 16 | Public Office | 26 | Public Office |
| 17 | Public Office | 27 | Public Office |
| 18 | Public Office | 28 | Public Office |
| 19 | Public Office | 29 | Public Office |
| 20 | Public Office | 30 | Public Office |

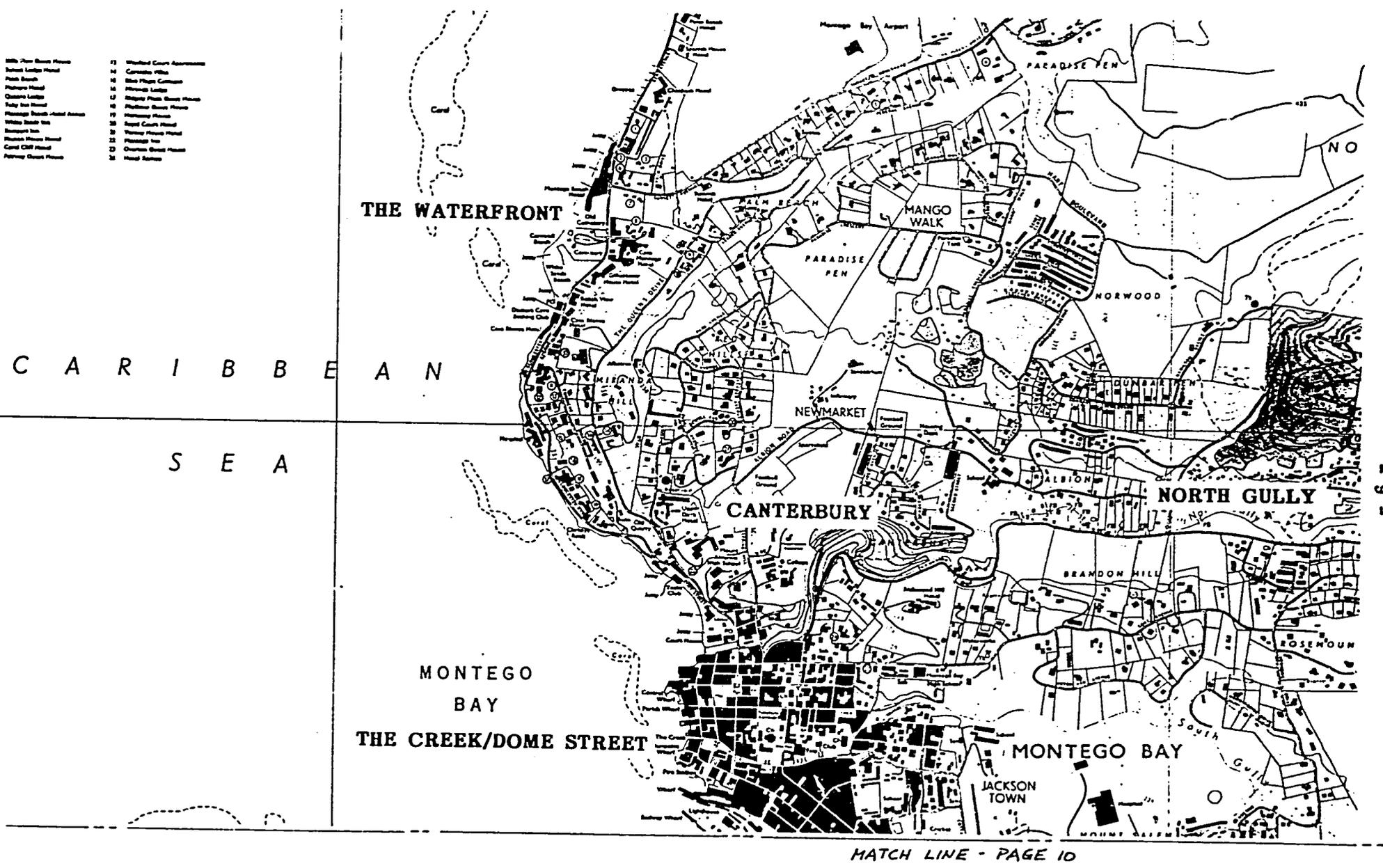
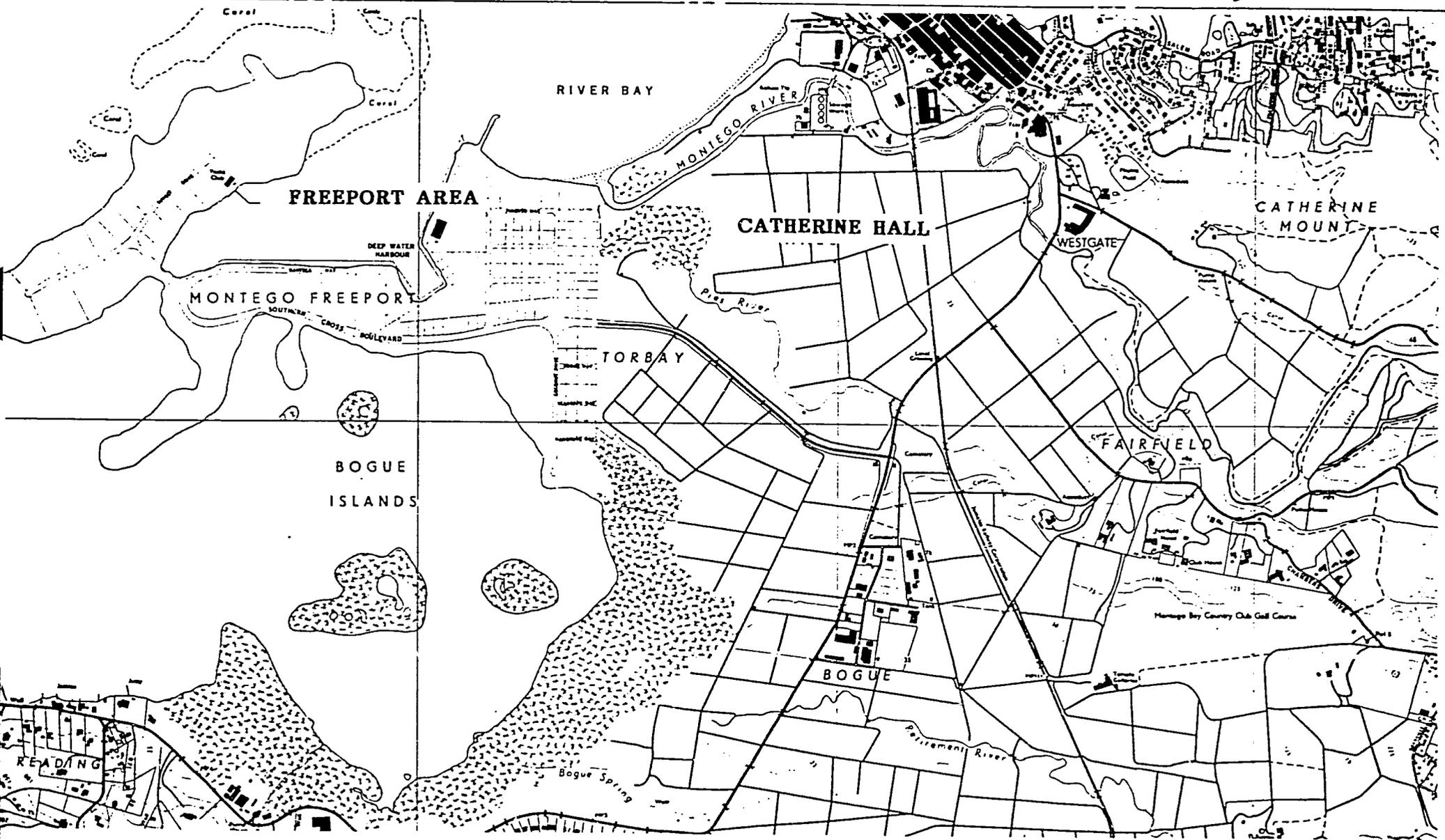


