

APPENDIX A'
LIST OF REFERENCES

APPENDIX A

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APPENDIX B'

MONTSERRAT WATER AUTHORITY
DISASTER PREPAREDNESS PLANS FOR HURRICANES
AND DRAFT VOLCANO ALERT PLAN

APPENDIX B

MONTSERRAT WATER AUTHORITY

DISASTER PREPAREDNESS PLAN

Warnings are as follows:-

(a) "First Warning - "Storm Warning"

This indicate that there is a tropical storm approaching the Leeward Islands are which might develop into a hurricane.

(b) "Second Warning - "Hurricane Watch"

This indicates that the tropical storm has increased in strength to hurricane force and that hurricane conditions in Montserrat are a real possibility within twenty-four hours but not imminent.

(c) 'Final Warning - "Hurricane Warning'

This indicates that a hurricane is likely to strike Montserrat within twenty-four hours, or even less.

1. At the Storm Warning

- 1.1 Water level in reservoirs to be checked and action taken to bring them up to maximum without depriving the public, e.g. increase pumping etc.
- 1.2 All Mechanic and Pump Operators are to check vehicles and plant serviceability and where necessary bring up to standard. Where possible diesel and other emergency supplies should be stored.
- 1.3 Check stocks of pipes (2" and larger), chlorine and tools at the start of hurricane season.
- 1.4 All accounting records and office files are to be properly secured by the Accountant, Secretary and Supervisors.
- 1.5 Stocks of food, drinks, coffee and first aid materials to be procured by Operations Manager and Supervisor and held at Woodlands by the Store-keeper.

2. At the Hurricane Watch

- 2.1 Water Tanker to be filled and kept at Salem. Store-keeper should issue flashlights, cloaks, masks, etc.
- 2.2 All vehicles, plant etc. after normal working hours to be filled with fuel, etc. and brought into Woodlands. In cases where the weekend is involved, all drivers and Operators should report for duty to ensure that their vehicles are filled with petrol or diesel.

A special number of forty-five (45) gallons oil drums should be collected washed and cleaned thoroughly. These should be filled with diesel/petrol and placed at each pumping station. These can be used in JCB/Tractor and other plant after the hurricane has passed.

2.3 Security Officers report to compound for duties. Employees on duty for more than eight hours (8hrs) should return home for food if possible.

3. 'At the 'Hurricane Warning'

3.1 Emergency meeting between management and staff should be arranged to discuss appropriate action. The public must be notified to store drinking water and boil water after hurricane.

Team (1) East	Team (2) North	Team (3) South	Team (4) Central	Team (5)
E. Duberry R. Cabey G Frye J. Ryan L. Daley -----	R. Kirwan J. Daley A Tuitt -----	S. Skerritt R. Mulcare R. Hogan T.E. Ryan -----	W. Weekes C. Aymer A. Weekes -----	B.Greenaway K. Ryan
Vehicles				
G2540	G2061	G2081	G1387	G2040

The supervisor of pumping will issue authority to turn off power at all pumping stations after consultation with Monlec.

All vehicles returned to compound and workers returned home.

Note:

Public Works Department Tanker will be stationed at the St. John's Clinic.

3.2 Compound to be secured and staff return to their homes. Ronold Hogan and Wayne Locker and Supervisor responsible for Area (II).

3.3 Office to be secured and staff returned to their homes These include computerize system, typewriters, cabinets, files and any other assets.

4. After Hurricane has passed

4.1 Mr. Ryan, Engineer Thomas, Operations Manager, Mr. Chambers, Mr. E. Duberry, Account and Supervisor Irish is to carry out an assessment after the hurricane has passed.

4.2 All employees must report for duties as soon as possible after the hurricane.

4.3 External assistance should be sought, priority should be given to Montserrat Water Authority if required.

4.4 William Tonge to manage workshop and monitor water quality closely.

4.5 Hilderine Tuitt/Patricia Cabey to control and issue stores, tools, food etc.

4 6 Accountant and Supervisors organise clean-up of office

4.7 Coopt/employees to assess and collect reports of damage.

Employees should report to assist with restoration of supply and clean-up as soon as possible.

