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Environmental Audits for Sustainable Tourism

Environmental Management Audit

Negril Cabins Resort

Negril, Jamaica, W.I

Final Report

EAST Report No 98-235

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Prepared for
EAST Project
c/o Jamaica Hotel and Tourist Association
2 Ardenne Road
Kingston
Jamaica, W I

By
Hagler Bailly Services, Inc
1530 Wilson Boulevard
Arlington, Virginia 22209
U S A

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Executive Summary

What is an environmental management system?

- ▶ An environmental management system (EMS) is a management tool through which a property can evaluate and improve its environmental performance, and establish, achieve and sustain its own environmental performance objectives

Why should Negril Cabins develop an EMS?

- ▶ An EMS will help Negril Cabins sustain the social and physical environment on which it depends for its survival. Tourists visit Negril to savor the beauty of its reefs, beaches and nature and to experience the warmth and kindness of its people. The day Negril loses these valuable attributes will mark the end of its tourism industry.
- ▶ Hotel guests are increasingly taking an interest in the environment. A recent poll conducted by *Conde Nast Traveler* revealed that
 - 91% of the respondents were concerned about the environmental conditions at the destination to which they are making travel plans,
 - 50% claimed that the environment had become a factor in their travel planning over the last ten years,
 - 25% have changed travel plans because of what they perceived to be an environmental issue at their chosen destination

The “green” image created and sustained through an effective EMS will therefore provide Negril Cabins with an additional marketing tool

- ▶ Since many environmental measures are aimed at reducing the consumption of water, energy, chemicals and materials, an effective EMS will help the property save money and ensure the sustainability of the measures and actions that yield these savings

During the course of the audit, the EAST team reviewed Negril Cabins’ water, energy, chemicals and materials consumption practices, evaluated its policies, procedures and management structure, identified ways to improve its environmental performance and develop an effective EMS. As illustrated in the following section, the audit revealed that Negril Cabins could greatly benefit by becoming a more “environmentally friendly” property

Summary of Implementation Costs and Paybacks

The following table summarizes the costs and benefits of 12 of the more than 70 recommendations presented in this report. The detailed analysis of these 12 recommendations, or projects, is presented in Section 5 of this report.

Project no and description	Environmental benefits	Financial savings	Implementation cost	Payback period
1) Install flow aerators on all faucets	<ul style="list-style-type: none"> Reduces water consumption and wastewater generation Improves the operation of septic tanks and tile fields Saves energy 	3 700 J\$/year for each typical back-of-house faucet	60 J\$ per aerator	1 to 4 weeks
2) Install low-flow shower heads	<ul style="list-style-type: none"> Reduces water consumption and wastewater generation Improves the operation of septic tanks and tile fields Saves energy 	16,700 J\$/year for each low-flow shower head	300 to 850 J\$ per low-flow shower head	< 3 weeks
3) Install flow diverters in toilet tanks	<ul style="list-style-type: none"> Reduces water consumption and wastewater generation Improves the operation of septic tanks and tile fields 	6,700 J\$/year for 60% of the property's conventional toilets	3,400 J\$	6 months
4) Install displacement devices in toilet tanks	<ul style="list-style-type: none"> Reduces water consumption and wastewater generation Improves the operation of septic tanks and tile fields 	6,700 J\$/year for 60% of the property's conventional toilets	800 J\$	3 months
5) Replace existing toilets with water-saving models	<ul style="list-style-type: none"> Reduces water consumption and wastewater generation Improves the operation of septic tanks and tile fields 	1 050 J\$/year for guest bathrooms		
		3,700 J\$/year for public restrooms	4,000 J\$ per public restroom	13 months
6) Use rainwater for laundry operations	<ul style="list-style-type: none"> Reduces the use of NWC water Reduces the use of the water softening and rust removing chemicals 	24,100 J\$/year for a 5 000 ft ² rain catchment area	unknown but probably moderate	probably < 1 year
7) Convert from billing rate 20 to rate 40	<ul style="list-style-type: none"> Reduces the cost of Negril Cabins electricity 	367,000 J\$/year	70,000 J\$	2.5 months

8)	Reduce the time of operation of the pool filter pump	<ul style="list-style-type: none"> Reduces Negril Cabins consumption of electricity Extends the service life of the pump 	23 100 J\$/year	0 to 1,800 J\$	0 to 1 month
9)	Upgrade to energy efficient lighting	<ul style="list-style-type: none"> Reduces Negril Cabins' consumption of electricity 	see table in Project 9	478 J\$ per energy-efficient bulb	typically 6 to 12 months
10)	Implement a waste management program	<ul style="list-style-type: none"> Reduces the volume of waste generated by the property Reduces the negative impact of the waste generated by the property 	unknown	moderate	probably <1 year
11)	Implement a linen and towel reuse program	<ul style="list-style-type: none"> Reduces water consumption and wastewater generation Reduces Negril Cabins' consumption of electricity Reduces chemicals consumption 	can reduce laundry costs by up to 20%	negligible	immediate
12)	Improve the hotel's composting program	<ul style="list-style-type: none"> Provides the property with a free source of fertilizer and soil conditioner 	unknown	low to moderate	<1 year

Summary of Initiatives Already Underway

To its credit, Negril Cabins has already implemented a variety of environmental initiatives in all departments. Some of the initiatives identified by the audit team are listed below.

General

- ▶ The hotel staff is conscious of the need to turn off air-conditioners in unoccupied offices, guest rooms and meeting rooms.

Maintenance department

- ▶ The hotel has installed compact fluorescent bulbs in some exterior lights and guest rooms (Note: The maintenance staff should consider purchasing bulbs rated for 50 Hz instead of 60 Hz; bulbs with the correct frequency rating will likely perform better and last longer.)
- ▶ The maintenance staff monitors and records water and electricity meters readings daily.
- ▶ The maintenance staff has recently begun using a preventive maintenance checklist for the guest rooms. This practice will establish a regular monthly check of the equipment in each room and a formal system for addressing any problems.

Grounds department

- ▶ Yard waste is generally collected in large trash cans instead of plastic bags. This practice saves money and reduces waste.
- ▶ Instead of mixing the yard waste with the property's garbage, the grounds staff disposes of it in the "unofficial" compost piles located in the bushes behind the property.

Housekeeping department

- ▶ Housekeepers leave soap bars in the guest bathrooms until the guest either uses them fully or checks out. Upon checkout, the partially-used bars are collected and used in the employee bathrooms.
- ▶ The hotel only provides guests with two bars of soap instead of a multitude of amenities.
- ▶ Rolls of toilet paper in guest rooms are only replaced if they are nearly empty when the guest checks out. These rolls are then used in the employee bathrooms.
- ▶ As a general practice, housekeepers turn off air-conditioners and lights in guest rooms.
- ▶ Housekeepers periodically clean the bulbs in the guest room lamps to maximize their light output.
- ▶ The housekeeping carts include large reusable Rubbermaid bags to collect garbage from the guest rooms. Many hotels use disposable bags for this purpose, which wastes money and creates additional trash.
- ▶ Sheets are changed every other day unless the guest requests more frequent service.
- ▶ Maintenance issues identified by the housekeepers are promptly called in to the housekeeping supervisor who then fills out a maintenance request form.
- ▶ Most of the housekeeping cleaning products are purchased in bulk and poured into reusable pump bottles. This saves the hotel money and reduces packaging. The products that are not purchased in bulk should be re-evaluated.

Laundry department

- ▶ The dryer lint filters are cleaned twice each day This practice helps the dryer perform more efficiently
- ▶ The ironer for the tablecloths is turned on immediately before it is used and turned off immediately afterwards
- ▶ Heavily-stained items are pre-soaked by the laundry staff before being washed This reduces the need to wash these items several times in the washer to remove tough stains
- ▶ The staff uses trolleys rather than disposable plastic bags to collect the dirty linens and towels from guest rooms

Kitchen

- ▶ The kitchen equipment is cleaned daily to ensure maximum efficiency and the required sanitary conditions
- ▶ Dishes are pre-rinsed thoroughly before being placed in the dishwasher This practice ensures the efficient performance of the dishwasher
- ▶ The hotel recycles grease and oil from the kitchen The kitchen staff is careful to keep the lid of the recycling container closed to prevent rainwater or debris from entering the container and spoiling its contents
- ▶ Food from the breakfast buffet is given to the staff on their coffee break instead of being thrown away
- ▶ Juice is served in dispensers on the breakfast buffet This reduces packaging waste and saves money
- ▶ The chef is very conscious of the amount of packaging used for foods He tries to buy products from the local market whenever possible, but has found that often the containers used are very small In those cases he has been able to purchase imported products with less packaging The hotel should continue to pressure local suppliers to use less packaging

Purchasing department

- ▶ Liquid soap dispensers are used in public bathrooms
- ▶ The hotel uses recycled facial tissue and toilet tissue in the guest rooms This encourages suppliers to manufacture more recycled paper products and also sends a positive environmental message to concerned guests
- ▶ The hotel uses durable cleaning rags instead of disposable towels for all cleaning operations

I. Introduction

I.1 EAST Project

The Environmental Audits for Sustainable Tourism (EAST) Project is an activity funded by the U S Agency for International Development (USAID) that is designed to assist the tourism and hospitality industry implement effective environmental management systems (EMS)

The specific objectives of this project are (1) to develop greater awareness and understanding of the benefits of environmental management systems and audits among hoteliers, restaurateurs, allied tourism businesses, as well as in the manufacturing industry, (2) to train Jamaican consultants on EMS auditing techniques, (3) to assist a select, representative number of tourism establishments in carrying out environmental audits, and (4) to help finance, on a cost-sharing basis, specific audit recommendations in the participating establishments to demonstrate the financial benefit of the systematic application of environmentally friendly practices and, thereby, encourage others in the tourism industry to do likewise EAST is being implemented by Hagler Bailly Services (USA) under the direction of USAID/Jamaica and the Jamaica Hotel and Tourist Association

I 2 Audit Team

The audit of the Negril Cabins Hotel was conducted by an interdisciplinary team in November 1997 The team members included Hugh Cresser, EAST Project Coordinator, Patricio Gonzalez Morel, Environmental Engineer, Hagler Bailly (USA), Cara Holley Montrief, Hotel Environmental Consultant, Lloyd Marsh, Senior Energy Engineer, Metrocad (Jamaica)

The EMS audit consisted of a detailed analysis of all departments and key service areas designed to identify the environmental aspects and impacts of the property's activities, and to formulate recommendations on how to improve the property's environmental performance and its environmental management system (EMS)

I 3 Audit Protocol

The audit protocols used by the audit team covered the following issues

- ▶ ISO 14,000 EMS gap analysis
- ▶ Water use and wastewater generation
- ▶ Energy use and efficiency
- ▶ Solid waste generation and handling
- ▶ Chemicals use and management
- ▶ Hotel procedures and operations

2. Background Information

2.1 Description of the Property

Negril Cabins is a 80-room property located on Norman Manley Boulevard in Negril, Jamaica. Most of the property lies on the garden side of the boulevard, but Negril Cabins also occupies some beachfront acreage which is presently largely undeveloped. This property is owned by Maxie and Faye Bell and managed by Raymond Francis.

Negril Cabins has a number of on-site facilities for its guests' comfort and entertainment, including

- a restaurant and a beach grill,
- a pool bar,
- a sports center and a tennis court,
- a pool and Jacuzzi, and
- a private beach

The hotel averages 80 employees, with approximately 95 employees on staff during high season. Key members of Negril Cabins' managerial staff include

Assistant Manager	James Thompson
Accounting/ Front Office Manager	Kevin Harvey
Guest Relations Manager	Simone Baur
Executive Chef	Bernd Schumann
Grounds Supervisor	Herman Burris
Administration	Loraine Mowatt
Security Supervisor	Orell Simpson
Maintenance Manager	Raynor Mills
Housekeeping Supervisor/ Laundry Manager	Cynthia Morrison
Food and Beverage Manager	Archie Williams
Purchasing Manager	Christopher Cumrie

2.2 Occupancy Data

The occupancy information given by Negril Cabins to the audit team covers the 12-month period from October 1996 to September 1997. This data is summarized in the following table and is used as the basis for the calculations presented in this report.

Month	Occupancy (room nights, RN)	Guest Nights (GN)
October 1996	1,147	2,294
November	1,340	2,860
December	1,523	3,046
January 1997	1,810	3,618
February	1,799	3,592
March	1,714	3,400
April	1,615	3,400
May	1,269	3,214
June	1,205	2,472
July	1,432	2,444
August	1,634	3,152
September 1997	1,250	2,568
Annual total	17,738	36,060

Based on this data, the occupancy criteria for Negril Cabins are

Average hotel occupancy = 1,478 RN/month
 = 3,005 GN/month

Average room occupancy = (36,060 GN/year) / (17,738 RN/year)
 = 2.03 Guest nights / Room night

2.3 Water Consumption and Wastewater Generation

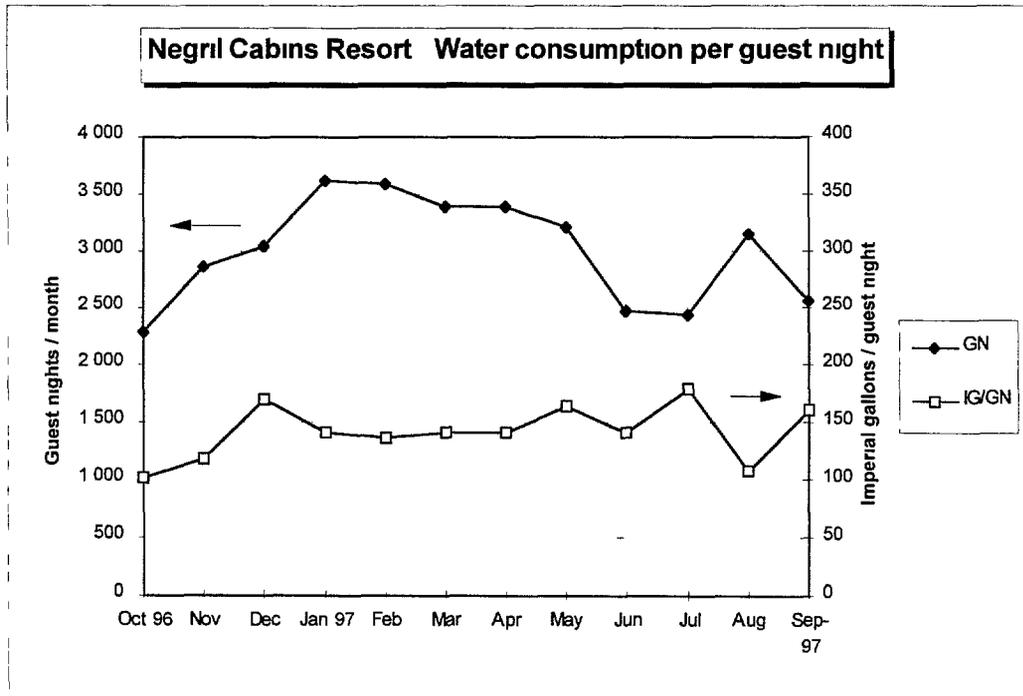
2.3.1 Current water use and wastewater generation at Negril Cabins

- ▶ All of the water consumed by Negril Cabins is purchased from the National Water Commission
- ▶ The bulk of the property's effluent is disposed on-site via 5 septic tanks and raised tile field systems. The gray waters generated by the laundry and the pool bar are discharged directly to the morass.

The water consumption information collected from Negril Cabins' NWC bills is presented in the following table and graph. This data is used as the basis for the calculations presented in this report.

NWC water consumption figures					
Month	Water use Imp Gal/month	JS/month	JS/1,000 IG	GN	IG/GN
October 1996	232,000	45,952	198 1	2,294	101 1
November	336,000	66,123	196 8	2,860	117 5
December	519,000	101,865	196 3	3 046	170 4
January 1997	512,000	100,676	196 6	3,618	141 5
February	492 000	97,397	198 0	3,592	137 0
March	479,000	96,088	200 6	3,400	140 9
April	480,000	96,088	200 2	3,400	141 2
May	524,000	104,899	200 2	3,214	163 0
June	348,000	70,089	201 4	2,472	140 8
July	436,000	87,938	201 7	2,444	178 4
August	339,000	68,873	203 2	3 152	107 6
September	414,000	84,456	204 0	2,568	161 2
Annual total	5,111,000	1,020,445		36,060	

Note IG = Imperial gallons
GN= Guest night



Based on this data, the average water figures for Negril Cabins are

Current water cost = 204 J\$/1,000 IG

Average water use = (5,111,000 IG/year) / (12 months/year)

= 425,900 IG/month
 = 86,900 J\$/month

Av water use per GN = (5,111,000 IG/year) / (36,060 GN/year)
 = 142 IG/GN

As shown in the graph, Negril Cabins' water consumption index (i.e., the consumption of water per guest night) varies throughout the year in response to changes in weather, occupancy rates, guest type (e.g., large influx of college students for spring break), and other similar factors

During the 12 month period covered by the data, this index ranged from a low of 101 IG/GN (October 1996) to a high of 170 IG/GN (December 1996). Although the 70% increase in water consumption per guest night observed between October and December is low compared to Jamaican hotel standards, Negril Cabins should nevertheless attempt to define and control the factors responsible for this rise in its water consumption index

2.3.2 Impact of water conservation at Negril Cabins

Because of the high cost of water, it is in this property's best interest to engage in an aggressive water conservation program. The comparison made in the following table between Negril Cabins and a "water efficient" hotel, as defined by the International Hotels Environmental Initiative, shows that this property could achieve significant savings through water conservation

Average water consumption for hotels		Savings if Negril Cabins achieved the water consumption of a water efficient property	
Location	Water use	Water savings	J\$ savings
Water efficient hotel	128 IG/guest night	504,000 IG/year	103,000 J\$/year
Negril Cabins	142 IG/guest night		

- Notes
- The savings presented in this table are based on the total annual occupancy figure calculated in Section 2.2 of this report (36,060 guest nights per year)
 - The International Hotels Environmental Initiative uses the following figures to rate the relative water efficiency of hotels

Property size (with gardens and laundry)	Water efficiency rating - water use figures are in IG/guest night				
	Good	Fair	Poor	Very poor	Negril Cabins
50 - 150 rooms	< 128	128 - 148	148 - 177	> 177	142

After the completion of Negril's new sewer and wastewater treatment plant in mid-1999, the cost of the NWC water is expected to increase by a factor of two. The reader should therefore keep in mind

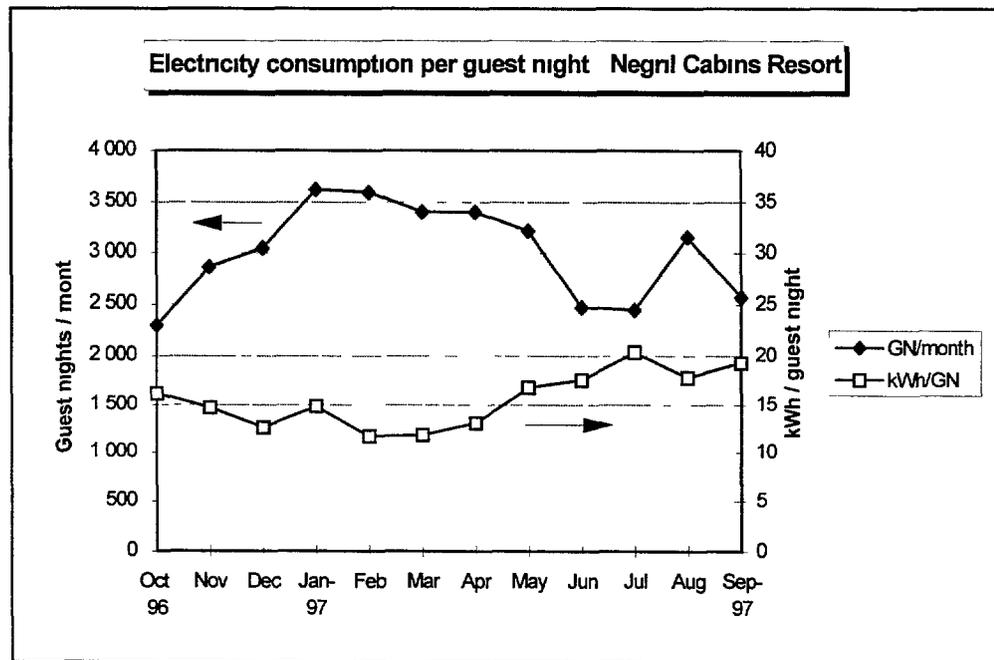
that the water conservation measures proposed in this report will have, in the near future, an even greater impact on reducing Negril Cabins' utility costs