FIGURE 1: POTENTIAL FLOOD HAZARD AREAS



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FIGURE 1 (CONTINUED): POTENTIAL FLOOD HAZARD AREAS

INSTITUTIONAL PROBLEMS

Decline of Municipal Services

Development and improvement activities in Montego Bay have progressed at a very slow pace. Neither local nor national government has pursued the development strategies outlined for the city by the TPD and the UDC in the physical plans prepared by these agencies. The major public construction activities undertaken within the town tend to be of a remedial nature and not in accordance with the recommendations outlined in the various plans. These remedial activities lag far behind the development requirements of the city. The repair and upgrading of infrastructure and municipal services is essential to serve Montego Bay's growing population, particularly if Montego Bay is to retain its position as a centre for tourism in the Caribbean.

The Parish Council currently lacks sufficient funding to address the present decline of services within the city. None of the key Parish agencies are currently capable of performing their functions in an efficient and effective manner. This includes the office of the Superintendent Roads and Works, the Fire Service, Poor Relief Department and other supporting agencies.

Medical Service

Faced with the twin problem of lack of manpower and under-financing, the medical service for the Parish is currently incapable of responding fully to a major disaster. The problem of hospital flooding during heavy rains (due to poor site design) also compounds the problems of efficient management during a weather-related disaster event. In addition to their regular duties, hospital staff are required to cope with the problem of keeping patients and supplies dry.

Public Works

The Public Works Department operates a number of heavy vehicles within the Parish. It is currently faced with a lack of funding for the maintenance of "down units" and the licensing of operational units. In this situation it is unlikely that the Department would be able to respond fully to an emergency situation.

Institutional Conflicts

The Parish Council in Montego Bay is faced by a dilemma in which council members wish to stimulate additional growth but at the same time lack the financial resources to move toward realization of such growth. Being unable to directly implement the projects and programmes deemed necessary, the Council gives support to, but cannot directly influence projects carried out by other government ministries, departments and statutory bodies. Consequently the regulatory and planning functions of the Council have tended to become increasingly less effective.

Even among central government agencies, problems periodically arise relative to the actual and perceived roles of agencies operating within Montego Bay. An example of this is the confusion regarding the maintenance of the dike along the Montego River. Although this dike was built by the Urban Development Corporation to protect a Ministry of Housing project, it is the opinion of members of the Parish Council that its maintenance is the responsibility of the Natural Resources Conservation Department.

Parish Council's Role In Reconstruction

The major role of rehabilitation and recovery following an emergency (disaster) is generally seen by members of the Council as the responsibility of the national government. While there are a number of reasons for this attitude, the predominant one is financial. It is generally accepted that the national government, being the funding source, will in any serious disaster event determine and dictate the style and scope of recovery/rehabilitation activities. The ability of the Council is perceived as being very limited in this regard.

Parish Disaster Committee

This committee, composed of those persons listed below, has not met on a regular basis and at the moment is not overly concerned with post-disaster rehabilitation.

- The Custos - Chairman
- The Mayor - Deputy Chairman
- The Parish Councillors
- The Senior Police Officer
- The Senior Fire Brigade Officer
- The Senior Medical Officer
- The Senior Poor Relief Officer
- The Superintendent of Roads and Works
- The Parish Managers of Central Government Ministries
- The Parish Managers for the Public Utilities
- Representatives of the Voluntary Agencies within the Parish
- Representatives of the Private Sector within the Parish
- Representatives of the HAMS and CB Clubs within the Parish
- A representative from Jamaica Information Service (JIS)
- The Parish Council Secretary

The Disaster Committee is responsible for implementing the Parish Disaster Plan, the purpose of which is to detail arrangements to cope with the effects of natural and man-made disasters occurring in the Parish. As such, the primary focus of the existing Disaster Plan is on pre-disaster preparedness activities, with post-disaster actions being limited to the immediate clean-up tasks.

SUMMARY OF FINDINGS

Key Issues

As a result of the background research conducted by ODP and the dialogue between ODP, Ralph Field Associates, Parish officials, and local professionals, several key issues affecting the development of a comprehensive hazards management programme in Montego Bay have emerged. While some of these issues may be viewed as constraints to the development of an effective programme, these issues may also be seen to highlight the need for such a programme.

No coordinated disaster response and recovery plan. Although the various agencies of Parish government exhibit an understanding of their respective responsibilities in responding to natural disasters, no coordinated plan or programme exists for the mobilization of Parish and central government resources prior to and immediately following a disaster event, nor is there a strategy for recovery and reconstruction in high risk areas following a disaster.