Priority Areas:

4.8

- a) check mainline from Killiecrankie
- b) check generators
- c) restore water to Hospital (Mr. Chambers)
- d) restore water to Monlec
- e) restore water to Plymouth and all areas.

4.9 Manager to liaise direct with the National Disaster Committee and make in-house arrangements for relief to essential workers.

4.10 Miss G. White and Miss D. Herbert will receive reports and disseminate information where necessary.

4.11 Mrs Y. Jeffers and Store-keeper will be relief officers

Note:-

Water Tankers are not to distribute water without authority from Lab Technician as rationing may have to be enforced. PWD officials should be informed to adhere to this instruction.

Security control of reservoirs - spring sources

Essential Items

- (a) Vehicles - All pick-ups, land rover, JCB, tipper truck, tractor, front end tipper.
- (b) Plant - Compressors, pipe cutting saws, wood cutting saws, portable pump welding machine.
- (c) Tools - Picks, shovels, cutlasses, axes, wrenches, etc. valve keys, lamps.

Note:

Allocation of vehicles subject to changes made as required:

- 1 G2040 - Pump Operators
- 2. G2540 - East
- 3. G1387 - Central
- 4. G2061 - North
- 5. G2081 - Southern

General Manager, MWA

Date

MONTSERRAT WATER AUTHORITY

DRAFT VOLCANIC ALERT PLAN

INTRO:

Human behaviour will influence the outcome of a volcano emergency. Some staff will cooperate with instructions while others will not heed alarm or warnings of danger. Panic can cause more deaths and injuries than the effect of high winds, flooding, darkness or fire.

The Montserrat Water Authority throughout its existence has shown that workers can accomplish a great deal in times of disasters.

The alert stages of volcanic activities will be read and broadcast by all media centres using the three (3) categories of coded colours, to inform the public on the state of preparedness for the probability of an evacuation.

These are:

- (1) GREEN
- (2) ORANGE (a) & ORANGE (b)
- (3) RED

GREEN indicates that an alert is given to inform or warn residents that seismic activities are being experienced and therefore people should be aware of the state of readiness for evacuation to the designated safe areas.

ORANGE (a) indicated that increases in volcanic activities have been observed. All residents, schools, Institutions, Government Departments, Utilities, Business places etc., should begin to secure their assets or move them across the safe line that has been established by the scientists.

ORANGE (b) indicates a probability exist for an eruption and therefore property and company equipment will be moved to a safe location across the demarcation line.

RED indicated that an eruption is likely to take place within a lead time of two (2) - six (6) hours for residents to evacuate from the danger areas to a safe location that has been established.

WARNING SYSTEM

Ringling of Church bells.

Sounding of police and fire sirens.

ASSEMBLY POINTS

In case of an evacuation order authorised by the person or persons to do so, the Water Authority staff at the following locations e.g. Wall street and Colony House will assemble at these points. All workers will be accounted for by a member of staff.

WALL STREET

All workers including distribution, water quality, engineering, stores, Distribution clerk, mechanic workshop will assemble in the area immediately north of the security guard house.

The security guard will register the names of workers leaving the compound. Workers will then leave for their homes or proceed to designated safe area.

If by any means that the Water Authority have secured suitable accommodation for staff or critical operational staff, such as repair crews, pump operators, security guards etc., they will report to this location for duties.

ADMINISTRATION

All Administration staff will assemble downstairs in front of the building office.

The Accountant will register the names of workers. Workers will then leave for their homes or proceed to the designated safe area.

Other staff members, who may not be present at the two (2) locations mentioned, all efforts will be made to contact them either by beeper, telephone, radio communication, or via Radio Montserrat to alert them of the evacuation order.

It is expected that at this stage all contingency plans prior to the different stages of alert will have been completed by all employees including the following:

- General Manager
- Operations Manager
- Engineer
- Accountant
- Supervisors
- Snr/Act/Clerk
- Foremen
- Stores Accountant
- Storekeeper
- Operation Clerk
- Secretaries
- Operators of Heavy Equipment
- Senior and Junior Plumbers

Security staff and
Other members of staff

Such plans will include moving and securing important documents, computers, and computerised systems, typewriters, printers, draughting equipment, photo copiers, files etc.; heavy equipment, transport, generators, spare parts for pumps and motors, spare pumps and motors, pipe and fittings, tools, oil and petrol, Gaseous chlorine, calcium hypochlorite, spare parts for gaseous chlorinators etc.; other equipment used for testing water quality. etc.;

It would be most essential at this point for the Stores Accountant and storekeeper to secure pipes and fittings for maintenance in the safe zone, and transfer them to a safe place in the north to be secured by MWA.