Besides the direct financial benefits, a reduction in water consumption will also reduce the flow processed through the property's on-site wastewater treatment systems and, thereby, improve the performance of the septic tanks and raised tile fields

2.4 Electricity Consumption

The electricity consumption information collected by the audit team from Negril Cabins' JPSCO bills is presented in the following table and graph

JPSCO electricity consumption figures					
Month	kWh/month	J\$/month	J\$/kWh	GN/month	kWh/GN
October 1996	37,080	170,264	4.59	2,294	16.2
November	42,000	193,033	4.60	2,860	14.7
December	38,400	176,691	4.60	3,046	12.6
January 1997	53,640	246,812	4.60	3,618	14.8
February	42,000	192,142	4.57	3,592	11.7
March	40,080	183,954	4.59	3,400	11.8
April	44,400	204,204	4.60	3,400	13.1
May	54,000	248,926	4.61	3,214	16.8
June	43,440	200,847	4.62	2,472	17.6
July	49,680	230,013	4.63	2,444	20.3
August	56,160	260,430	4.64	3,152	17.8
September	49,560	230,298	4.65	2,568	19.3
Annual total	550,440	2,537,614		36,060	



Based on this data, the electricity consumption figures for Negril Cabins are

Current cost of electricity	= 4 65 J\$/kWh
Average electricity consumption	= (550,440 kWh/year) / (12 months/year) = 45,870 kWh/month = 213,300 J\$/month
Av electricity consumption per GN	= (550,440 kWh/year) / (36,060 GN/year) = 15 3 kWh/GN

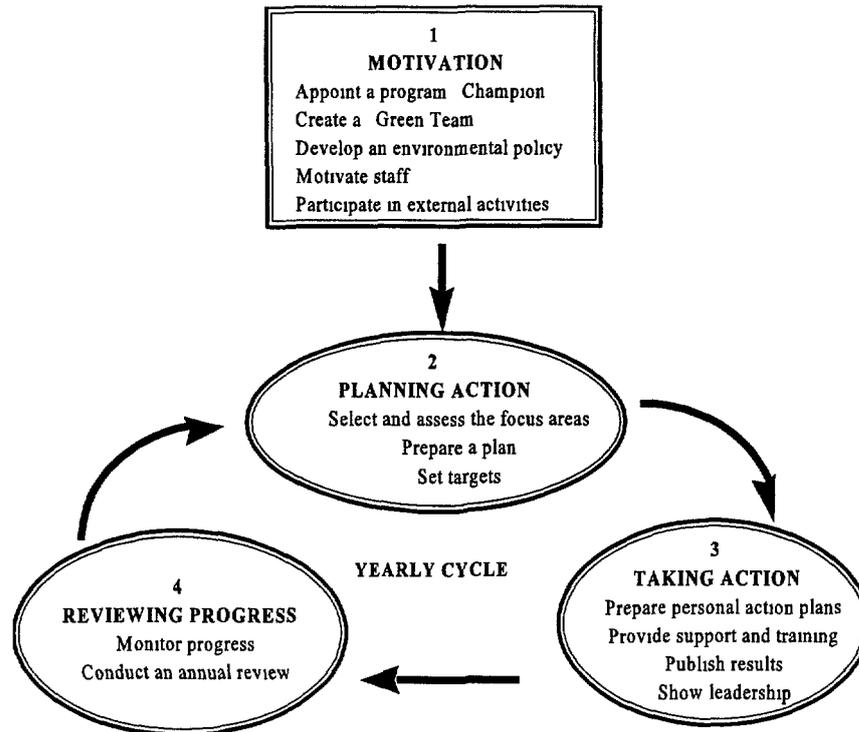
As shown in the graph, Negril Cabins' electricity consumption index (i.e., the consumption of electricity per guest night) varies throughout the year in response to changes in weather, occupancy rates, guest type, and other similar factors

During the 12 month period covered by this data, this index ranged from a low of 11 7 kWh/GN (February 1997) to a high of 20 3 kWh/GN (July 1997). Although the 75% increase in electricity consumption per guest night observed between February and July is low compared to Jamaican hotel standards, Negril Cabins should nevertheless attempt to define and control the factors responsible for this rise in its energy consumption index.

3. Guidelines for the Development of an Environmental Management System

3.1 Environmental Management System (EMS) Overview

Becoming an environmentally friendly property is not a challenge that can be met overnight. It is a long-term commitment and a continuous process of improvement which should be integrated in the daily operations at a pace which is right for each property. The key phases in the creation and development of an effective environmental management system are illustrated below.



Note This EMS cycle is based on the approach developed by the International Hotels Environmental Initiative

The four phases are

- ▶ **Motivation** -- in which you begin to integrate the initiative in your property by appointing a “Champion” to coordinate the program, creating a “Green Team” to assist in the implementation and monitoring of the program, developing a policy which defines the property’s environmental objectives, and by motivating the staff to participate and contribute to the program
- ▶ **Planning action** -- in which you select and conduct a detailed review of the property’s priority areas, identify measures to be taken, prepare an action plan and set a timetable for the implementation of the program

- ▶ **Making it happen** -- in which staff commitment is gained for the action plan, responsibilities are allocated, and the plan is implemented
- ▶ **Reviewing process** -- in which progress is monitored against set targets and objectives, an annual review of overall progress is conducted to assess the successes and failures, and priorities are set for the coming year

As shown above, phases 2, 3 and 4 form a yearly environmental management cycle. Each year the property will go back through this cycle again, using the review of the previous year's successes and failures to improve the effectiveness of its EMS and revise, if necessary, its environmental policy.

3.2 Motivation

3.2.1 Appoint the environmental program's "Champion"

Once the hotel is ready to move ahead with its environmental program, Negril Cabins will need to appoint a "Champion" who will have the responsibility for coordinating and implementing the environmental program. This person must have a good operational knowledge of the hotel, the respect of other employees, a commitment to the project, and the full support of the property's owners and top management. The Champion will keep the environmental program on line, ensure good business and environmental results are achieved, and ensure the participation or cooperation of all staff members.

3.2.2 Create a "Green Team"

The creation of a "Green Team" is crucial to ensure the introduction and the implementation of environmental policies. The functions of the Green Team include:

- ▶ assist the program Champion in the day-to-day management, supervision and troubleshooting of the environmental program,
- ▶ keep the property's staff motivated and dedicated to the principles of the environmental program,
- ▶ develop new ideas and strategies for improving the program,
- ▶ act as the principal link between the property and local community groups or environmental organizations.

To be most effective, the Green Team must be composed of highly motivated individuals, selected from each of the property's departments and representing all levels of employee hierarchy -- from executive-level to line-level employees. The actual size of the Green Team will depend on the requirements of Negril Cabins' environmental program, however, when assembling the team, keep in mind that as the group gets larger, the team as a whole becomes less focused and less productive.

The employees selected for the Green Team must have the motivation and character needed to insure the success and the dissemination of the program. Criteria for the selection of team members may include:

- ▶ recommendations by managers or supervisors,
- ▶ nomination by fellow employees, or
- ▶ a simple application process which requires the candidates to explain their expected contribution to the environmental program and their reasons for wanting to join the team

Note Negril Cabins should create more personalized names for the “Champion” and “Green Team” to reflect the property’s “personality” In this report, the terms “Program Champion” and “Green Team” are used as generic names to represent two key components of an effective EMS

3.2.3 Develop an environmental policy for Negril Cabins

An environmental policy is an important tool for communicating, both internally to employees and externally to guests, that the property is serious about its role in preserving and protecting the environment. The policy should therefore embody the property’s commitment to the environment and define the goals it wishes to achieve.

The formulation of the environmental policy should be a concerted effort, involving management, the program Champion, the Green Team and all interested staff members. This combined effort will insure that the environmental policy is understood and respected by all employees, and will provide the staff with a sense of ownership over the property’s environmental program.

The breadth of the environmental policy adopted by the hotel will define the complexity and magnitude of the environmental management system that will be needed to put the policy’s words into actions. The property is therefore advised to develop a first policy that is appropriate to the nature and scale of its environmental impact, but not overly ambitious. The first environmental policy should include manageable commitments which bring obvious benefits to the property or help remedy its most significant environmental impacts. Examples of commitments appropriate for a first environmental policy include:

- ▶ safeguarding natural resources by achieving a more efficient use of water, energy, chemicals and materials,
- ▶ preventing pollution by reducing the amount of waste generated by the property,
- ▶ complying with all applicable environmental regulations

After mastering the basic principles and operations of its EMS, Negril Cabins should broaden the scope of its environmental policy and review its objectives and targets. Examples of complete and comprehensive environmental policies are given below and in Appendix I.

The environmental policy must be clearly communicated and explained to all current employees and all new hires. It should be discussed in staff meetings, included in employee handbooks and posted on the staff notice board. Once the property has put into practice the key elements of its EMS and achieved the first noticeable results, management should place a framed copy of the environmental policy in the hotel lobby, in full view to all guests and visitors.

Hotel Code of Conduct

By the Negril Area Environmental Protection Trust (NEPT) and the Negril Chapter of the JHA

We pledge our commitment to the environment of our area as well as that of the whole Earth and therefore strive always to

- Make the best most efficient use possible of the resources available to us including water and energy knowing that in so doing we are not only being good neighbors in our resort community but also minimizing negative impacts inherent in the provision of these services*
- Respect preserve and protect the air water land plants and animals within our care,*
- Comply with all regulations and statutes concerning development and the environment,*
- Minimize waste and all forms of pollution,*
- Make the smallest impact possible on the natural beauty and bounty of our area our city our country and our world, and to enhance this beauty and bounty wherever we can,*
- Create wise management policies to benefit our business our customers our staff and the environment realizing that these are integrated,*
- Work together with others to achieve wider environmental and development goals*
- And in all way to be good stewards of our natural world for this and future generations*

3 2 4 Motivate the staff

The hotel does not currently have regular staff meetings. Monthly, or at least quarterly, meetings of all employees are important to establishing communication between management and employees and to building staff morale. More frequent meetings of department heads will build teamwork among departments and keep everyone apprised of important issues in the hotel. It is important that the hotel begin holding meetings of staff and department heads as soon as possible. These meetings do not have to be lengthy -- in fact, they will typically be more effective if a brief agenda is set beforehand.

Management should use these staff meetings to inform all employees of the environmental program's objectives and to call for their ideas and support. Involving the staff not only helps gain their commitment to the initiative, but it also allows the program to benefit from their creativity and experience. Line-level employees often know best how to reduce waste and improve efficiency, and how to carry out specific programs and actions in the most practical manner. The Champion and the Green Team should, therefore, strive to gain the support and collaboration of their colleagues at all levels and in all the departments of this property.

In most cases, staff will not effectively practice environmentally-conscious behavior unless they are

given proper training and motivated through an appropriate incentives program. For example, employees will engage more willingly in good housekeeping practices once they are clearly instructed on what must be done, informed of the benefits of these practices, and encouraged and rewarded by management. Since staff participation in the environmental program can generally save the property a lot of money, management should take the time to devise an appropriate and effective incentive program.

Incentives can include monetary rewards such as sharing with the staff part of the water and energy savings achieved through the environmental program, or giving bonuses to particularly deserving employees. Incentives can also include non-monetary rewards such as extra paid vacation days, parties and gifts (e.g., t-shirts with the hotel's "green team" logo, gift certificates).

3.2.5 Participate in external activities

Negril Cabins' management and staff should get involved in local and national initiatives, attend events, subscribe to environmental publications, discuss environmental issues with colleagues in the industry, and promote "networking" of good ideas through the Negril Chapter of the JHTA. Participation in external activities will help the property gain a deeper understanding of the issues, learn of how others are tackling their environmental problems, and enhance the property's reputation in the industry.

An effective and productive way for Negril Cabins to further enhance its environmental program is by developing strong community relationships. By actively participating in local civic and environmental activities, Negril Cabins will highlight its leadership role and bolster the motivation of its employees by allowing them to positively affect the community in which they live and by providing them an alternate means for professional growth.

3.3 Planning action

3.3.1 Select and assess the program's focus areas

The Green Team, under the leadership of the Program Champion, must review the property's activities in order to determine which areas, departments or issues should be targeted first by the environmental management program. This review process is generally conducted by

- 1) identifying the environmental aspects of the property's activities -- an environmental aspect is an element of a property's activity which interacts, in a beneficial or detrimental manner, with the environment,
- 2) evaluating these environmental aspects in order to determine which of these have a significant negative impact on the environment,
- 3) highlighting the areas of significant negative environmental impact that can be affected through the property's environmental program

The environmental aspects of the various activities carried out in hotels can generally be classified in at least one of the following categories

- water use,
- energy use,
- solid waste generation,
- generation of water pollutants,
- use of hazardous products,
- generation of air emissions, and
- damage to the eco-system

A description of the environmental impacts and the types of activities associated with Negril Cabins' principal environmental aspects is given in Appendix II

The identification of environmental aspects and impacts provides the property with a sense of its current environmental performance and enables the property to establish the environmental targets and objectives of its future EMS activities. The background information and the recommendations given in this report should help Negril Cabins identify its principal priority areas.

After selecting the priority areas for the environmental program, the Green Team will have to conduct a detailed review of each priority area. The purpose of this review process is

- 1) To assess current performance in each particular priority area. Current performance can be best evaluated by calculating environmental performance indicators from the property's energy, water and solid waste bills, chemicals and materials purchase records, and hotel occupancy records. Examples of the type of indicators which can be used by Negril Cabins to gauge its current environmental performance include
 - gallons of water consumed by the property per guest night
 - kWh consumed by the property per guest night
 - number of tanker loads pumped from the septic tank per 1,000 guest nights
 - gallons of water consumed per pound of material processed through the laundry
 - pounds of laundry (or number of wash loads) processed per guest night
 - pounds of laundry chemicals used per guest night
 - pounds (or volume) of solid waste hauled out of the property per guest night
 - pounds of materials (glass, paper, plastic, metals) recycled per guest night
 - pounds of a specific chemical product used per guest night

This initial assessment is very important since it provides the benchmark against which progress will be measured in a particular focus area (e.g., the laundry room) or in the property as a whole.

- 2) To identify improvement options. The Green Team will need to identify what is already being achieved in order to gain an idea of where improvements can be made without sacrificing other operational criteria. This is where discussion with key staff in each area is not only very useful (they often understand best where and how improvements can be made) but also essential if they are to be committed to the process.

The findings and conclusions of this preliminary review process should be recorded so that they may be used, at the end of the yearly EMS cycle, to evaluate the results and achievements of the environmental program

3 3 2 Prepare a plan

The preparation of the action plan involves four important steps

- decide which of the actions identified by the review should be pursued first,
- define the steps to implement each action,
- allocate responsibility for these steps,
- set target dates for action

The action plan should prioritize

- actions needed to meet environmental laws and standards,
- good management practices which are simple and will bring a combination of environmental and business benefits,
- investment measures which have a rapid payback

The action plan forms given in Appendix III illustrate the outputs of this task

The task of working up the plan of action may involve testing the performance, cost and operational implications of an option. It may be wise to try out an idea before fully implementing it.

The audit team recommends that the hotel begin with back-of-house environmental improvements first. Since Negril Cabins has not yet begun a comprehensive environmental effort, it would not be wise to start its program with an initiative such as a Linens and Towels Reuse Program, which solicits guest participation. These types of programs are best implemented (the guests are more likely to willingly participate) when the guest can see that the hotel has made some efforts toward conservation.

3 3 3 Set targets

The purpose of setting targets is to provide clear benchmarks against which to measure the success of the program. However, since changing environmental practice takes time and effort, the Green Team should carefully evaluate the program's targets. It is often better to set targets which are achievable and which can provide real satisfaction once achieved, than to set over-ambitious targets which only lead to failure and staff demoralization.

The targets established by the Green Team for the property's environmental program can either be based on environmental performance indicators or on specific actions that must be completed by a given date.

Examples of indicator-based targets include

- Reduce the amount of water consumed by the property per guest night in 1998 by 10% with respect to the 1997 figure
- Reduce the mass of solid waste hauled out of the property per guest night in 1998 by 20% with respect to the 1997 figure
- Before the end of 1998, achieve a water use ratio of 2.1 IG per pound of laundry processed

Examples of action-based targets include

- Start a composting program for all garden waste by March 1998
- Develop a check list for a guest room preventive maintenance program by January 1998 and begin the program by February 1998

3.4 Taking action

3.4.1 Prepare personal action plans

Negril Cabins' employees must clearly understand that responsibility for minimizing the waste of energy, conserving water, recycling materials, and other tasks defined by the property's environmental program is part of their job. They must be aware that they will be recognized if they carry out these responsibilities successfully, and noticed if they do not. The key to achieving this objective is to translate the overall action plan into personal action plans which detail the specific and general actions expected of specific employees.

An example of a personal action plan is provided in Appendix IV

3.4.2 Provide support and training

The key to success for any environmental program is education. Employees must learn how to perform their daily tasks in a manner that will maximize conservation, and understand why Negril Cabins is undertaking this effort and the positive effects this effort will have on them, their families and the local community. This understanding will provide a sense of ownership in the environmental effort that will contribute to its long-term success.

The objectives of the training program are simple: to ensure that all employees understand the property's important environmental issues and have acquired the skills to perform their work in an environmentally responsible manner. Employees need to realize that resources are limited and that proper waste disposal in an island environment is critical. For instance, the audit team has found that employees at many hotels in Jamaica do not realize that fresh water is scarce or expensive because there is so much water everywhere you look in Jamaica. The hotel needs to educate its employees on these types of issues in order to gain their participation.

3 4 3 Publish results

Employees want to know the results of their endeavors. Management and the Green Team should therefore regularly post the results of monitoring on the staff notice board, congratulate success, and rewarding individuals or departments that have done particularly well.

Many hotels put up energy and water consumption monitoring results on their staff notice boards. The results for the current month are displayed in a simple graphic format and compared with the previous month and the same month in the previous year. Staff take a great interest and pride in these results.

Negril Cabins may also decide to publicize the results of its environmental program in promotional literature.

3 4 4 Show leadership

Achieving staff commitment is an ongoing task -- if enthusiasm is to be maintained, staff need to be constantly reminded of the objectives and targets which have been set. Management and the Green Team must demonstrate its continued commitment and leadership, notice when action is being taken and when lapses occur, and continually refresh enthusiasm in the challenge of transforming Negril Cabins in an environmentally friendly property. Like customer care, good environmental management practices must become part of the management culture.

3 5 Reviewing progress

3 5 1 Monitor progress

The saying, "you can't manage what you don't measure," applies as much to environmental management as to other areas. Negril Cabins needs to establish good monitoring procedures to insure that the program is working and achieving its objectives. Monitoring should be sufficiently frequent to enable corrective action to be taken if there is a significant change in the average daily consumption or a large deviation from targeted performance. Ideally, water and electricity meters should be checked on a daily basis. This activity need not take a member of staff more than 30 minutes per week.

Examples of water and energy monitoring forms are provided in Appendix V

Especially in the early days when progress will be patchy, and difficulties will arise, the Green Team should frequently hold short meetings with relevant individuals to review the progress made, and to help sort out problems as they arise.