No consensus on magnitude of risk. While there is general agreement among local officials about the areas in Montego Bay that are most subject to damage from natural hazards, there is less unanimity about the magnitude of risk. This is particularly true of the Catherine Hall area, where informed opinion runs the gamut, from judging the area to be relatively safe to characterizing it as highly vulnerable. In the absence of any consensus, it is understandable that contingency plans for warning, emergency evacuation, and pre-disaster mitigation have not been devised.

No capital improvements programme for flood control and drainage planning. Despite repeated instances of local flooding and coastal erosion there is no comprehensive capital improvements programme for dealing with these problems. Indeed, the formulation of such a programme is almost precluded by the division of responsibility for capital construction between Parish and central government agencies and among central government agencies themselves. The development of Catherine Hall, for example, has been carried out by the Ministry of Construction and the UDC. Yet neither agency is responsible for flood control despite the fact that the entire development is within the flood plain of the Montego River, protected by earthen dikes. There is no single urban

storm water drainage plan or programme for Montego Bay and it is unclear who is responsible for this function, particularly since the Ministry of Construction (Works) and the UDC have assumed separate responsibilities for the reconstruction of the North and South Gullies respectively.

Shortage of funds and manpower. Because of the current shortage of funds, the Parish Council is only able to carry out routine tasks on a daily basis. This has slowed disaster preparedness activities within the Parish since such activities are not seen to represent immediate needs. The Parish Council and its local operating agencies are also handicapped by a serious shortage of qualified personnel. While the shortage of technical personnel has been exacerbated by the current financial problems, the situation cannot be entirely blamed upon present circumstances. The permitting and enforcement process, for example, has been chronically weak. Only two building inspectors are available for the entire Parish, a situation that predates the present budgetary difficulties. Yet Montego Bay is the second largest city in Jamaica and St. James is one of the most rapidly expanding parishes.

Uncertainty regarding local planning and decision-making authority. In reviewing the implementation of hazard mitigation measures the Parish Council appears to be unclear as to the appropriate division of responsibility between it and the agencies of the central government. This uncertainty also applies to the role of the Parish Council in planning for the future development of Montego Bay. In this regard, the role of the Council is dwarfed in comparison with the power exercised by central government units, particularly by the Urban Development Corporation. The UDC has been the driving force behind the development of the Montego Bay waterfront, Freeport, and Catherine Hall, as well as playing a major role in the planning and construction of municipal infrastructure. If the Parish Council is to assume an enhanced role in disaster preparedness and related activities, its planning and decision-making functions need to be significantly strengthened.

Opportunities for Programme Development

In addition to the basic constraints affecting the development of a hazards management programme (due in large part to current budgetary and manpower shortages), several opportunities for programme development are also evident.

Local interest in hazard mitigation. Local officials have expressed a definite interest in pursuing the development of specific hazard mitigation measures. In discussions with members of the Disaster Executive Committee concerning opportunities for effective hazard mitigation, interest centered on the following types of activities: relocation of people from high risk areas; storm water control in areas where the problem can be readily rectified; and reclamation of sections of the waterfront, including the construction of sea defenses.

Local awareness of risk-related problems. Awareness of the risk-related problems among Parish officials is quite evident. While there is interest and willingness to address many of the problems there is, however, understandable uncertainty as to the course to be followed and the financial capability of the Parish to implement any new activities.

Potential for involving the tourist industry. The importance of tourism in the Jamaican economy, and the importance of Montego Bay in the tourism industry would seem to be a strong inducement for the central government to strengthen the planning and programming capabilities of the St. James Parish Council, particularly with regard to hazard mitigation. Much closer liaison, for example, is needed between the Parish Council and the tourist hotels to cope with potential emergency situations, including possible evacuation of shorefront hotels during a hurricane.

Potential for coordinating disaster preparedness and response planning with development planning. There is, above all, a need for a continuing dialog between the agencies of government responsible for the health and safety of Montego Bay during emergencies, and the local and central government agencies responsible for planning the future growth and development of Montego Bay. Since the Parish Disaster Committee now has representatives from all of the principal central and local government agencies, this Committee is in an excellent position to seize the initiative in helping to strengthen the leadership role of Parish government.