Specific safe holding areas for utilities and government equipment will be identified. The Supervisor Operations and Foreman mechanic will liaison with the Utilities Coordinators for a suitable location to park MWA heavy equipment.

The alert and response of each worker, teams, supervisors or individuals will depend on there ability to operate and be accountable for his or her duties and to secure company assets which he/she will be responsible for before and post recovery of a disaster

CRITICAL STAFF ALERT AND RESPONSE

General Manager

ALERT

The General Manager must ensure that all staff members are aware of the pending alert stages and to initiate their activity and completion before the evacuation begins

Ensure that the public is advised to carry with them water for drinking purposes.

RESPONSE

Manage the water supply system and post recovery efforts through NDC.

Maintain liaison between the NDC by informing the public on actions being taken to improve water supplies.

Receive assessment of damage to the water supply infrastructure.

Maintain dialogue with all utilities, ministries, and departments for possible assistance.

Operations Manager

ALERT

Pre-position all Water Authority heavy equipment in a safe place to minimise time in the event that key routes are closed after the disaster.

Ensure that critical staff members have completed their operational task to by-pass or close off reservoirs and divert water supplies to the safe areas.

Secure other MWA assets and assist supervisors and foremen in securing MWA staff members homes.

RESPONSE

Provide logistical service to key districts as required. This will also be linked with all operations in the delivery of the water supply. These will include:

- a) Hospital
- b) Infirmary
- c) Shelters and other institutions

The Water Authority will seek assistance from the Defence Force to guard key water installations.

Assess the daily water demand requirements and storage and introduce water rationing when necessary to meet some daily demands.

Advise the General Manager on the status of the water system daily and make recommendations to improve the level of service on short and long term basis

Ensure that communication channels are opened between the EOC and the utility.

Engineer

ALERT

Secure or pre-position all Water Authority drawing equipment, computer etc., in a safe location to minimise time.

Ensure that staff is aware of alert advisory being carried by radio and television.

Provide logistical support in securing MWA property at Wall Street, these will include all buildings on the compound.

Supervisor Area (1)

ALERT

Deploy emergency work crews to by-pass or close off reservoirs and divert water supplies where necessary to the safe areas.

Distribute pipes and fittings to team members with vehicles assigned to them for storing in the safe area provided by the Water Authority at its operational base.

RESPONSE

Monitor the distribution system in the safe area.

Coordinate information from the Emergency Operation Centre (EOC) if truck borne water supplies are necessary at the following; Hospital, Infirmary, Shelters and the public.

Assist with damage and repairs to the distribution system after the disaster.

Vehicle will be assigned.

Supervisor Area (1-A)

ALERT

Deploy emergency crews both electrical, and distribution to key pumping stations and reservoirs to switch off electricity and close off or by-pass reservoir and divert water supplies to the safe areas.

Ensure that spare pumps, motors and spare part for these are transferred along with the necessary pipes and fittings to carryout repairs after the disaster. These will be placed in the safe area provided by the Water Authority.

RESPONSE

Coordinate information received from the Emergency Operation Centre (EOC) if truck borne water supplies are requested at the following: Hospital, Infirmary, Shelters, and the public.

Assist with damage and repairs to the distribution system after the disaster.

Ensure that adequate amounts of fuel and oils are stored at the pumping station to maintain regular supply of water.

Vehicle will be assigned.

Water Technologist

ALERT

Pre-position all laboratory and chemical apparatus used for the disinfection of the water supply to a safe place in the northern area.

RESPONSE

Monitor the water supply for possible contamination in the safe areas.

Coordinate information with the Engineer MWA and the environmental department for possible assistance if required.

Carryout regular residual checks on a daily basis to prevent contamination of the water supply.

Foremen

All MWA Foremen will be advised by their Supervisors when to activate their tasks in the event that an evacuation order is given to relocate in the safe area.

