ENVIRONMENTAL PROTECTION DEPARTMENT ANNUAL REPORT

2011

ENVIRONMENTAL PROTECTION DEPARTMENT

Director's Review

In March of 2011, the Environmental Protection Department (EPD) celebrated its 40th anniversary. Since its humble beginning in 1971 as the Public Health Engineering Unit with a small staff of nine persons, the Department has evolved to address new and recurring environmental issues such as:

- Marine litter and other solid waste management issues;
- Persistent Organic Pollutants (POPs);
- Chemical Weapons;
- Increasing levels of groundwater contamination;
- Air and noise pollution; and
- Public apathy regarding environmental matters.

Despite the progress made over the past 40 years, there are still several challenges, which must be addressed for the EPD to become the premier regulatory agency in Barbados managing environmental issues. The two most notable challenges are public apathy and lack of appropriate legislation. It is disheartening to see the lack of interest in safeguarding our environment given its importance to our quality of life. Furthermore, without stringent and enforceable legislation there is no impetus for the public to change this attitude.

The Department reaffirms its commitment to overcoming these challenges by redoubling its public awareness campaign and lobbying policymakers to enact effective legislation. In doing so, the Department will enable future generations to inherit an environment which is healthy, productive and enjoyable.

Anthony Headley
Director (ag)

Executive Summary

The mission of the Environmental Protection Department is to preserve and improve Barbados' quality of life and its natural and built environment, through the enforcement of legislation, promotion of sustainable practices, education, and partnerships. The Department has seven technical sections that carry out its functions. These sections are supported by the administrative staff. Below is a summary of their activities for 2011.

Air and Noise Pollution Control

The Air and Noise Pollution Control Section (ANPCS) recorded an increase in the number of indoor air quality complaints received in 2011 relative to 2010. Over two-thirds of the complaints received in 2011 were related to ambient air quality. On the other hand, the Department received five noise complaints in 2011 and conducted three-building assessments.

In addition to its routine monitoring activities, the Air and Noise Pollution Control Section also began an ambient air quality assessment of the Bridgetown area. Officers of the ANPCS also prepared and submitted draft guidelines on ambient air pollution and noise monitoring for inclusion into the EIA review process.

Building Development Control

The Building Development Control Section received 1,975 applications. By the end of 2011, 55% of these applications had received approval, 7% were approved with conditions, 2% were refused and 36% were awaiting a decision. The majority of applications were for developments in the parishes of St. Michael, St. Philip and Christ Church.

The section commissioned the development of a standard operating procedure (SOP) for the section to standardize the review of specific aspects of building development applications. Training in the use of the SOP was conducted in August of 2011.

Derelict Buildings and Vehicles Programme

During 2011, 107 derelict buildings were demolished and 1,406 derelict vehicles were removed at costs of $ 521,660.50 and $ 198,039.25 respectively. The number of buildings demolished represented a 39% decrease relative to 2010. Similarly, the number of vehicles removed represented a decrease of 30% relative to 2010. A reduction in the budgetary allocation for this activity contributed to the decrease in the number of derelict buildings and vehicles removed.

The officers of the Derelict Buildings and Vehicle Programme approved 86 requests for disposal of asbestos-containing material and fibreglass.

Environmental Impact Assessment (EIA) Review Process

The Environment Protection Department sits on the EIA review panel and advises the Chief Town Planner on matters regarding the environmental management of new developments. In 2011, the Department reviewed and provided comments to the Chief Town Planner on six EIAs.

Multi-lateral Environmental Agreements (MEAs)

The Department is currently responsible for the implementation of several multilateral environmental agreements (MEAs) namely, the Stockholm Convention, the Basel Convention and Chemical Weapons Convention.

Under these agreements, the EPD undertook two projects during 2011. During 2011, the Department concluded a project that sought to build capacity in Barbados to testing for persistent organic pollutants (POPs). The overarching objectives of the project were to enable Caribbean countries to perform POPs analysis and to increase regional cooperation between laboratories responsible for POPs analysis and policy. Additionally, the Department began a two-year project, with assistance from the United Nations Institute for Training and Research (UNITAR), to develop a National Implementation Strategy for the Implementation of the GHS.

Marine Pollution Control

Officers of the Marine Pollution Control Section continued to fulfil their mandate to characterize sources of pollution across the island by conducting audits of 28 funeral homes across the island. The report on the audits is being prepared. The section also conducted compliance audits of previously audited entities. The purpose of the compliance audits was to assess the extent to which previously audited facilities had implemented recommended environmental control measures.

Also, the Marine Pollution Control Section conducted the following activities;

- investigated 26 complaints related to marine pollution – the majority of which were due to wastewater discharges;
- completed appendices to the Oil Spill Contingency Plan; and
- developed terms of reference for a project to characterize and assess the impacts stormwater discharges to the marine environment.

Solid and Hazardous Substance Management

The Department, through the Solid Waste and Hazardous Substance Programmes, fielded requests from the public for advice on how to dispose of both hazardous and solid wastes. The Department also monitored and regulated the disposal sites operated by the Sanitation Service Authority (SSA). Also, the Department received data on the quantities of used oil collected at Mount Rum Distillery for use as fuel in their boilers. Furthermore, the Department approved applications to import radioactive material for medicinal and exploration purposes.

Water Quality Management

Under the Groundwater Monitoring Programme, water samples were taken and analysed from 20 wells and two springs across the island from which the island's potable water supply is derived. The results were compared to the World Health Organizations (WHO) Drinking Water Guidelines. It was found that:

1. all of the supply wells recorded average chloride concentrations that were below the recommended WHO drinking water guideline value of 250 mg/l;

2. all of the wells had average Nitrate-N concentrations that were less than the WHO guideline of 10 mg/l (however, most of the wells had concentrations above 6 mg/l);

3. all of the supply sources recorded average concentration of sulphates that were below the WHO guideline of 500 mg/l;

4. the majority of water for the various supply sources had tastes that would be classified by the WHO drinking water guidelines as "Good" since the average concentrations of the total dissolved solids (TDS) ranged from 300 – 600 mg/l;

5. the levels of Faecal Coliforms were non-detectable for all of the supply wells and springs except those where the samples were collected before the chlorination point.

Samples were collected from 37 wastewater treatment facilities in 2011. The majority of the plants complied with the standards for pH, biochemical oxygen demand and total suspended solids. In contrast, most of the facilities failed to comply with the standards for total nitrogen and total phosphorous. As each facility was only sampled once, there was an insufficient number of samples collected to determine whether the plants complied with the standards for faecal coliforms and enterococci.

Concerning recreational (beach) water quality monitoring, samples were taken from 17 beaches; eight on the west coast and nine on the south coast, and analyzed to determine the concentration of Faecal Coliforms and Enterococci present. The results

of the analyses were compared to the proposed List of Prohibited Concentrations under the Marine Pollution Control Act. For most of the sites on the beach, an insufficient amount of samples were collected to compare the results to the standard for faecal coliforms. All of the beaches on the south and west coast complied with the standard for Faecal Coliform. However, some beaches on both the south and west coasts exceeded the standard for Enterococci during some months of the year.

Looking Forward

Three areas were highlighted that would enable the Department to execute its mandate more effectively. These included developing ambient air quality legislation and partnership with the University of the West Indies to characterize the source of pollution in Barbados.

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1 INTRODUCTION

The mission of the Environmental Protection Department is to preserve and improve Barbados' quality of life and its natural and built environment, through the enforcement of legislation, promotion of sustainable practices, education, and partnerships The Department has regulatory functions in the areas of ambient air quality, building development control, derelict buildings and vehicles, hazardous materials management, management of multi-lateral environmental agreements, marine pollution control, noise pollution control, solid waste management and water quality management. These functions include environmental policy development in addition to routine activities such as processing building development applications, water quality monitoring and response to complaints of environmental pollution.

The Department comprises management and administrative sections in addition to seven technical sections. There are fifty-two (52) posts (see Table 1) in the Department of which 48 are established and 6 are temporary. Two of the posts – Marine Pollution Inspector and Environmental Inspector – are frozen while they are being upgraded.

Table 1: Posts within the Environmental Protection Department

	Section	No. of Posts
1.	Management	2
2.	Administration	14
3.	Air & Noise Pollution Control	4
4.	Building Development Control	14
5.	Removal of Derelict Buildings & Vehicles	6
6.	Management of Multi-lateral Environmental Agreements	3
7.	Marine Pollution Control	4
8.	Management of Solid Waste & Hazardous Materials	2
9.	Water Quality Management	3
		51

2 AIR AND NOISE POLLUTION CONTROL

The Air and Noise Pollution Control Section (ANPCS) deals with issues related to ambient air, indoor air and noise pollution. The section conducts technical research into air and noise quality issues; carries out air quality assessments of office buildings; and conducts environmental noise assessments. Additionally, the section investigates complaints related to outdoor air pollution, the indoor environment in office buildings and from persons who are experiencing problems with environmental noise pollution.

Four persons staff the section: one senior officer and three Environmental Technicians. However, only three persons staffed the section during 2011.

2.1 Planned Activities for 2011

The goal of the air and noise pollution control programme is to protect the public from harmful air pollutants and noise, which can have negative health effects and degrade the quality of life. To achieve this goal, the ANPCS work programme for 2011 was as follows.

a. Provide stakeholders with a copy of the ambient air quality (AAQ) policy paper using various media (electronic copies, photocopies, etc) and revise the policy paper in light of comments received from stakeholders.
b. Conduct an ambient air quality assessment of Bridgetown using passive samplers.
c. Participate in discussions with the Ministries of Health and Labour on the indoor air quality (IAQ) policy paper and if necessary revise the paper before developing programmes to implement the IAQ policy.
d. Investigate complaints received.
e. Repair and calibrate monitoring equipment.

2.1.1 Ambient Quality Policy Paper

The ANPCS deferred plans for the ambient policy paper to the next financial year as it is awaiting policy direction from the Ministry of Environment and Drainage before furthering work on this subject. Consequently, the Section did not distribute copies of the AAQ policy paper to stakeholders.

Additionally, due to limited human resources during the year, it would have been difficult to undertake this activity.

2.1.2 AAQ Assessment of Bridgetown

In the second quarter of 2011, the ANPCS identified and selected a supplier to provide the passive samplers for the (AAQ) assessment. In the third quarter, the supplier of the passive samplers submitted a Performa Invoice and the GOB issued payment to the supplier of the passive monitors in the fourth quarter. The supplier is expected to ship the passive samplers to the island in 2012.

The Government Electrical Engineering Department granted permission for the mounting of the passive samplers on their electrical poles. Discussions are ongoing with the Barbados Light and Power Company Limited (BL&P) regarding the use of their electrical poles for the same purpose. The BL&P has agreed in principle to the use of their light poles and the Department is presently awaiting documentation.

Once the Department receives formal permission from the BL&P, and the section receives the samplers, they will be mounted and the assessment will begin.

2.1.3 IAQ Policy Paper

The ANPCS sent correspondence to the Ministry of Environment and Drainage (MED) regarding the draft policy paper entitled, "Management of Indoor Air Quality in Barbados", which the Department submitted in November 2007. This was a follow-up step toward finalising the indoor air quality policy paper. The Department is awaiting a response from MED before further work is done in the area. Consequently, discussions with the Ministries of Health and Labour on the indoor air quality (IAQ) policy paper were not undertaken.

2.1.4 Receipt and Response to Complaints

2.1.4.1 Air Quality

Complaints received by the ANPCS were classified as relating to emissions from industrial stacks, manufacturing operations, nuisance and vehicular maintenance facilities. The section also receives complaints related to the working environment – occupational matters (IAQ). The definitions of these classifications are as follows:

Table 2: Classification of air quality complaints

Classification	Definition
Industrial Stacks	Emissions from industrial sources that negatively affect the ambient air quality in its vicinity
Manufacturing Operations	Emissions from manufacturing sources that negatively affect the ambient air quality in its vicinity e.g. furniture manufacturing, wrought iron works
Nuisance	Emissions from miscellaneous sources that negatively impact the ambient air quality in its environs e.g. open burning of materials, chemical odours, and fugitive emissions
Vehicular Maintenance Facility	Emissions from vehicular maintenance facilities and any location where vehicle or auto-body repair was conducted that result in the emission of toxic sprays or odours that negatively impacts the ambient air quality in its vicinity
Occupational (IAQ)	Relates to complaints of the physical discomfort of employees in the work environment, mostly related to ventilation systems

During 2011, the ANPCS received 49 complaints about air quality. These comprised 23 IAQ complaints and 26 ambient air quality complaints. Grievances about vehicular maintenance facilities and nuisance emissions accounted for the majority of ambient air quality complaints as shown in Figure 1.**Error! Reference source not found.**

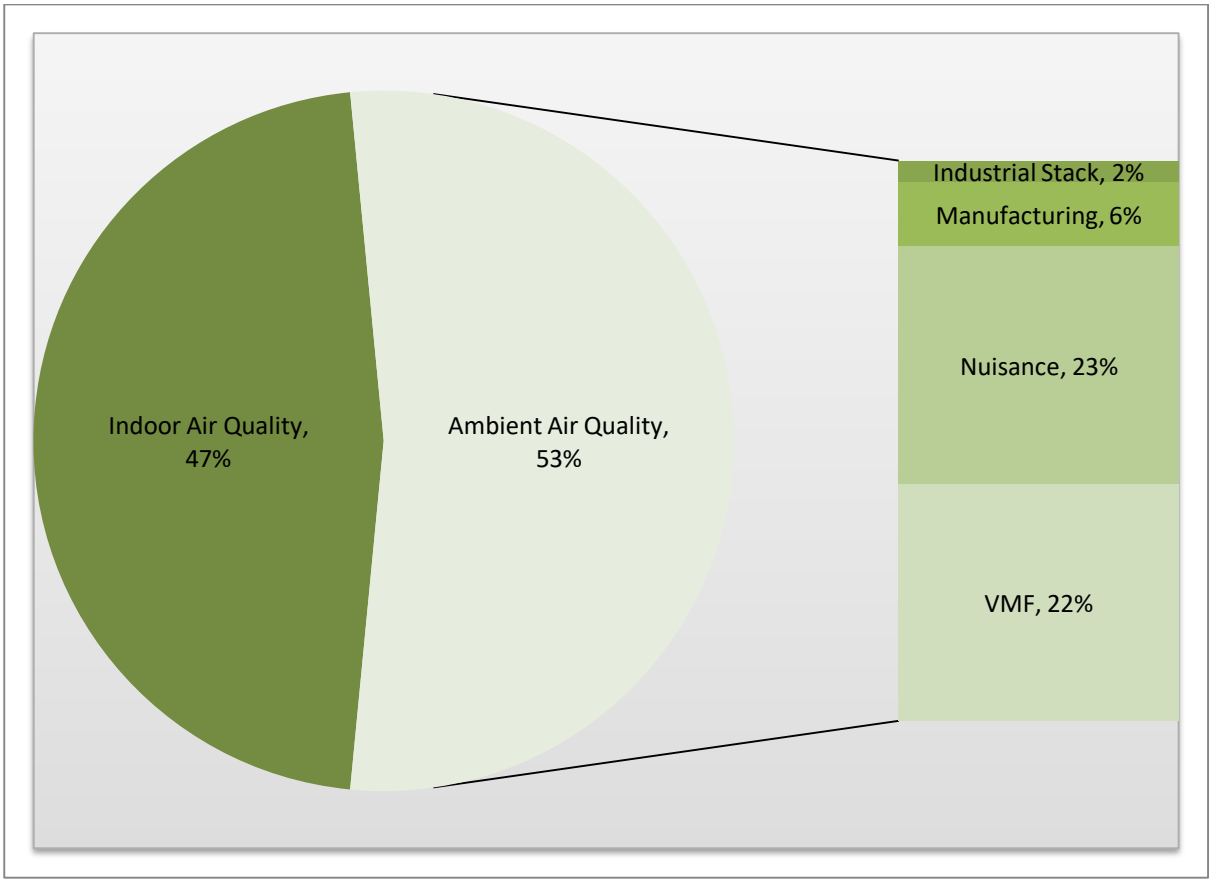


Figure 1: Proportion of Air Quality Complaints received in 2011

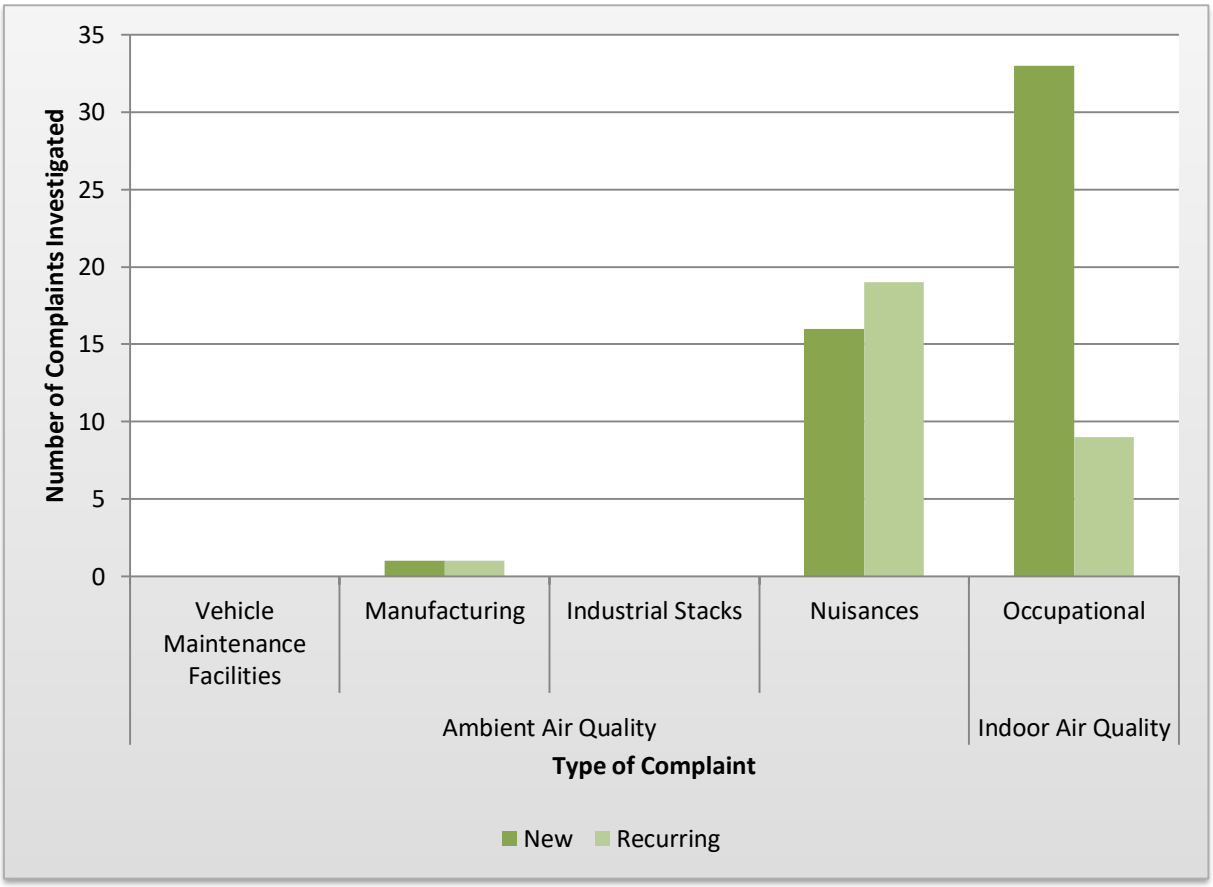
The complaints received by the ANPCS were further divided into new and recurring complaints. The ANPCS classifies new complaints as those lodged with the section for the first time. Recurring complaints are those that were lodged with the section before and the section has received subsequent complaints from the same or other complainants for the same alleged offender. Approximately, 4% of the complaints received were recurring complaints.