Effective utilities metering will pay back very rapidly. Some hotels have installed separate utility metering for different parts of the hotel. This enables them to better identify where energy or water wastage is occurring. Typically the cost of installing new meters will be met from utility cost.

savings in the first year

3 5 2 Conduct an annual review

Once a year Negril Cabins will need to step back to check the progress in its environmental performance. This review might best be undertaken by the Champion and may take the form of a short report attaching completed targeting and monitoring forms of the initiatives undertaken. Alternatively, management may prefer to use independent consultants if it feels that Negril Cabins does not have the resources or expertise in house to perform this task. The review should cover the property's environmental management capabilities as well as the progress made with specific environmental actions. It should entail

- A general review of the property's environmental performance to assess what progress has been made, and to help re-prioritize action
- A summary of measured achievements against set targets and objectives
- Discussions with relevant staff to identify the difficulties that have arisen, and the successes, and their recommendations for future action

This review process is invaluable. It will highlight problem areas as well as help identify the most appropriate environmental management approach for Negril Cabins. Management and the Green Team can then begin to plan for the coming year -- but this time on the basis of the experience acquired over the past year.

4. Recommendations for Improving the Property's Environmental Performance

Table 1 provides a summary of the recommendations proposed by the audit team to help the property address many of its activities that have a negative impact on the environment. It is important to note however, that this list only contains the recommendations identified during the course of a three day audit, these recommendations should therefore be viewed as only a the first phase of the property's continuous EMS process

The recommended actions listed in Table 1 are classified by department or area of activity (e.g., maintenance department, housekeeping department, guest rooms, gift shop) and by the environmental aspect category addressed by each recommendation (e.g., water use, energy use, solid waste generation). Table 1 also provides an evaluation of the environmental impact, the implementation cost and the cost effectiveness of each recommended action. The ratings used to qualify the recommendations are defined as follows

Criteria	Rating	Description of rating
Environmental benefit of the action	High (H)	Significant reduction of the property's impact on the environment (e.g., a large reduction in the toxicity or volume of generated waste a significant improvement in the use of water, energy, chemicals or other products)
	Moderate (M)	Moderate reduction of the property's impact on the environment
	Low (L)	Low or insignificant reduction of the property's impact on the environment
Cost to implement the action	High	Cost > 1,750 J\$ per room (> 50 US\$ per room)
	Moderate	Cost = 350 to 1,750 J\$ per room (10 - 50 US\$ per room)
	Low	Cost < 350 J\$ per room (< 10 US\$ per room)
Cost effectiveness of the action	High	Payback < 2 months
	Moderate	Payback = 2 months to 1 year
	Low	Payback > 1 year

The property's management and staff can use the ratings to select the recommendations that should be implemented first and to identify the recommendations that yield the greatest benefits -- that is, High environmental benefit, Low implementation cost and High cost effectiveness

The high priority actions are highlighted with the "⊗" symbol. These actions are those which either have an immediate payback (cost effectiveness = H) or have a high environmental benefit combined with a moderate payback (cost effectiveness = M)

Table I Recommendations for Improving the Property's Environmental Performance

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
MAINTENANCE DEPARTMENT			
General maintenance issues	Action's env impact = H	Cost = L	Cost effectiveness = H
<p>⊙ This property has a good monitoring program which tracks the daily consumption of water, electricity and LPG. Currently, all utility meters are read on a daily basis and the collected information is used to identify leaks and other potential problems. Furthermore, management has recently asked the maintenance department to prepare and submit monthly utilities consumption reports -- a task that could be greatly facilitated if the maintenance department had access to a computer equipped with spreadsheet programs and other appropriate software.</p> <p>The audit team would like to encourage the maintenance staff to calculate the property's utility consumption indices and to include these performance indicators in the monthly utilities reports. The utility consumption indices are obtained by dividing the amount of water, electricity and LPG consumed during a particular period of time by the number of guest nights provided during the same period of time (i.e., kWh/guest night, Imperial gallon/guest night, liters of LPG/guest night). This data will help the property:</p> <ul style="list-style-type: none"> • define its normal consumption patterns and set consumption targets, • identify any unusual shifts in its consumption pattern that may indicate equipment (i.e. water leaks) or operational problems, • ensure that employees are complying with water, energy, and materials conservation guidelines, • ensure the effectiveness of preventive maintenance operations, • evaluate the progress of the hotel's conservation and environmental efforts. <p>Management should also consider including in this monitoring program other items that are important to the property's environmental and financial performance. Examples of such items include:</p> <ul style="list-style-type: none"> • the volume of garbage generated by the property, • the number of laundry loads processed, and • the amount of key chemicals consumed by the property. <p>Samples of water and electricity monitoring forms are presented in Appendix V.</p>			
Water use	Action's env impact = H	Cost = see specific actions	Cost effectiveness = see specific actions
<p>⊙ Water consumption at Negril Cabins (142 Imperial gallons per guest night) is greater than the industry average for a water efficient property (128 Imperial gallons per guest night). Given the high cost of NWC water (204 J\$/1,000 IG), it is in this property's best interest to engage in an aggressive water conservation program.</p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)	
Water use	Action's env impact = M	Cost = L Cost effectiveness = H
<p>⊙ Promptly fix all leaks in faucets, toilets and pipes and ensure that all water-using fixtures are in proper working order. The audit team detected only a few leaking faucets while inspecting the property, suggesting that Negril Cabins provides effective and timely maintenance to its water-using fixtures. However, since even a single dripping tap can waste up to 10,000 IG/year (2,000 J\$/year) and an overflowing toilet can easily lose 720 IG/day (145 J\$/day), Negril Cabins should persevere in its leak detection and maintenance efforts.</p> <p>Maintaining Negril Cabins' water-using fixtures in proper working order requires an effective preventive maintenance program and the collaboration of all employees. All staff members -- and in particular housekeepers, kitchen and laundry workers -- should be trained to detect leaks and malfunctioning toilets (leaky flapper valves, sticking flush mechanism, overflowing toilet tanks), and to promptly report these problems to maintenance.</p> <p>Maintenance staff should have the training and the means to promptly answer maintenance requests and conduct a regular and effective preventive maintenance program. The preventive maintenance program should include the following operations:</p> <ul style="list-style-type: none"> • Replace missing or damaged faucet aerators • Ensure that there are no excessive leaks in the valves which divert water from the tub faucet to the shower head -- that is, only a minimum amount of water should come out of the tub faucet while the valve is on the "shower" position • Ensure there are no excessive leaks around the packing of tub and sink faucets • Periodically clean the carbonate deposits from shower heads. Clogged shower head may encourage guests to take baths rather than showers -- an average bath consumes 4 times more water than a shower • Ensure that tub and sink stoppers seal properly. Repair damaged stopper mechanism and replace leaking stoppers • Check for broken toilet flush mechanisms. A damaged or jammed flush mechanism can waste more than 5 IG/minutes (7 200 IG/day) until it is detected and corrected • Check for damaged and leaking toilet flapper valves • Remove scale deposits in toilet tanks that obstruct the flapper valve • Adjust the water level in toilet tanks to the minimum level required for proper operation. An excessively high water level in the toilet tank can waste up to 0.5 IG/flush, letting the water level rise above the top of the tank overflow pipe can result in a constant loss of water of more than 0.5 IG/min <p>The cost of these maintenance operations is generally minimal.</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ Install faucet aerators wherever possible Many of Negril Cabins' faucets are not equipped with flow aerators (e.g., kitchen and bar sinks, guest and employee bathroom sinks) The absence of these low-cost water-saving devices contributes to the excessive consumption of water at Negril Cabins Currently some of the hotel's faucets have flows in excess of 6.0 IG/min, these flows could easily be reduced to less than 2.0 IG/min with aerators</p> <p>The use of flow aerators is particularly important in places where taps are used frequently or are left running for long periods of time</p> <p>This recommendation is analyzed in Project 1</p>			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ In addition to flow aerators, the output of faucets can be further controlled by adjusting the shut-off valves located on the pipes that bring water to the faucets In many cases, these valves are wide open and thus subject the faucets to the full pressure carried by the water distribution system These valves should be adjusted to reduce the water pressure acting on the faucets and thereby reduce the maximum flow output of the faucets</p> <p>Negril Cabins should use this technique to limit the output of its older faucets which cannot accommodate flow aerators and which cannot be economically replaced by new, water-saving faucets</p>			
Water use	Action's env impact = M	Cost = M	Cost effectiveness = H
<p>☉ Continue the installation of low flow shower heads Since the low flow shower heads installed by Negril Cabins use less than 1.5 IG/min as compared to more than 8.0 IG/min for some of this property's standard shower heads, the installation of these devices is a very cost effective water and energy conservation measure At the time of the audit, Negril Cabins had already installed low-flow shower heads in the newer guest bathrooms</p> <p>This recommendation is analyzed in Project 2</p>			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ Ensure that all guest bathroom sinks are equipped with stoppers which seal properly The lack of properly fitting stoppers forces guests to use running faucets when shaving, washing clothes, etc Sink stoppers were missing in 25% of the guest bathrooms inspected by the audit team</p> <p>☉ Periodically check the tub stopper mechanisms Leaking tub stopper mechanisms lead guests to use more water whenever they take baths Since baths consume on average 4 times more water than showers, Negril Cabins may want to discourage guests from taking baths In such a case, Negril Cabins should dismantle all tub stopper mechanisms</p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>⊗ Ensure that there aren't any excessive leaks in the valves which divert water from the tub faucet to the shower head -- that is, ensure that only a minimum amount of water is lost out of the tub faucet while the valve is on the "shower" position. Leaking shower valves waste water and energy (if the water is hot) and may significantly affect the output/performance of shower heads in low pressure areas.</p> <p>Negril Cabins' newer guest bathrooms are equipped with such shower valves. Approximately half of shower diverter valves inspected by the audit team leaked, however, these leaks were generally small.</p>			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = M
<p>Whenever possible, install flow diverters in the water tanks of conventional toilets (i.e., toilets which are equipped with large water tanks and therefore use between 3.3 to 4.2 IG per flush). Flow diverters fit at the end of the hose that feeds water to the toilet bowl's refill pipe, and divert to the water tank part of the flow that would otherwise drain to the toilet bowl.</p> <p>Flow diverters can therefore be used to</p> <ol style="list-style-type: none"> 1) regulate the amount of water sent to refill the toilet bowl, 2) set a suitable water level in the toilet bowl (very often the water level in the toilet bowl is unnecessarily high), and 3) avoid overfilling the toilet bowl (once the water reaches the maximum allowable level in the bowl, all additional water added to the bowl is automatically discharged from the toilet). <p>Flow diverters can be easily installed on most conventional toilets and can save from 0.4 to 0.8 IG per flush. Technical information on flow diverters is given in Appendix VI.</p> <p>This recommendation is analyzed in Project 3</p>			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = M
<p>Install displacement devices in the water tanks of conventional toilets (i.e., toilets which are equipped with large water tanks and therefore use more than 3.3 IG/flush). The use of these devices can reduce by approximately 0.4 IG the amount of water used for each flush. This water conservation measure requires only a minimum investment since toilet dams are generally home-made (plastic bottles filled with pebbles and water).</p> <p>This recommendation is analyzed in Project 4</p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use	Action's env impact = M	Cost = M	Cost effectiveness = M
<ul style="list-style-type: none"> • Establish a policy to replace any damaged or unusable guest bathroom toilet with a water-saving toilet (1.3 IG/flush) • Replace conventional toilets with 1.3 IG/flush toilets in frequently used public or employee restrooms <p>This recommendation is analyzed in Project 5</p>			
Water use	Action's env impact = H	Cost = M	Cost effectiveness = M
<ul style="list-style-type: none"> ☉ Consider collecting and using rainwater for laundry and other hotel operations <p>Since rainwater is virtually free, plentiful during at least 6 months of the year, and relatively clean it is an ideal source of laundry water. Collected rainwater is also naturally soft and contains little dissolved iron which stains linens and towels, using it for laundry operation will therefore reduce the need for water softening and rust removing chemicals</p> <p>This recommendation is analyzed in Project 6</p>			
Water use	Action's env impact = H	Cost = M	Cost effectiveness = M
<ul style="list-style-type: none"> ☉ Negril Cabins should pursue Mr. Bell's plans to use guest room and possibly laundry room gray water to irrigate the dense green perimeter which surrounds the property. Gray water, as opposed to wastewater, generally contains few pathogens (disease causing organisms) and can be readily used for irrigation if the following precautions are taken • Gray water should be directly applied to the land using distribution pipes, hoses or a drip irrigation system. To avoid the risk of spreading airborne pathogens, sprinklers should not be used for gray water irrigation • For greater safety, the areas irrigated with gray water should not be accessible to the general public. Gray water should never come into contact with fruits or vegetables used for human consumption • Negril Cabins should minimize the amount of harmful chemicals which enter the gray water collection system. Bleach, caustic and acid cleaners, and toxic cleaning agents harm the soil and vegetation and should ideally be absent from the gray water that is used for irrigation <p>The basic components of a gray water irrigation system include</p> <ul style="list-style-type: none"> • A small collection or "equalization" tank which serves to homogenize the quality (temperature and composition) of the gray water before it is applied to the land. The use of an equalization tank is particularly needed in areas, such as laundry rooms, that produce highly variable effluents (e.g., high temperature and pH variations throughout the day) • A simple filtration system (gravity sand filter or a fine sieve) to eliminate particles which may obstruct the gray water distribution system • A distribution system composed of pipes or hoses to convey the gray water from the equalization tank via pressure or gravity 			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>⊗ Many areas of this property are subject to high water pressures which damage plumbing fixtures and increase the water output of shower heads and faucets. Some of the measures that could be taken to remedy this problem are discussed below</p> <ul style="list-style-type: none"> • Install pressure regulating valves at key points on the property's water distribution system • Install globe valves on the water supply line of each cabin. Use these valves to choke the water supply line thus reducing the dynamic water pressure experienced in the cabins 			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = M
<p>The plumbing in most of the filter systems which process water from the decorative ponds is improperly designed and should be corrected</p> <p>In many of these systems the pipe which bypasses the filter is not equipped with a shut-off valve, therefore, the water which exits the pump is free to choose between two parallel paths -- through the filter and back to the pond, or bypassing the filter and back to the pond. Since even a clean filter obstructs the flow of water most of the water processed through the system automatically bypasses the filter and simply recirculates back to the pond. As a result of this faulty configuration, the pond water is never properly filtered and must be frequently discarded and replaced because of poor color or odor</p> <p>In order to correct this situation, Negril Cabins should take the following actions</p> <ul style="list-style-type: none"> • Install a shut-off valve on the line which bypasses the sand filter. When closed, this valve will force all of the water circulated by the pump to pass through the filter before returning to the pond • The pond recirculation/filtration system should normally be operated with an open bypass line. Constantly operating the system with a closed bypass line is unnecessary and wastes energy by forcing the pump motor to work harder • Whenever necessary, close the valve on the bypass line for a short period of time (1 - 2 hours) in order to filter and clean the pond water 			
Energy use general energy issues	Action's env impact = L	Cost = M	Cost effectiveness = H
<p>⊗ Negril Cabins is currently billed at rate 20. This property should consider converting to rate 40 in order to lower its energy bills</p> <p>This recommendation is analyzed in Project 7</p>			
Energy use general energy issues	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>⊗ Although pool filter pumps are generally operated continuously, experience shows that in most cases pool water quality can be maintained by running the filter pumps for 12 to 16 hours per day. Negril Cabins should therefore shut off its filter pump at night to save energy and increase the service life of the pump</p> <p>This recommendation is analyzed in Project 8</p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Energy use general energy issues	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>The seals on the dryer are damaged and its door does not shut properly. These flaws allow hot air to escape or cool air to enter the unit, thus forcing the dryer to work harder than necessary. The maintenance staff should service the dryer and regularly check the dryer seals as part of their preventive maintenance program.</p>		
Energy use lighting	Action's env impact = M	Cost = M	Cost effectiveness = L/M
	<p>There is a large number of incandescent bulbs used around the property. Wherever possible, Negril Cabins should consider retrofitting existing lights with energy efficient fixtures (e.g. compact fluorescent bulbs). Highest priority should be given to replacing the incandescent bulbs that have a medium to high wattage (60 W or higher) or those that burn for long periods of time (> 8 hours per day).</p> <p>To its credit, this property has already installed a few 60 Hz compact fluorescent lamps in some of the newer guest rooms. However, Negril Cabins should try to locate a supplier of 50 Hz compact fluorescent lamps which are ideally suited to the electric current supplied by JPSCO.</p> <p>This recommendation is analyzed in Project 9</p>		
Energy use lighting	Action's env impact = M	Cost = M	Cost effectiveness = M
	<p>The audit team discovered that many cabin porch lights were inadvertently left burning during daytime. Possible solutions to remedy this situation are discussed below:</p> <ul style="list-style-type: none"> • Install photocells on the cabin porch lights to ensure that these lights cannot be turned on during the day. • Instruct housekeepers to switch these lights off during daytime. Even if the lights are equipped with photocells, housekeepers should still shut off the switches of the porch lights. • Place labels on the light switches that are located by the guest room entrance. Currently, many guests mistake the porch light switch with a "dead" switch. Alternatively, Negril Cabins should consider moving the porch light switch closer to the porch door. 		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Energy use lighting	Action's env impact = M	Cost = L	Cost effectiveness = M
<p>The lights are often left on in the dry goods storage room, walk-in refrigerators and freezers, employee bathrooms, and storage areas. The hotel should consider installing timers or occupancy sensors in these areas to reduce the operating time of the bulbs</p> <ul style="list-style-type: none"> • A timer will allow the lights to remain on for a specified length of time (generally 15 to 30 minutes depending on the model purchased). When an employee enters the room, he or she would turn on the timer just like a light switch. After the time on the timer expires, the lights would turn off. Many models will warn anyone still in the room that the lights are about to go out by flashing the lights or sounding an alarm, which allows the employee time to reset the timer if necessary. • An occupancy sensor will turn the lights on any time an employee enters the room, leave them on for a specified period, and turn them off if no one is detected in the room at the end of that period of time. Occupancy sensors are only applicable in certain types of rooms, depending on the room's size and layout. <p>Both timers and occupancy sensors are inexpensive, and either will pay for itself fairly quickly.</p>			
Energy use air-conditioning	Action's env impact = M	Cost = M	Cost effectiveness = H
<p>⊗ The cabins' louvers and doors are loose and allow large volumes of hot and humid air to seep into the air-conditioned rooms. The airtightness of the doors and louvers is so poor that, in some cabins, the air-conditioning units produce sustained condensate flows of 1 IG per hour when operated during daytime.</p> <p>The maintenance staff should install durable weather stripping on the louvers and at the base of the entrance doors to reduce heat gain and the energy consumed by the air conditioners. Installing weather stripping should also help to reduce the number of lizards and insects entering the guest rooms.</p> <p>Note: The condensate (i.e., distilled water) generated by the property's air-conditioning units could be collected and used in "non-critical" industrial applications. Mr. Bell currently purchases 4 gallons per week of distilled water at a cost of 400 J\$/gallon. This amount of distilled water could be easily collected from a cabin in a few hours.</p>			
Energy use air-conditioning	Action's env impact = M	Cost = M/H	Cost effectiveness = L/M
<p>In order to reduce the use of air-conditioning in guest rooms, Negril Cabins should consider implementing the following measures:</p> <ul style="list-style-type: none"> • Insulate the cabins' roofs. The existing roof structure (dark shingles laid directly on the interior wooden ceiling) transmits a significant amount of heat inside the rooms. • Add ceiling fans in all guest rooms and encourage guests to use them. Most guests which stay in rooms that are not equipped with ceiling fans are forced to constantly rely on air-conditioning since the natural draft through the louvers is not sufficient to keep the room reasonably cool (even during nighttime). 			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Energy use air-conditioning	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>⊙ The audit team found that many of the filters of the air-conditioning units were extremely dirty. Air filters are thin foam pads or meshes which are fitted directly over the evaporator coils. They must be periodically cleaned (approximately once a month) in order to keep an unobstructed flow of air to the evaporator coils and prevent the growth of fungi or other organisms in the accumulated dust. A clogged filter forces the fan motor to work harder, reduces the efficiency of the air conditioning unit and may affect the air quality in the guest room.</p> <p>To clean the air filters, follow the following steps</p> <ul style="list-style-type: none"> • remove the filter from the unit, • wash it with a mild detergent, • rinse it clean, • shake out excess water, and • air dry before re-inserting it in the air conditioning unit 		
Energy use air-conditioning	Action's env impact = M	Cost = M	Cost effectiveness = M
	<p>Negril Cabins should investigate the possibility of installing a main key switch at the entrance of guest rooms. The function of this key switch would be to shut off all room lights and turn off (or turn back) the air-conditioning unit when the guest leaves the room and removes the key from the switch. Alternatively, Negril Cabins may consider to install a simple manual switch that would perform the same function as the key switch.</p>		
Energy use refrigeration	Action's env impact = M	Cost = L	Cost effectiveness = M
	<ul style="list-style-type: none"> • Regularly check and provide adequate maintenance to the door seals of all freezer and refrigerator units • Periodically check the temperature of all refrigerated units to ensure they are operating at optimal conditions 		
Energy use refrigeration	Action's env impact = M	Cost = L	Cost effectiveness = M
	<p>Install plastic curtains in the walk-in refrigerator and freezer to reduce the loss of cold air when the doors are opened.</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Energy use water heaters	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ In order to save energy, the hot water heaters in all cabins are turned on for only 2 two-hour periods during the day (6 to 8 AM and 3 to 5 PM) However, since the security guards who turn the heaters on at 6 00 AM do not know which cabins are vacant, they regularly turn on all of the property's hot water heaters The water heaters of vacant cabins are later turned off by the housekeepers, but by that time energy has already been wasted in heating up the water heater's contents Possible solutions to remedy this situation include</p> <ul style="list-style-type: none"> • Provide occupancy information to the security guards to insure that the water heaters are turned on only in occupied cabins • Shut off the water heaters only in unoccupied cabins and leave the others operating 24 hours per day Since a water heater consumes energy only when the water temperature drops below the thermostat temperature setting, there should be little difference in the amount of energy consumed by a water heater that is operated continuously and one that is operated intermittently <p>By leaving the water heaters constantly on in occupied cabins, Negril Cabins will be able to lower the temperature setting of these units Currently, the water heaters' thermostats are set excessively high to ensure that water temperature will still be acceptable several hours after the heaters have been shut off Furthermore, if Negril Cabins switches over to JPSCO's billing rate 40, ending the practice of turning on all water heaters at the same time will reduce this property's peak power demand and the corresponding peak demand charge</p>			
Energy use water heaters	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ The thermostat setting in most water heaters is excessively high and, according to one employee, "the water is often hot enough to make tea"</p> <p>Negril Cabins should ensure that all water heater thermostats are set to the 'energy efficiency' range indicated on the thermostats High water heater temperatures increase heat losses from water tanks and hot water pipes, and increase the risk of scalding guests and employees In many parts of the US setting water heaters at a temperature greater than 120°F is prohibited by law</p>			
Energy use water heaters	Action's env impact = H	Cost = M/H	Cost effectiveness = L/M
<p>☉ The property should consider repairing or upgrading the passive solar panel systems used to heat water in some of the older cabins After providing years of service, many of the property's are currently in a state of absolute disrepair Consider the following facts</p> <ul style="list-style-type: none"> • Passive solar heating is a cost effective technology in Jamaica's climate • It is a simple technology which can provide years of service with minimum amount of maintenance and supervision • The use of solar power will enhance green image of this property <p>Negril Cabins should consider using solar power to supply hot water to its kitchen and laundry areas Given the economies of scale, large arrays designed for laundries or kitchens will be more cost effective than the smaller arrays designed only for a two-room cabin</p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Solid waste generation	Action's env impact = H	Cost = M	Cost effectiveness = M
	<p>☉ Negril Cabins should implement a hotel-wide recycling program to segregate glass plastics metal, cardboard, paper, and green waste from its general waste stream</p> <p>This recommendation is analyzed in Project 10</p>		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = N/A
	<p>In the future, consider purchasing air-conditioners that can be operated from control boxes that are hard-wired to the units. The type of batteries used in remote controls often contain heavy metals (mercury, lead, cadmium) which contaminate soil and water in landfills. Furthermore, remote controls can be easily lost or misplaced and guest often borrow remote control batteries for their cameras and electronic gadgets</p>		
Use of chemicals	Action's env impact = H	Cost = L	Cost effectiveness = H
	<p>☉ Avoid the use of drain cleaning chemicals whenever possible. Drain cleaning chemicals are toxic, hazardous and expensive, they should therefore be used sparingly and only as a last resource. Furthermore, when discharged to an on-site wastewater disposal system, these chemicals harm the bacteria which decompose and purify the waste in septic tanks and tile fields. The destruction of these beneficial bacteria increases the rate at which solids accumulate in septic tanks, increases the possibility of clogging the tile fields, and increases the mass of pollutants which reach the ground water table</p> <p>The maintenance staff should first try to clear clogged drains with a plunger or "snake" before using chemicals. Snakes are long, highly flexible metal wires or coils which are very effective in cleaning and unclogging drains, they can be operated manually or powered through a drill-like device. The cost of these tools range from 20 US\$, for a manual snake to 250 US\$, for a top-of-the-line power-driven snake</p> <p>☉ Negril Cabins should also stop using drain cleaning chemicals in the routine cleaning of the kitchen's grease traps. Maintenance staff should manually remove the grease and solids which accumulate in the grease traps instead of dissolving them with drain cleaning chemicals</p>		
Damage to the ecosystem	Action's env impact = H	Cost = N/A	Cost effectiveness = N/A
	<p>Negril Cabins should stop discharging the untreated effluent from its laundry and pool bar in the morass. The discharge of sewage and noxious effluents in bodies of water is prohibited by Jamaica's Natural Resources Conservation Authority Act</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
PURCHASING DEPARTMENT			
Solid waste generation	Action's env impact = H	Cost = L	Cost effectiveness = N/A
	<p>☉ The hotel should purchase as many recycled paper products as possible (office paper toilet paper facial tissues, paper towels, etc) Most paper products manufacturers have environmentally-friendly alternatives which contain a minimum of 20% POST CONSUMER waste The price and quality of recycled paper products are often comparable to those of virgin paper products The use of these products also helps to convey the hotel s concern for the environment to its guests</p>		
FRONT OFFICE AND RECEPTION AREA			
Solid waste generation	Action's env impact = M	Cost = M	Cost effectiveness = N/A
	<p>The hotel should consider converting to a computerized reservation and accounting system This conversion will reduce paper waste and be a more reliable cost-tracking system</p>		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ The hotel should discontinue the practice of laminating the guest identification cards which are used for only a few day This practice generates unnecessary plastic waste, is needlessly expensive and is incompatible with this property's environmentally-friendly image It would be better from an environmental and cost-savings standpoint to simply replace any guest card that gets wet or damaged</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
GUEST ROOMS AND HOUSEKEEPING			
General housekeeping issues	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ Create a checklist, or personal action plan, for housekeepers to ensure they are aware of and comply with the conservation measures adopted by Negril Cabins. Examples of items that should be included in this checklist include</p> <ul style="list-style-type: none"> • Turn the air conditioner off (or lower the air conditioner setting) when entering the room • Before leaving the guest room, turn off all lights, televisions and radios, ensure that faucets and toilets are not running, close all louvers and windows (if the air conditioning is left on or if the room is cool) • Check for and report malfunctioning equipment and fixtures. Pay particular attention to water leaks in toilets, faucets and shower heads, excessively high flows from faucets or shower heads, sticking toilet flush handles, sink and bathtub stoppers which don't work or don't fit properly, damaged windows or louvers, scalding hot water, malfunctioning air conditioners • Do not replace the trash can liners (plastic bags) unless they are soiled or otherwise unacceptable for further use • Collect and separate all recyclable items left in guest rooms • Remove used soaps and amenities only at checkout <p>A sample of a "Personal action plan" for housekeepers is provided in Appendix IV</p>			
Water use / energy use and generation of water pollutants	Action's env impact = H	Cost = L	Cost effectiveness = H
<p>☉ Let guests decide if they want to replace their linens and towels every day. International and Jamaican (JHTA) experience has revealed that this measure can reduce the laundry load by up to 20%. By reducing the amount of material processed through the laundry, Negril Cabins will be able to lower its water, chemicals and energy consumption and costs</p> <p>This recommendation is analyzed in Project 11</p>			
Water use / energy use and generation of water pollutants	Action's env impact = H	Cost = L	Cost effectiveness = H
<p>☉ Currently, the hotel washes its guest bedspreads after every checkout. This practice</p> <ol style="list-style-type: none"> 1) increases the property's consumption of water, energy and chemicals 2) increases the laundry's workload, 3) shortens the service life of laundry equipment, and 4) increases the wear and tear on the bedspreads, forcing Negril Cabins to replace them more frequently <p>Since many hotels wash their bedspreads only once per month, and more often only if needed, Negril Cabins should consider modifying its current practices</p>			