Instructions will be give to all other members of staff by Supervisors. The categories are:

SENIOR & JUNIOR PLUMBERS

PUMP OPERATORS & ELECTRICIAN

HEAVY EQUIPMENT OPERATORS

OPERATIONS CLERK

MECHANICS

SECURITY GUARDS

(Please note that you must report for duty after the disaster)

ADMINISTRATION STAFF

SENIOR ACCOUNTS CLERK

BILLING SUPERVISOR

STORES ACCOUNTANT

STATISTICS OFFICER

SECRETARY

CASHIER

BILLING CLERK

OFFICE ATTENDANT

(Please note that you must report for duty after the disaster)

MONTERRAT WATER AUTHORITY

VOLCANIC PLAN 1995

PHASE (2)

This second phase of the Water Authority volcanic alert plan will be dealing primarily with the essential aspects of operating procedures of the water supply and critical staff who will be directly involved.

The following response mechanisms are:

- 1) VEHICLE AND HEAVY EQUIPMENT PARKING
- 2) FUEL AND OIL STORAGE AND LOCATION
- 3) CRITICAL STAFF ACCOMMODATION
- 4) WATER SUPPLY OPERATION
- 5) PUMPING AND RATIONING OF WATER SUPPLIES
- 6) STORES AND INVENTORY

These response mechanisms will provide some guidance in the event that it may become necessary to put this contingency plan into operation, if the volcanic activities increase significantly.

1 VEHICLE AND HEAVY EQUIPMENT PARKING

- 1.1. All vehicles such as double cabs, landrovers, long wheel base, will be parked at a location in Woodlands. This location may be changed, but all employees will be informed of any changes. The Water Authority will use the premises for conducting limited service to the public such as:

Billing and collection of revenue

Water connections

Maintenance of the water system

- 1.2 Critical staff and in particular those employees who will be operating pumping stations, distribution repairs, and other critical works to maintain adequate water supplies, vehicles may be assigned for the purpose of discharging their duties.
- 1.3 All heavy equipment will be parked at the Salem Junior Secondary School campus until further notice is given by the Director of Public Works.

These include:

JCB G1192, Ford G1229, Case Tractor G288, Front End Tipper G87, Tipper Truck G97, Compressors 100, 160 and 250, Welding Machine, etc.

2. FUEL AND OILS, STORAGE AND LOCATION

- 2.1 Supervisor of operation will select a suitable site at St. Peter's Pumping Station to place either a 1,000 or 1,500 gallon fuel tank for storing diesel. Its primary purpose is to store adequate amounts of fuel to minimise interruption of pumped water supplies to residents north of the safe line, and in particular extreme north of the Island.
- 2.2. The Stores Accountant, Storekeeper, will be responsible for preparing the necessary purchase orders for fuel storage.
- 2.3. It will also be the responsibility of the Storekeeper to prepare and issue SIV's for fuel which will be delivered to the various vehicles, plant and standby generators. The same process will apply for oils etc.
- 2.4. The Foreman Heavy Equipment will continue to prepare requisition for diesel fuel from MWA stock, and the same procedure for gasoline fuel from local petrol station across the safe zone.
- 2.5. Security for diesel fuel will be of paramount importance and therefore, the Storekeeper should purchase suitable locks and install them on the tank for its protection.
- 2.6. The Supervisor Operation will be responsible for transporting the storage tank from Texaco Bulk Terminal. The storage tank will be erected at St. Peters Pumping Station at a suitable spot to deliver fuel to the generator and vehicles as required.

3 CRITICAL STAFF ACCOMMODATION

- 3.1 The Water Authority have provided limited office accommodation for staff such as Administration, billing Stores, Operations, Security and a base for pump operators who will be responsible for pumping of water to the north of the Island. This accommodation is located in Woodlands. All MWA staff should familiarise themselves with the location of this temporary accommodation without further delay.

However, the Water Authority would like to make it quite clear that this location is not a permanent facility.

4 WATER SUPPLY AND OPERATION

- 4.1 All residential areas north of the safe line will be supplied with water either by gravity or by pumping.