Generally, over the past five (5) years, there has been a decrease in the number of air quality complaints received by the ANPCS as shown in Figure 2. Despite this decrease, the relative proportions of IAQ complaints have steadily increased from 19% in 2007 to 47% in 2011. To a lesser extent, an increase in the proportions of complaints related to VMF was also observed.

Figure 2: Total Number of Air Quality Complaints Received over the Period 2007-2011

Officers of the section investigated 79 complaints during the year. These comprised 49 recurring complaints and 50 new complaints. Figure 3 shows the category of air quality complaints investigated. From the figure, it is evident that the majority of investigated complaints about ambient air quality were nuisance complaints and the majority of these were recurring complaints. The section also investigated a large number of IAQ complaints.

Figure 3: Number of Air Quality Complaints Investigated in 2011 Categorized by the Type of Complaint



The high proportion of recurring complaints about nuisances is indicative of the absence of suitable legislation to conclusively address these issues. On the other hand, the large number of IAQ complaints suggests that there is a need to improve all of the aspects which ensure that the office environment is healthy, particularly, the maintenance of mechanical ventilation systems.

Historically, the EPD has performed a consultative role through conducting investigations into IAQ complaints. However, this practice introduces a conflict of interest concerning the regulatory mandate of the EPD. It is therefore recommended that investigations be carried out by property managers or private consultants.

2.1.4.2 Noise Pollution

The ANPCS received five new complaints about environmental noise pollution in 2011; there were no recurring complaints. No noise complaints were investigated in 2011. This was due primarily to the sound level meters requiring calibration.

2.1.5 Repair and Calibration of Equipment

Like any other type of monitoring equipment, the Department's noise meters require factory calibration once per year. The Department sent the VelociCalc velometer to

the manufacturer for calibration during the second quarter of 2011. The velometer was returned during the third quarter. Also during the third quarter, the Dust Trak 8520 and the Alnor anemometer were sent to their manufacturer, TSI, for calibration and returned during the final quarter. Calibration of these pieces of equipment amounted to $ 4970.84 in Barbadian currency.

The section will send the Bruel & Kjaer sound level meters, calibrators and microphones to the manufacturer for repair and calibration in the first quarter of 2012.

However, the Department faces challenges with the length of time it takes to:

- procure foreign exchange for facilitating the calibration; and
- obtain local purchase orders for shipping and clearance of equipment.

This often results in equipment being out of the department for several months, which impacts on productivity during that period.

2.2 Building and Noise Assessments

Building assessments are conducted in conjunction with the Building Development Section and are typically done upon request from the Ministry of Housing and Lands. Officers of the ANPCS, visually inspect the ventilation systems of the building to determine; the type and condition of the ductwork being utilized, the presence of fresh air intake, the cleanliness and condition of the air handling room and air-handling units, and to identify conditions that could affect the quality of the indoor air. A report on the assessment is subsequently submitted to the agency that had requested the assessment.

Three building assessments were performed in 2011/2012. These were assessments of the:

- Proposed offices for the Department of Public Prosecution, National Task Force on Crime Prevention and a "Special Branch" of the Royal Barbados Police Force at 5th Avenue, Belleville, St. Michael.
- Accommodation of the Drainage Unit at Lot #1, Warrens Industrial Park, St. Michael.
- Assessment of Gildan Building, Warren Industrial Park, Warrens, St. Michael for the Office of Trade Negotiations, CSME and Consultants.

Noise assessments are conducted to determine the impact of the noise generated by a business operation on surrounding receptors. These are normally requested to the

party likely to generate the noise. The section conducted one noise assessment in 2011 to determine impacts of the operation of Cementium Inc, Newton Industrial Park, Christ Church on residents.

3 BUILDING DEVELOPMENT CONTROL

The objective of the Environmental Protection Department's building development programme is to ensure that all building occupants enjoy a comfortable environment that satisfies national environmental health, construction and land use standards. The programme seeks to improve construction standards and the habitable building environment for residential, commercial and industrial use. This is achieved by enforcing the Health Services Act, Cap 44 and Regulations relating to building development control, the Groundwater Protection Zoning Policy and to some extent the Marine Pollution Control Act.

The Building Development Control Section (BDCS) comprises seventeen (17) officers. A summary of the various posts and number of officers in those posts is below.

Chief Building Development Officer	1
Senior Building Development Officer	2
Building Development Officer	8
Building Development Inspector	2
Draughtsman Technician	1
Clerk/Typist	1
Clerical Officer	1
Environmental Inspector	1

3.1 Planned Activities for 2011/2012

The planned activities for the Building Development Control Section were as follows:

a. Continue vetting of applications for residential, commercial and industrial developments.

b. Develop a policy for the construction and use of rainwater harvesting and rainwater storage tanks design.

c. Develop an SOP manual for the Building Development Section to cover areas of operation in the section.

d. Produce a booklet on environmental standards/policies, design and operation of preschools.

e. Raise awareness about prosecution regimes amongst staff.

3.1.1 Processing of Applications

During 2011, the BDCS received 2,011 applications for building development. Table 3 categories the number of application received by the type of application.

Table 3: Types of Building Development Applications Received in 2011

Type of Application	Number of Applications
Residential	1747
Commercial	241
Industrial	6
Agricultural	1
Residential/Commercial	14
Commercial/Industrial	2
	2011

Of the 2,011 applications, 1,355 received decisions and the reminder are awaiting a decision as shown in Figure 4.

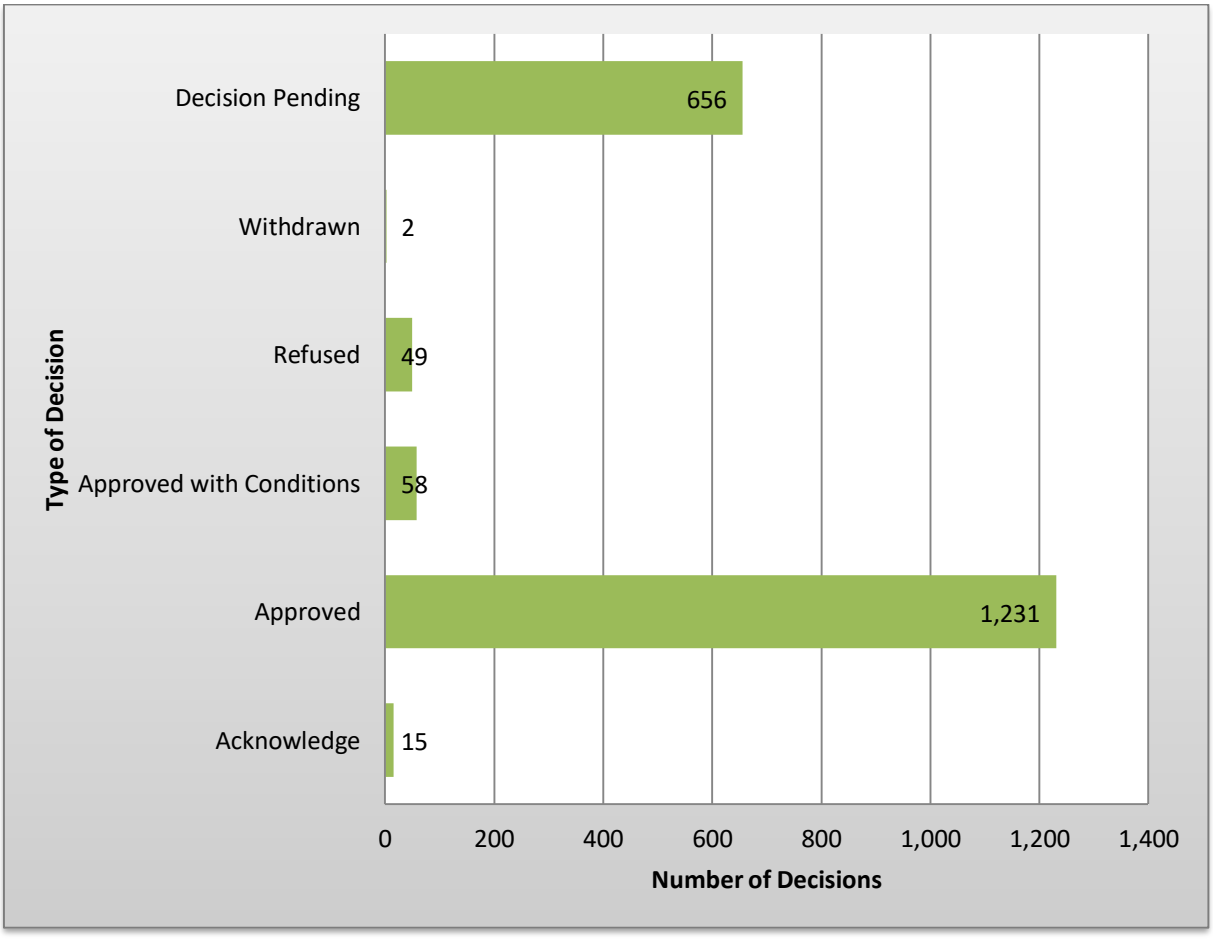


Figure 4: Decision made for Application Received in 2011.

The majority of applications received were for development in the parishes of St. Michael and Christ Church. The least number of applications received were from the parish of St. Andrew. Figure 5 depicts the distribution of applications received across the island.

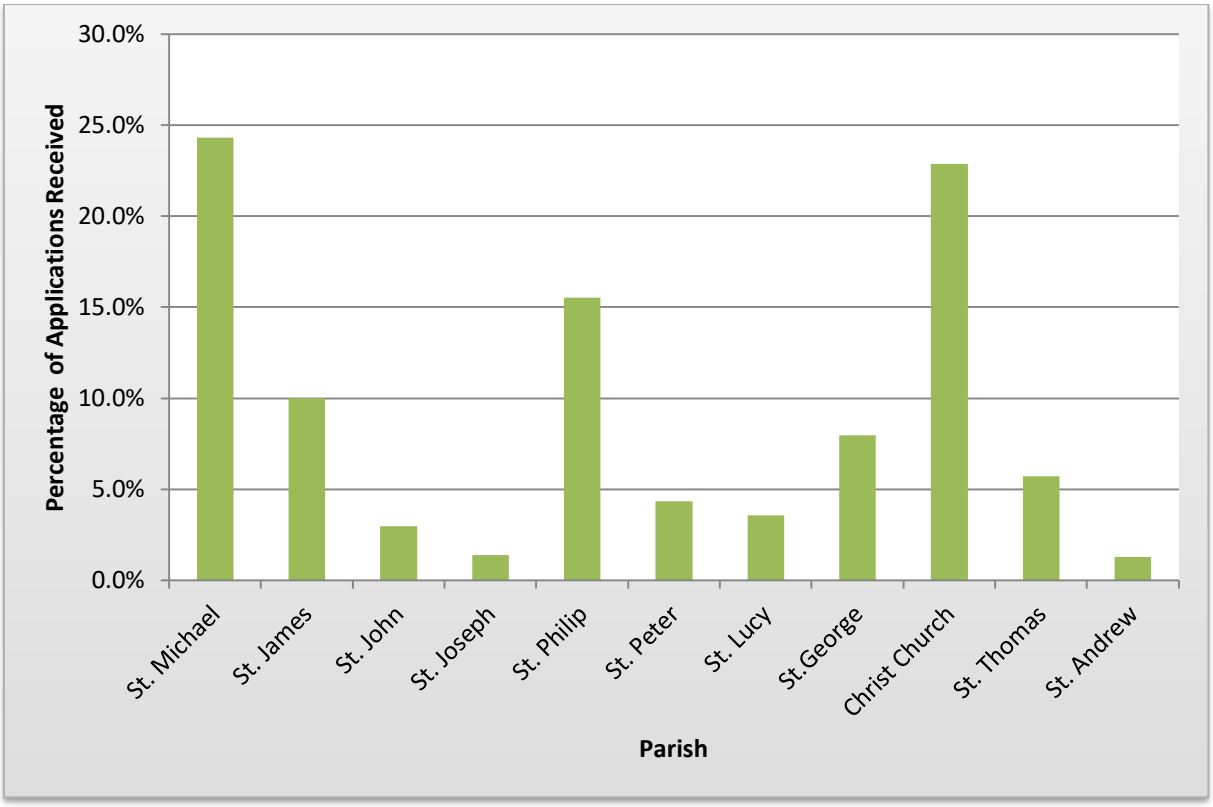


Figure 5: Percentage of Building Development Applications Received by Parish

The BDCS observed a decrease in the number of applications received since 2008. This reduction might have been the result of the downturn in the construction sector due to the global financial crisis.

In addition to vetting building applications, the section also conducted 42 septic tank inspections before building occupation. These inspections served to safeguard the island's groundwater supply by examining the construction of septic tanks before use. Approximately 60% of the septic tanks inspected were found to be satisfactory.

3.1.2 Policy Regarding Rain Water Harvesting and Storage

Development of a policy regarding rainwater harvesting and storage did not commence in 2011. The BDCS will therefore strive to undertake this activity in 2012.

3.1.3 Development of SOP Manual

There is a diverse interpretation and application of the Health Services Act, 1969, other statutory acts and policies by the building development team, thereby creating inconsistency in the processing of building applications. Additionally, existing legal requirements do not address all of the innovations within the building industry, for example, the use of mechanical ventilation in buildings and residences. As a result, there is a need for standardized procedures to guide officers on the evaluation of building development applications.

In 2010, the Environmental Protection Department contracted an environmental engineer to develop a standard operating procedure for the BDCS. The objective of the consultancy was to develop an instrument for the systematic and methodological review of specific aspects of building development applications.

In August of 2011, the consultant conducted training for officers in the BDCS to familiarize them with the SOP and clarify any issues that the officers had. Environmental Technical Officers and officers from the ANPCS and Water Quality Section also participated in the training.

3.1.4 Guidelines for Pre-schools

Development of guidelines for pre-schools did not commence in 2011. The BDCS will therefore strive to undertake this activity in 2012.

3.1.5 Prosecution Regimes

Due to time constraints, the section did not undertake the public education campaign to raise awareness about prosecution regimes.

3.2 Other Activities

The BDCS undertook the following activities:

- In preparation for the commencement of a project assessing the performance of the up-flow filter bed design used in Zone 1, Building Development Inspectors received in-house training from the Water Quality Section regarding procedures for collecting samples of wastewater.
- Staff from the BDCS continued to assist the Ministry of Health's Advisory and Inspection Committee on nursing homes in developing a booklet for Nursing Homes and Private Hospitals. Additionally, officers of the section accompanied members of the Ministry of Health's Advisory and Inspection Committee for nursing homes to perform inspections and assessments of

proposed nursing homes. Three assessments of proposed nursing homes were conducted in 2011.

4 REMOVAL OF DERELICT BUILDING AND VEHICLES

The Derelict Buildings and Vehicles Section comprises one Senior Environmental Inspector and three Environmental Inspectors (EIs). The section enforces the provisions of the Health Services Act, Cap 44 and the Health Services (Disposal and Collection of Refuse) Regulations, 1975 related to derelict buildings and vehicles.

Derelict buildings are identified by Environmental Inspectors (EIs) or reported to the EPD by Environmental Health Officers and the public. The EIs investigate identified buildings to determine if they are derelict; and if they are, a notice is served on the owner or owner's agent requiring them to renovate or remove the structure. The notice specifies the period during which the owner of the building must comply. The Department then publishes a listing of derelict buildings in a daily newspaper as required by Section 11 (1a) of the Health Services Act, Cap 44. If the owner is unable to comply during the specified period, a stay of execution may be requested by the owner of a derelict building to carry out cleaning, repairs or renovations. If the owner of a derelict building does not comply with a notice or request a stay of execution, the building may be demolished and the cost for the demolition of the building may be recovered from the owner as a debt due to the Crown.

4.1 Planned Activities for 2011

The goals of the Derelict Building and Vehicles Removal Programme are to:

- enhance/preserve the aesthetics of the island; and
- reduce the presence of breeding sites for mosquitoes, rats and other disease vectors in the interest of public health.

This goal is achieved through the identification, monitoring and removal of derelict buildings and vehicles on a national scale. To this end, for 2011 the section planned to:

- continue to remove/demolish derelicts;
- formalize its standard operating procedures; and
- improve its cost recovery system.