RECOMMENDED DIRECTIONS FOR ACTION

Since the major problems currently facing the Parish Council revolve around making ends meet on a daily basis, it is unlikely that hazards management will receive priority attention without active encouragement and support from the Office of Disaster Preparedness.

Given this reality, the Office of Disaster Preparedness can most effectively assist the Council in alleviating some of the most urgent needs by creating a bridge between the Council and key agencies of the central government, particularly the Ministry of Construction and the UDC. Such assistance would serve to strengthen the working relationship between the Office of Disaster Preparedness and the Parish Council, facilitating development of the local programme for natural hazards management. The basic goal of this programme should be to expand and integrate the disaster preparedness and emergency operations components of the current Parish Disaster Plan with: (a) additional procedures for recovery and reconstruction; and (b) a longer-term mitigation plan for implementing pre-disaster measures for reducing future disaster effects.

While the development of certain components of the overall programme will require the assistance of central government agencies, the principal responsibility for programme development should rest with the Parish Council. Without the total involvement and commitment of the Parish Council in this endeavor, the programme cannot be successfully developed and implemented.

Suggested Programme Framework

As noted above, the programme should be designed to incorporate the elements of the existing Parish Disaster Plan with a plan for recovery and reconstruction and a plan for developing longer-term measures to mitigate future disaster effects. Stated another way, the overall program should address: disaster preparedness and response; post-disaster recovery and reconstruction; and pre-disaster mitigation.

To date, the greatest attention in St. James Parish and Montego Bay has been directed toward disaster preparedness and response as evidenced in the preparation of the Parish Disaster Plan. The planning and implementation of effective pre-disaster mitigation measures, however, will necessarily represent a longer-term work effort on the part of those involved. The overall programme might therefore be thought of as a two-part plan containing two basic components: an immediate action component — the "Disaster Plan"; and a long-range component for reducing risk and vulnerability to natural disasters — a "Mitigation Plan". The suggested elements of these two components are outlined below.

Part 1: The Disaster Plan

This component of the overall programme should address disaster preparedness and response measures as well as recovery and reconstruction activities in the post-disaster period. Individual elements of this component should, where possible, address responsibilities and procedures for:

1. Forecasts and warnings of hazard events.
2. Emergency operations, including search and rescue, traffic control and security, maintenance of public health.
3. Evacuation.
4. Damage assessment.
5. Repair and replacement of damaged facilities; including provision for technical and financial assistance and possible relocation of damaged facilities.
6. All-perils insurance provision.
7. Public education.

Vital to the effectiveness of the Disaster Plan will be the development of a programme for training Parish personnel to carry out these disaster preparedness and response elements.

Part 2: The Mitigation Plan

This longer-range component of the overall programme should address the development of pre-disaster mitigation measures — that is, measures designed to reduce future damage impacts rather than simply warn the population at risk, conduct emergency operations, and "pick up the pieces". Such measures should, where possible, include:

1. Data Collection and Risk and Vulnerability Analysis, including
 - o Delineation of Hazard Areas; Mapping
 - o Assessment of Vulnerable Development within Hazard Areas
2. Planning and Regulatory Measures to Guide Future Development, including possible
 - o Land Use Regulations
 - o Comprehensive Planning (incorporating disaster mitigation planning with development planning)
 - o Construction Standards
 - o Open Space Acquisition
 - o Insurance and Lending Practices
 - o Public Investment and Construction Policies
3. Corrective Measures Applied to Existing Development, including possible
 - o Relocation and Acquisition
 - o Redevelopment and Renewal
 - o Retrofitting
4. Structural Measures, including possible
 - o Engineering Works
 - o Drainage Planning
5. Public Education

Suggested Next Steps

The successful development and implementation of the comprehensive hazard management programme will necessarily require a long-term work effort and commitment on the part of all involved. While the difficulties associated with this effort are compounded by the current lack of Parish Council and central government resources, there are some elements of the programme which, with the aid of ODP, can nevertheless be initiated at this time.