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Water use / energy use and generation of water pollutants	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ The hotel triple-sheets beds in VIP rooms This practice is unnecessary, especially in the tropics where guests are unlikely to use blankets and where, in most instances, the use of blankets will only increase the use of air-conditioning The extra sheets add to the laundry's workload and costs, and are probably not expected by the guests</p>		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Many guests leave the air conditioner running and lights on after leaving their rooms Negril Cabins should place a tactful note in the rooms to encourage guests to turn off air conditioners and lights whenever they leave their rooms for extended periods</p> <p>Other action that can be taken by the hotel to reduce the energy consumed by its air conditioning units include</p> <ul style="list-style-type: none"> • Ask the housekeepers to turn the air conditioning units off when entering a room or, if this is unacceptable to the guests to adjust the air conditioner thermostat to a "low cool" setting (or the lowest possible setting) • Unless special ventilation is required ask housekeepers keep the guest room door closed during guest room preparation this will keep the room cooler and prevent insects (especially mosquitoes) from entering the room If the door must be left open during guest room preparation, ask housekeepers to turn off the air conditioning units • Curtains in the guest rooms should be closed by the housekeepers during the day to prevent the rooms from getting too hot This will reduce the need for guests to use their air conditioning when returning to the rooms • Investigate the possibility to control the operation of the air conditioning units with infrared sensors and magnetic door switches 		
Solid waste generation	Action's env impact = M	Cost = M	Cost effectiveness = M
	<p>The hotel should consider installing liquid soap dispensers in the guest bathrooms Attractive in-room amenities dispensers are becoming more popular in hotels worldwide and will reduce the hotel's costs and the amount of waste that it produces Many dispenser distributors include special signage to inform the guests that the dispensers are being used for environmental reasons</p>		
Generation of air emissions and solid waste	Action's env impact = M	Cost = L	Cost effectiveness = M
	<p>The use of aerosol air fresheners should be avoided even if these are free of CFCs -- many types of aerosols contain propellant gases which contribute to the green house effect</p> <p>Many hotels successfully use liquid air fresheners in a refillable pump bottle These products are less expensive since they can be purchased in bulk and they reduce air emissions the generation of packaging waste produced by the hotel</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
LAUNDRY			
Water use / energy use and generation of water pollutants	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ The laundry often washes loads that are not full. This practice should be discouraged since it wastes water, energy, and chemicals. The hotel should have enough turns of towels and sheets to allow the laundry to leave partial loads to be washed the next day with other items.</p>		
Water use	Action's env impact = M	Cost = M/H	Cost effectiveness = L/M
	<p>The washers use four rinse cycles, which wastes a tremendous amount of water. The hotel should set the washers to use fewer rinses or should consider collecting the water from the rinse cycles for reuse. A laundry water reuse system reduces the amount of freshwater used by the washers by 25% to 40%.</p> <p>Kemco Systems in Florida will conduct a full payback analysis of this option. Kemco can be contacted at (813) 573-2323 or (1-800) 633-7055.</p>		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Since all laundry loads at Negril Cabins are currently washed with hot water, the laundry staff should experiment with washing some loads with only cold water. Many hotels wash most of their laundry in cold water and use hot water only for heavily-stained loads. Pre-washing heavily-stained items can also be used to reduce the laundry's consumption of hot water.</p>		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ The laundry staff currently packages clean laundry that is returned to the guest rooms in large disposable plastic bags. In order to reduce waste and save money, the hotel should consider using durable cloth bags or baskets for this purpose.</p>		
Use of chemicals	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ The laundry uses too many detergents and other products in each load of wash, furthermore none of these products are biodegradable. According to the laundry staff, a liquid stain remover is added to every load of whites even though the heavily-stained items are already pre-soaked and the detergent used contains an optical brightener.</p> <p>Negril Cabins should evaluate its practices, eliminate the use of all unnecessary chemicals, and contact its vendors to identify more environmentally friendly laundry products. By reducing the number and the harshness of its laundry chemicals, Negril Cabins will save money and facilitate the use of the laundry effluent for gray water irrigation.</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
KITCHEN			
Water use, energy use, and use of chemicals	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ The dishwasher is sometimes run with less than a full load. Dishes should be collected until a full load is ready before the dish tray is put into the dishwasher. The dishwasher will use the same amount of water for a partial load as a full load.</p>		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ The kitchen floor is mopped every morning and hosed down every night. Since a properly mopped floor ensures in most cases the necessary sanitary conditions, Negril Cabins should conserve water by hosing down the kitchen floor less frequently.</p>		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Wash vegetables in a basin full of water rather than under a running faucet.</p>		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ The kitchen staff should find a way to open the walk-in doors less often. The staff indicated that the walk-in freezer is frequently accessed during several hours in the morning and the afternoon. A great deal of cold air escapes each time the door is opened.</p> <p>Many hotels have established a controlled access program in their walk-ins, giving the chef or a supervisor a key to the walk-ins and allowing access only during certain times of the day. During those access times, food for the next meal(s) is removed and moved to a smaller refrigerator in the kitchen where it can be easily accessed for preparation. Access during other times of the day is only allowed in special circumstances as determined by the chef or supervisor.</p>		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = M
	<p>The canopy over the cooking equipment operates from 6 am to 10 pm daily. The kitchen staff should ensure that the canopy only operates when the cooking equipment is being used. Any reduction in operating hours will save energy. Perhaps a reminder sign could be posted on the canopy switch or a timer could be installed to regulate the hours of use.</p>		
Solid waste generation	Action's env impact = H	Cost = L	Cost effectiveness = M
	<p>☉ Food waste is now being sent to the landfill. In the future, this waste should be sent to the property's compost pile to improve the quality of the compost and reduce the volume of waste disposed of by Negril Cabins.</p> <p>Information on composting practices are given in Project 12</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
RESTAURANT AND BAR			
Water and chemicals use	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Discontinue the practice of supplying guests with new glasses with each new order. If a guest orders the same beverage twice, offer to refill the glass as an alternative to giving a new glass. This measure will reduce the amount of water and detergent used to wash dishes from the bar.</p>		
Solid waste generation	Action's env impact = M	Cost = M	Cost effectiveness = M
	<p>Although no soft drinks or beers are currently available on tap at Negril Cabins, the store room manager indicated that the hotel is considering adding taps to its bar. Negril Cabins is encouraged to pursue this option since the use of taps lowers costs and reduces the volume of packaging waste generated by the property.</p>		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = M
	<p>Buy reusable coasters instead of using paper napkins as coasters. True cardboard or cork coasters will work better, last longer, and cost less over time.</p>		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = M
	<p>The hotel uses a variety of disposable plastic cups, paper plates, and plastic utensils at the beach bar/ grill. The use of these items should be discouraged and tightly controlled. The chef indicated that the grill will be expanded in the near future and will then be able to use reusable items. The hotel should consider purchasing a small dishwasher for the new beach grill so that reusable items are easier to clean. Also the design of the new beach grill should include permanent tables and chairs to encourage guests to stay in this area while eating/ drinking. This will reduce the breakage of reusable items.</p>		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Do not give straws out automatically with drinks. Place straw dispensers on the bar or ask guests if they need a straw before serving the drinks. Also replace plastic straws with paper straws.</p>		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ In both the main bar and the restaurant, silverware is often wrapped in two paper napkins. The staff should use only cloth napkins or, if paper napkins are necessary, only one napkin should be used to reduce waste and costs. Extra paper napkins can be made available for those guests who need them.</p>		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ The restaurant serves sugar at breakfast and lunch in individual packages but uses containers of sugar at dinner. The chef indicated that there was some concern about insects getting into the sugar if it were served in containers at all meals. The hotel should purchase containers with lids that seal firmly and use these at all meals. This will prevent the insect problems while lowering costs and the generation of packaging waste.</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>⊗ All items on the buffet (both breakfast and dinner) should be served in bulk, including jelly, butter, and any other condiments. Currently there are a large number of individually-packaged items. Purchasing bulk products lowers costs and reduces the generation of packaging waste.</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
POOL			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ The pool caretaker should be encouraged to use a broom instead of a hose to clean the sidewalks around the pool and pool bar. A running hose is generally a very expensive and ineffective substitute for a broom.</p>		
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Currently the pool caretaker backwashes the pool filter at least once per day.</p> <p>Backwashing the sand filter every day wastes water and does not necessarily improve the performance of the sand filter. Generally sand filters operate best when they are slightly dirty since the impurities contained in the filter help capture particles from the pool water as it passes through the layer of sand.</p> <p>According to the manufacturer's guidelines, pool filters should be backwashed only when the filter pressure rises by 6 to 8 psi over the clean filter pressure (i.e., the pressure generated in a recently backwashed filter). The clean filter pressure of Negril Cabins' equipment is approximately 20 psi; therefore the system should not be backwashed until the filter pressure reaches at least 26 psi. It was observed that after 48 hours of constant operation the filter pressure rises by approximately 2 psi.</p>		

Env aspect	Description and rating of the recommended action (H = high, M = moderate, L = low)		
GROUNDS			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = M
	All hoses should be equipped with spray nozzles to prevent water flow when it is not needed		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
	☉ Security should turn off ceiling fans in the main building after guest traffic has slowed (i.e. after 10 p.m.) and then turn them on again at dawn. There is no reason for these fans to operate all night.		
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = N/A
	The grounds staff should keep plants around exterior lights trimmed. Lighting levels in the garden areas are already low, making it critical to keep all plants trimmed so that they do not block the light. The audit team found a number of exterior lights that are completely covered by vegetation.		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = N/A
	The hotel should install trash receptacles around the property and at the beach to make it easier for guests and employees to throw items away. The audit team noted some trash on the grass around the hotel grounds and on the beach, possibly because trash cans are now hard to find. Purchasing more trash receptacles will make the job of the grounds staff easier and will keep the grounds looking good even when the grounds staff is not around.		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
	☉ Discontinue the practice of using plastic bags to collect yard waste. The hotel should provide its grounds crew with enough wheelbarrows, reusable containers or canvas bags to eliminate the need for disposable plastic bags.		

5. Detailed Analysis of Selected Recommendations

Project I: Install flow aerators on all faucets

Summary of results and benefits

- ▶ Reduces water consumption and wastewater generation by 18,250 IG/year, corresponding to savings of 3,700 J\$/year for each aerator installed on a typical back-of-house faucet
- ▶ Saves energy and money by reducing the use of hot water from faucets
- ▶ Reduces the volume of wastewater discharged to the property's septic tanks and tile fields thereby improving the performance of the on-site wastewater disposal systems
- ▶ The payback period of this water conservation measure is typically 1 to 4 weeks

Current situation Most faucets in this property's guest bathrooms, kitchen, bar, employee bathrooms and public restrooms are not equipped with flow aerators. In fact, only 1 of the 4 guest bathroom faucets and 8 of the 22 public and back-of-house faucets inspected by the audit team were equipped with these water-saving devices.

Some of the maximum flows measured by the audit team in back-of-house areas are listed below.

Location	Maximum flow (IG/min)	Aerator
Kitchen cold room sink	1.2	yes (rated at 1.7 IG/min)
Kitchen vegetable preparation sink	7.5	no
Kitchen pan washing sink (cold water)	4.6	no
pan washing sink (hot water)	5.8	no
Pool bar sinks	4.6 to 5.0	no

Recommendations Install flow aerators on all faucets which can be equipped with these inexpensive water saving devices. Flow aerators screw directly at the end of faucets and reduce their output without affecting the "feel" of the flow. The maximum flow output of standard aerator models ranges from 0.4 to 2.1 IG/min. 0.4, 1.3 or 1.7 IG/min aerators are generally used for bathroom faucets, while 2.1 IG/min models are generally installed on kitchen or bar faucets. In most instances, the actual output of an aerator is well below its rated maximum output.