4.1.1 Removal/Demolition of Derelicts

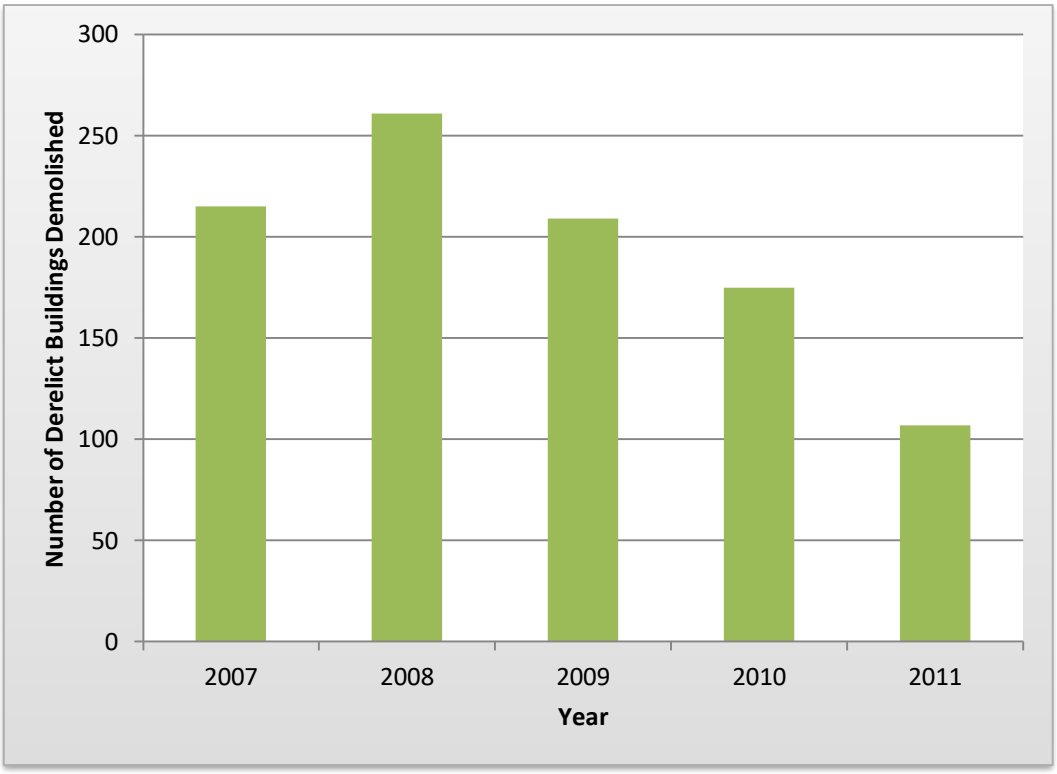
4.1.1.1 Derelict Buildings

One hundred and seven (107) derelict buildings were demolished in 2011 at a total cost of five hundred and twenty-one thousand, six hundred and sixty dollars and fifty

cents ($521,660.50). The majority of derelict buildings (58%) were removed from St. Michael and Christ Church, whereas the least number of buildings demolished were in St. Andrew.

Since 2007, the Department has observed an overall decrease in the number of derelict buildings demolished annually (see Figure 6) due to the efforts of the Department. However, in 2011 the number of derelict buildings demolished decreased by approximately 39% when compared to 2010. This decrease was the direct result of a reduction in the budgetary allocation for this activity.

Figure 6: Number of Derelict Buildings Demolished Annually during the Period 2007 – 2011



4.1.1.2 Derelict Vehicles

One thousand, four hundred and six (1,406) derelict vehicles were removed in 2011 at a cost of approximately one hundred and ninety-eight thousand and thirty-nine dollars and twenty-five cents ($198,039.25). When compared to 2010, the number of derelict vehicles removed in 2011 decreased by approximately 30%. The primary reason for the reduction in the number of derelict vehicles removed was a reduced allocation of funds in the Department's budget for this activity.

The total number of derelict vehicles removed during the five years, 2007 to 2011 is shown in Figure 7**Error! Reference source not found.**. From the figure, it can be seen

that there has been a slight decrease in the number of derelict vehicles removed annually over the period with the largest number of vehicles being removed in 2008.

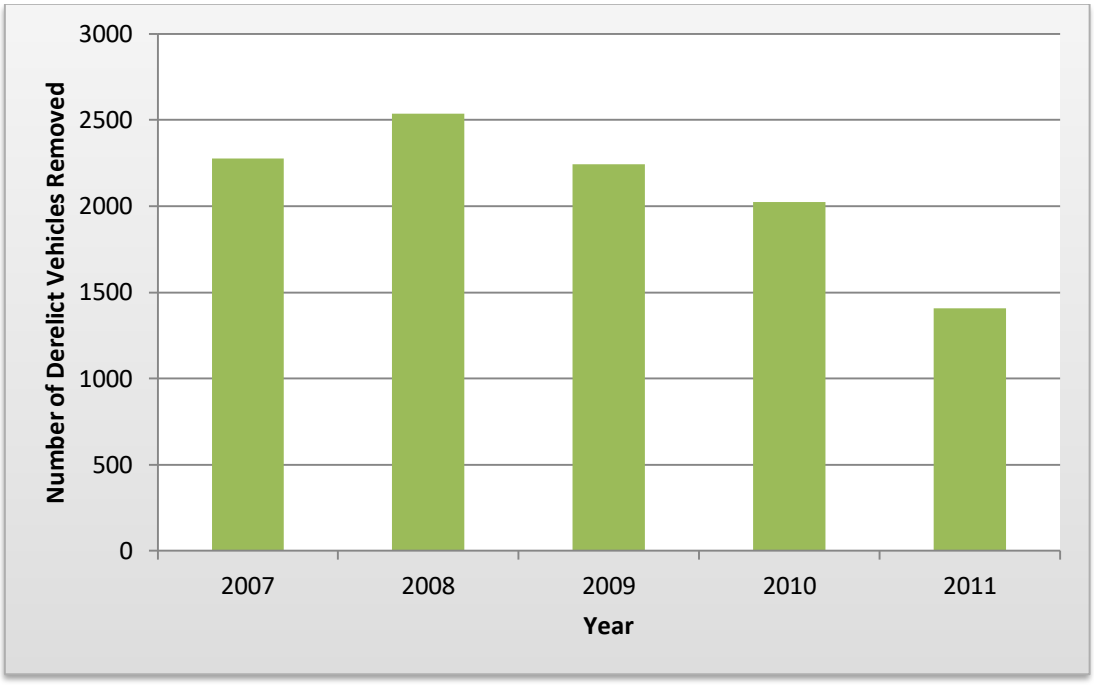


Figure 7: Number of Derelict Vehicles Removed Annually during the Period 2007 – 2011

Over the years, the Department has encountered challenges concerning serving notices under Health Services Regulations, 1969. These challenges have resulted in matters before the High Court where, among other things, the owner/agent of a property that was demolished is suing the Government. To avoid such occurrences in the future, there is a burning need for legalisation to clarify this situation.

4.1.2 Formalization of Standard Operating Procedures

Officers of this section undertook a review of their existing procedures to define how the individual tasks within the section should be executed. The exercise aimed to improve the functioning of the section.

4.1.3 Improving Cost Recovery

When owners of derelict buildings do not comply with a notice to remediate the state of the building or request a stay of execution, the building may be demolished and the cost for the demolition of the building may be recovered from the owner as a debt due to the Crown, during 2011 the Department recouped $ 19, 600.

Currently, the process of recording monies received is a paper-based system, which makes timely report difficult. The proposed solution was to develop a Microsoft Access database to store, track and report on these money transactions. Unfortunately, due to time constraints, the development of this database was not undertaken and will be deferred to 2012.

4.2 Removal of Asbestos and Fibreglass

Asbestos is the name given to naturally occurring fibrous silicate minerals. The types of asbestos include chrysotile (white asbestos), amosite (brown asbestos) and crocidolite (blue asbestos).

Exposure to asbestos fibres poses a health hazard. Controlling the generation of dust and using devices to guard against inhalation of the fibres can minimize the hazards posed by asbestos. To this end, the Government of Barbados has in place guidelines for contractors, workers and other persons engaged in the removal and disposal of asbestos. The removal of the asbestos-containing materials (ACM) and fibreglass must comply with the existing guidelines for removal of these substances and they must be disposed at the disposal site at Rock Hall, St. Philip.

In 2011, officers of the Derelict Buildings and Vehicles Section approved 68 requests for disposal of ACM and 18 for the disposal of fibreglass. These requests corresponded to 185 loads of ACM and fibreglass being disposed at the disposal facility at Rock Hall, St. Philip during 2011.

5 ENVIRONMENTAL IMPACT ASSESSMENTS

Environmental Impact Assessments (EIAs) and Environmental Scoping Studies (ESS) are intended to identify potential positive and negative impacts of development beforehand so that measures can be put in place to eliminate, where possible, or otherwise reduce and manage the negative impacts. If the impacts cannot be suitably mitigated, the EIA may be the basis of a decision not to approve a proposed project.

Under the National Physical Development Plan 2003, EIAs and Scoping Studies are required for the following classes of development:

- Chemical or petroleum manufacturing plants, other than plants for the manufacturing of pharmaceutical drugs;
- Refineries;
- Desalination plants;
- Electricity generating plants;
- Cement plants or other plants for the burning of lime or bricks;
- Any industry where the processes are potentially obnoxious or dangerous to health or amenity because of excessive smell, fumes, smoke, dust, grist, ash, noise or vibration;
- Waste management facilities other than facilities for the initial sorting or processing of source-separated dry recyclables;
- Waste disposal sites;
- Golf courses;
- Development within a Natural Heritage Conservation Area;
- Development within a National Park Forest Area;
- Development within an Agricultural area;
- Mining operations including quarries and sand mines;
- Applications for initial construction of, or expansions of major transportation infrastructure including highways, airports, seaports, wharves, marinas or jetties;

- Sewage treatment facilities;
- Crematoriums and funeral parlours; and
- Amusement parks.

EIAs may also be requested if it is the opinion of the Chief Town Planner that a proposed development may have significant adverse environmental impacts.

The Environment Protection Department sits on the EIA review panel and advises the Chief Town Planner on matters related to environmental management. The EPD is generally involved with reviewing Terms of Reference and reviewing EIA reports.

5.1 Planned Activities

The main activity planned for 2011 was to review EIAs and ESSs and provide comments to the Chief Town Planner.

5.2 EIA and ESS

In 2011, the Department reviewed and provided comments to the Chief Town Planner on six environmental impact assessments. Four of the EIAs pertained to sub-divisions of land, one to the extension of an existing quarry and the other to the expansion of the portion of the natural gas network.

5.3 EIA Guidelines

The technical sections of the EPD contributed to the development of guidelines to standardize the Department's requirements for developers with respect to monitoring conducted in an EIA. The guidelines will help to improve the environmental assessment of proposed developments with the view of mitigating, as far as practicable, pollution generated from development activities.

6 MANAGEMENT OF MULTI-LATERAL ENVIRONMENTAL AGREEMENTS (MEAS)

Multilateral Environmental Agreements (MEAs) are legally binding agreements between two or more countries, which relate to environmental issues. The Department is currently responsible for the implementation of several multilateral environmental agreements (MEAs). These are:

- The Stockholm Convention on Persistent Organic Pollutants (POPs)
- Basel Convention on the Transboundary Movement of Hazardous Wastes and their Disposal
- Chemicals Weapons Convention (CWC)
- Cartagena Convention and its protocols

Additionally, the Department is responsible for the Strategic Approach to International Chemicals Management (SAICM). SAICM is a policy framework for international action on chemical hazards. It supports the achievement of the goal to ensure that by 2020 chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health. The Department also has reporting obligations for the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (the London Convention).

6.1 Planned Activities

The activities planned by the Department for the year 2011 were as follows:

- Monitor and regulate the transboundary movement of hazardous waste in accordance with the Basel Convention
- Develop a National Implementation Strategy for the Implementation of the Globally Harmonized Systems of Classification and Labelling of Chemicals (GHS).
- Continue project to building capacity to test for POPs
- Build capacity concerning the Chemicals Weapons Convention
- Participate in the CReW project
- Participate in meeting or conference relating to the various conventions.

6.1.1 Guidelines for Environmental Impact Assessments (EIAs)

Officers from the ANPCS prepared and submitted draft guidelines on ambient air pollution and noise monitoring for inclusion into the EIA review process. The Marine Pollution Control Section also provided input into the development of the guidelines. The purpose of the guidelines is to ensure that the environmental assessment of a

proposed development to mitigate, as far as practicable, pollution generated from development activities.

6.1.2 Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is the most comprehensive global environmental agreement on hazardous and other wastes. The Convention aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes. The Basel Convention came into force in 1992 and Barbados was a Party from 1995.

The Environmental Protection Department's role in the Basel Convention is to provide technical assistance and guidance to waste generators, to ensure that hazardous waste is treated and disposed of in an environmentally sound manner. Where local disposal is not possible given the technical and infrastructural constraints of the island, the Department regulates the movement of hazardous and other wastes out of the country, in keeping with the guidelines of the Basel Convention. Annual reports are generated for submission to the Basel Convention Secretariat, which helps provide data to determine future initiatives required to strengthen the Convention. The Department also serves as the local implementation arm for undertaking projects, training and technology transfer.

A representative from the EPD participated in the 10th meeting of the Conference of the Parties for the Basel Convention that was held in Cartagena de Indias, Colombia, from October 17th to 21st 2011. The topics discussed were of importance to the work of the Environmental Protection Department as the National Focal Point for the implementation of the Basel and Stockholm Conventions and regulatory agency for waste management and disposal in Barbados. Some of the matters discussed included:

- Review and strengthening of the operation of the Basel Convention regional and coordinating centres
- Technical guidelines:
    - on transboundary movements of electronic and electrical waste (e-waste), in particular regarding the distinction between waste and non-waste
    - for the environmentally sound management of used and waste pneumatic tyres

    - for the environmentally sound management of wastes consisting of elemental mercury and wastes containing or contaminated with mercury
    - on the environmentally sound co-processing of hazardous wastes in cement kilns
    - for the environmentally sound management of wastes consisting of containing or contaminated with persistent organic pollutants
- Capacity-building for the implementation of the Basel Convention; and
- National reporting

Participation in the meeting will assist the Environmental Protection Department in achieving its goal of having environmentally sound management of hazardous substances and hazardous wastes as outlined in Barbados' Sustainable Development Policy.

In 2011, the Department completed its annual reporting for the Basel Convention. The annual report outlined the number and composition of hazardous waste shipments that left in Barbados in 2011. This document was forwarded to the Basel Convention Technical Secretariat by electronic mail on December 29, 2011.

Regarding the shipment of hazardous waste abroad, the Department recommended to Foreign Affairs that a bilateral agreement be established with the United States of America (USA) and requested information from the US Environmental Protection Agency to prepare this document. The bilateral agreement would allow Barbados to ship hazardous waste to the USA for environmental sound disposal, which would be more economical than the existing practice of shipping such waste to Canada for disposal.

6.1.3 Development of a National Implementation Strategy

The Department began a two-year project, in association with the United Nations Institute for Training and Research (UNITAR), to develop a National Implementation Strategy for the Implementation of the GHS.

The GHS is a system for standardizing and harmonizing the classification and labelling of chemicals. It is a logical and comprehensive approach to:

- defining health, physical and environmental hazards of chemicals;
- creating classification processes that use available data on chemicals for comparison with the defined hazard criteria; and

- communicating hazard information, as well as protective measures, on labels and Safety Data Sheets (SDS).

From April 11-13, 2011, representatives from Government agencies, industry, academia, and the civil society were invited to participate in the launch of the project. During the year, the Department selected and contracted a consultant to conduct the substantive work for the project. The consultant prepared and submitted a report, which outlined the environment in Barbados for hazard communication and the GHS. The Department also facilitated the preparation of a Comprehensibility Testing Report and a Legal Analysis Report. The report on Comprehensibility Testing sought to assess the existing level of understanding of the GHS communication tools such as labels and pictograms. The Legal Analysis report sought to identify necessary changes in the legislative environment to facilitate the implementation of the GHS. Both reports should be finalized by the first quarter of 2012.

6.1.4 Building Capacity for POPs

The Stockholm Convention on Persistent Organic Pollutants (POPs) is a global treaty to protect human health and the environment from a category of highly dangerous organic chemicals. Exposure to Persistent Organic Pollutants (POPs) can lead to serious health effects including certain cancers, birth defects, dysfunctional immune and reproductive systems, greater disease susceptibility and even diminished intelligence. Given their long-range transport, no one government acting alone can protect its citizens or its environment from POPs. In response, the Stockholm Convention, which was adopted in 2001 and entered into force in 2004, requires Parties to take measures to eliminate or reduce the release of POPs into the environment. Substances controlled by the Stockholm Convention are:

- **Pesticides**: chlordecone, alpha hexachlorocyclohexane, beta hexachlorocyclohexane, lindane, pentachlorobenzene;
- **Industrial chemicals**: hexabromobiphenyl, hexabromodiphenyl ether and heptabromodiphenyl ether, pentachlorobenzene, perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride, tetrabromodiphenyl ether and pentabromodiphenyl ether;
- **By-products**: alpha hexachlorocyclohexane, beta hexachlorocyclohexane and pentachlorobenzene; and
- **Newly Added**: alpha hexachlorocyclohexane, beta hexachlorocyclohexane, chlordecone, Hexabromobiphenyl, hexabromodiphenyl ether and

heptabromodiphenyl ether (commercial octabromodiphenyl ether), lindane, Pentachlorobenzene, Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride, Tetrabromodiphenyl ether and pentabromodiphenyl ether (commercial pentabromodiphenyl ether).

Under Article 7 of the Convention, Parties must develop and endeavour to implement a plan for the implementation of its obligations under this Convention. Such a plan was developed and approved by Cabinet in 2007.

During 2011, the Department concluded a project that sought to build capacity in Barbados to testing for POPs. The overarching objectives of the project were to enable Caribbean countries to perform POPs analysis and to increase regional cooperation between laboratories responsible for POPs analysis and policy. Increased capacity to test for POPs would allow Barbados to contribute local data to future evaluations of the Convention and better manage POPs locally. Unfortunately, problems with equipment at the Government Analytical Services prevented some of the project objectives from being fully realized.

Monitoring under the Global Atmospheric Passive Sampling (GAPS) continued with sample replacement and retrieval conducted quarterly. The GAPS network is a global research survey that monitors the presence of Persistent Organic Pollutants and other chemicals in the air. The data which is obtained allows for comparison of sites around the world. Under the project, samples are sent to and analysed by Environment Canada.

6.1.5 Chemicals Weapons Convention

The Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (Chemical Weapons Convention) aims to eliminate an entire category of weapons of mass destruction by prohibiting the development, production, acquisition, stockpiling, retention, transfer or use of chemical weapons by States Parties. States Parties, in turn, must take the steps necessary to enforce prohibition concerning persons within their jurisdiction. Via a Cabinet decision in 2009, the Department was charged with administering Barbados' obligations under this Convention.

In 2011, the Department forwarded copies of the 2010 report to stakeholders for review and comment to finalize the report for submission to the Convention secretariat.

6.1.6 CReW Project

The Caribbean Regional Fund for Wastewater Management (CReW) is a four-year project which seeks to provide a mechanism through which key stakeholders can build capacity within the wastewater sector. The CReW seeks to assist countries with the establishment or expansion of wastewater management programmes in three main ways:

1. The provision of a sustainable financing mechanism
2. Supporting reforms in policy and legislation
3. Fostering knowledge exchange and dialogue among key stakeholders

Thirteen countries including Barbados will be participating in this project with pilot studies being established in four of them; Guyana, Trinidad and Tobago, Belize and Jamaica. For the remaining nine countries, the CReW will be supporting other projects and activities; so while Barbados is not involved in the pilot studies, it will still benefit from the overall initiative.