If the order is given to evacuate, the Supervisor Operation will be responsible for diverting the water supply from Killiecrankie via Hope CSR or Steel Reservoir. This could then be fed to Lawyers Reservoir, but would still have the capability to supply Salem, Olveston, Old Towne, Woodlands and still be able to keep the north section adequately supplied to Baker Hill.

The storage capacity north of the safe line are as follows:

(a)	Hope CSR	400,000	gals
(b)	Hope Steel	100,000	"
(c)	Olveston	60,000	"
(d)	Lawyers	150,000	"
(e)	Fogathy	20,000	"
(f)	Buelar Con	20,000	"
(g)	Baker Hill	60,000	"
(h)	Baker Hill Con	20,000	"
(i)	Dick Hill	40,000	"
(j)	Davy Hill	20,000	"
<hr/>			890,000 gals.

All pipe works for diverting this supply should be tested again to verify if pumping requirements are needed to increase the efficiency of the flow of water from Killiecrankie to Hope reservoir.

- 4.2. All water pumped from St. Peters to Baker Hill will flow by gravity to Dick Hill. If for any reason that gravity is not the most efficient means of meeting the demands of the extreme north, then direct pumping from St. Peters will be introduced to bring storage supplies up to speed at Dick Hill reservoir.
- 4.3. Supervisors for the two (2) areas north of the safe line that is Areas: (I.A) and (2.B) will check with district chairpersons at the various shelters to see whether there is a need to fill up their emergency water tanks before rationing of the water supply becomes effective.
- 4.4. If for any reason that it becomes absolutely necessary to ration water supplies, Supervisors should discuss this option before taking any action.
- 4.5. If rationing of the water supply is put into effect the Operations Manager will inform the General Manager who will then inform the EOC and prepare radio press release and send necessary advisory for broadcasting.

Reservoirs will be closed during the nights from 6:00 pm to 5:00 am daily until adequate storage and replacement of Baker Hill.

Reservoirs which may require closing off are Dick Hill, Davy Hill and Baker Hill.

- 4.6. The probability exist for firm contingency plans to improve and upgrade the pumping capability at St. Peters with a standby pump. This standby unit may reduce the likelihood of rationing. But there is still a strong need for a water bowser.
- 4.7. It will be the responsibility of the health sector officials or the Director of Health Services to distribute any or all water purification tablets which may be available for distribution to the public.

5 WATER QUALITY

- 5.1 The Water Technologist will begin to move the following laboratory equipment, chemicals, gaseous chlorine (150) lbs cylinders and some apparatus etc., across to the Water Authority accommodation at Woodlands.

Pump Operators, Electrician and Water Quality personnel will use their regular means of transportation to carryout their daily dosing and residual checking of the water supply in all areas north of the safe line.

- 5.2. It will also be the responsibility of the Water Technologist to secure a section at Hope reservoir valve house to store the gaseous chlorine containers.

6. STORE AND INVENTORY

- 6.1. The stores is one of the most important elements of the Water Authority operations and therefore the Stores Accountant and Storekeeper should now begin to move light stores to the Water Authority secured accommodation at Woodlands.
- 6.2. It will be necessary for the Stores Accountant, Storekeeper, Area Supervisor, Accountant and the Operations Manager to select a suitable site for storing large and small pipes, preferably at a reservoir compound.

These sites can be considered: Hope, Lawyers, Olveston or St. Peters pumping station.

- 6.3 It will be necessary at this point in time for the Stores Accountant and Storekeeper to begin the process of moving quantities of fast moving fittings, pipes SIV and stationery etc., to the temporary accommodation at Woodlands. However, two (2) locations that can be used as suitable sites are Hope and Lawyers.
- 6.4. Separate keys for the temporary stores will be kept by both Stores Accountant and Storekeeper.

The Operations Manager will liaison with the EOC Telecommunication Adviser, Government Telecommunication Officer and Cable and Wireless personnel to assist with communication planning for the Water Authority.

They will provide assistance and guidance to the best location for MWA communication network system, and the capability for backup communication.

7. SUPERVISORS

Supervisors will provide and maintain a list of critical items for post-disaster recovery.

These will include:

- Pipes and type, quantity and quality
- Fittings for various type of pipes
- Pumps and electrical motors and spares
- Tools both electrical and manual

7.1 The senior Supervisor, Supervisor Operation, Water Technologist must begin to brief their subordinates on their involvement to secure company's assets and contingency to move important items into the safe zone. They should be advised on the limited accommodation that is available for some critical staff.