The use of flow aerators is particularly important on faucets that are used frequently (e.g., public and employee restrooms) are left running for long periods of time (e.g., kitchen bar and laundry room), or have exceedingly high outputs. Flow aerators also save energy by reducing the amount of hot water drawn from faucets.

The use of aerators in Negril Cabins' kitchen should also alleviate the frequent shortages of hot water experienced in this area.

Input, assumptions and calculations

a) Calculation of the savings achieved by installing a flow aerator on a typical back-of-house faucet

- ▶ Assume a typical back-of-house faucet is operated for 20 minutes per day
- ▶ Assume the flow of a typical back-of-house faucet with no aerator is greater than 4.0 IG/min. By installing an aerator, this flow can be reduced to less than 1.5 IG/min
- ▶ The cost of water is 204 J\$/1,000 IG

$$\begin{aligned}
 \text{Water savings} &= (20 \text{ min/day/faucet}) \times (4.0 \text{ IG/min} - 1.5 \text{ IG/min}) \times (365 \text{ days/year}) \\
 &= 18,250 \text{ IG/faucet/year} \\
 &= (18,250 \text{ IG/faucet/year}) \times (204 \text{ J\$/1,000 IG}) \\
 &= 3,720 \text{ J\$/faucet/year}
 \end{aligned}$$

b) Calculation of the implementation cost and payback period

- ▶ The cost of a faucet aerator ranges from 30 to 60 J\$

$$\text{Implement cost} = 60 \text{ J\$/faucet}$$

$$\begin{aligned}
 \text{Payback period} &= (\text{implementation cost}) / (\text{annual savings}) \\
 &= (60 \text{ J\$/faucet}) / (3,720 \text{ J\$/faucet/year}) \\
 &< 1 \text{ week}
 \end{aligned}$$

Comments The savings achieved with flow aerators can justify, in certain cases, the cost of purchasing new fixtures to replace old-fashioned faucets which cannot be equipped with aerators. The following table illustrates this point by presenting the savings resulting from the purchase of aerators and new fixtures for faucets that are operated from 5 to 60 minutes each day.

Faucet use (minutes/day)	Water savings (IG/year)	Water savings (J\$/year)	Payback period for a 60 J\$ aerator	Payback period for a 3,000 J\$ faucet
5	4,560	930	3.5 weeks	3.2 years
10	9,125	1,860	2 weeks	1.6 years
20	18,250	3,720	6 days	9.5 months
40	36,500	7,440	3 days	5 months
60	54,750	11,160	2 days	3.5 months

- Note
- The savings presented in this table are based on the same flow assumptions used in the preceding calculations -- that is, initial flow of 4.0 IG/min reduced to 1.5 IG/min with the use of an aerator or with a new fixture equipped with an aerator. The cost of a new faucet is estimated at 3,000 J\$.
 - In areas where hot water is drawn from the faucets, the installation of a flow aerator will also save energy by reducing the consumption of hot water.

Project 2: Install low-flow shower heads

Summary of results and benefits

- ▶ Installing a single low-flow shower head in a guest bathroom reduces water consumption by 23,200 IG/year and electricity consumption by 2,570 kWh/year, and saves the property 16,700 J\$/year in water and electricity
- ▶ Improves the performance of the on-site wastewater disposal systems
- ▶ The payback period for this water and energy conservation measure is typically less than 3 weeks

Current situation

- ▶ Negril Cabins has installed low-flow shower heads in some guest bathrooms. However, 75% of the guest bathrooms inspected by the audit team still have old shower heads which do not use water efficiently
- ▶ The showers in the two employee bathrooms located by the laundry room have no shower heads at all
- ▶ The maximum output of some of Negril Cabins' shower heads is summarized in the following table

Location	Maximum flow (IG/min)	Type of shower head
Room 405 (superior)	1.5	low-flow
Room 105 (standard)	8.5	not low-flow
Room 108 (standard)	8.5	not low-flow
Room 409 (superior)	6.5	not low-flow
Male employee bathroom (2 showers)	7.5	no shower heads
Female employee bathroom	8.5	no shower head

Recommendations

- ▶ Install low-flow shower heads in all guest bathrooms. The low-flow shower head installed in room 405 uses less than 1.5 IG/min and outperforms the standard shower heads used elsewhere in the property. In addition to reducing the property's water consumption, low-flow shower heads also save energy by reducing the amount of hot water consumed in showers.

Given the extremely high water output of its old-fashioned shower heads, Negril Cabins should implement this recommendation as soon as possible. Installing low-flow shower heads is a cheap and simple operation which could be completed well ahead of the planned remodeling of Negril Cabins' older rooms.

- ▶ Install low-flow shower heads in all employee bathrooms. Given the high output of the "open pipe" showers and the fact that most employees use the showers before returning home, it is in

Negril Cabins' best interest to implement this measure as soon as possible. Many manufacturers offer theft-proof shower head models. A theft-proof feature generally increases the cost of a low-flow shower head by less than 50 J\$.

Input, assumptions and calculations

a) Calculation of the water and energy savings achieved by installing a single low-flow shower head in a guest bathroom

- ▶ Assume two 5-minute showers per guest night
- ▶ Assume a piped water temperature of 70°F (21°C) and a shower water temperature of 105°F (41°C)
- ▶ Negril Cabins' low-flow shower heads consume 1.5 IG/min while the older shower heads consume at least 6.0 IG/min
- ▶ The cost of water is 204 J\$/1,000 IG
- ▶ The electricity consumed by Negril Cabins' electric water heaters costs 4.65 J\$/kWh and yields 860 kcal/kWh. The electric water heaters have an assumed efficiency of 95%
- ▶ The property has 70 guest rooms and an occupancy of 36,060 guest nights per year. This corresponds to an average of 515 GN/year/room

$$\begin{aligned}
 \text{Water savings} &= (2 \times 5 \text{ min/GN}) \times (6.0 \text{ IG/min} - 1.5 \text{ IG/min}) \\
 &= 45 \text{ IG/GN} \\
 &= (45 \text{ IG/GN}) \times (515 \text{ GN/year/room}) \\
 &= 23,200 \text{ IG/year/room} \text{ or } 105,000 \text{ liters/year/room} \\
 &= (23,200 \text{ IG/year/room}) \times (204 \text{ J}/1,000 \text{ IG}) \\
 &= 4,730 \text{ J}/\text{year/room}
 \end{aligned}$$

$$\begin{aligned}
 \text{Energy savings} &= (105,000 \text{ lit/year/room}) \times (1 \text{ kcal/lit}/^\circ\text{C}) \times (41^\circ\text{C} - 21^\circ\text{C}) \times (1/0.95) \\
 &= 2,210,000 \text{ kcal/year/room} \\
 &= [(2,210,000 \text{ kcal/year/room}) / (860 \text{ kcal/kWh})] \times (4.65 \text{ J}/\text{kWh}) \\
 &= (2,570 \text{ kWh/year/room}) \times (4.65 \text{ J}/\text{kWh}) \\
 &= 11,950 \text{ J}/\text{year/room}
 \end{aligned}$$

$$\begin{aligned}
 \text{Total savings} &= \text{water savings} + \text{energy savings} \\
 &= 16,700 \text{ J}/\text{year/room}
 \end{aligned}$$

b) Calculation of the implementation cost and payback period

- ▶ The cost of a low-flow shower head ranges from 300 to 850 J\$, but the following calculations will use a conservative cost of 850 J\$/unit

$$\text{Implementation cost} = 850 \text{ J}/\text{shower head}$$

$$\begin{aligned}
 \text{Payback period} &= (850 \text{ J}/\text{shower head}) / (16,700 \text{ J}/\text{year/shower head}) \\
 &< 3 \text{ weeks}
 \end{aligned}$$

Project 3: Install flow diverters in toilet tanks

Summary of results and benefits

- ▶ Reduces water consumption and wastewater generation by 33,000 IG/year if flow diverters are installed in 60% of the property's conventional toilets
- ▶ Saves the property 6,700 J\$/year in reduced water bills
- ▶ Improves the performance of the on-site wastewater disposal systems
- ▶ The payback period for this recommendation is 6 months

Current situation

Many of Negril Cabins' bathrooms and restrooms are equipped with conventional toilets which consume from 3.3 to 4.2 IG per flush. None of the conventional toilets inspected had any type of water conservation device in place.

Recommendations

Whenever possible, install a flow diverter on the hose which feeds water to the toilet bowl refill pipe of conventional toilets. By diverting back into the water tank part of the flow that normally drains to the toilet bowl, this simple device can be used to set a suitable water level in the toilet bowl and avoid the waste of water resulting from overflowing the toilet bowl. In most cases, flow diverters do not affect the performance of the toilet because they do not reduce the water level in the toilet tank or the amount of water used to flush the waste from the bowl. Flow diverters can be easily installed on most conventional toilets and can save from 0.4 to 0.8 IG per flush.

Flow diverters are used in many US hotels which are not equipped with water-saving toilets.

Product information on flow diverters is included in Appendix VI.

Input, assumptions and calculations

- a) Calculation of the savings resulting from installing flow diverters in the property's conventional toilets
 - ▶ There are 70 guest bathrooms on this property. Since 75% of the inspected guest bathrooms were equipped with conventional toilets, these calculations will assume that 52 guest rooms are equipped with conventional toilets.
 - ▶ There are 4 conventional toilets in employee and public area restrooms.
 - ▶ Assume 4 flushes per guest night in guest bathrooms and 20 flushes/day/toilet in public and employee restrooms.
 - ▶ Assume flow diverters reduce by 0.4 IG the amount of water used to refill the bowl after each flush.
 - ▶ Since flow diverters do not work effectively on all conventional toilets, these calculations assume that flow diverters can be installed in 60% of this property's conventional toilets.

- ▶ The cost of water is 204 J\$/1,000 IG
- ▶ The hotel has an occupancy of 36 060 guest nights per year

$$\begin{aligned}\text{Water savings} &= 60\% \times [(4 \text{ flushes/GN}) \times (0.4 \text{ IG/flush}) \times (75\% \times 36,060 \text{ GN/year}) \\ &\quad + (20 \text{ flushes/day/toilet}) \times (4 \text{ toilets}) \times (0.4 \text{ IG/flush}) \times (365 \text{ days/year})] \\ &= 32,970 \text{ IG/year} \\ &= (32,970 \text{ IG/year}) \times (204 \text{ J\$/1,000 IG}) \\ &= 6,700 \text{ J\$/year}\end{aligned}$$

b) Calculation of the implementation cost and payback period

- ▶ Flow diverters cost approximately 100 J\$/unit

$$\begin{aligned}\text{No. of diverters purchased} &= 60\% \times (52 + 4) \\ &= 34 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{Total implementation cost} &= (100 \text{ J\$/unit}) \times (34 \text{ units}) \\ &= 3,400 \text{ J\$}\end{aligned}$$

$$\begin{aligned}\text{Payback period} &= (3,400 \text{ J\$}) / (6,730 \text{ J\$/year}) \\ &= 6 \text{ months}\end{aligned}$$

Comments

Possible supply sources for flow diverters include

Mr John Albino
AquaSaver Sales Inc
5062 South 108 th Street #291
Omaha, NE 68137
Tel (402) 895-4073

The flow diverters (AquaSaver™) supplied by AquaSaver Sales cost 2.50 USD/unit. Shipping 50 - 100 flow diverters from the US to Jamaica costs approximately 10 USD.

Project 4: Install displacement devices in conventional toilets and adjust the water level in the toilets' water tanks

Summary of results and benefits

- ▶ Reduces water consumption and wastewater generation by 33,000 IG/year if displacement devices are installed in 60% of the property's conventional toilets
- ▶ Saves the property 6,700 J\$/year in reduced water bills
- ▶ Improves the performance of the on-site wastewater disposal systems
- ▶ The payback period for this recommendation is less than 3 months

Current situation

- ▶ Many of Negril Cabins' bathrooms and restrooms are equipped with conventional toilets which consume between 3.3 and 4.2 IG per flush. None of the conventional toilets inspected had any type of water conservation device in place.
- ▶ A total of 10 gravity flush toilets were inspected during the course of the audit. In 5 of these (50%), the water depth in the toilets' water tanks was higher than necessary (the recommended water level is often indicated by a mark drawn inside the water tank).
- ▶ The audit team observed that, for a single toilet model, the water depth in the toilets' tanks ranged from 7.9 to 9.1 inches. Both the high and low water levels allowed the toilets to perform adequately, but, with each flush, the tank with 9.1" of water used 0.5 IG more than the tank with 7.9" of water.

Recommendations

- ▶ Whenever possible, equip conventional toilets with displacement devices which reduce the amount of water used in each flush. Displacement devices include home-made plastic bottles filled with pebbles and water, flexible panels, and filled bags, these devices are placed in the storage tank of conventional toilets to reduce the volume but not the height of the stored water. The displacement device must be compatible with the existing toilet and not interfere with the flush mechanism.
- ▶ Adjust float valves to achieve a consistent and reasonable water depth in all toilet water tanks. Periodically check the toilet tanks to ensure that the water depth is at the predetermined height and never reaches the top of the overflow pipe.

Input, assumptions and calculations

- a) Calculation of the savings resulting from installing displacement devices in conventional toilets
 - ▶ There are 70 guest bathrooms on this property. Since 75% of the inspected guest

bathrooms were equipped with conventional toilets, these calculations will assume that 52 guest rooms are equipped with conventional toilets

- ▶ There are 4 conventional toilets in employee and public area restrooms
- ▶ Assume 4 flushes per guest night in guest bathrooms, and 20 flushes/day/toilet in public and employee restrooms
- ▶ Assume displacement devices reduce by 0.4 IG the amount of water used in each flush
- ▶ Since displacement devices do not work effectively in all conventional toilet, these calculations assume that displacement devices can be installed in 60% of the property's conventional toilets
- ▶ The cost of water is 204 J\$/1,000 IG
- ▶ The hotel has an occupancy of 36,060 guest nights per year

$$\begin{aligned}
 \text{Water savings} &= 60\% \times [(4 \text{ flushes/GN}) \times (0.4 \text{ IG/flush}) \times (75\% \times 36,060 \text{ GN/year}) \\
 &\quad + (20 \text{ flushes/day/toilet}) \times (4 \text{ toilets}) \times (0.4 \text{ IG/flush}) \times (365 \text{ days/year})] \\
 &= 32,970 \text{ IG/year} \\
 &= (32,970 \text{ IG/year}) \times (204 \text{ J\$/1,000 IG}) \\
 &= 6,730 \text{ J\$/year}
 \end{aligned}$$

b) Calculation of the implementation cost and payback period

- ▶ The cost of a commercial displacement device is approximately 170 J\$ Negril Cabins could however produce home-made displacement devices at a minimum cost (e.g., a used plastic bottle filled with pebbles and water). The following calculations assume a cost of 40 J\$ for a home-made displacement device

$$\begin{aligned}
 \text{No. of displacement devices} &= 60\% \times (52 + 4) \\
 &= 34
 \end{aligned}$$

$$\begin{aligned}
 \text{Total implementation cost} &= (40 \text{ J\$/toilet}) \times (34 \text{ toilets}) \\
 &= 1,360 \text{ J\$}
 \end{aligned}$$

$$\begin{aligned}
 \text{Payback period} &= (1,360 \text{ J\$}) / (6,730 \text{ J\$/year}) \\
 &< 3 \text{ months}
 \end{aligned}$$

Comments

- ▶ Negril Cabins should test the effectiveness of the displacement units in a few toilets before implementing this water conservation measure throughout the property

Project 5: Replace existing conventional toilets with water-saving toilets

Summary of results and benefits

- ▶ Replacing a damaged guest bathroom toilet with a water-saving model lowers water consumption and wastewater generation by 5,150 IG/year and saves 1,050 J\$/year
- ▶ Installing a water-saving toilet in a frequently used public or employee restroom reduces water consumption and wastewater generation by 18,250 IG/year and saves 3,700 J\$/year. The payback period for this water conservation measure is 13 months
- ▶ Improves the performance of the on-site wastewater disposal systems

Current situation

Many of this property's conventional toilets consume from 3.3 to 4.2 IG per flush

Recommendations

- ▶ For guest bathrooms, establish a policy to replace any damaged or unusable toilet with a water-saving model which uses 1.3 IG/flush (i.e., 1.6 US gallon/flush). Water-saving toilets have become the industry standard in many countries and are readily available in Jamaica. The cost of 1.3 IG/flush toilets is comparable to that of conventional toilets
- ▶ For all frequently used public or employee restrooms, replace conventional toilets with 1.3 IG/flush toilets

Input, assumptions and calculations

- a) Calculation of the savings achieved by replacing a damaged conventional toilet with a 1.3 IG/flush toilet in a guest room
- ▶ Assume 4 flushes per guest night
 - ▶ Water-saving toilets use 1.3 IG/flush while conventional toilets use on average 3.8 IG/flush
 - ▶ The cost of water is 204 J\$/1,000 IG
 - ▶ The property has 70 guest rooms and an occupancy of 36,060 guest nights per year. This corresponds to an average of 515 GN/year/room

$$\begin{aligned}\text{Water savings} &= (4 \text{ flushes/GN}) \times (3.8 \text{ IG/flush} - 1.3 \text{ IG/flush}) \times (515 \text{ GN/year/room}) \\ &= 5,150 \text{ IG/year/room} \\ &= (5,150 \text{ IG/year/room}) \times (204 \text{ J}\$/1,000 \text{ IG}) \\ &= 1,050 \text{ J}\$/\text{year/room}\end{aligned}$$

b) Calculation of the savings achieved by replacing a conventional toilet with a 1.3 IG/flush toilet in a public or employee restroom

- ▶ Assume that on average a public or employee restroom toilet is flushed 20 times per day
- Water-saving toilets use 1.3 IG/flush while the conventional toilets use on average 3.8 IG/flush
- ▶ The cost of water is 204 J\$/1,000 IG

$$\begin{aligned}\text{Water savings} &= (20 \text{ flushes/day/toilet}) \times (3.8 \text{ IG/flush} - 1.3 \text{ IG/flush}) \times 365 \text{ days/year} \\ &= 18,250 \text{ IG/year/toilet} \\ &= 3,700 \text{ J\$/year/toilet}\end{aligned}$$

c) Calculation of the implementation cost and payback for replacing an operational conventional toilet with a 1.3 IG/flush toilet in a public or employee restroom

- ▶ Average cost of a 1.3 IG/flush toilet = 4,000 J\$
- ▶ These calculations assume the replaced conventional toilet has no economic value

$$\text{Implementation cost} = 4,000 \text{ J\$/toilet}$$

$$\begin{aligned}\text{Payback period} &= (4,000 \text{ J\$/toilet}) / (3,700 \text{ J\$/year/toilet}) \\ &= 13 \text{ months}\end{aligned}$$

The preceding analysis shows that it is economically beneficial to replace all frequently used public restroom toilets with new water-saving units, even if the existing toilets are still in good conditions. After the completion of Negril's sewer system, the payback period for this recommendation will be reduced to 6.5 months.

Project 6: Use rainwater for laundry or other operations

Summary of results and benefits

- ▶ A 5,000 ft² rain catchment will reduce the purchase of NWC water by 118,000 IG/year and save the property 24,100 J\$/year
- ▶ The use of rainwater for laundry operations should reduce the property's consumption of rust removing and water softening chemicals

Current situation

- ▶ On average, the Negril area receives 57 inches of rainfall per year, therefore, each ft² of rain catchment surface could theoretically collect 29.4 Imperial gallons of water per year. At the present time, Negril Cabins does not collect any rainwater.
- ▶ Because of the quality of NWC water (hardness and high iron content), Negril Cabins is forced to use a liquid phosphate water conditioner (Regenerate) and a liquid rust removing sour (Kleracid) in every laundry load. These chemicals cost money and affect the quality of the laundry room effluent.