In Barbados, the CReW will support a project entitled "Strengthening policy and institutional frameworks while building capacity for wastewater management in Barbados." This is an area that the Government of Barbados has identified as a priority. It is hoped that the knowledge gained in this undertaking will guide the implementation and operation of technologies used in wastewater management which are appropriate for current and future conditions. Additionally, it will enable Barbados to meet its goal to improve compliance with its obligations under the Cartagena Convention and its Protocol on Land-Based Sources of Pollution.

In 2011, the EPD made a request to become the national focal point for this project as it falls under the Cartagena Convention for which the Department has responsibility.

6.1.7 Attendance at Conference and Meetings

The attendance of officers of the Environmental Protection Department to meetings and conference about the Convention is dealt with under Section 11.2.

7 MARINE POLLUTION CONTROL

The Marine Pollution Control Section (MPCS) has responsibility for this function. The MPCS comprises four officers - a Senior Marine Pollution Officer and three Marine Pollution Officers. The section seeks to prevent, reduce and control pollution of the marine environment of Barbados from whatever source. This is achieved by enforcing the Marine Pollution Control Act 1998 (MPCA); investigating reports from the public regarding potential occurrences of marine pollution; developing programmes, projects and policies to control marine pollution; and educating the public about marine pollution and its harmful effects.

7.1 Planned Activities for 2011

For the year 2011, the MPCS planned to:

- conduct regulatory inspections at Pine Hill Dairy, Barbados Bottling Company and B&B distribution;
- conduct compliance assessments at rum distilleries;
- collect scientifically sound data on marine litter for use in decision making;
- assess marine pollution complaints received by Department;
- review of bathing water quality;
- develop appendices to the National Oil Spill Contingency Plan.

7.1.1 Regulatory Inspections

Regulatory inspections seek to characterize the sources of pollution entering the environment by identifying those aspects of a company's operations that have the potential to harm the environment. This is a requirement under Section 4 of the MPCA. Once these sources are identified, the section recommends appropriate mitigation measures.

Additionally, the MPCS conducted inspections of twenty-eighty (28) funeral homes across the island. This report is currently in draft format and management of the Department is reviewing them.

7.1.2 Compliance Inspections

A year after the MPCS conducts a regulatory inspection at an establishment; a compliance inspection is done to determine the extent the entity implemented the Department's recommendations.

In 2011, the MPCS conducted a compliance inspection of the Barbados Light and Power Company Limited (BL&P). The section also completed compliance inspections for the Seawell Generating Station, Garrison Generation Station, Spring Garden Generation Station and Haggatt Hall Storage. The associated reports are in draft and management of the Department is reviewing them.

7.1.3 Marine Litter

The MPCS continued its National Marine Litter Monitoring Programme in 2011. The marine litter programme allows the MPCS to collect and analyse data, which can be used to raise awareness to changes or trends in marine litter.

As part of the marine litter programme, the MPCS hosted a clean-up of Morgan Lewis Beach in St. Andrew. This annual activity occurred for the sixth time on Saturday the 24th September 2011. A diverse group of people including staff from the Environmental Protection Department (EPD), residents of St. Andrew, the Rotary Club of Barbados and the Rotaract Club of Cave Hill amongst others participated in the event.

Volunteers collected and recorded the quantities of each type of litter on a one-kilometre section of the beach. At the end of the two and a half hours exercise, the volunteers had collected a total of 885lbs of litter. In descending order, the largest amount of litter items collected were bottle caps/lids, plastic beverage bottles and rope.

7.1.4 Investigation of Complaints

In 2011, the MPCS received and investigated 26 complaints about marine pollution, of which complaints about wastewater discharges accounted for the majority**Error! R eference source not found.**. Complaints classified as "Other" include those related to the release of diesel from a sunken vessel and algal blooms.

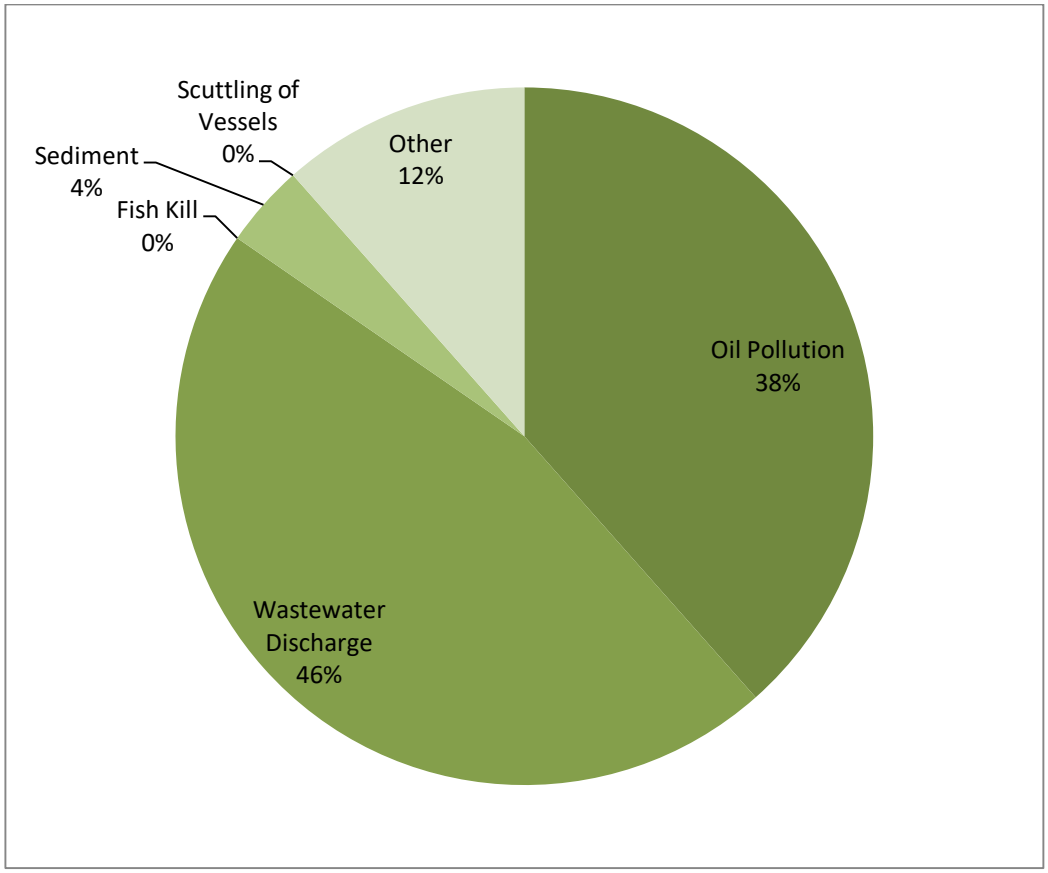


Figure 8: Type of Complaints Received by the Marine Pollution Control Section in 2011

In comparison to 2010, there was a 44% decrease in the total number of complaints received by the MPCS. There were noticeable increases in the number of complaints about oil pollution, wastewater discharges and scuttling of vessels. In contrast, there was a decrease in the number of complaints of sediment and those classified as "Other". There was no change in the number of fish kills received.

The number of marine pollution complaints received by the Department has shown an overall decrease over the past five years but a slight increase between 2010 and 2011. A summary of the number of complaints received and investigated since 2007 is depicted in Figure 9**Error! Reference source not found.**.

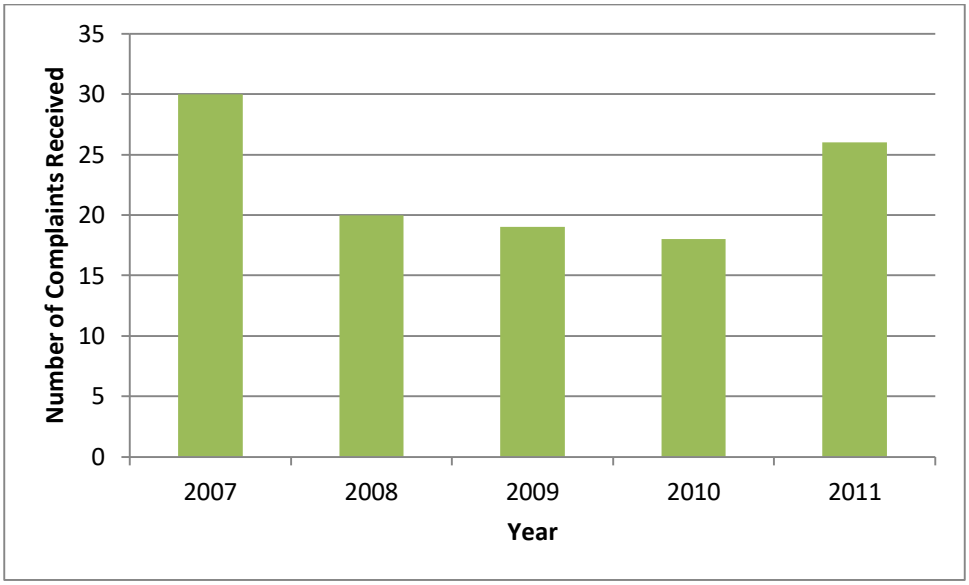


Figure 9: The Number of Marine Pollution Complaints Received during the Period 2007 – 2011

Although the number of complaints has decreased over the past five years, the ability of the Environmental Protection Department to bring closure to complaints is still limited because the attendant regulations, under the Marine Pollution Control Act, have not come into force. Without the relevant regulations, there is little impetus for an offender to curtail their negative behaviour.

7.1.5 Oil Spill Contingency Planning

The National Oil Spill Contingency Plan was revised and is awaiting submission to Cabinet. The updated Plan speaks to the development of several appendices; some of which have been completed. Appendices such as the sensitivity maps are being developed.

The Barbados National Response Team (BNRT), head by the EPD, worked with the Regional Marine Pollution Emergency Information and Training Center for the Wider Caribbean (REMPEITC) to facilitate the development of Environmental Sensitivity Index (ESI) Maps for Barbados. REMPEITC funded the project and hired consultants to conduct the work.

REMPEITC consultants Mr Felix Lopez and Ms Véronique Moriniere came to Barbados from April 3-8, 2011 to start the process of developing ESI maps for Barbados. During this time they met with EPD, CZMU and with the National Oil Spill Response team to determine what information was available and the information Barbados needed was displayed on the maps. The consultants also met with various individuals to collect data, toured the island, examined the different types of

coastlines and visited any other areas of interest for the development of the sensitivity maps.

The consultants visited Barbados again from July 5-7, 2011 to continue the process of developing ESI maps for the Island. During this time the EPD coordinated a national workshop for the development of ESI maps at the lecture theatre of the Warrens Office Complex where the consultants presented their work. This workshop was a technology-based aimed at assessing the draft ESI maps for Barbados. Consequently, the consultants facilitated the delivery of the completed Environmental Sensitivity Index (ESI) maps for the Island.

A Cabinet Paper on the national workshop for the development of ESI maps for Barbados was prepared and submitted to the Ministry of Environment.

The BNRT in association with ESSO Standard Oil Barbados, the sole sponsor of the drill, and the EXXON Mobil Latin America Regional Response Team (LARRT) conducted a desk-top Tier III Oil Spill Simulation Exercise over the period May 2nd – 6th 2011 at the Barbados Hilton Hotel. This Hemispheric Tier III Exercise was preceded by the Tier I and Tier II Exercise conducted in October 2010. Approximately one hundred and twenty (120) persons within municipal, regional and international spheres spanning both private and public sector entities took part in the simulation exercise. The number of estimated international participants totalled seventy (70) whilst the sum of local participants is approximated at fifty-seven (57). Among the noted international participants were: EXXON Mobil Latin America Regional Response Team (LAART) and Clean Caribbean and Americas (CCA) whilst local participants constituted the Ministries of Labour, Agriculture, Health, Tourism, Finance, the Environment as well as key government departments such as the Divisions of Energy, Public Works, Customs & Excise and International Transport. This exercise was a success. All involved improved their knowledge of oil spill response procedures and the integration of international teams in the event of a Tier III level spill. The report for the National Oil Spill Tier III simulation exercise has been completed and submitted to Cabinet.

Also in 2011, one officer from the BNRT completed the Oil Spill Preparedness and Response Training Course with the Clean Caribbean & Americas (CCA) group in Florida, USA.

7.2 Development of Terms of Reference

The MPCS developed Terms of Reference (TOR) for a project to characterize and assess the impacts of stormwater discharges on the marine environment.

Under Section 4 of the Marine Pollution Control Act, 1998-40 (MPCA), the Director must characterize pollution from sources such as land-based and dumping activities. Moreover, the Director must develop and implement a programme for the prevention, reduction and control of pollutants into the environment.

One of the sources in need of investigation is surface runoff. The proposed project will help to identify the potential impacts of dumping of solid waste on water quality and promote strategies to reduce sediment loads in stormwater, among other things. Management of the Department is reviewing the TOR.

8 MANAGEMENT OF SOLID WASTE AND HAZARDOUS MATERIALS

The Solid Waste and Hazardous Materials Section (SWHMS) comprises two officers – a Senior Environmental Protection Officer and an Environmental Protection Officer – and is responsible for the regulation of solid waste management facilities and disposal of hazardous substances. This is achieved by inspecting solid waste disposal sites; advising the public on the safe storage, use and disposal of hazardous substances; helping businesses and industries to identify and manage hazardous waste; developing policies for the management of hazardous substances; and regulating the shipment of hazardous substances under Basel Convention protocols and reporting this activity to the Basel Secretariat.

8.1 Planned Activities

For the year 2011, the SHMCS planned to:

- Continue routine monitoring and regulation of government-operated solid waste disposal facilities;
- Investigate complaints related to solid waste disposal and regulate the disposal of hazardous waste;
- Review request to radioactive materials; and
- Foster relations with recycling preparation companies to ensure their operations do not negatively impact the environment and human health.

8.1.1 Monitoring and Regulation of Solid Waste Disposal Facilities

The Environmental Protection Department regulates the disposal of waste at several disposal sites operated by the Sanitation Service Authority (SSA). These disposal sites are:

- Mangrove Pond Landfill, St. Thomas;
- Bulky Waste Facility, Bagatelle, St. Thomas;
- Asbestos Disposal Site, Rock Hall, St. Philip; and
- Blood and Grease Disposal Site, Lonesome Hill, St. Peter.

The following is a summary of the activities at these locations during 2011 based on information provided by the Sanitation Service Authority:

- 144,931 tonnes of municipal waste were deposited to the Mangrove Pond Landfill.
- 7,351 loads of metal waste were brought to the Bagatelle disposal facility.
- 185 loads of asbestos or asbestos-containing material were disposed of at the asbestos disposal facility in Rock Hall, St. Philip.
- 2,191,202 gallons of liquid waste were delivered to Lonesome Hill.

To improve the regulation of SSA's disposal facilities, the Department began the development of inspection forms to standardize the process for inspecting such sites. The form has been circulated to the relevant stakeholders for their input and is expected to be utilized in 2012.

In addition to the disposal locations listed above, the section monitored and regulated the activities at two other locations – Edgecumbe Quarry and Foster Lodge Quarry. These locations are used for the disposal of construction and demolition waste and vegetative matter.

8.1.2 Investigation of Complaints and Regulation of Disposal

Providing advice and ensuring the proper disposal of special and hazardous waste was a major part of the sections workload during 2011. The advice was provided on a case-by-case basis, taking into account several factors such as the quantities and toxicity of the waste to be disposed of. If a chemical could not be disposed of locally, the owner of the waste was instructed to ship the chemical out of the country to an approved facility following the procedure set out by the Basel Convention to which Barbados is a signatory.

During 2011, the SWHMS received twenty-nine (29) requests for disposal advice and seventy-nine (79) requests for the disposal of paint and oily water. Requests for assistance in these areas were primarily from private sector organizations, schools and government agencies. Disposal advice is a general enquiry about how to dispose of a substance. A disposal request is submitted to seek permission to dispose of a hazardous substance at one of the approved disposal sites in Barbados.

8.1.3 Importation of Radioactive Materials

From January 5th to December 6th 2011, the Department received applications for the importation of radioactive materials for use in oil exploration and radiopharmaceuticals. Applications were received from the Barbados National Oil Company Ltd, Queen Elizabeth Hospital and ESSO Barbados.

The largest quantity of radioactive material imported was 273.6 kg of molybdenum. Other quantity of radioactive material imported included 60.2 kg of sodium iodide and 40 kg of Caesium-137.

Also in 2011, the Department began to revise the Radioactive Material Import Application Form. The new form aims to improve the management of radioactive materials by gathering information pertaining, among other things, to the:

- qualifications of those handling the material;
- emergency plans in place to deal with accidents involving the material; and
- transporter of the material.

8.1.4 Regulating Recyclers

The section initiated routine monitoring and inspections of the known recycling preparation and recycling entities to improve the operations at these entities and to ensure that their activities do not negatively impact on the environment.

Additionally, the section began to develop guidelines for recycling preparation entities. The guidelines are still in development.

9 WATER QUALITY MANAGEMENT

The Water Quality section has a mandate to ensure that the quality of Barbados' drinking water supply is maintained. The section's primary responsibilities are to monitor the:

1. quality of the ground/potable water at the source (i.e. the well-head);
2. quality of nearshore marine water at several beaches to assess whether the microbial quality of the marine environment is suitable for recreational purposes;
3. discharges from wastewater treatment facilities; and
4. impact of waste disposal on groundwater quality.

Three officers staff this section: one Senior Environmental Protection Officer and two Environmental Protection Officers.

9.1 Planned Activities

Activities regarding water quality management for the year 2011 were as follows:

- Monitor the quality of water from potable and agricultural wells and springs.
- Conduct a wide-screen analysis of water from potable and agricultural wells.
- Monitor near-shore water quality.
- Monitor wastewater treatment plants.

9.1.1 Groundwater Monitoring

9.1.1.1 Monitoring of Public Supply Wells

To assess the quality of the drinking water in Barbados, water samples were taken from twenty (20) wells and two (2) springs across the island. Roughly, half of the samples are collected by the Environmental Protection Department; the other samples are collected by the Barbados Water Authority. These sampling locations are presented in Table 4. It should be noted that the Desalination Plant is not included in the monitoring regime for the Environmental Protection Department and consideration should be given to its inclusion.