Facilitate Inter-Governmental Coordination

The confusion which currently exists regarding the role of the national government vs. the role of the Parish Council in the event of a disaster must be clarified, as should the specific division of responsibility among government departments, ministries and statutory bodies operating in the area. In addition, closer liaison is needed between the Ministry of Local government, the Parish Council, and the various central government agencies operating in Montego Bay in order to facilitate the preparation of the comprehensive disaster programme. ODP will take the lead in these efforts through

organisation of meetings involving representatives of key central government agencies and the St. James Parish Council. These meetings (initiated in January 1985) have addressed the needs and objectives of the Montego Bay hazards management programme and the importance of the Parish Council taking the lead in its preparation. The principal objective of future meetings will be to reach consensus on the clarification of roles and a determination of how much responsibility the Parish Council will have in implementing specific aspects of the programme.

To facilitate the establishment and implementation of this consensus, ODP, with the concurrence of the St. James Parish Council, has initiated the preparation of an intergovernmental, interagency Memorandum of Agreement. This agreement, which would be signed by all participating agencies, will specify: (1) general roles in disaster preparedness and response, post-disaster recovery and reconstruction, and pre-disaster mitigation; and (2) area specific responsibilities for protecting life and property in known high-risk areas. A draft outline for the Memorandum of Agreement is contained in Appendix V.

Proceed with Early Action Components

Procedures for emergency operations are contained in the Parish Disaster Plan. Forms for use by Parish officials in damage assessment have also been developed. These procedures and damage assessment forms need to be tested, however, and additional preparedness planning remains to be carried out including such priority tasks as:

- o Organising the local emergency communications network.
- o Establishing search and rescue procedures.
- o Identifying critical facilities potentially at risk.
- o Inventorying local equipment and personnel available for emergency response.
- o Researching historical hazard events and local impacts.
- o Mapping high-risk areas based on historical experience.

Such measures can and should be accomplished in the immediate future. Development of other preparedness measures, such as evacuation planning for selected high-risk areas (possibly the Catherine Hall area and/or the North and South Gully areas) will require more time and resources to develop. Nevertheless, evacuation planning work can proceed at this time through the identification of potential public shelters and the assessment of their structural soundness. Development of a plan for relocating development (e.g., residences, utilities) from damaged areas, however, will require longer-term efforts due in part to legal implications and to economic and social costs which must be considered.

In addition to the immediate action components noted above, several additional work activities contributing to development of a comprehensive hazards management programme may also be initiated at this time.

o Initiate involvement of the tourist industry in programme preparation.

Since tourism is the major economic activity in Montego Bay, the Parish Council should seek to involve this sector in the preparation of an overall emergency plan for the Montego Bay area. To facilitate this involvement, ODP will initiate dialogue with the Ministry of Tourism and a survey of hotels and guest houses to assess emergency preparedness. ODP is currently preparing a survey form/checklist for this purpose which will include status evaluations of: existing fire equipment; liaison with Parish Disaster Committee; communications equipment and organisation; training of employees with respect to disaster preparedness and response functions, etc.

o Assess risk and vulnerability to fire hazards.

A special survey should be conducted to assess the vulnerability of Montego Bay to fire damage. Although such a survey is to be carried out in accordance with normal Fire Brigade responsibilities, given the current scarcity of resources this survey may not have been completed at this date. It may be possible for the Superintendent of Roads and Works to assist the Fire Brigade in this effort or to draw reserves from the KSAC Fire Brigade to lend assistance. From casual observation it would appear that fire is a major threat, being particularly high in the downtown area. The vulnerability of residential as well as commercial and industrial sites should be assessed. The fire department is in dire need of specialized equipment including aerial ladders and rescue vehicles. Given the concentration of tourist hotels in Montego Bay coupled with the responsibility of the fire brigade for dealing with airport emergencies, the needs of this department should receive priority attention.

There is also a need to review potentially hazardous industrial situations such as presented by fuel tank farms and chemical operations in the area.

o Initiate preparation of municipal maintenance programme.

Municipal upkeep and maintenance are as important to the development and progress of a town as is good design. Efforts should therefore be made to develop a priority

maintenance programme for Montego Bay that will allow for the focusing of limited resources on identified problem areas. Gully cleaning is a continuing problem, as is solid waste disposal. Trash and garbage now accumulate on residential and commercial streets adjacent to downtown Montego Bay. This is principally a public health problem, but it also has a negative impact on tourists visiting Montego Bay from other areas of Jamaica and from overseas.

o Identify alternate transportation routes.