8. ENGINEER

In light of the present volcanic activity the Engineer will assist the Area Supervisors with logistical support in post disaster rehabilitation work.

9. ADMINISTRATION

The General Manager will hold regular meetings with senior staff members.

If assistance is required the General Manager would request and liaison with other regional water utility counterparts. It will be more than likely that they will not hesitate to assist with manpower or materials to restore the water system if necessary.

Administrative initiatives will be handled by the General Manager or the Operations Manager in her absence.

The location of the temporary accommodation will be announced on radio and television for public information.

10. ACCOUNTANT

The Accountant will meet and discuss with accounts and billing staff in preparation to move files, computers, office equipment and other valuables that may be required if the order to evacuate is given. Area supervisors will assist with the moving of these essential items to temporary accommodation in Woodlands.

All journals, audited statements, vote books, payment vouchers, cash book, bank statements, etc. should be prepared for transferring to the temporary accommodation across the safe line.

APPENDIX C'
WATER QUALITY ANALYSES
SPRING SOURCES
&
RAIN WATER

M E M O R A N D U M

TO: Director of Health Services
Ministry of Health

FROM: General Manager
Montserrat Water Authority

DATE: 27 January 1997

cc: Water Quality Supervisor

*Water Quality Monitoring Meeting between Dr. R.cooper
Director of Health Services. General Manager.MWA William
Tonge MWA and Supervisor Water Quality.*

Further to our meeting on Thursday 16 January between MWA /Director of Health Services I confirm the following:

The Director of Health Services stated that the purpose of the meeting was to encourage closer working relationship and understanding between both institutions in order to ensure that the water supplied to the public is potable.

1. MWA would carry out comprehensive bacti analysis at least twice monthly and chemical analysis would be carried out at least once per month. Additional analyses would be carried out depending on frequency of ash emissions from the Volcano. Samples would be taken from sources, reservoirs and distribution system especially from Amersham and Webbs reservoirs as these are located almost below ground level.
2. MWA would ensure that vulnerable water sources are protected from ash deposits.
3. The Director was assured that chlorine residuals throughout the distribution system were taken every day except Sundays. The Gen. Manager instructed the Lab. Supervisor to pass on techniques to Lab Assistants in order to maintain consistency in residual levels.
4. Water Quality Supervisor, was asked to pass on results from rainwater samples through the MVO to the Director of Health Services.
5. MWA pointed out that water quality in St. Patricks has not been monitored since September 1996 as sources of water are located under the volcano plume in the unsafe zone.


6. Monitoring of Ginger Ground Spring Source revealed that animals were allowed to roam freely in this watershed area. The General Manager said that despite request for surveillance by the Police and Department of environment the animals were still polluting the water source. The Supervisor water Quality said that he had sought the assistance of the MVO helicopter pilot for possible aerial surveillance over watershed areas to investigate what activities are being carried out above the water sources. Increase in fecal coliform especially following heavy rainfall could be indicative of the presence of animals in the watershed areas.

7. MWA would prepare a list of essential laboratory equipment and supplies as requested by the Director of Health Services for transmission to EMAD for possible funding:

Item 1.	7 Qty. Booster pumps for chlorinators; staynite model JHD 3 pump with 1 phase motor starter and 24 HR timer	7 x US\$1,100	US\$7,700
Item 2.	2 Qty. Chlorinators complete	2 x US\$1,400..	2,800
Item 3.	1 Qty. Laboratory Oven	1 x US\$900.....	900
Item 4.	1 Qty. Turbidity Meter	1 x US\$1,800.....	1,800
Item 5.	1 Qty. De-ionizer	1 x US\$2,100.....	2,100
Item 6.	2 Qty. Sterilized Grided filters	2 x \$365...	730
Item 7.	4 Qty. 500 petri dishes- 25 Sleeve/pack 500	4 x US\$130	520
Item 8.	Palintest reagents-L	175

Total cost = US\$16,839.
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A copy of the bacti. analysis carried out on 17 and 24 January 1997 are enclosed herewith for your information.


 Margaret Dyer-Howe
 General Manager.