Table 4: Sampling Locations for Public Supply Wells

Belle Catchment	Hampton Catchment	West Coast Catchment	Springs
Applewhaites	Bowmanston	Alleynedale	Benn Spring
Applewhaites Well Field	Carrington	Ashton Hall	Codrington College
Belle	Hampton	Carlton	
Codrington		Haymans	
Constant		Hope	
New Market		Molyneaux	
Sweet Vale #1		Trents	
Sweet Vale # 2		The Whim	
Waterford			

Samples were taken monthly. The Belle catchment was sampled on the first Tuesday of each month, followed by the Hampton catchment on the second Tuesday and the West Coast and Springs on the third and fourth Tuesday respectively. The samples collected were tested for twenty-one (21) water quality parameters and, where applicable, the results compared to the World Health Organisation (WHO) Guidelines for Drinking Water (all parameters do not have guideline values). The results of the water quality analysis of the springs were also compared with the WHO Drinking Water Quality Guidelines since the water from springs is used for recreational purposes and consumption by a sector of the society. Five parameters that have implications for the health and aesthetic quality of potable water were selected for discussion. These parameters, the associated WHO guideline values, possible sources and their implications are listed in Table 5.

Table 5: Selected Water Quality Parameters and their Associated Sources and Health Implications

PARAMETER	STANDARD	USE	IMPLICATIONS
Chloride	250 mg/l	In excessive amounts, it can be an indicator of saline intrusion or pollution from industrial waste or sewage.	High levels may give water an objectionable taste. High concentrations can be corrosive to metal distribution pipes and release heavy metal ions into the water.
Faecal Coliform	0 CFU1/100 ml	Indicator of faecal contamination from a warm-blooded animal	Gastrointestinal illness and other waterborne diseases
Nitrate expressed as Nitrogen (Nitrate-N))	10 mg/l	Indicator of pollution from agriculture, fertilizer, sewage, and industrial wastewater	May cause methemoglobinemia particularly in infants less than six months of age
Sulphates	500 mg/l	General indicator of pollution	High sulphates concentrations may cause transitory diarrhoea.
Total Dissolved Solids (TDS)	Taste Thresholds <300 mg/l - excellent 300-600 mg/l - good 600-900 mg/l - fair 900-1200 mg/l - poor >1200 mg/l - unacceptable	Indicator of dissolved organic and inorganic substances General indicator of pollution	High total dissolved solids may result in an aesthetically displeasing taste, colour and odour and encrusting of distribution pipes. Low total dissolved solids may result in an insipid taste and cause corrosion of distribution pipes and the release of heavy metal ions into the water.

[1] CFU – Colony Forming Units

9.1.1.1.1 Chlorides

All of the supply wells recorded average chloride concentrations that were below the recommended WHO drinking water guideline value of 250 mg/l (Figure 10). Average chloride concentrations were observed to be lowest in the Belle catchment and highest in the West Coast catchment.

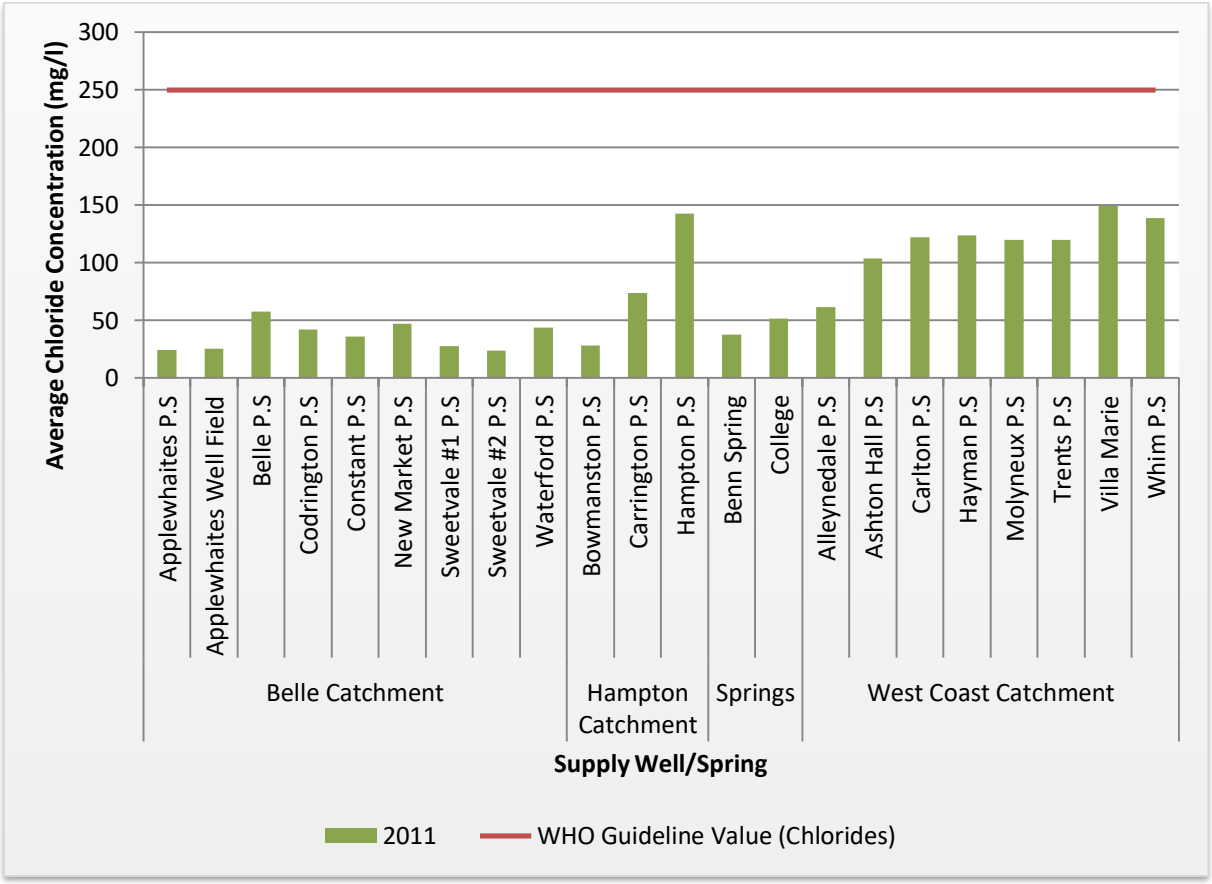


Figure 10: Average Chloride Concentration for Supply Sources for 2011

When comparing the average chloride concentrations for 2011 to those for the period 2007-2010, it was found that most of the supply wells had average chloride concentrations that were similar to those recorded over the period 2007 to 2010 (see Figure 11). Only the pumping stations at Hampton and Carrington registered average concentrations in 2011 that were markedly above their respective average concentrations over the period 2007-2010.

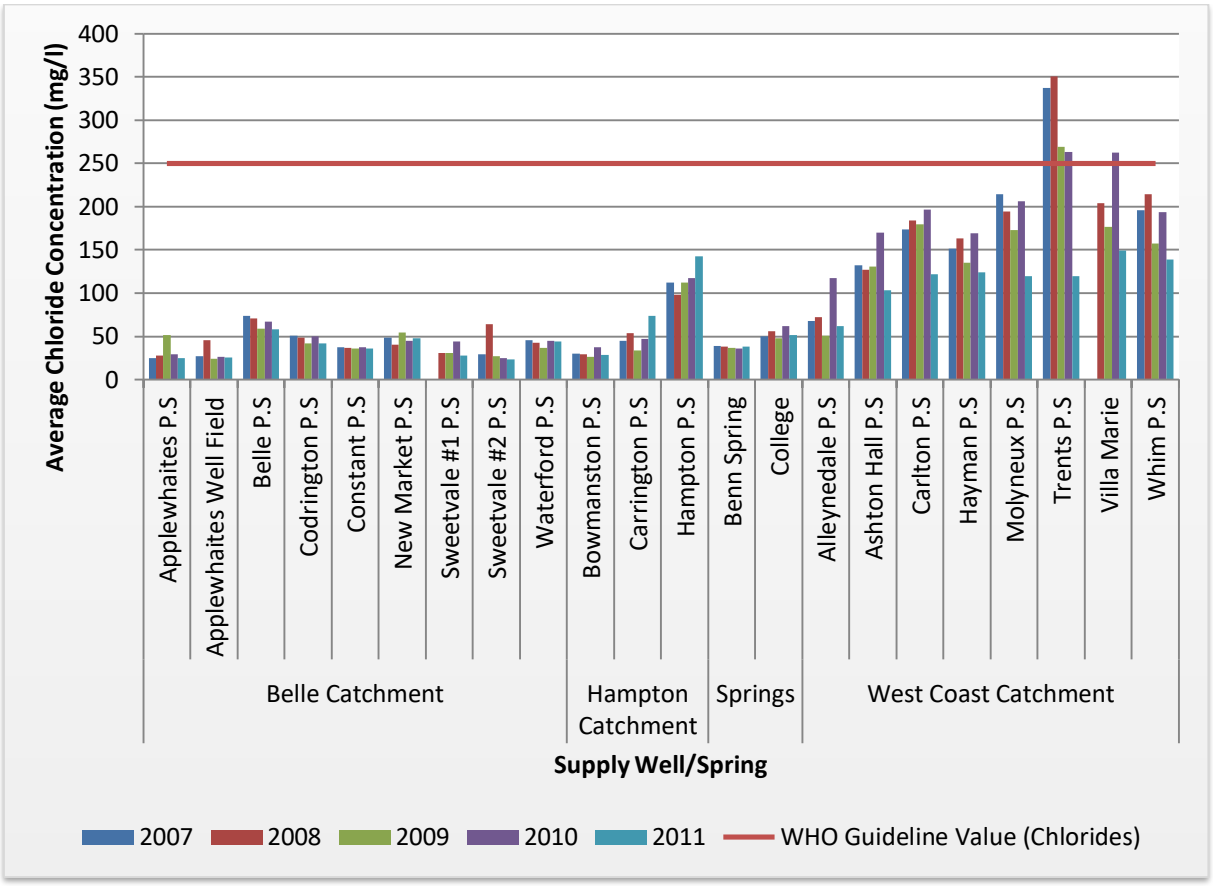


Figure 11: Average Chloride Concentration for Supply Sources over the Period 2007-2011

In contrast, all of the supply sources on the West Coast registered average chlorides concentrations for 2011 that was markedly less than the averages of the previous four years. This may have been the result of less saltwater intrusion in 2011 due to lower abstraction rates.

9.1.1.1.2 Nitrate expressed as Nitrate-N

In 2011, all of the public supply sources recorded average Nitrate-N concentrations that were less than the WHO guideline of 10 mg/l. However, most of the supply wells registered average Nitrate-N concentration above 6 mg/l (Figure 12). Only eight supply sources observed average Nitrate-N concentrations, which were less than 6 mg/l. Only one sample was collected from Codrington during 2011 because the well was out-of-production during 2011.

Within the Belle catchment, the Belle P.S recorded an average Nitrate-N concentration of 8.0 mg/l. This value was the highest of all the supply wells and supply springs. Other wells, which registered elevated average Nitrate-N concentrations, were Ashton Hall, which recorded a value of 7.3 mg/l, and the Whim, which recorded a value of 7.1 mg/l.

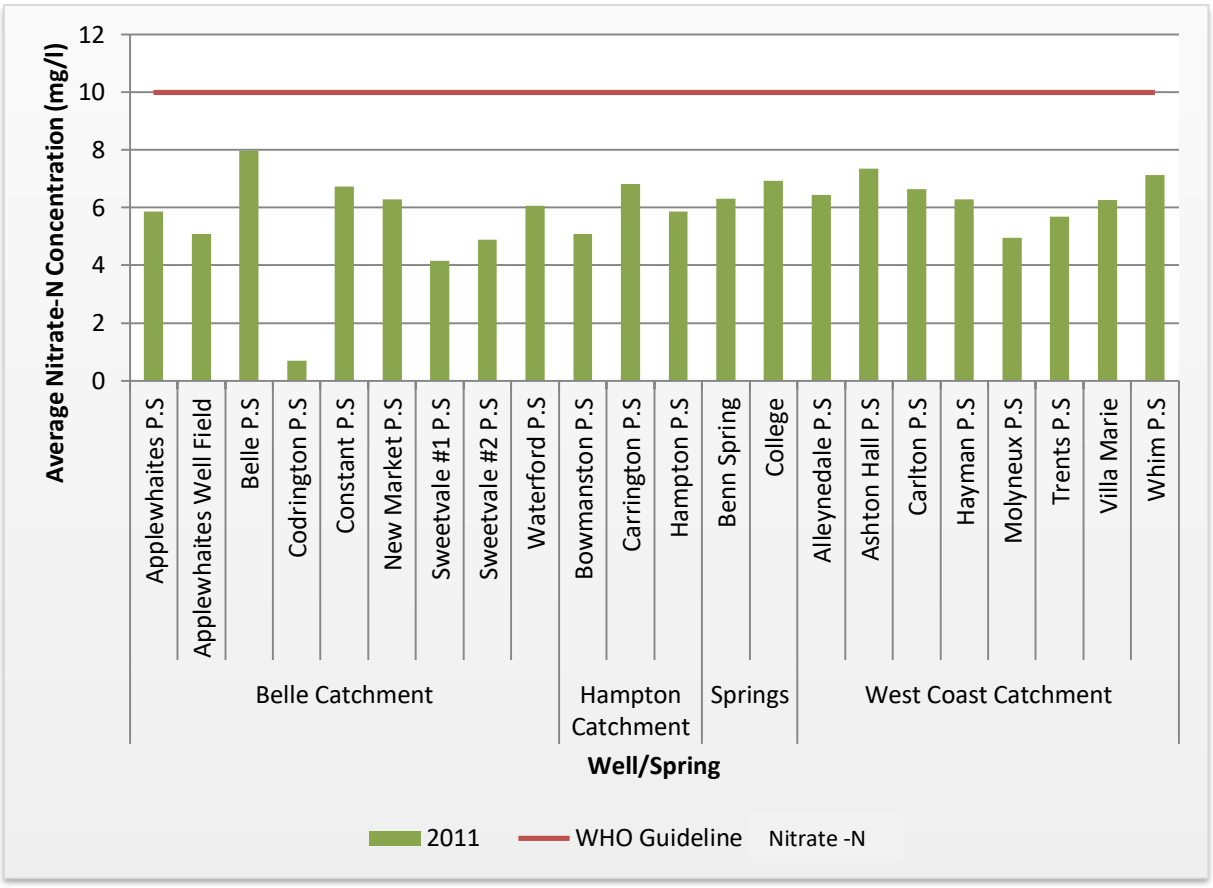


Figure 12: Average Nitrate-N Concentrations for Supply Sources for 2011

For most of the public supply locations, the average Nitrate-N concentrations observed during 2011 were less than those observed over the period 2007 to 2010 (Figure 13). However, the pumping station at Codrington recorded an extremely low Nitrate-N concentration. This may have been the result of an analytical error.

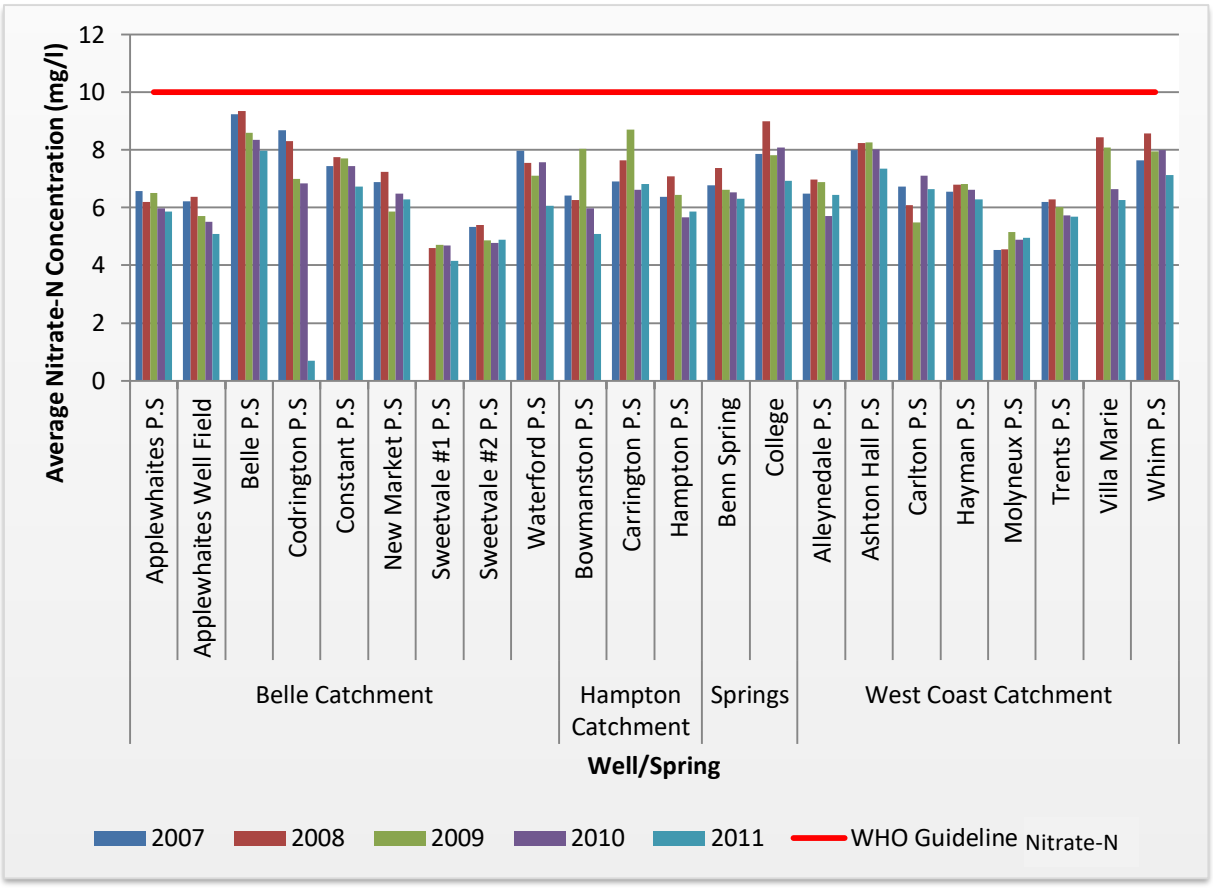


Figure 13: Average Nitrate-N Concentrations for Supply Sources over the Period 2007-2011

9.1.1.1.3 Sulphates

The highest recorded average concentration of sulphates, 34.4 mg/l, was recorded at the Trents P.S. This value was remarkably less than the WHO guideline of 500 mg/l (Figure 14).