Due to the nature of local topography and other conditions, it is highly likely that certain roads in the Montego Bay area will be washed out during heavy rains. There is need to identify the most vulnerable roads and to establish alternative transportation routes to be used in emergency response operations such as evacuation, search and rescue, etc.

There is an immediate need for establishing "secure corridors" for vehicular movement following heavy rains or other disaster events. These corridors should permit all-weather movement between the airport and the hospital, between the eastern and western sections of Montego Bay, between the upper and lower Canterbury area, and between the JDF base to the north of the airport runway and the main airport road.

APPENDIX 1: BRIEF DISASTER HISTORY OF MONTEGO BAY

Historical Record

- 1789 - Montego Bay was almost completely ruined by hurricane which destroyed Savanna-la-mar.
- 1795 - Great Montego Bay fire, one hundred and ten (110) homes destroyed.
- 1808 - Second great fire in Montego Bay.
- 1839 - Flooding in Montego Bay destroyed several homes and resulted in loss of lives.
- 1844 - Hurricane which affected Cuba, caused high seas in western Jamaica, affecting several parishes. Montego Bay was severely affected.
- 1849 - Fire in Montego Bay destroyed several buildings.
- 1951 - Hurricane Charlie affected the city.
- 1957 - Earthquake occurred with epicentre off the Montego Bay coast.
- 1963 - Flooding from Hurricane Flora.
- 1980 - Damage sustained from Hurricane Allen.

Historical Expenditures in Montego Bay by the Ministry of Construction (Works) 1962 - 1983. (Expenditures for 1963 not included.)

- River Control Works and Drainage	\$463,431.
- Reclamation Works	619,494.
- Sea Control Works	68,636.
- Flood Control	2,994,493.
- Flood Damage Reconstruction (excluding Hurricane Allen)	<u>49,801.</u>
TOTAL:	\$3,19,855.

APPENDIX II: GEOLOGICAL FORMATIONS IN MONTEGO BAY

Stability of Geological Formations

<u>LITHOLOGIES</u>	<u>BEARING CAPACITY</u>	<u>SLOPE STABILITY</u>	<u>DRAINAGE</u>	<u>PERMEABILITY</u>	<u>SEISMIC STABILITY</u>
Reclaimed Lands	L	-	L to M	L to M	L
Marsh and Swamp	Very L	-	Very L	Very L	L
Marine Sediments	L	L	L to M	L	L
Alluvium, Interior Valley Deposits	L	-	H	H	L
Limestone Reefs	M	L Wet M Dry	L to M In Rubble	Primary L Secondary H	L to M
Coastal Limestone	M	M	L to M In Rubble	Primary L Secondary H	L to M
Montpelier Limestone	M to H	H	H	Primary L Secondary H	H
Gibraltar-Bonny Gate Limestone	M to H	H	H	Primary L Secondary H	H
Font Hill Beds	M to H	M Wet H Dry	M to H	Primary L Secondary H	M to H

Stability Code:

L - Low
M - Medium
H - High

SOURCE: TOWN PLANNING DEPARTMENT, MONTEGO BAY

[Map of geological formations to be added.]

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APPENDIX III: NAMES OF KEY CONTACTS IN MONTEGO BAY

NAME	ORGANISATION	TELEPHONE NUMBERS
Supt. Philip McKain	Fire Brigade	952-2311
Mr. A. C. Melbourne	Poor Relief	952-2683
Supt. F. G. O'Meally	Roads & Works Parish Council	952-5500
Dr. M. C. Holding Cobham	Cornwall Regional Hospital	952-2693
Mr. D. R. Richards	Supt. Public Works Department	952-2931

APPENDIX IV: SELECTED BIBLIOGRAPHY

1. Mines and Geology Division (Ministry of Mining and Natural Resources), The Urban and Engineering Geology of Montego Bay: A Preliminary Report.
2. Planning Institute of Jamaica, Economic and Social Survey of Jamaica, 1983.
3. Town Planning Department (Ministry of Finance and Planning), Montego Bay Development Plan - 1976.
4. Urban Development Corporation: Montego Bay Development Project.