Recommendations

Consider collecting rainwater from the property's rooftops. The collected rainwater could then be used for laundry room operations, irrigation and other hotel operations. However, since times of peak rainwater supply always coincide with times of minimum irrigation, the use of collected rainwater for grounds irrigation is a less attractive alternative.

Since rainwater is virtually free, plentiful during at least 6 months of the year, and relatively clean, it is an ideal source of laundry water. Collected rainwater contains little dissolved iron which stains white linens and towels, it is also naturally soft and should therefore greatly reduce the need and consumption of water softening chemicals.

Input, assumptions and calculations

a) Calculation of the estimated water consumption of Negril Cabins' laundry operations

- ▶ Industry surveys show that towel/linen use in hotels ranges from 4 to 6 lb per guest night and, according to commercial laundry equipment manufacturers, institutional washing machines use from 1.7 to 2.1 IG per pound of linen laundered. Therefore, it is assumed that a beach property such as Negril Cabins uses an average of 9.5 IG of laundry water per guest night (i.e., 5 lb/GN x 1.9 IG/lb of laundry).
- ▶ It is assumed that linens and towels account for 75% of the total laundry load.

$$\text{Laundry water consumption} = (9.5 \text{ IG/GN}) \times (36,060 \text{ GN/year}) / (0.75)$$

= 457,000 IG/year

Note The laundry water needs are expected to drop significantly after Negril Cabins implements some of the recommendations made in this report (e.g., towel reuse program, optimization of laundry room operations, reduced frequency of bedspread washing)

b) Calculation of the savings resulting from using collected rainwater in laundry room operations

- ▶ The cost of NWC water is 204 J\$/1,000 IG
- ▶ Assume Negril Cabins can collect rainwater over a 5,000 ft² area. The roof of the new laundry building (1,300 ft²) and of the adjacent employee building (800 ft²) already provide a total collection surface of 2,100 ft²
- ▶ Assume that only 80% of the rain which falls on the catchment area is collected and stored
- ▶ Due to a lack of information, these calculations will not take into account the savings resulting from reducing the consumption of water softening and rust removing chemical
- ▶ The precipitation data for Negril is given in the following table

Month	1997 precipitation		30 year mean precipitation	
	(mm)	(IG/ft ²)	(mm)	(IG/ft ²)
Jan	58	1.19	97	1.99
Feb	134	2.74	44	0.90
Mar	15	0.31	57	1.16
Apr	67	1.37	92	1.88
May	212	4.34	164	3.35
Jun	170	3.48	158	3.23
Jul	149	3.05	160	3.26
Aug	157	3.22	175	3.57
Sep	119	2.43	155	3.16
Oct	-	-	180	3.80
Nov	-	-	80	1.64
Dec	-	-	71	1.45
Annual total	-	-	1,433 mm	29.4 IG/ft ²

Total collected rainwater = 80% x (29.4 IG/ft²/year) x 5,000 ft²
 = 118,000 IG/year
 = 26 % of Negril Cabins' laundry water needs
 = 24,100 J\$/year

c) Implementation cost and payback period

No information is available at the present time on the cost of a rain collection and storage system. The property should contact a local contractor to obtain a cost estimate for this system.

Project 7: Convert from billing rate 20 to rate 40

Summary of results and benefits

- ▶ Reduces Negril Cabins' energy bills by 367,000 J\$ per year
- ▶ Negril Cabins will recover the investment required to implement this recommendation in 10 weeks

Current situation

- ▶ The requirements needed to qualify for billing rate 40 are
 - Minimum peak demand of 20 kW
 - Service character 3 phase, 50 Hz, 220 V delta or 415/240 star system
- ▶ Negril Cabins is serviced by a 220 V, 3 phase, delta connected system, and its peak demand is greater than 20 kW Therefore, Negril Cabins is qualified to be billed under rate 40

Recommendations Negril Cabins should consider converting from billing rate 20 to rate 40

Input, assumptions and calculations

- ▶ Based on the size of and equipment used at this property, Negril Cabins average peak demand is assumed to be equal to 150 kW Since currently the peak demand of Negril Cabins is not measured or included in JPSCO's bills, management should verify the validity of this assumption before proceeding with the implementation of this recommendation
- ▶ Negril Cabins' average monthly energy consumption = 46,000 kWh (see Section 2.4)
- ▶ The typical fees related to the two billing rate codes are as follows

Bill item	Rate code 20	Rate code 40
Customers charge	6 J\$/month	497 J\$/month
Demand charge	none	176 J\$/kW
Energy charge	2 286 J\$/kWh	1 215 J\$/kWh
Fuel charge	1 276 J\$/kWh	1 259 J\$/kWh
Foreign exchange adjustment	32.6%	32.6%

a) Calculation of the average electricity bill for Negril Cabins under rate 20

$$\begin{aligned} \text{Cost / kWh for rate 20} &= [(2\,286 \text{ J\$/kWh}) + (1\,276 \text{ J\$/kWh})] \times 1\,326 \\ &= 4\,72 \text{ J\$/kWh} \end{aligned}$$

$$\begin{aligned} \text{Average bill for rate 20} &= [(46,000 \text{ kWh/month}) \times (4\,72 \text{ J\$/kWh})] + (6 \text{ J\$/month} \times 1\,326) \\ &= 217,100 \text{ J\$/month} \end{aligned}$$

b) Average electricity bill for Negril Cabins under rate 40

$$\begin{aligned} \text{Cost / kWh for rate 40} &= [(1\,215 \text{ J\$/kWh}) + (1\,259 \text{ J\$/kWh})] \times 1\,326 \\ &= 3\,28 \text{ J\$/kWh} \end{aligned}$$

$$\begin{aligned} \text{Demand charge for rate 40} &= 150 \text{ kW} \times 176 \text{ J\$/kW/month} \times 1\,326 \\ &= 35,000 \text{ J\$/month} \end{aligned}$$

$$\begin{aligned} \text{Average bill for rate 40} &= [(46,000 \text{ kWh/month}) \times (3\,28 \text{ J\$/kWh})] + 35,000 \text{ J\$/month} \\ &\quad + (497 \text{ J\$/month} \times 1\,326) \\ &= 186,500 \text{ J\$/month} \end{aligned}$$

c) Savings achieved by converting from rate 20 to rate 40

$$\begin{aligned} \text{Difference between rate 20 and rate 40 bills} &= (217,100 - 186,500) \text{ J\$/month} \\ &= 30,600 \text{ J\$/month} \\ &= 367,000 \text{ J\$/year} \end{aligned}$$

d) Implementation cost and payback period

- ▶ Negril Cabins will need to hire a consultant to develop the proposal and prepare the application for the rate change to JPSCO. The consulting fee is estimated at 70,000 J\$.

$$\text{Implementation cost} = 70,000 \text{ J\$}$$

$$\begin{aligned} \text{Payback period} &= (70,000 \text{ J\$}) / (367\,000 \text{ J\$/year}) \\ &= 10 \text{ weeks} \end{aligned}$$

Project 8: Reduce the time of operation of the pool filter pump

Summary of results and benefits

- ▶ Reduces Negril Cabins' energy consumption by 4,960 kWh/year, resulting in savings of 23,100 J\$/year
- ▶ Extends the service life of the pool filter pump
- ▶ The payback period for this recommendation is 1 month

Current situation The swimming pool's filtration system is equipped with a 3.0 HP (2.3 kW) pump. Normally this pump operates 24 hours per day.

Recommendations Experience shows that, in most cases, pool water quality can be maintained by running the filter pumps for only 12 to 16 hours per day. Negril Cabins should therefore shut off its filter pump at night in order to save energy and to increase the service life of the pump. The pump can either be shut off manually or Negril Cabins may decide to purchase an automatic timer for its pool filter system.

In order not to put at risk the quality of its pool water, Negril Cabins should implement this recommendation gradually. Negril Cabins should first shut off its pool filter for a reasonably short period of time (e.g., 5 hours per night), and increase the duration of this shut off period only after it has been ascertained that the change in operations does not harm the pool water quality.

Input, assumptions and calculations

- ▶ Assume that the pool pump can be turned off every day from 10 PM to 6 AM
- ▶ The pump's average power draw is estimated at 1.7 kW
- ▶ The cost of energy is 4.65 J\$/kWh
- ▶ An automatic timer costs less than 1,800 J\$

a) Calculation of the savings resulting from turning off the pump during nighttime

$$\begin{aligned}
 \text{Energy savings} &= 8 \text{ hr/day} \times 1.7 \text{ kW} \times 365 \text{ days/year} \\
 &= 4,960 \text{ kWh/year} \\
 &= 23,100 \text{ J$/year}
 \end{aligned}$$

b) Calculation of the implementation cost and payback period

$$\text{Implementation cost} = 1,800 \text{ J\$}$$

$$\begin{aligned}
 \text{Payback period} &= 1,800 \text{ J\$} / (23,100 \text{ J\$/year}) \\
 &= 1 \text{ month}
 \end{aligned}$$

- ▶ If Negril Cabins decides to manually control the operation of the pool pump, the implementation cost of this recommendation would be nil.

Project 9: Upgrade to energy efficient lighting

Summary of results and benefits

- ▶ Reduces Negril Cabins' energy consumption and saves money
- ▶ Savings and payback periods vary depending on bulb wattage and hours of operation Typical payback periods range from 6 months to 1 year

Current situation Most lights in guest rooms, gardens and public areas use inefficient incandescent bulbs

Recommendations Wherever possible, replace incandescent bulbs with CF bulbs Although is almost always economically beneficial to use CF bulbs instead of incandescent bulbs, this property should first focus on replacing the incandescent bulbs that have a medium to high wattage (60 W to 100 W) and those that burn for extended periods of time (> 8 hours per day) -- these fixtures offer the greatest potential savings and shortest payback periods

Compact fluorescent bulbs consume less energy than incandescent light to produce the same amount of light, CF bulbs also last 10 times longer than incandescent bulbs Therefore, although CF bulbs cost more than incandescent bulbs they save electricity and money The following table shows the equivalence, in terms of light output, between CF and incandescent bulbs

Compact fluorescent		Incandescent
9 Watt bulb	replaces a ☺	25 Watt bulb
11 Watt bulb	replaces a ☺	40 Watt bulb
15 Watt bulb	replaces a ☺	60 Watt bulb
20 Watt bulb	replaces a ☺	75 Watt bulb
27 Watt bulb	replaces a ☺	100 Watt bulb

Input, assumptions and calculations

- a) Sample calculation of the savings achieved by replacing a single 75 Watt incandescent bulb, which burns for 12 hours per day, with a 20 Watt compact fluorescent bulb
- ▶ The cost of energy is 4.65 J\$/kWh
 - ▶ The characteristics of incandescent and CF bulbs are as follows
 - Cost of a 75 W incandescent bulb = 22 J\$/bulb
 - Service life of an incandescent bulb = 800 hours/bulb
 - Cost of a 20 W compact fluorescent bulb = 500 J\$/bulb
 - Service life of a compact fluorescent bulb = 10,000 hours/bulb

a 1) Operating cost of a single lamp equipped with a 75 W incandescent bulb

$$\begin{aligned}
 \text{Hours of operation} &= 12 \text{ hr/day/lamp} \times 365 \text{ days/year} \\
 &= 4,380 \text{ hr/year/lamp} \\
 \\
 \text{Energy cost} &= 75 \text{ W} \times (4,380 \text{ hr/year/lamp}) \times (4.65 \text{ J\$/kWh}) \\
 &= (328 \text{ kWh/year/lamp}) \times (4.65 \text{ J\$/kWh}) \\
 &= 1,520 \text{ J\$/year/lamp} \\
 \\
 \text{Cost to replace burnt bulbs} &= [(4,380 \text{ hr/year/lamp}) / (800 \text{ hr/bulb})] \times (22 \text{ J\$/bulb}) \\
 &= (5.48 \text{ bulbs/year/lamp}) \times (22 \text{ J\$/bulb}) \\
 &= 120 \text{ J\$/year/lamp} \\
 \\
 \text{Total operating cost} &= \text{energy cost} + \text{cost to replace burnt bulbs} \\
 &= 1,640 \text{ J\$/year/lamp}
 \end{aligned}$$

a 2) Operating cost of a single lamp equipped with a 20 W compact fluorescent bulb

$$\begin{aligned}
 \text{Hours of operation} &= 4,380 \text{ hr/year/lamp} \text{ (same as above)} \\
 \\
 \text{Energy cost} &= 20 \text{ W} \times (4,380 \text{ hr/year/lamp}) \times (4.65 \text{ J\$/kWh}) \\
 &= (87.6 \text{ kWh/year/lamp}) \times (4.65 \text{ J\$/kWh}) \\
 &= 407 \text{ J\$/year/lamp} \\
 \\
 \text{Cost to replace burnt bulbs} &= [(4,380 \text{ hr/year/lamp}) / (10,000 \text{ hr/bulb})] \times 500 \text{ J\$/bulb} \\
 &= (0.438 \text{ bulb/year/lamp}) \times 500 \text{ J\$/bulb} \\
 &= 219 \text{ J\$/year/lamp} \\
 \\
 \text{Total operating cost} &= \text{energy cost} + \text{cost to replace burnt bulbs} \\
 &= 626 \text{ J\$/year/lamp}
 \end{aligned}$$

a 3) Savings and payback period for replacing a single 75 Watt incandescent bulb with a 20 Watt compact fluorescent bulb

$$\begin{aligned}
 \text{Total savings} &= (\text{total operating cost for inc}) - (\text{total operating cost for CF}) \\
 &= 1,640 \text{ J\$/year/lamp} - 626 \text{ J\$/year/lamp} \\
 &= 1,014 \text{ J\$/year/lamp} \\
 \\
 \text{Implementation cost} &= \text{cost of a CF bulb} - \text{cost of an incandescent bulb} \\
 &= 500 \text{ J\$/bulb} - 22 \text{ J\$/bulb} \\
 &= 478 \text{ J\$/bulb} \\
 \\
 \text{Payback period} &= (\text{implementation cost}) / (\text{savings for 1 lamp}) \\
 &= (478 \text{ J\$/bulb}) / (1,014 \text{ J\$/year/bulb}) \\
 &= 0.47 \text{ years}
 \end{aligned}$$

- b) The same approach can be use to calculate savings and payback for other bulb outputs and operating hours These results are summarized in the following tables

Financial savings achieved by replacing an incandescent bulb with a CF bulb					
Incandescent bulb	CF replacement bulb	hours of operation of the bulbs (hours/day)			
		6 hours/day	8 hours/day	10 hours/day	12 hours/day
40 W	11 W	245 J\$/year	327 J\$/year	409 J\$/year	491 J\$/year
60 W	15 W	408 J\$/year	544 J\$/year	680 J\$/year	816 J\$/year
75 W	20 W	510 J\$/year	679 J\$/year	849 J\$/year	1,019 J\$/year
100 W	27 W	693 J\$/year	923 J\$/year	1,154 J\$/year	1 385 J\$/year

Payback period for replacing an incandescent bulb with a CF bulb					
Incandescent bulb	CF replacement bulb	hours of operation of the bulbs (hours/day)			
		6 hours/day	8 hours/day	10 hours/day	12 hours/day
40 W	11 W	2 0 years	1 5 year	1 2 year	1 0 year
60 W	15 W	1 2 years	0 88 year	0 70 year	0 59 year
75 W	20 W	0 94 year	0 70 year	0 56 year	0 47 year
100 W	27 W	0 69 year	0 52 year	0 41 year	0 35 year

Some of the specific locations where Negril Cabins could replace incandescent bulbs with compact fluorescent bulbs are listed in the following table

Location	Existing bulb type & Wattage	Quantity of bulbs	Hours of operation
Loading dock	Inc 40 W	6	12
Path way	Inc 60 W	2	12
Al Fresco restaurant	Inc 40 W	7	8
Al Fresco restaurant	Inc 100 W	6	12
Pool bar	Inc 40 W	10	12
Block entrance	Inc 40 W	20	12
Stage (front)	Inc 100 W	5	12
Stage lamps	Inc 100 W	5	12
Court yard	Inc 100 W	2	12
Main restaurant	Inc 40 W	8	12
Lobby	Inc 40 W	10	12
Main gate security	Inc 40 W	5	12
Garden globe lamps	Inc 40 W	45	12
Tree lights	Inc 40 W	8	12

Comments In order to minimize the risk of theft in certain areas, Negril Cabins could purchase CF bulbs equipped with anti-theft mechanisms This locking mechanism increases only slightly the cost of the compact fluorescent bulbs (approximately 40 J\$/bulb)

Project 10: Implement a property-wide waste management program

An effective waste management program is built around three basic principles—reduce, reuse and recycle all possible waste streams. Implementing such a program will help Negril Cabins reduce its impact on the environment by decreasing the amount of solid waste it sends to the local dump and save money by improving its use of materials, resources and energy.

As the first step in its waste management program, NC should conduct a waste review to examine the types and quantities of waste generated in its various operations. Once this review is complete, NC should evaluate each type of waste and determine if it can be reduced, reused or recycled and thus eliminated from the property's general waste stream. Whatever waste cannot be reduced, reused or recycled will need to be discarded, however, by implementing an effective waste management program a typical property should be able to reduce its generation of solid waste by more than 50%.

Reduce the generation of waste

NC can reduce the impact and the amount of waste it produces by

- using materials efficiently and discarding them only when they are no longer fit for use,
- using durable goods which need to be discarded less frequently,
- avoiding the purchase of excessively packaged goods, and
- minimizing the use of hazardous materials and products which harm the environment.

Reducing the generation of waste is obviously the first option that should be considered by NC. This approach fosters the efficient use of resources, and reduces the volume of waste material that must be handled by employees and hauled away to the dump. The bulk of the responsibility for reducing waste generation generally lies with management and the purchasing department; they decide what is brought into the property and thereby determine what eventually leaves the property as waste.

The types of waste reduction measures include

- Avoid purchasing items that are excessively packaged (e.g., foods, beverages, amenities, chemicals, cleaning products, appliances). Packaging alone can account for up to 40% of a hotel's waste stream.
- Purchase food items in bulk rather than in individually packaged portions (e.g., sugar, salt, pepper, jams, condiments, butter, cereals, syrup, cream, juice). Bulk items are less expensive and create less packaging waste.
- Reduce or eliminate the use of disposable items such as plates, cups, tableware, paper napkins and place mats. In most cases, disposable items can be easily and cost-effectively replaced with reusable items, such as durable plastic plates and cups.
- Minimize the use of straws and purchase paper straws.
- Use durable coasters instead of paper napkins which must be replaced with every drink.
- Use cloth napkins instead of disposable doilies for buffet lines, platters and bread baskets.
- Purchase reusable plastic containers to store food in refrigerators and freezers.
- Use cloth cleaning rags instead of disposable paper towels.
- Use cloth bags or baskets instead of plastic bags to collect and return guest laundry, towels and linens.

- Eliminate the use of paper wrap or covers for guest room drinking glasses. Instead, store the drinking glasses upside-down.
- Install soap dispensers in guest bathrooms, public bathrooms and employee locker rooms.
- Use refillable containers for chemicals and cleaners. For example, replace aerosols with products that can be purchased in bulk and dispensed from refillable pump bottles.
- Avoid using laundry, kitchen, or housekeeping detergents which contain phosphates.
- Minimize the purchase and control the use of harsh or hazardous chemicals (e.g., drain cleaning agents, solvents, bleach).
- Avoid using battery-powered appliances. If necessary, purchase rechargeable or mercury-free batteries.
- Instead of using disposable plastic bags, use canvas bags, wheelbarrows or yard carts to collect garden waste.
- Coordinate the property's purchasing process to reduce the number of orders placed with each vendor. This will probably save money and reduce packaging waste.

Reuse all possible items

Whenever possible, NC should reuse items in their original form for the same or a different purpose rather than disposing of them. If an item cannot be reused on-site, the property should investigate the possibility of selling it or giving it to employees, outsiders, charitable organizations, and local schools or businesses.