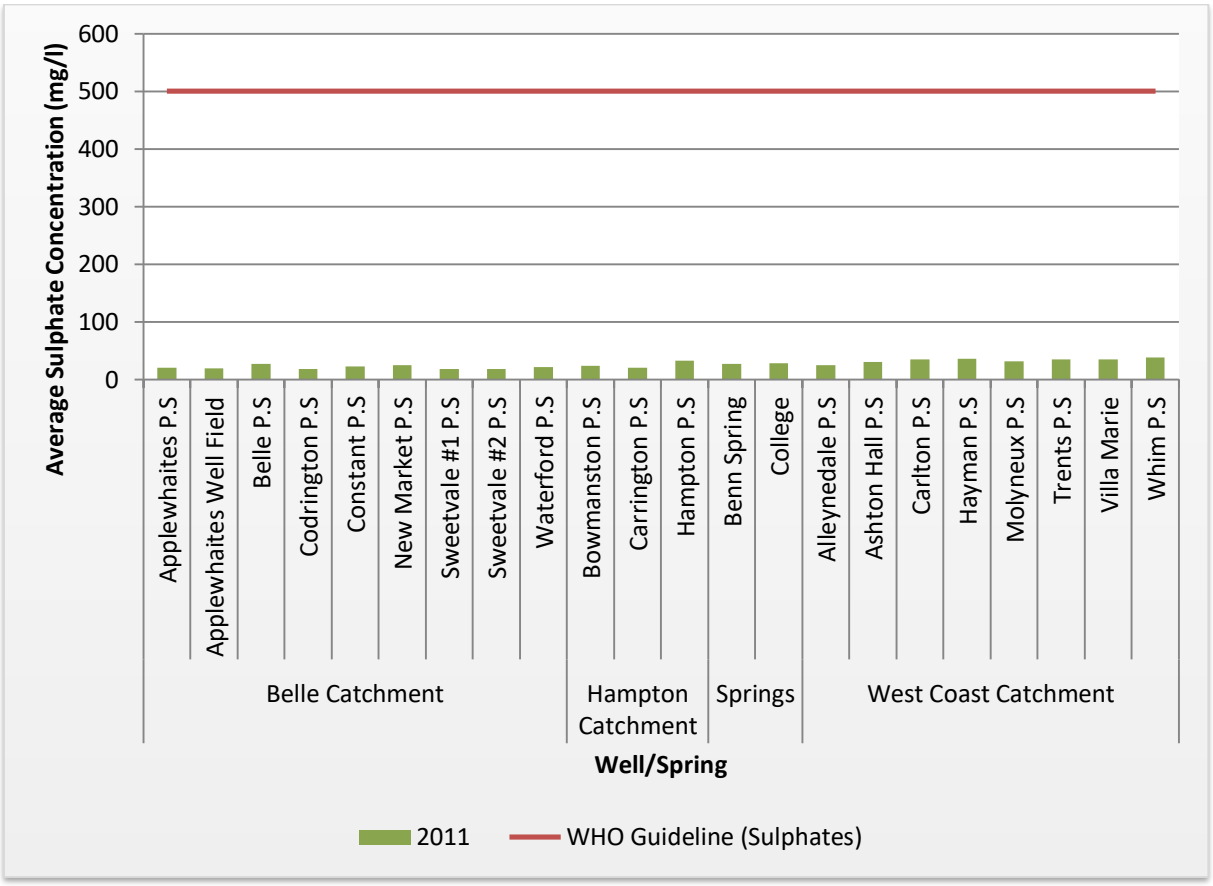


Figure 14: Average Sulphate Concentrations for Supply Sources

Similarly, all of the average concentrations for sulphate over the period 2007-2010 were markedly less the WHO guideline value. This illustrates that the supply sources in Barbados are not being overly impacted by pollution (see Figure 15).

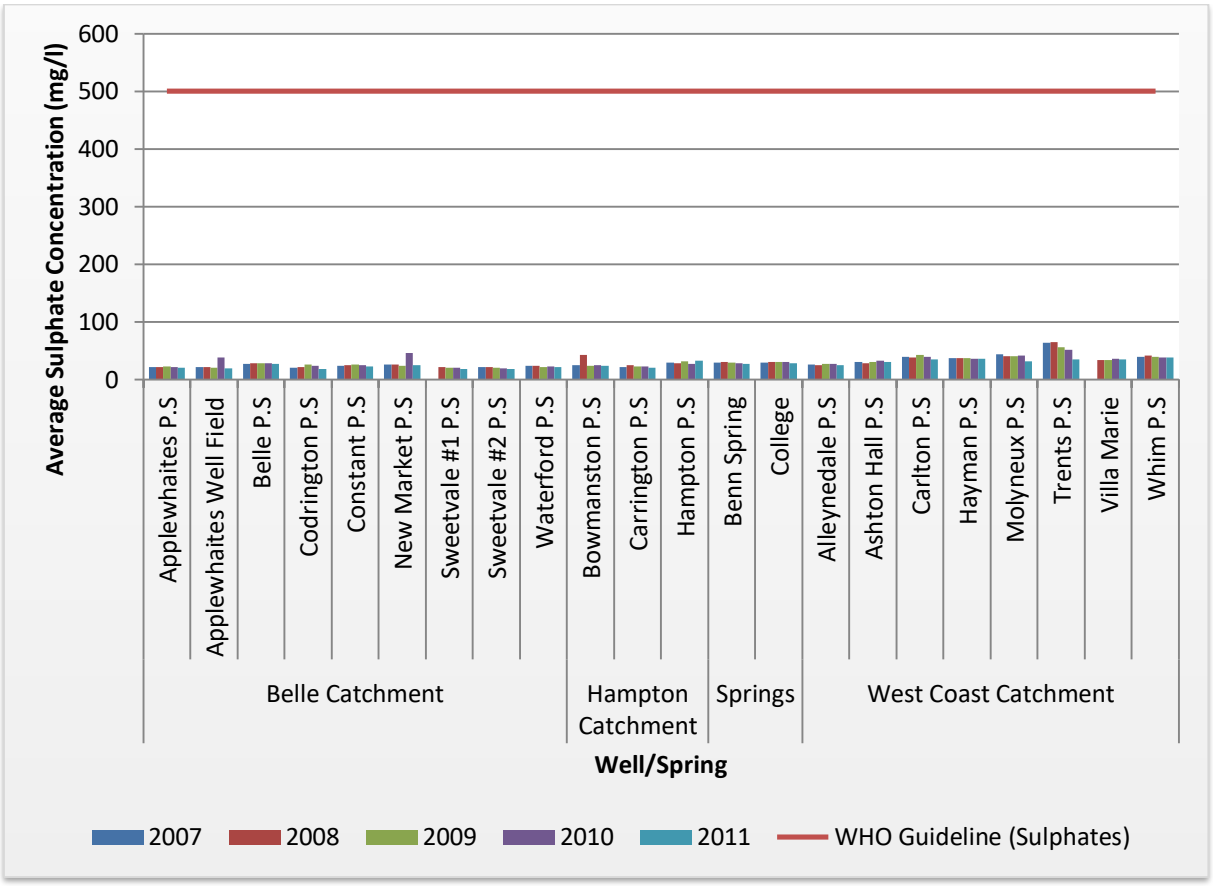


Figure 15: Average Sulphate Concentrations for Supply Sources over the Period 2007-2011

9.1.1.1.4 Total Dissolved Solids (TDS)

The majority of supply sources should have had tastes that would be classified by the WHO drinking water guidelines as "Good" since the average concentrations of the total dissolved solids (TDS) ranged from 300 – 600 mg/l (Figure 16).

Several supply wells, Sweetvale #2, Applewhaites Well Field, Applewhaites P.S Codrington, Constant, Waterford and Bowmanston recorded an average TDS concentration that was less than 300 mg/l. Drinking water from these locations would therefore be classified as "Excellent" according to the WHO drinking water guidelines.

Although the concentration of TDS at the Hampton well is presently in the 'good range', it is approaching the 600 mg/l threshold.

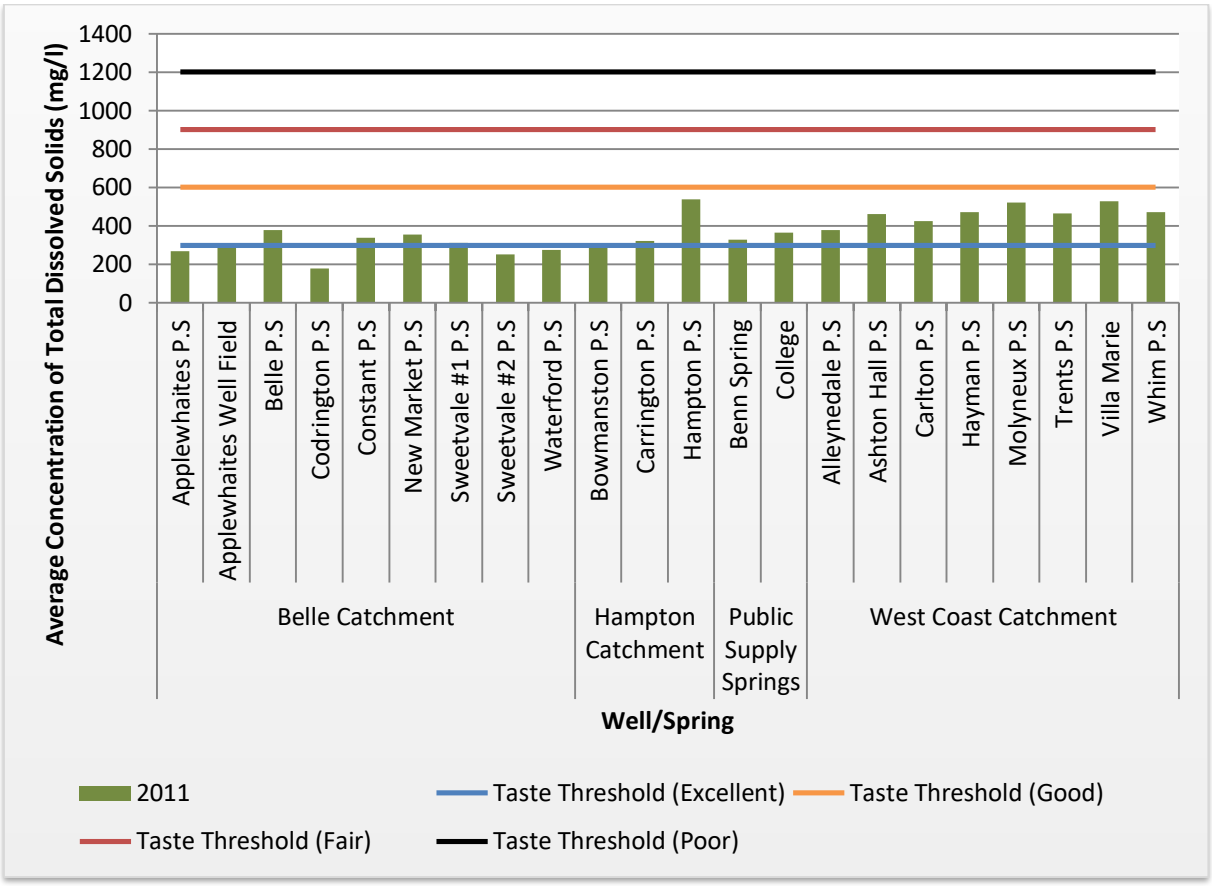


Figure 16: Average Concentration of TDS for Supply Sources for 2011

From Figure 17, it was also observed that over the period 2007-2010, the average concentrations of TDS were greatest in the West Coast catchment and least in the Belle catchment. This pattern was also observed in 2011.

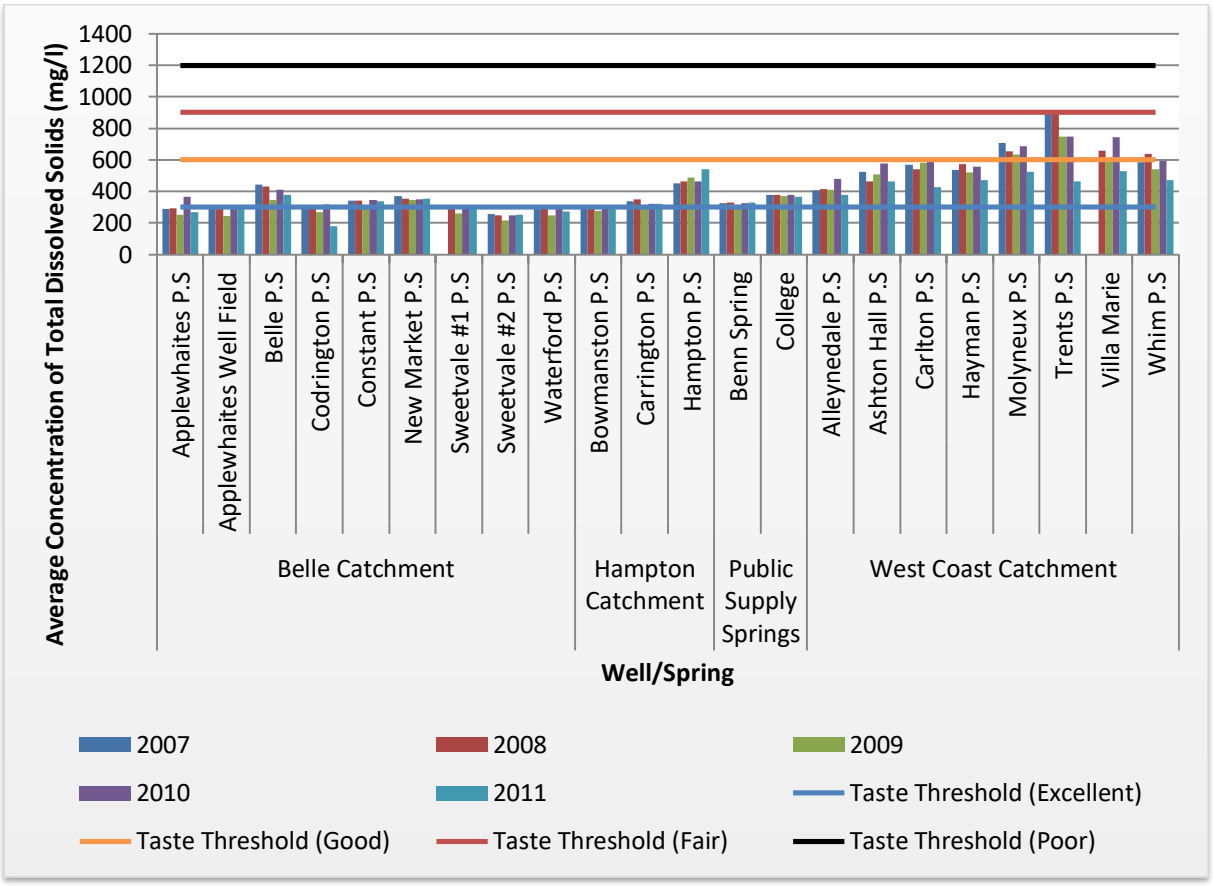


Figure 17: Average TDS Concentrations for Supply Sources over the Period 2007-2011

Two public supply sources, Hampton P.S and Benn Spring recorded average concentrations of TDS that were higher than those in 2010. The elevated average concentrations of the TDS may have been the result of increased agricultural activities or poor disposal practices in the vicinity.

9.1.1.1.5 Faecal Coliforms

The WHO drinking water guideline for Faecal Coliforms is zero Colony Forming Units/100 ml. Faecal Coliforms are an indicator of faecal contamination. It is used to indicate the potential presence of disease-causing agents. To prevent exposure of the public to such risk, water from public supply sources is chlorinated before distribution. If the chlorination is effective, microorganisms should be destroyed, and consequently, the levels of Faecal Coliforms in the drinking water should be zero.

Figure 18 illustrates the maximum concentration of Faecal Coliforms recorded for each supply source in 2011. The levels of Faecal Coliforms were non-detectable for the majority of supply wells.

However, values greater than zero were observed at Applewaithes P.S, Applewaithes Well Field, Constant P.S, New Market P.S, Sweetvale #1 P.S, Sweetvale #2 P.S, Bowmanston P.S, Benn Spring, College Spring, Molyneux P.S and the Whim P.S.

Samples collected from Applewaites P.S, Applewaithes Well Field, Sweetvale #1 College Spring and Molyneux P.S are all unchlorinated samples. Samples from these locations were taken at a point before chlorination.

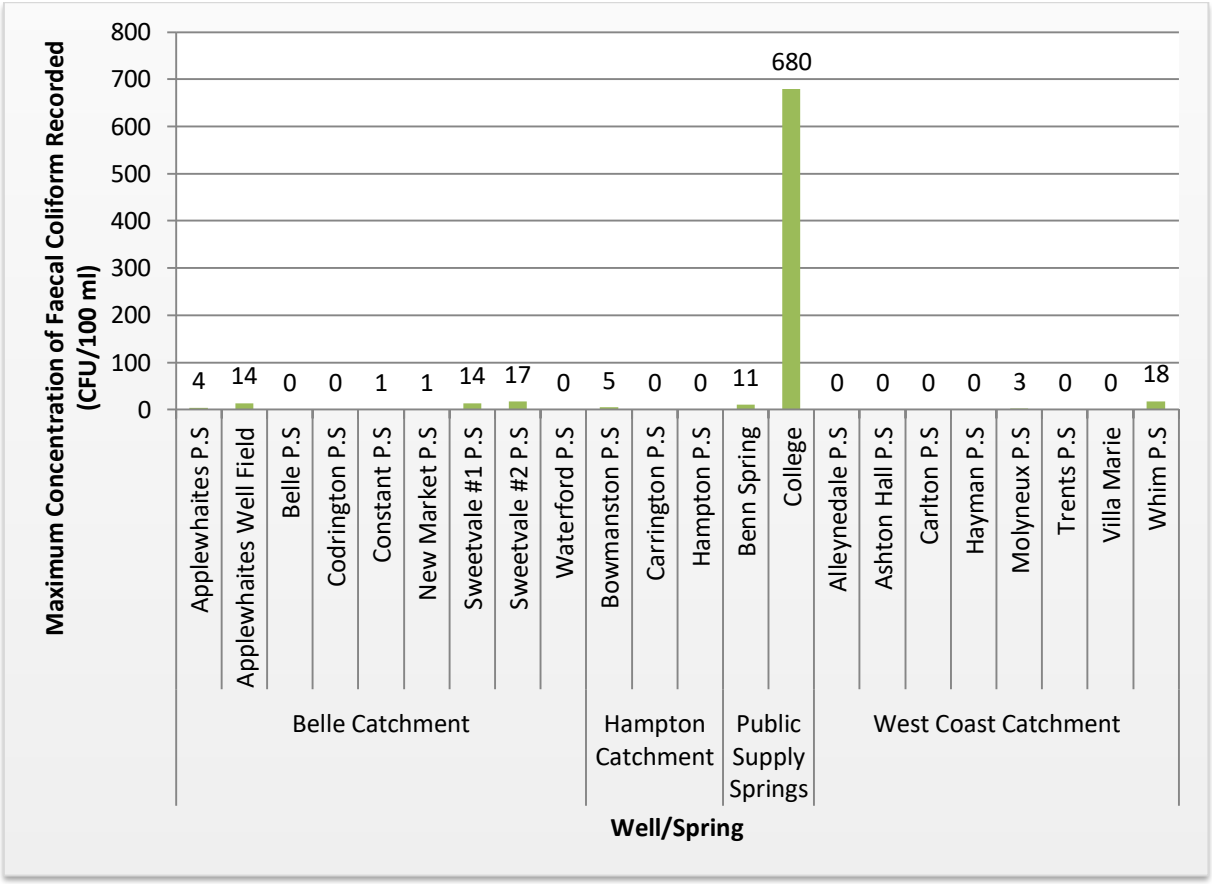


Figure 18: Maximum Recorded Concentration of Faecal Coliform for Supply Sources

Concerning the other supply wells that recorded concentrations of Faecal Coliform greater than zero CFU/ 100 ml, this may have been due to ineffective chlorination at these locations. EPD officers occasionally reported that the levels of residual chlorine were less the 0.5 mg/ml. According to the WHO drinking water guidelines, for effective disinfection, there should be a residual concentration of free chlorine of ≥0.5 mg/ml after a 30 minute contact time at pH < 8. Consequently, the EPD needs to formally communicate its observations to the BWA so that they can investigate and implement the necessary corrective measures.