APPENDIX V: OUTLINE FOR MEMORANDUM OF AGREEMENT

Part 1: Purpose

The signatory agencies to this Memorandum of Agreement concur in the need to:

Clarify their general role in disaster preparedness, emergency response, post-disaster recovery and reconstruction, and pre-disaster mitigation relative to protecting lives and property in the Parish of St. James and the City of Montego Bay against the effects of such disasters as may be caused by natural hazards, fires, and other events.

The signatory agencies do further see the necessity of setting forth their specific responsibilities for protecting life and property in the following areas which are judged to be particularly vulnerable to the hazards of flooding.

1. The Canterbury area adjacent to the North Gully.
2. The Catherine Hall housing estate west of the Montego River.
3. The South Gully/Creek/Dome Street area.
4. The Flankers area.
5. The waterfront commercial and tourism development on the south side of Kent Avenue adjacent to the seawall.
6. Montego Freeport.

Part 2: General Roles and Responsibilities

[Additional discussions are required among the identified central and local government agencies in order to reach consensus on appropriate agency roles with regard to disaster preparedness and emergency response, post-disaster recovery and reconstruction, and pre-disaster mitigation activities. Once consensus is reached, the roles and responsibilities will be set forth below in the final memorandum.]

A. Disaster Preparedness and Emergency Response

1. Central Government Responsibilities
 - o Office of Disaster Preparedness (ODP)
 - o Ministry of Construction (Works)
 - o Ministry of Construction (Housing)
 - o Urban Development Corporation (UDC)
 - o Ministry of Tourism
 - o Natural Resources Conservation Department (NRCD)
 - o Ministry of Health
 - o Town Planning Department
 - o Airport Authority
2. Local Government Responsibilities
 - o Ministry of Local Government
 - o Parish Council and Disaster Committee
 - o Police
 - o Fire Brigade
 - o Superintendent of Roads & Works

B. Post-Disaster Recovery and Reconstruction

1. Central Government Responsibilities
2. Local Government Responsibilities

C. Pre-Disaster Mitigation

1. Central Government Responsibilities
2. Local Government Responsibilities

Part 3: Specific Responsibilities for Area Protection

[The participating central and local government agencies will also reach consensus on specific preparedness, response, recovery, reconstruction, and mitigation measures that may be appropriate in each of the risk areas identified below. These measures will be set forth in the final memorandum of agreement. The appropriate agencies agreeing to accept responsibility for implementing these measures will also be identified in the memorandum. By signature of the final memorandum, the signatory agencies will establish their commitment to carrying out these measures.]

A. Canterbury

1. Disaster preparedness and emergency response
 - o Central government agencies
 - o Local government agencies
2. Post-disaster recovery and reconstruction
 - o Central government agencies
 - o Local government agencies
3. Pre-disaster mitigation
 - o Central government agencies
 - o Local government agencies

B. Catherine Hall

1. Disaster preparedness and emergency response
 - o Central government agencies
 - o Local government agencies
2. Post-disaster recovery and reconstruction
 - o Central government agencies
 - o Local government agencies
3. Pre-disaster mitigation
 - o Central government agencies
 - o Local government agencies

C. South Gully/Creek/Dome Street

1. Disaster preparedness and emergency response
 - o Central government agencies
 - o Local government agencies
2. Post-disaster recovery and reconstruction
 - o Central government agencies
 - o Local government agencies
3. Pre-disaster mitigation
 - o Central government agencies
 - o Local government agencies

D. Flankers

1. Disaster preparedness and emergency response
 - o Central government agencies
 - o Local government agencies
2. Post-disaster recovery and reconstruction
 - o Central government agencies
 - o Local government agencies
3. Pre-disaster mitigation
 - o Central government agencies
 - o Local government agencies

E. The Waterfront

1. Disaster preparedness and emergency response
 - o Central government agencies
 - o Local government agencies
2. Post-disaster recovery and reconstruction
 - o Central government agencies
 - o Local government agencies
3. Pre-disaster mitigation
 - o Central government agencies
 - o Local government agencies

F. Montego Freeport

1. Disaster preparedness and emergency response
 - o Central government agencies
 - o Local government agencies
2. Post-disaster recovery and reconstruction
 - o Central government agencies
 - o Local government agencies
3. Pre-disaster mitigation
 - o Central government agencies
 - o Local government agencies