Examples of reuse actions include

- Use gray water from guest rooms to irrigate the grounds.
- Serve only beverages that are packaged in reusable bottles which can be returned to the manufacturer.
- Use the back side of computer and office paper for taking notes and writing internal memos.
- Give preference to vendors that supply their products in returnable or refillable containers. For example, Country Bucket provides ice cream in reusable 3-gallon containers, thereby saving the property money and reducing the amount of waste it generates. Someone on the staff should be made responsible for ensuring that all returnable containers are properly sent back to the vendors.
- Remove used soap bars from guest bathrooms only at checkout. The used soap bars should be collected and reused around the property or given away to staff or charities. Soap bars can be used in employee bathrooms and used (either as bars or as home-made liquid soap) to carry out a variety of cleaning operations.
- Replace trash can liners only when these are soiled or unsuitable for further use.
- Repair and reuse damaged furniture or donate it to interested parties.
- Serve leftover food in the employee cafeteria or donate it to charities.

Recycle

Many items that cannot be reused in their original form can be sold or given away to processors for recycling. Even if the property does not directly profit from its recycling efforts, diverting items from the waste stream should allow the property to reduce the frequency and the cost of trash collection.

The items which can generally be recycled include

- green waste from kitchen and garden (this material can be composted on-site or sent to a local composting program)
- white paper, mixed paper and newspaper,
- glass bottles and jars,
- plastic bottles and containers made of PET (a plastic typically used for soft-drink and water bottles) and HDPE (a plastic typically used for milk jugs and chemical containers)
- aluminum cans and foil,
- steel cans,
- steel scrap such as old pipes and appliances,
- other metals such as copper and brass,
- frying oil and grease,
- motor oil (from cars, motor boats and jet skis)

At the present time, RYCO-JA, a waste oil and grease recycler, is the only company that provides regular recycling services in the Negril area. However, the EAST project, the Negril Chapter of the JHTA and the Negril Area Environmental Protection Trust (NEPT) are collaborating to organize a recycling program for the Negril area by acting as a link between interested properties and Jamaican recycling companies.

Although EAST's survey of Jamaican recycling companies is not yet complete, the companies listed below have already been identified. At the conclusion of this survey, the EAST project will provide Negril properties with an updated list of recycling companies, and details on the requirements related to the collection, sorting, quality, and packaging of the recyclable materials.

Glass Recycling

West Indies Glass Company Contact - Michael Austin, (809) 923-0787-9. Glass must be sorted into three color groups: clear, brown, and green. The company pays 300 J\$ per ton (2,000 lbs) and will provide free transportation to pick up the recyclables when there are five tons of glass available at a site.

Glass recycling bins should be placed in bars, kitchens, housekeeping areas and key public areas. Each bin should be clearly labeled to define what items can be placed in it (e.g., CLEAR GLASS ONLY), and to discourage guests and staff from contaminating its contents with other materials.

Plastics

Wysinco Environmentals, Ltd Contact - Mrs Pat Wright, (809) 943-9800. As of October 1997, this company only collects PET bottles from schools and specific media-announced pickup points. Therefore, Wysinco asks that PET bottles be donated to local schools - the schools can then trade the PET bottles for computers, videos, paint and tools. Properties may also bring and sell (8 J\$/kg) the PET bottles directly to the Wysinco Recycling Plant in Spanish Town.

Properly labeled PET recycling bins should be placed at key points around the property such as kitchens, bars and housekeeping areas.

Plastic/Metal Drums

Kemcan Development Company Contact - Ms Usherwood, (809) 922-5270 This company recycles plastic and metal drums, and provides pickup services if it can collect 30-50 drums in a single trip Negril properties should consider using this service to dispose of any drums which cannot be returned to the suppliers NC should coordinate with other hotels to reduce the number of drums that must be stored by each individual property and increase the frequency of Kemcan's pickup services

Paper

Nature's Handmade Paper Contact - Ms Gloria Dorman, (809) 993-8172 Nature's Handmade Paper is a small company set up with the assistance of the Peace Corps in 1986 This company is prepared to do a special project for the Negril hotels, whereby they will provide hotel stationery and guest cards made from the recycled paper collected by the hotels The cost of the paper recycling service is negotiable

JA Pottinger & Co , Ltd Contact - Mr Pottinger or Ms Nadine Higgins, (809) 926-8957 This company collects used paper from properties and exports it for recycling JA Pottinger provides pick-up services if it can collect a full truckload (approximately 50 large garbage bags) from a single property or a cluster of properties The fee paid is negotiable and the company is prepared to meet with EAST/ JHTA to discuss a program for the Negril area

Properly labeled paper recycling bins or containers should be placed in housekeeping areas, the front desk and offices Since paper can be recycled only if it is clean and dry, it should be collected as close to the source as possible, and special care should be taken in its collection, handling and storage to prevent contamination

Another paper recycling option is to sell it to companies, such as Exotic Flowers of Montego Bay, that use large quantities of packaging materials

Metal/Aluminum

Contact Louis Daley for information regarding the recycling efforts organized by Mr McLaughlin in Mandeville

Waste vegetable oil (frying oil) and grease

Recycling Corp of Jamaica (RYCO-JA) Contact - Mr Kevin Mullane, (809) 968-7002, (1-800) 991-7926 RYCO-JA collects waste kitchen oil and grease which is then used for the production of chicken feed RYCO provides free of charge covered steel drums to store the used oil and grease, and collects the material from each participating property on a regular schedule This recycling scheme benefits the hotel by reducing the discharge of oil and grease to the septic tank (thus reducing risk of clogging the property's tile fields) and helps Jamaica by reducing the amount of yellow grease that is imported for the production of animal feed

Project II: Implement a linen and towel reuse program

Negril Cabins should consider implementing a linen and towel reuse program which lets guests decide when their linens and towels should be replaced. This measure will lower the property's environmental impact and costs by reducing its consumption of laundry water, energy and chemicals. However, NC should implement this program only after putting in place a few highly visible initiatives that clearly convey the property's environmental concerns to all its guests. Guests react more positively to a linen and towel program if they can see that the property is truly concerned with the environment, guests don't want to feel like they are making all of the sacrifices or that the hotel is simply trying to save money.

Towel reuse

The towel reuse portion of this program is straightforward. Guests are asked to leave their towels hanging up if they wish to use them again, and put them on the floor if they would like to have them replaced. The principal concern with a towel reuse program is to ensure that housekeepers comply with the guest's requests. In many cases, housekeepers routinely replace all bathroom towels, including those that are left hanging by the guests.

Linens reuse

The sheets portion of the program is designed in one of two ways:

- 1) The guest is asked to leave a card on the door or on the bed indicating that it is not necessary to change the sheets that day. This approach works but gets fairly low guest participation, since even environmentally-concerned guests often forget to leave the card in the correct place.
- 2) The guest is informed that, in an effort to protect the environment, the hotel only changes sheets every two or three days. If the guest would like to have the sheets changed more frequently, the materials ask that a card be placed on the door or on the bed to have them changed that day. This method puts the burden on the guest and therefore results in considerably higher participation. Hotels that have implemented this type of program in conjunction with a towel reuse program have reduced their laundry costs by up to 40%.

Once the hotel is ready to begin this program, it should purchase attractive, colorful in-room materials to communicate the program to the guest. These materials are available through a variety of sources, including the Caribbean Hotel Association. The CHA cards offer two key advantages over some of the other cards on the market:

- The design of the CHA materials will capture the guests' attention better than many other cards. It is important that the guests be clearly told about the program so that they feel that they have been given the opportunity to make a choice. The program is not designed to trick the guest into participating, but that is how they will feel if the program is not properly communicated.
- The CHA materials state that it is the hotel's policy to change sheets every three days unless the

guest request that they be changed more often. As indicated above, this approach results in the greatest savings.

The success of the towel and linen programs relies on the effective participation of the property's housekeepers. If this program is implemented, all housekeepers should be thoroughly trained to ensure they clearly understand their role and responsibilities.

As discussed below, programming and scheduling the linen changes can be accomplished in several ways:

- Designate certain days as "sheet changing days." With this approach, all guest room linens are changed on fixed days of the week (for example, every Tuesday and Friday) instead of every three days. Assigning fixed "sheet changing days" allows the property to easily increase housekeeping and laundry staff to handle the additional workload on those days, and avoids confusing housekeepers. On the other days of the week, housekeepers only change sheets in checkout rooms and where requested by the guests.
- Count off every three days and post a notice to inform housekeepers which days are "sheet changing days." This approach ensures that sheets are changed on the exact schedule noted on the in-room materials, and still makes it relatively easy for housekeepers to know when to change the sheets. As mentioned before, on the other days of the week, housekeepers only change sheets in checkout rooms and where requested by the guests.
- Keep track of each guest room and change the sheets only after it has been occupied for three consecutive days. However, many properties find it difficult to use this approach since it requires a complex information, tracking and communication system. If applicable, this approach yields the greatest savings since it ensures that guest room linens are not changed more often than specified by the program.

Each property will have to select one of these approaches and modify it as needed to incorporate it in its housekeeping and laundry operations.

Two other issues are key to the success of the linen reuse program:

- Housekeepers should replace soiled linens even when guests have not requested a change of sheets. A bed should never be made with dirty linens.
- If a guest checks out early on a day when sheets were not changed, it is important that someone be assigned to change the sheets before a new guest checks in. One way to know for sure if the sheets were changed is to leave the bedspread in a turn-down type of configuration whenever used sheets are left on the bed. If the bed is completely remade, it will look just like a bed with fresh sheets, but leaving the bedspread partly turned back will allow anyone entering the room to know that the sheets have been used.

Project I2 : Implement a composting program

Composting has become an increasingly popular method for disposing of food scraps, floral waste and garden waste. The benefits of implementing a composting program include

- it reduces the cost of waste handling and disposal,
- it reduces the property's environmental impact by decreasing the volume of waste it sends to the local dump,
- it provides the property with a high-profile program which can be advantageously used for public relations and media efforts,
- it provides the property with a constant supply of high quality soil conditioner

Studies show up to 75% of the waste generated in food service functions consists of compostable food scraps and other organic materials. If the compostable material, along with the recyclable plastic, glass, and metal items are diverted from the waste stream, the property can achieve a truly significant reduction in the amount of waste generated by the food service area. Both pre-consumer and post-consumer food scraps can be composted. Pre-consumer food scraps include items such as cuttings left from vegetable preparation, and leftovers which have not been served and cannot be reused, post-consumer scraps include all leftovers collected from guest and employee dishes.

In addition to food scraps, the following wastes can also be composted

- produce, vegetables, fruits, peels, rinds, salads,
- bread and pastries, excess batter,
- frozen foods,
- coffee grounds/filters, tea bags,
- egg shells,
- flower waste (wilted cut flowers from restaurants and guest rooms),
- green waste from the garden and beach (grass, leaves, twigs, branches, seaweed),
- paper items- paper, napkins, paper towels, paper plates and cups, paper food wrappers,
- dairy products (see note 1),
- seafood (see note 1),
- meat trimmings, without bones or large quantities of grease or fat (see note 1)

Note (1) Although these items can be composted, they often generate foul odors and attract animals and pests. If the compost pile is located close to public or work areas, this property should exclude these items from its composting program. If these items are composted, the compost pile should preferably be kept covered.

Properties often find it easier to have the composting program evolve slowly, that is, to start with garden wastes and pre-consumer food scraps from kitchen prep stations, then add other materials like paper, and finally add post-consumer food scraps.

Not everything is compostable, and some materials can actually lower the quality of the finished

compost or hamper the composting process. The items that should be kept out of the compost piles include

- glass,
- metals,
- soiled paper (if it can be recycled),
- cardboard,
- plastics,
- aluminum foil or plastic wrap,
- batteries,
- garden waste contaminated with pesticides,
- weeds with heads/ seeds (these will reproduce quickly in the compost heap), and
- diseased plants

Contaminating the compost piles can be avoided only if employees know which items should not be discarded in the container for compostable materials. Continuous employee education and motivation and appropriate signage will help. In most instances, placing a sign on a container which reads "COMPOST ONLY - NO BONES, PLASTICS, GLASS OR METALS" should make the point.

The composting site should be large enough for all phases of composting - that is, unloading materials, storing items before they are added to the compost, aerating and mixing the compost pile, storing equipment, and storing the finished compost before it can be used. If necessary, the property should also build a fence around the composting site to hide it from guest view and to prevent dogs and goats from entering the area.

Other useful precautions include

- Provide adequate drainage around the compost pile
- Promptly clean up any food spills
- Cover food waste with grass, leaves and other yard waste to minimize odor generation
- Periodically aerate the compost pile by turning it over with a pitchfork or other tool. Aeration fosters bacterial action, speeds up the decomposition process, and prevents odor generation

If the pile is properly managed and aerated, the compost should be ready for use in less than two months. Compost is classified as a soil conditioner, not a fertilizer, because its nutrient content (nitrogen, potassium and phosphorus) is not as high as that of a commercial fertilizer. However, unlike fertilizers, compost gradually releases its nutrients to the soil, increases the organic content and the water-retaining capabilities of the soil, and promotes root growth.

Appendix I

Hotel Environmental Policy

By the International Hotels Environmental Initiative

We recognize that our business has an important role to play in protecting and enhancing the environment for future generations, and to help secure the long term sustainability of the tourism industry

To this end our hotel is committed to taking action

- To achieve sound environmental practices across our entire operation*
- To comply fully with all environmental legislation*
- To minimize our use of energy, water and materials*
- To reduce our pollution to a minimum and, where appropriate, to treat effluents*
- To invite our customers suppliers and contractors to participate in our efforts to protect the environment*
- Where we can, to work with others in the tourism industry in public agencies and the community to achieve wider environmental goals*
- To provide all employees with the training and resources required to meet our objectives*
- To openly communicate our policies and practices to interested parties*
- To monitor and record our environmental impacts on a regular basis and compare our performance with our policies objectives and targets*

Appendix II Summary of Negril Cabins environmental aspects, impacts and EMS objectives

Type of environ aspect of the hotel's activities	Type of activities which have these environmental aspects	Environmental impact of the activities	Objective of the property's EMS
WATER USE	<ul style="list-style-type: none"> - Use of guest room and public bathrooms - Laundry room and operations - Housekeeping and cleaning operations - Kitchen and bar operations - Garden upkeep 	<ul style="list-style-type: none"> - Inefficient use of a valuable resource 	<ul style="list-style-type: none"> - Reduce water consumption
ENERGY USE	<ul style="list-style-type: none"> - Operation of a/c units water heaters washing machines, dryers and pool pumps - Use of hot water and lighting 	<ul style="list-style-type: none"> - Inefficient use of valuable and non-renewable resources - Generates air pollution (mainly at the power plant), greenhouse gases, acid rain 	<ul style="list-style-type: none"> - Reduce energy consumption
SOLID WASTE GENERATION	<ul style="list-style-type: none"> - Office operations (paperwork) - Food purchasing preparation and serving - Bar operations - Maintenance operations - Garden and beach upkeep 	<ul style="list-style-type: none"> - Disposal of solid wastes in inadequate municipal dumps - Contamination of groundwater and surface water - Loss of raw materials 	<ul style="list-style-type: none"> - Reduce the amount of solid waste generated by the property
GENERATION OF WATER POLLUTANTS	<ul style="list-style-type: none"> - Laundry room operations (e.g. use of phosphate based detergents) - General housekeeping and cleaning operations (excessive use of chemical cleaning and disinfecting products) - Maintenance operations (improper disposal of used oil and spent solvents) - Food preparation (disposal of grease/oil) 	<ul style="list-style-type: none"> - Increases pollutant load discharged to surface and groundwater - Reduces the effectiveness of septic tanks and wastewater treatment systems 	<ul style="list-style-type: none"> - Reduce the pollutant load contained in the hotel's effluent
USE OF HAZARDOUS PRODUCTS	<ul style="list-style-type: none"> - Laundry room operations (use of bleach, and acid or caustic cleaners) - General housekeeping and cleaning operations (use of bleach, toxic cleaning chemicals, insecticides) - Maintenance operations (use of lead paint, drain clearing chemicals) - Grounds keeping (pesticides/insecticides) 	<ul style="list-style-type: none"> - Exposes guests and employees to hazardous products 	<ul style="list-style-type: none"> - Reduce the number and amount of hazardous products used on the property - Improve gray water handling
GENERATION OF AIR EMISSIONS	<ul style="list-style-type: none"> - Maintenance operations (e.g., release of CFC from air-conditioning units, use of solvents) - General housekeeping and cleaning operations (use of aerosols) - Grounds keeping (insecticide fogging) 	<ul style="list-style-type: none"> - Release of CFCs to the atmosphere - Exposes guests and employees to hazardous air pollutants 	<ul style="list-style-type: none"> - Phase out CFC refrigerants - Reduce the use of solvents insecticides pesticides
DAMAGE TO THE ECOSYSTEM	<ul style="list-style-type: none"> - Use of fertilizer, insecticides and pesticides in the gardens - Discharging untreated gray water to the morass 	<ul style="list-style-type: none"> - Damages the environment and ecosystem surrounding the property 	<ul style="list-style-type: none"> - Reduce the damage caused by the property's operations on the ecosystem

Appendix III

ACTION PLAN FORM			
MAINTENANCE DEPARTMENT - WATER CONSERVATION ISSUES			
Action	By whom	Target date	Actual date
Implement a leak detection and prevention program			
• Prepare a plan for carrying out a monthly inspection of the property's water distribution system, guest bathrooms, public restrooms, kitchen, bar, beach showers, and irrigation system	J Doe	12/1/97	
• Develop the checklist forms that will be used to track the preventive maintenance work conducted by this program	J Doe	1/1/98	
• Hold a training workshop to teach housekeeping staff on how to detect and report malfunctioning equipment and leaks Prepare a summary of this information for inclusion in housekeeping staff's training manual	G Bush	1/15/98	
• Begin the first round of inspections Repeat the cycle of inspection each month	Maint staff	2/1/98 - onw	
• After each round of inspection, present summary of findings to general manager	J Doe	3/1/98 - onw	
Install 16 US gallon/flush toilets in the beach-side public restrooms			
• Identify the type/brand of 16 US gal/flush toilets which have given satisfactory results in Jamaica Get recommendations from maintenance staff of other hotels	P Peters	2/1/98	
• Contact vendor and place order for 4 units	S Holmes	3/1/98	
• Install the units	P Peters	< 1 mth after receipt	
• Monitor weekly to ensure proper performance Continue the weekly monitoring for two months following installation	P Peters	after installation	
Water consumption monitoring program			
• Prepare the forms that will be used to collect data from the property's 3 meters	T Rex	12/1/97	
• Train all members of the maintenance staff on how to properly read the meters enter the information on the forms, and calculate the property's weekly water consumption	T Rex	12/15/97	
• Begin collecting the water consumption monitoring program	Maint staff	1/1/98 - onw	
• On the first day of each month calculate the total water consumption and collect total guest night figures for the previous month Calculate IG/GN value for the previous month Provide the IG/GN figure to the Green Team	P Peters	2/1/98 - onw	

Appendix IV

Personal Action Plan - Housekeeping staff		
Action	By whom	Date
<p>Guest room preparation checklist</p> <ul style="list-style-type: none"> • If the guests have left their a/c running, leave the guest room door closed during room preparation. If the door must be left open, turn the air conditioner off • Do not replace the trash can liners (plastic bags) unless these are soiled or otherwise unacceptable for further use • Report all malfunctioning equipment to the hotel operator -- contact the maintenance department directly only if the need for repair is urgent <p>Pay particular attention to water leaks in toilets, faucets and shower heads, excessively high flows from faucets or shower heads sticking toilet flush handles sink and bathtub stoppers which don't work or don't fit properly damaged windows or louvers scalding hot water, malfunctioning air conditioners</p> <ul style="list-style-type: none"> • Collect all recyclable items placed in the guest room green recycling containers Recyclable items consist of <ul style="list-style-type: none"> ◦ clear, green, and amber glass bottles ◦ plastic beverage bottles ◦ aluminum beverage cans ◦ metal cans ◦ newspaper ◦ white paper • At the end of your shift, place all collected recyclables in the appropriate recycling bins located by the laundry room • Before leaving the guest room <ul style="list-style-type: none"> ◦ turn off all lights, televisions and radios, ◦ turn the a/c unit to the "low cool" setting if the guests have left the a/c running ◦ if the a/c is left on, make sure that all windows and louvers are properly closed, ◦ ensure that faucets and toilets are not running 	<p>All house-keeping staff</p>	<p>Start on 12/01/97</p>
<p>Towel and linen reuse program</p> <ul style="list-style-type: none"> • • • 		