9.1.1.2 Spring Monitoring

In addition to the two springs, which are used to supply drinking water, samples were collected from five additional springs. These springs are located at Bath, Fortesque, Porey Spring, Pot House and Three Houses. These springs are not used as a source of public drinking water supply. However, they are used for drinking by some members of the public who do not want to be exposed to chlorine. Additionally, with the presence of cholera in the region (Haiti), drinking water that has not been properly treated may be an avenue for the escalation of the disease should it reach these shores.

Consequently, a summary of some of the parameters used for the drinking water sources is presented below, to highlight any threats that might be posed to persons utilizing water from these springs. Moreover, an analysis of water from these locations can provide useful insight as to how the groundwater is being impacted.

9.1.1.2.1 Chlorides

Each of the five springs recorded average chloride concentrations that were below the WHO drinking water guideline for chloride of 250 mg/l. Fortesque and Pot House each recorded the highest average chloride concentration of 112.7 mg/l and 107.7 mg/l respectively whereas Porey Spring recorded the lowest value of 30.5mg/l (Figure 19).

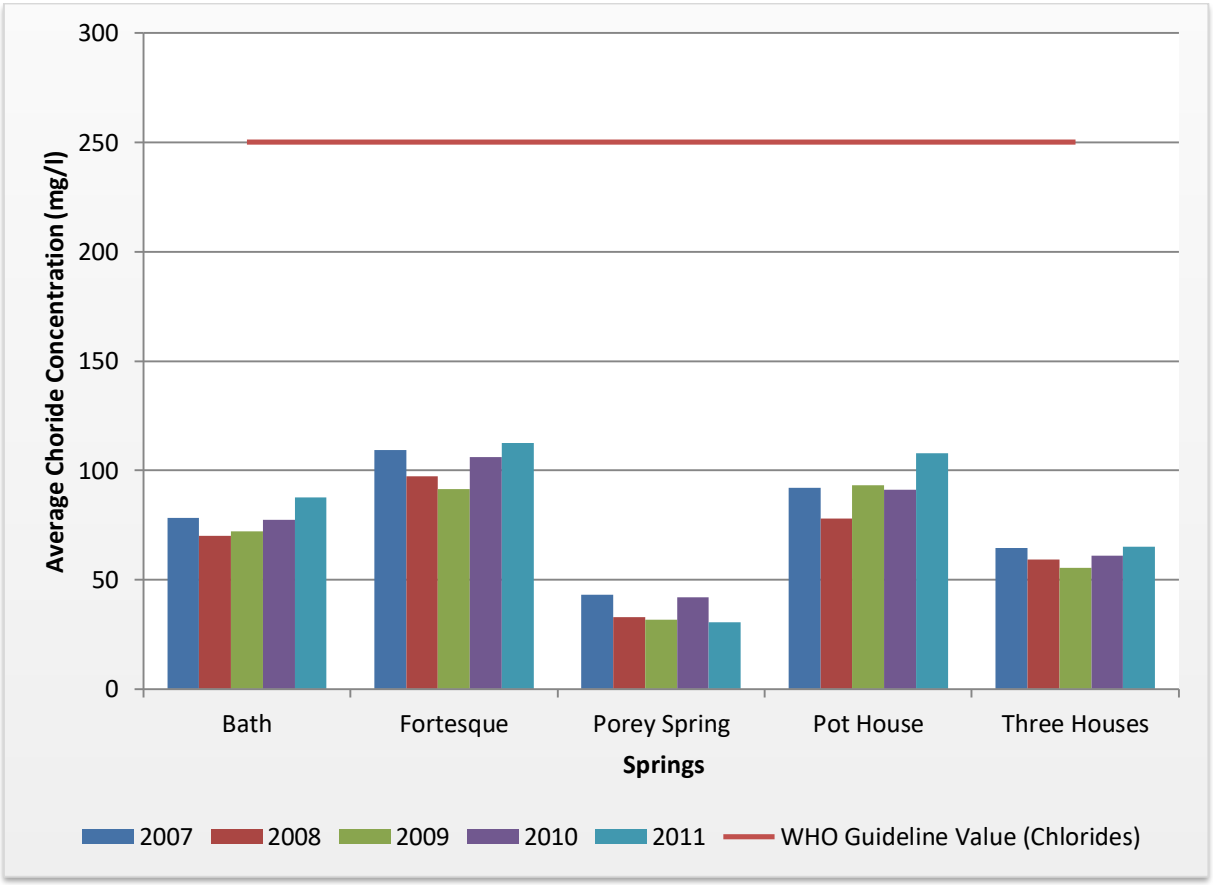


Figure 19: Average Chloride Concentration for Non-Public Supply Springs

9.1.1.2.2 Nitrates expressed as Nitrogen (Nitrate-N)

The two spring sources at Bath and Fortesque recorded markedly higher levels of nitrates than the other springs. The Bath spring recorded an average Nitrate-N concentration of 11.3 mg/l and the average Nitrate-N concentration recorded at Fortesque was 9.9 mg/l. The use of water for drinking from these locations is therefore of particular concern since the average Nitrate-N concentrations exceeded or were very close to the WHO drinking water guideline for Nitrate-N of 10 mg/l. The high Nitrate-N levels have the potential for negative marine impacts. In contrast, Porey Spring showed a Nitrate-N concentration of 4.0 mg/l (Figure 20).

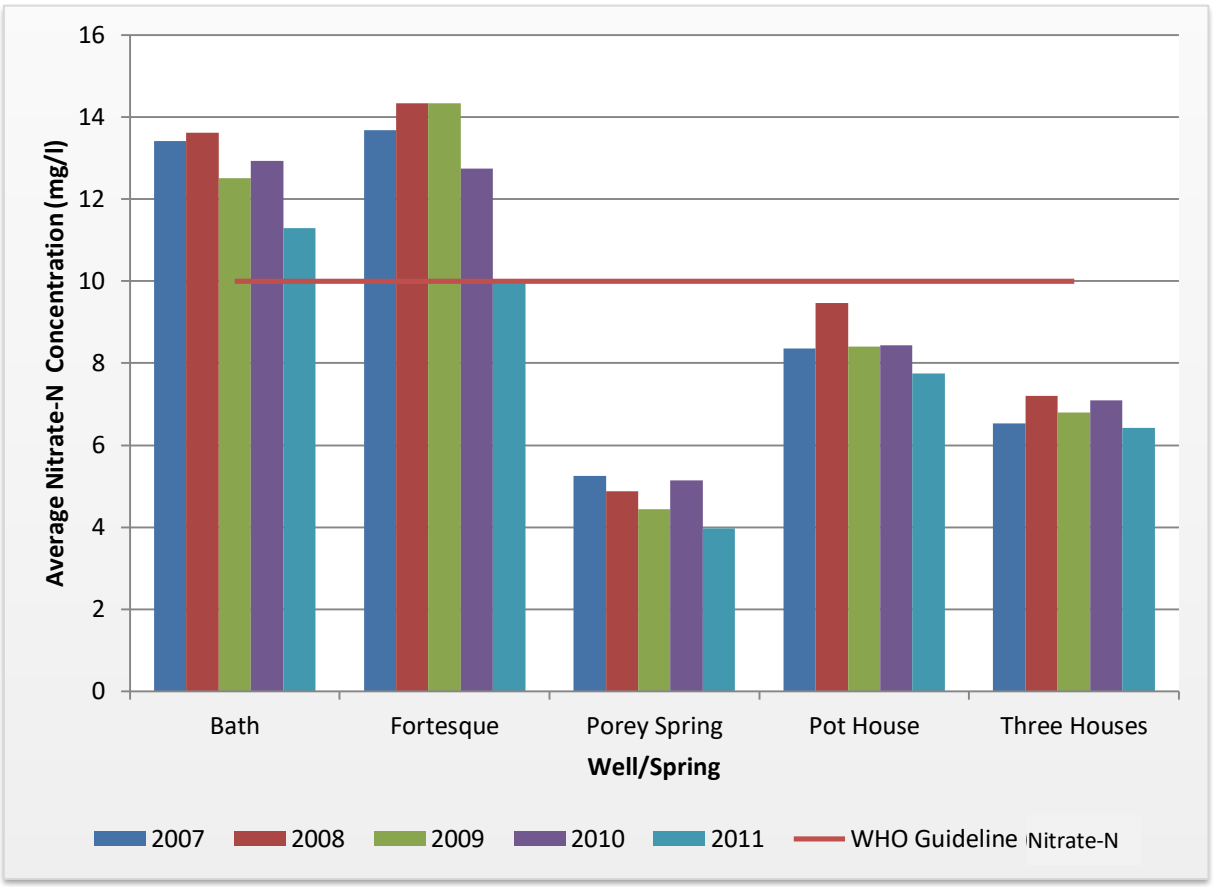


Figure 20: Average Nitrate-N Concentration for Non-Public Supply Springs

9.1.1.2.3 Faecal Coliform

Since the water from these five (5) springs is not used as a public drinking water source no chlorination is employed. Consequently, all of the springs recorded average concentrations of Faecal Coliform above the WHO drinking water guideline value of zero CFU/100 ml (Figure 21).

The spring at Three Houses recorded a maximum Faecal Coliform concentration of 2,600 CFU/100 ml; Porey Spring had the lowest value of 33 CFU/100 ml. High concentrations of Faecal Coliform in water from these locations indicate the possible presence of pathogens that may induce gastrointestinal illness in persons that ingest the water.

To minimize the risk to the public from using water from springs, educational programmes need to be developed, which highlight the dangers associated with the use of untreated spring water for potable or domestic purposes. The educational programmes should also emphasize how the use of untreated spring water for potable purposes can negate the efforts of the cholera plan for the island that was prepared by the Ministry of Health.

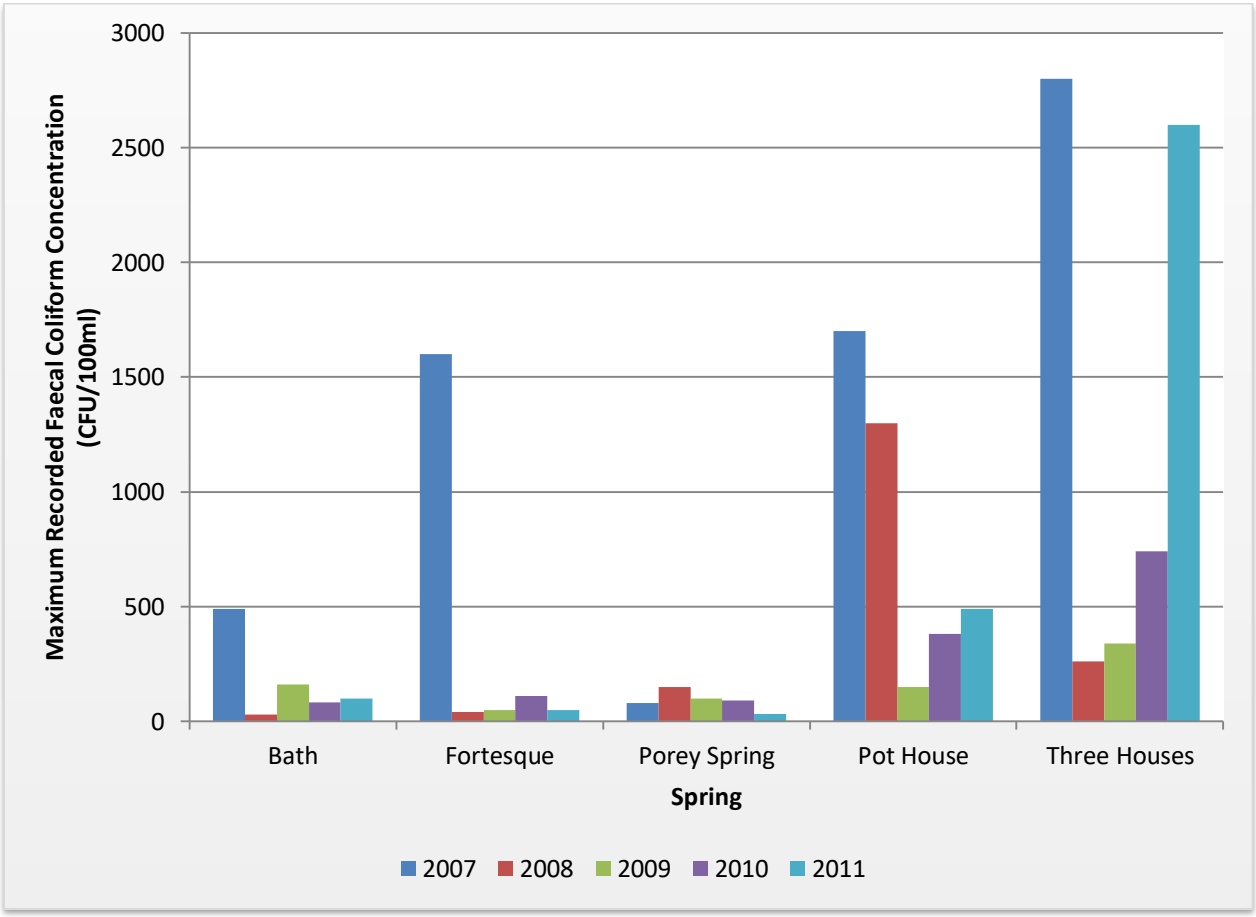


Figure 21: Maximum Faecal Coliform Concentration for Non-Public Supply Springs

9.1.2 Wastewater Plant Monitoring

Thirty-seven (37) wastewater plants were sampled in 2011. Of these 24 discharged their effluent directly to wells and 13 facilities reused their effluent for irrigation. Effluent samples collected from the wastewater plants were analysed for ten parameters. The following is a summary of compliance with the standards for pH; biochemical oxygen demand (BOD); total nitrogen (TN); total phosphorous (TP); total suspended solids (TSS); faecal coliforms and enterococci. Table 6 outlines the acceptable discharge standard for these parameters.

Table 6: End of Pipe Discharge and Reuse Standards

Parameter	Discharge Standard	Re-use Standard
pH	6-9	6-8
BOD	< 30 mg/L	< 10 mg/L
TN	< 5 mg/L	< 5 mg/L
TP	< 1 mg/L	No Standard
TSS	< 30 mg/L	< 10 mg/L
Faecal Coliforms	The geometric mean of a minimum of 5 samples should not exceed 200 colonies/ 100ml in any 30-day period. **AND** no more than 10% of samples exceed 400 colonies/100ml	
Enterococci	The geometric mean of min. 5 samples should not exceed 35 colonies/100ml in any 30 day period. **AND** No sample should exceed 104 colonies/100ml	

Most of the wastewater plants (34) complied with the pH standard. Only 1 plant, Barbados Coast Guard Headquarters, did not comply with the pH standard and two plants did not have results for pH.

Concerning BOD, 19 of the plants that discharged their effluent directly to a well complied with the standard. Similarly, eight of the wastewater plants that reused their effluent complied. All of the remaining treatment facilities did not comply with the standard for BOD.

Only two plants complied with the standard for TN. One plant disposed of its effluent to a well while the other reused its effluent.

Concerning TP, only three plants recorded concentrations of TP that were below the 1 mg/l standard.

Fourteen wastewater plants that discharge to wells and 11 that reuse complied with the standard for TSS.

Comparison of the bacteriological results with the standard was not possible as insufficient samples were collected to determine a geometric mean. The standards for Faecal Coliforms and Enterococci require a geometric mean of 5 samples over 30 days.

9.1.3 Recreational Water Monitoring

Monitoring of recreational bathing waters was performed weekly. Samples were taken from 17 beaches, eight on the west coast and nine on the south coast. The sampling of beaches on the South Coast was performed on Mondays while West Coast beaches were sampled on Wednesdays. Beaches were selected based on their popularity and level of use, and consequent potential to affect public health.

The samples collected were analyzed to determine the concentration of Faecal Coliform and Enterococci present. The monthly geometric means were subsequently compared to the standards for Faecal Coliform and Enterococci that are outlined in the proposed List of Prohibited Concentrations under the Marine Pollution Control Act, 1998-40. These standards are presented in Table 7 below.

Table 7: Marine Quality Parameters and Proposed Standards

Parameter	Rationale	Standard
Enterococci	Public health indicator of sewage pollution in seawater This is generally the preferred indication of health risk	The geometric mean of a minimum of 5 samples should not exceed 35 colonies/100ml in any 30-day period. AND No sample should exceed 104 colonies/100ml
Faecal Coliform	Public health indicator of sewage pollution in freshwater, but historically used in seawater as well	The geometric mean of a minimum of 5 samples should not exceed 200 colonies/ 100ml in any 30-day period. AND

		No more than 10% of samples exceed 400 colonies/100ml

A beach was considered to have not complied with the standard for Enterococci or Faecal Coliform in any given month if the monthly geometric mean of any of its respective sampling sites exceeded the standards.

9.1.3.1 Faecal Coliform

During 2011, there were no occurrences where more than 10% of the samples collected for faecal coliform exceeded 400 CFU/100 ml. However, for most of the sites at the various beaches, an insufficient number of samples (INS) were collected (Table 8). Generally, samples were not collected due to unfavourable marine conditions. Therefore, it was not possible to determine whether the geometric means of a minimum of five samples for Faecal Coliform exceeded 200 colonies/100 ml.

Table 8: Compliance with South and West Coast Beaches to the Faecal Coliform Standard by Month in 2011

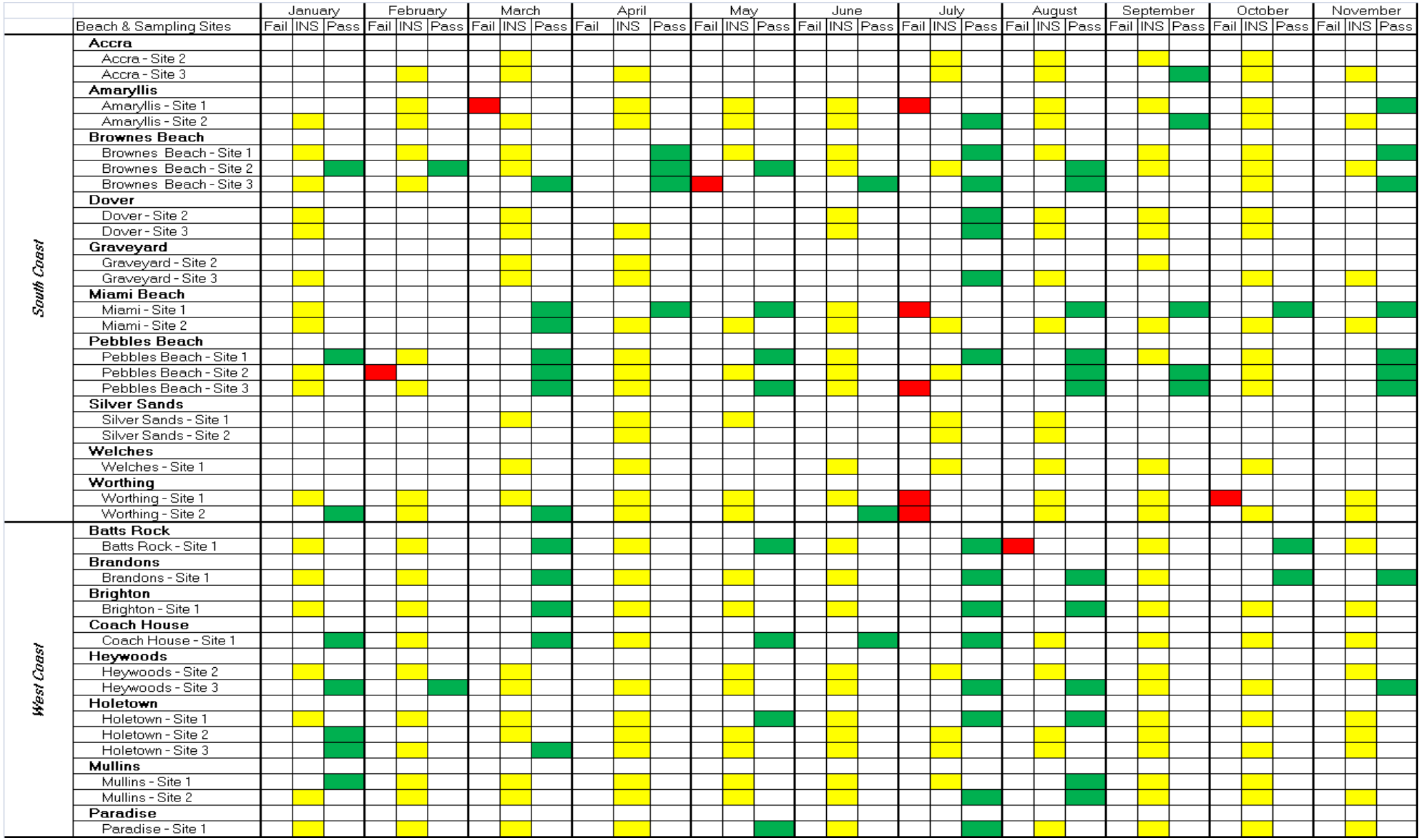
		January			February			March			April			May			June			July			August			September			October			November		
	Beaches	Fail	INS	Pass	Fail	INS	Pass	Fail	INS	Pass	Fail	INS	Pass	Fail	INS	Pass	Fail	INS	Pass	Fail	INS	Pass	Fail	INS	Pass	Fail	INS	Pass	Fail	INS	Pass	Fail	INS	Pass
South Coast	**Accra**																																	
	Accra - Site 2																																	
	Accra - Site 3																																	
	Amaryllis																																	
	Amaryllis - Site 1																																	
	Amaryllis - Site 2																																	
	Brownes Beach																																	
	Brownes Beach - Site 1																																	
	Brownes Beach - Site 2																																	
	Brownes Beach - Site 3																																	
	Dover																																	
	Dover - Site 2																																	
	Dover - Site 3																																	
	Graveyard																																	
	Graveyard - Site 2																																	
	Graveyard - Site 3																																	
	Miami Beach																																	
	Miami - Site 1																																	
	Miami - Site 2																																	
	Pebbles Beach																																	
	Pebbles Beach - Site 1																																	
	Pebbles Beach - Site 2																																	
	Pebbles Beach - Site 3																																	
	Silver Sands																																	
	Silver Sands - Site 1																																	
	Silver Sands - Site 2																																	
	Welches																																	
	Welches - Site 1																																	
	Worthing																																	
	Worthing - Site 1																																	
	Worthing - Site 2																																	
West Coast	**Batts Rock**																																	
	Batts Rock - Site 1																																	
	Brandons																																	
	Brandons - Site 1																																	
	Brighton																																	
	Brighton - Site 1																																	
	Coach House																																	
	Coach House - Site 1																																	
	Heywoods																																	
	Heywoods - Site 2																																	
	Heywoods - Site 3																																	
	Holetown																																	
	Holetown - Site 1																																	
	Holetown - Site 2																																	
	Holetown - Site 3																																	
	Mullins																																	
	Mullins - Site 1																																	
	Mullins - Site 2																																	
	Paradise																																	
	Paradise - Site 1																																	

9.1.3.2 Enterococci

For most of the beaches, an insufficient number of samples (INS) were collected. Generally, samples were not collected due to unfavourable marine conditions. Therefore, it was not possible to determine whether the geometric means of a minimum of five samples for Enterococci were exceeded 35 colonies/100 ml. However, sampling location at six beaches failed to comply with the standard for Enterococci (Table 9); consequently, were deemed not to comply with the standard for Enterococci. These beaches were Pebbles Beach, Amaryllis, Brownes Beach, Worthing, Miami Beach and Batts Rock.

July was the month when half of the beaches failed to comply with the standard for Enterococci. This occurrence may have been the result of heavy rainfall during this month. Heavy rainfall can contribute to direct and indirect discharges of contaminated stormwater into the sea resulting in increased nutrients and bacteria concentrations in the nearshore waters.

Table 9: Compliance with South and West Coast Beaches to the Enterococci Standard by Month in 2011



10 PUBLIC EDUCATION AND AWARENESS

The goal of the Public Education and Awareness Programme is to help increase the levels of environmental awareness and environmental stewardship among Barbadians.

10.1 Planned Activities

For the year 2011, the Environmental Protection Department (EPD) planned to:

- Produce and distribute its biannual newsletter;
- Continue the adopt-a-school programme with the Garrison Secondary School;
- Host at least one intern from the BCC Environmental Science Programme;
- Raise awareness about the Department via the print and electronic media

10.1.1 Biannual Newsletter

The Department published its newsletter in March and September of 2011. The March edition commemorated the EPD's 40th anniversary by highlighting some of the Department's achievements. This edition also seized the opportunity to educate readers about the functions of the Department. The September issue informed readers about some of the activities undertaken by the Department. For example, readers were made aware of a seminar about "Environmental Best Management Practices for Building Contractors" and the topics covered such as the impacts of construction and the process of applying for building approval.

10.1.2 "Adopt-a-School" Programme

The staff of the Environmental Protection Department took students from the Garrison Secondary School on a hike in the north of the island. The students were provided with a plethora of facts relating to the environment. Some of these interesting stories related to geological formations in the areas and the importance of protecting the delicate ecosystem for future generations.

10.1.3 BCC Internship

In 2011, the EPD hosted one final year student from the Environmental Science Programme at the Barbados Community College. The purpose of the internship is to provide meaningful work experience for young persons who have an interest in environmental science. Additionally, the internship provides an opportunity for the students to put into practice some of the principles they had learned. During their stint with the Department, the intern accompanied officers on their daily duties and

was exposed to the various functions of the Department. Additionally, the intern was assigned an individual project to complete.

10.1.4 Raise Awareness about the Department

The Department undertook the following activities to commemorate its 40th Anniversary.

- Articles were placed in the local newspapers which highlighted the functions of the Department as well as some of its achievements over the last 40 years.
- Commemorative paraphernalia such as pens, pencils, erasers and water bottles were purchased for distribution at public events such as the annual beach clean-up and open-days.
- Rebranding of the Department with a new logo and outfitting all of the Department's vehicles with decals of the new logo.
- Redevelopment of the EPD's website commenced but was not completed in 2011.
- Host an open-day in Jubilee Garden in the city.
- Aired advertisements of radio and television.

Concomitantly, the aforementioned activities also served to raise awareness about the work of the EPD and to educate the public on various environmental issues.

11 CONFERENCE, SEMINARS AND TRAINING

The Department participated in several training courses as well as seminars, conferences and workshops to increase the technical competence of the staff, and articulate Barbados' position on critical environmental matters. Additionally, training and retraining are essential to the efficient operations of the Department, and indeed any organisation. It is necessary to support the technical and administrative activities as well as promote the personal development of staff. The following is a summary of training activities undertaken in 2011 (Tables 10, 11, 12 and 13).

11.1 Training

11.1.1 Local Training

Table 10: Summary of Local Training Activities

Name of Course/ Activity	Location/ Date	Description	Officers (s) In Attendance
Stress Management	February 7-8, 2011 Garfield Sobers Gymnasium		• J. Yearwood - Environmental Technician
Public Service Human Resource Management	May 9-16, 2011	To further develop the personnel or human resource practitioner's skills to improve operational effectiveness to achieve organizational goals.	• J. Alleyne – Senior Clerk
Groundwater quality Analysis using AquaChem and PHREEQC	May 16th-19th, 2011		• D. Roach – Senior Environmental Protection Officer (Water Quality) • G. Hinds - Environmental Protection Officer

Name of Course/ Activity	Location/ Date	Description	Officers (s) In Attendance
Occupational Health and Safety	June 23rd-24th, 2011 Dining Club		• T. Armstrong – Senior Environmental Protection Officer (Solid Waste) • N. Aymes – Marine Pollution Officer • Glen Clarke – Building Development Officer • G. Hinds – Environmental Protection Officer
Training in Effective Customer Service	July 4th- 5th, 2011 UWI, Solutions Centre		• A. Reeves – Environmental Technician
Introduction to MS Access	July 4th- 12th Data Processing Department	To provide participants with basic knowledge and skills in Microsoft Access	• T. Armstrong – Senior Environmental Protection Officer (Solid Waste) • C. Browne – Building Development Officer
Finance for Non-Financial Managers	July 18-26, 2011 UWI, Solutions Centre	To provide participants with the knowledge to make financial decisions based on the analysis and interpretation of financial statements	• A. Headley – Deputy Director

Name of Course/ Activity	Location/ Date	Description	Officers (s) In Attendance
Court Prosecutors Course	August 8th- September 2nd, 2011 Regional Police Training Centre	To sensitize members of the importance of the role of the Court Prosecutor	• T. Marshall – Building Development Officer • L. Chapman – Environmental Technician
Dynamic Speech Writing Seminar	September 5th- 9th, 2011 UWI, Solutions Centre		• P. Pile – Environmental Technical Officer
Intermediate Excel	September 19th- 30th, 2011 Data Processing Department	To upgrade the participant's skill in Excel to and Intermediate level.	• R. Best – Clerk/Typist
Project Monitoring and Evaluation	September 27th- 30th, 2011 UWI, Solutions Centre	To improve the implementation and assessment of programs and projects in the public service towards achieving greater effectiveness and efficiency.	• P. Pile – Environmental Technical Officer
Supervisory Management	October 3rd- 19th, 2011 Garfield Sobers Gymnasium		• T. Armstrong – Senior Environmental Protection Officer (Solid Waste) • A. Reeves – Environmental Technician
Project Management	October 6,13,20,27, November 3,10, 2011 Lloyd Erskine Sandiford Centre		• D. Roach – Senior Environmental Protection Officer (Water Quality)

Name of Course/ Activity	Location/ Date	Description	Officers (s) In Attendance
Orientation of Junior Officers	November 7th-10th, 2011 Gymnasium		• L. Chapman – Environmental Technician

11.1.2 Overseas Training

Table 11: Summary of Overseas Training Activities

Name of Course/ Activity	Location/ Date	Description	Officers (s) In Attendance
Introduction to Marine GIS	May 16th- 20th, 2011 Oostende, Belgium	This course provides an in-depth overview of the application of Geographic Information System mapping and analyses to the marine environment using ArcGIS 9.x.	• A. Eversley – Senior Marine Pollution Officer (ag)
Oil Spill Preparedness and Response Course	May 9th- 13th, 2011 Fort Lauderdale, Florida		• A. Eversley – Senior Marine Pollution Officer (ag)
The United Nations Institute for Training and Research (UNITAR) Workshop on Nanotechnology and Manufactured Nanomaterials	May 31st- June 01st, 2011 Panama City, Panama		• J. Headley - Director
Regional Training Workshop on Implementation and Enforcement: "Strengthening the Legislative, Regulatory and Enforcement Capacity on Small Island Developing States (SIDS) in the Caribbean with regard to the Basel, Stockholm and Rotterdam Conventions"	July 12th-13th, 2011 Trinidad and Tobago	This workshop primarily aims to improve upon the regions' ability to effectively implement and enforce the Basel, Rotterdam and Stockholm Conventions.	• A. Headley – Deputy Director
Clean Caribbean & Americas (CCA): 'Oil Spill Preparedness and Response Course	October 21st- November 01st, 2011 Fort Lauderdale, Florida		• C. Worrell – Marine Pollution Officer

11.2 Conferences, Seminars & Workshop

11.2.1 Local

Table 12: Summary of Participation in Local Seminars, Conferences and Workshop

Name of Course/ Activity	Location/ Date	Description	Officers (s) In Attendance
Regional Training Workshop on Environmental Impact Assessment for Senior National Planning/Physical Planning and Environmental Officers	March 15th-17th, 2011	In the Medium to long term, it is expected that this training will help those professionals to utilize these skills to better represent their national interest in EIA decision- making.	• A. Headley – Deputy Director • I. Lavine – Senior Environmental Technical Officer
Visibility Conference on Standardisation	June 21st, 2011 Courtyard by Marriott Hotel	To significantly improve the efficiency of the organisation and its standards development processes.	• P. Pile – Environmental Technical Officer
Workshop on Solid Waste Management Legislation in Barbados	June 28th, 2011 The Savannah Hotel		• J. Headley – Director • T. Armstrong – Senior Environment Protection Officer
Global Environment Facility Project- "Piloting Climate Change Adaptation to Protect Human Health"	July 13th, 2011 Courtyard by Marriott Hotel	Water scarcity and the impact it will have on the health of the population, and the adaptation measures which will be implemented.	• D. Roach – Senior Environmental Protection Officer (Water Quality)
Invitation to Attend Employee Assistance Programme (EAP) Workshop	September 22nd, 2011 The Hospitality Institute		• C. Clarke – Senior Building Development Officer

Name of Course/ Activity	Location/ Date	Description	Officers (s) In Attendance
Renewable Energy Investment Analysis	October 11th, 2011 Courtyard by Marriott	This seminar will give a hands-on introduction to the analytical methods employed by software Retscreen, as well as its resource and product databases.	• P. Pile – Environmental Technical Officer

11.2.2 Overseas

Table 13: Summary of Participation in Overseas Seminars, Conferences and Workshop

Name of Course/ Activity	Location/ Date	Description	Officers (s) In Attendance
CSD Intercessional Conference on Building Partnerships for Moving Towards Zero Waste	February 16th- 18th, 2011 Tokyo, Japan		• A. Headley – Deputy Director
Basel Convention on the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	October 17th- 21st, 2011 Columbia		• A. Headley – Deputy Director
"Supporting the Implementation of the Global Monitoring Plan of Persistent Organic Pollutants (POP) in Latin America and Caribbean States"	March 21st- 25th, 2011 Barcelona, Spain		• P. Pile – Environmental Technical Officer
Basel Convention- Implementation and Enforcement	July 12th- 13th, 2011 Port of Spain, Trinidad		• A. Headley – Deputy Director
Regional Workshop on Assistance and Protection Against Chemical Weapons and Latin America and the Caribbean States.	September 21st- 23rd, 2011 Lima, Peru		• T. Armstrong – Senior Environmental Protection Officer (Solid Waste)
Regional Experts Workshop on Environmental Monitoring and Assessment in the Wider Caribbean Region	September 26th- 30th, 2011 Montego Bay, Jamaica	This workshop primarily aims to improve effluent reporting and assessment of water quality conditions throughout the Convention Area as required by the LBS Protocol.	• A. Headley – Deputy Director

Name of Course/ Activity	Location/ Date	Description	Officers (s) In Attendance
OPCW Workshop on Coordination of Assistance and Protection under Article X on the Chemical Weapons Convention	November 22nd- 24th, 2011 The Hague, The Netherlands	The Workshop will provide a forum in which States Parties can share their experience in the Practical implementation of Article X.	• A. Headley – Deputy Director
Second Session of the Intergovernmental Negotiating Committee to Prepare a Legally Binding Instrument on Mercury (INC2)	January 24-28, 2011 Chiba, Japan	This committee was formed based on a decision of the 25th Session of the United Nations Governing Council to develop a legally binding instrument on mercury.	• I. Lavine – Senior Environmental Technical Officer (ag)

12 LOOKING FORWARD

Based on the summaries and analyses for the sections of the Environmental Protection Department and their various programmes, the following areas have been highlighted as aspects that need to be developed or modified so that the Department can effectively execute its roles and responsibilities:

1. Legislation needs to be drafted or adopted to address ambient air quality concerns in Barbados.
2. The institutional framework for the assessment and response to IAQ complaints should be re-examined and rationalized, particularly concerning the distribution of functions and responsibilities between the EPD and the Labour Department. It should be taken into consideration that there is a comprehensive legal framework in place to permit the Labour Department to address IAQ issues, whereas the framework (nuisance regulations) under which the EPD operates is much less comprehensive.
3. A Memorandum of Understands needs to be established with the University of the West Indies characterize sources of pollution extant in the Barbadian environment.

The Department also faces challenges concerning its legislative authority to institute regulatory action against violators of local statutes. This is an area that requires exigent strengthening if the Department is to effectively carry out its mandate.