Appendix V

Sample water and electricity monitoring forms

Water - Monitoring form

Meter number		Month and year		Reading units
Day	By	Meter reading	Consumption	Comments or corrective action
			↔ Insert here the last meter reading of the previous month	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Total monthly consumption				

Number of guest nights for the month = _____

Water consumption index = (monthly water consumption) / (number of guest nights)
=

Example of a partially completed water monitoring form

Water - Monitoring form				
Meter number 34,524,356		Month and year December 1997		Reading units Thousand imperial gallons
Day	By	Meter reading	Consumption	Comments or corrective action
		15 234 600	↔ Insert here the last meter reading of the previous month	
1	PGM	15,256 700	15,256 700 - 15,234 600 = 22 100	
2	PGM	15,278 300	15 278 300 - 15,256 700 = 21 600	
3	PGM	15,302 500	24 200	
4	PGM	15,322 200	19 700	
5	PGM	15,342 700	20 500	
etc				
25	PGM	15,768 700	21 800	
26	PGM	15 791 600	22 900	
27	PGM	15 880 900	89 300	Because of jump in water consumption, maintenance began inspection of water distribution system
28	PGM	15 976 400	95 500	Discovered leak in property's main distribution line Leak was fixed at 10 30 PM
29	PGM	16,006 200	29 800	
30	PGM	16 027 500	21 300	
31	PGM	16,050 300	22 800	
Total monthly consumption			16 050 300 - 15 234 600 = 815 700 thousand imperial gallons	

Number of guest nights for the month = 3,077 GN (obtained from front desk records)

Water consumption index = (815,700 Imperial gallons) / (3,077 GN)
= 265.1 Imperial gallons/GN

Electricity - Monitoring form				
Meter number		Month and year		Multiplier
Day	By	Meter reading	Change in meter reading	Comments or corrective action
			↔ Insert here the last meter reading of the previous month	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Total change in meter reading for the month				

Total monthly electricity consumption = total change in meter reading x multiplier
 = _____ kWh

Number of guest nights for the month = _____

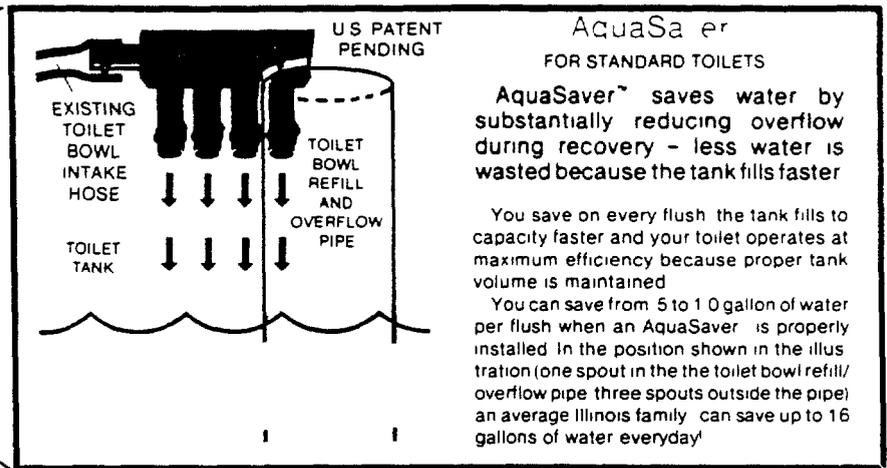
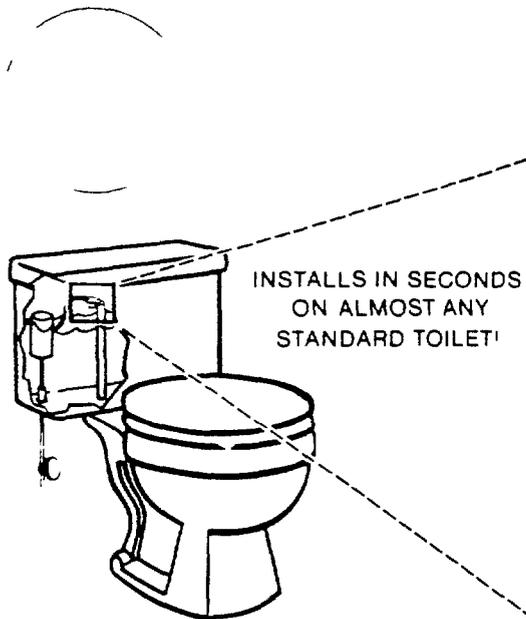
Electricity consumption index = (monthly elec consumption) / (number of guest nights) =

Appendix VI

Flow diverters: Technical information

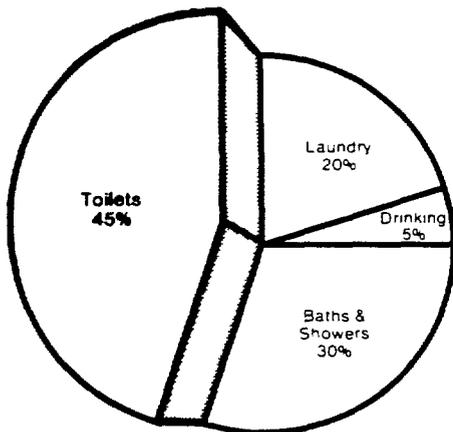
AquaSaver

Help Save Our Most Precious Resource!



Based on figures supplied by the Illinois Department of Commerce and Public Affairs

IN-HOME WATER USE



Source: National Wildlife Federation

The new AquaSaver™ from Aqua Smart™ Inc, saves water by controlling the amount of water feeding into the toilet bowl refill/overflow pipe. Only the amount of water necessary for proper functioning goes into the bowl and the tank fills faster, reducing the amount of water used on every flush.

St. Louis based Industrial Testing Laboratories, Inc, ran performance tests on the device and reported a water savings from one-half gallon to one gallon per flush, depending on toilet model and tank capacity. And, best of all, toilets function properly because proper tank volume is maintained.

The environmental impact of the device goes far beyond the economic savings for individual users, which can be substantial since 45% of household water usage is attributed to toilets (see chart at left). Every gallon of water saved from being flushed into municipal sewage systems is a gallon of water that doesn't need to be treated, so the AquaSaver™ saves both on front-end water usage and back-end wastewater treatment.

We think you will be pleasantly surprised at how much you can save after installing the AquaSaver™ in your home, apartment complex, hotel/motel, nursing home, etc. In Boston, MA you can save \$135.00 per year on a family of four by using the AquaSaver™. Good Results wouldn't you say?!

**New
Water
Saving
Product!**

SAVE!

Up to **6000 gallons**
every year for a family of four.

SAVE 16 GALLONS
OF WATER
EVERY DAY!

aqua smart, inc.
Every drop counts!™

How It Works

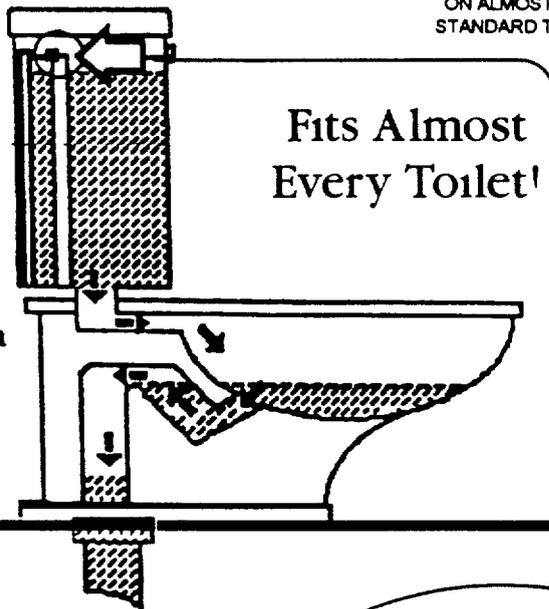
aquaSaver

INSTALLS IN SECONDS
ON ALMOST ANY
STANDARD TOILET

The Problem

As the toilet refills, some of the water is directed into the overflow pipe refilling the bowl. The bowl will continue to fill until the tank is full. Most toilet bowls will take water beyond the amount required to have a satisfactory surface area and even overflow.

Overflowing results in not just more water than you need in the bowl, but water and money pouring down the drain until the tank is full.



The Solution

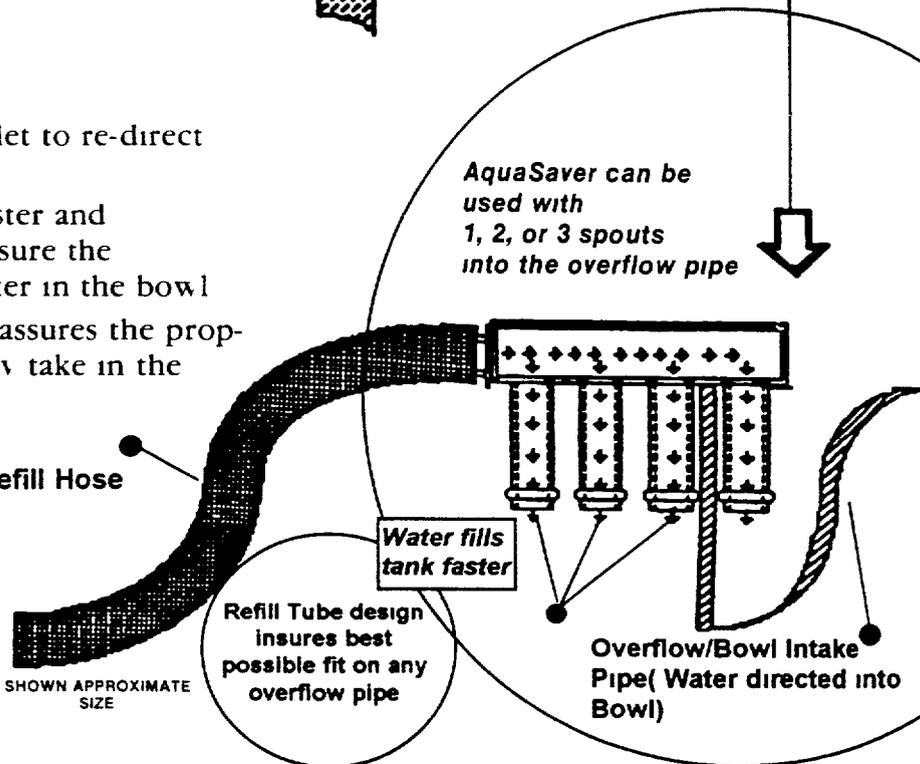
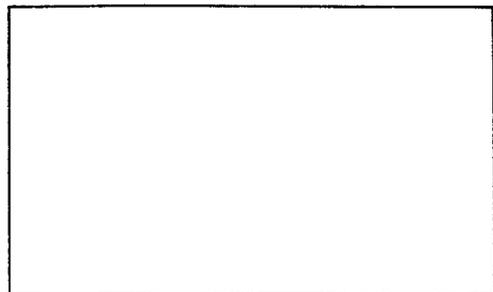
The AquaSaver allows the toilet to re-direct this incoming water.

This allows the tank to fill faster and because it can be adjusted will assure the minimum effective amount of water in the bowl.

Installation of the AquaSaver assures the property owner that the toilet will only take in the proper amount of water.

Your Refill Hose

For more information contact your distributor



INSTALLATION INSTRUCTIONS (See inside pictures)

- 1 Detach existing toilet bowl refill hose from the refill/overflow pipe. If there is a clip remove it. If there is a cap on the refill pipe remove it.
- 2 Insert AquaSaver into end of hose.
- 3 Place AquaSaver onto the bowl refill/overflow pipe so that any one spout is inside the pipe and the remaining three spouts are outside the pipe.
- 4 After flushing the water level in the bowl may or may not be a little lower than before. If you prefer more water in the bowl adjust AquaSaver by placing two spouts into the pipe.

QUESTIONS THAT YOU MIGHT HAVE

- 1 Do all installations take only a few seconds? And are all stools easy to install in?

A Yes in most cases. However some refill pipes are not a plastic or metal pipe but rather are cast into the tank. In those cases the walls of the refill are too thick for the AquaSaver to fit onto merely fit a hose (available at hardware stores) onto one of the spouts of the AquaSaver & place it (the hose) into the refill pipe. The important thing is One spout in & three out.

B On the Mansfield toilet the refill tube and the flapper are one unit and when the toilet is flushed they both lift up. Again the AquaSaver will need to be fitted with a hose on one spout.

C Kohler and Crane each have an expensive model where the refill pipe is built into the ballcock and the AquaSaver will not work.

D Some toilet refill pipes have a cap on them that you can remove by twisting upward.

E You can install the AquaSaver any of these ways just keep in mind that you can cut hoses to length needed to position AquaSaver so one spout fitted with a hose goes into the refill pipe and three spouts into the tank.
- 2 What water level should be in the toilet tank?

A Sometimes you will see the water line mark on the tank. The water level should be within one half inch from the top of the refill pipe.
- 3 Does the AquaSaver work with replacement Fluidmaster?

A Yes. The Fluidmaster adjusts the water level within 1/2 inch from the top of the refill pipe. It is not there to save water. The water level will vary with different toilets. Do not adjust the Fluidmaster below the recommended 1/2 inch from the top of the refill pipe.
- 4 What should you look for before installing the AquaSaver?

A Make sure the water level is turned on all the way.

B Check water level in the tank - again 1/2 inch from the top of the refill pipe. (These things will reduce flush quality repeat flushings defeat the purpose of the AquaSaver.)
- 5 Does the AquaSaver work with the brick, the plastic bag or the water dam?

A No. The quality of the flush has been significantly reduced if used in correlation with these devices. When using the AquaSaver you get a quality flush, and most importantly you save.
- 6 Does the AquaSaver work on the new 1.6 gallon tank?

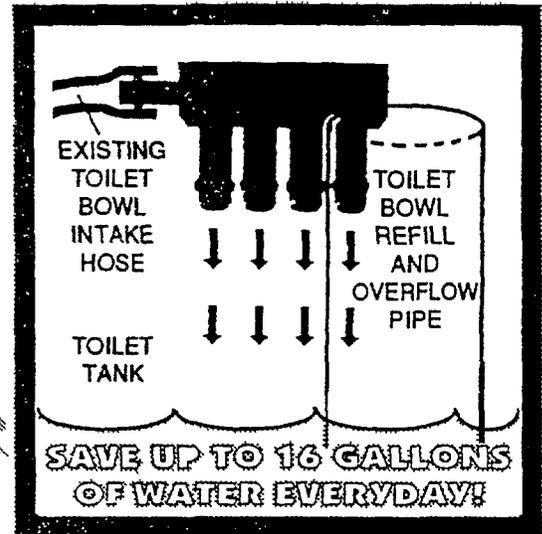
A Yes - but not recommended. There is very little savings and the 1.6 gallon toilets are having problems with their quality flush even before the installation of the AquaSaver. We feel the AquaSaver will be more effective on tank sizes ranging from 3.5 to 7 gallons.
- 7 Is the refill hose always the right size to slip onto the intake spout of the AquaSaver?

A Sometimes the refill hose is stretched or in some cases just a little larger OD. If the end of the refill hose is stretched cut off about 1/2 inch and then insert into the AquaSaver. If however the refill hose is too large OD use a short section of hose (available at hardware stores) and insert into the too large refill hose that is in place then snap AquaSaver into the step down size. Remember you can cut and position as needed to get hoses lengths needed to accomplish the objective of one spout in the refill and three out.
- 8 Is the amount of water coming out of each of the four spouts equally the same in volume?

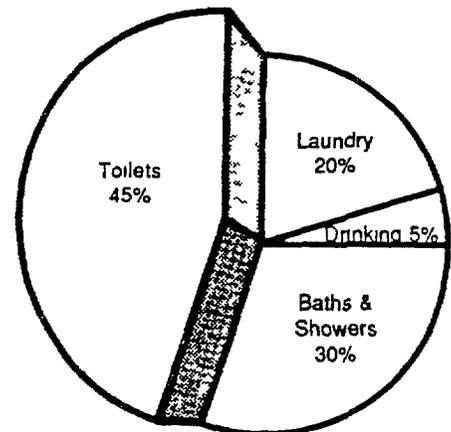
A Yes. The AquaSaver has been carefully engineered to achieve that objective. The volume of water coming into the AquaSaver at the intake is exactly the same coming out each spout. Therefore it does not matter which of the four spouts is routed into the refill pipe.

WHY DOES THE AQUASAVER SAVE WATER?

The water line coming into the toilet stool comes into the water control valve (ballcock). The water control valve disperses the water to two places: 1 To refill the tank and 2 To refill the toilet bowl stool. The problem with this situation is that water continues running into the bowl until the tank is full and most of this water goes down the drain therefore *wasted*. The AquaSaver redirects this incoming water by only putting 1/4th as much into the bowl - the other 3/4ths is directed into the tank - causing the tank to fill faster.



IN-HOME WATER USE



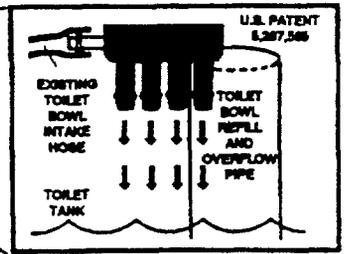
Source: National Wildlife Federation

INSTALLATION ON VARIOUS TOILETS

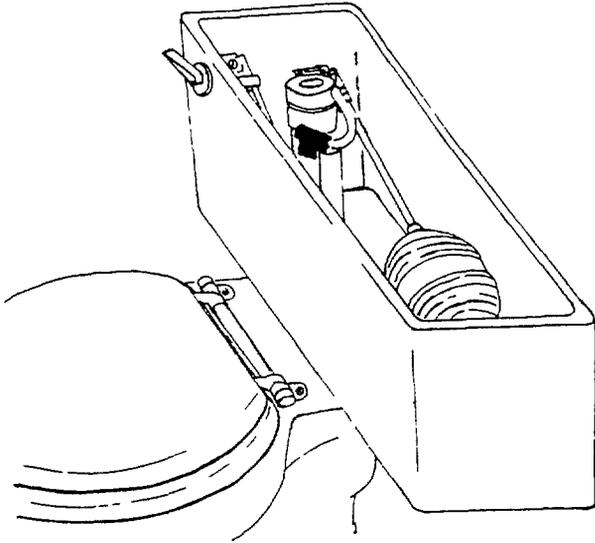
1 Normal installation



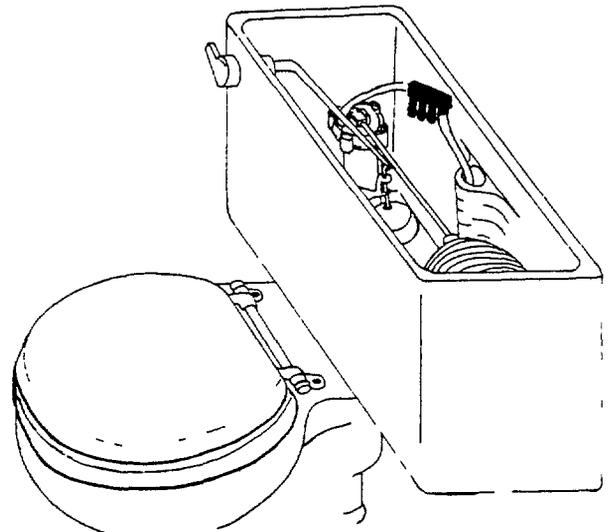
INSTALLS IN SECONDS
ON ALMOST ANY
STANDARD TOILET!



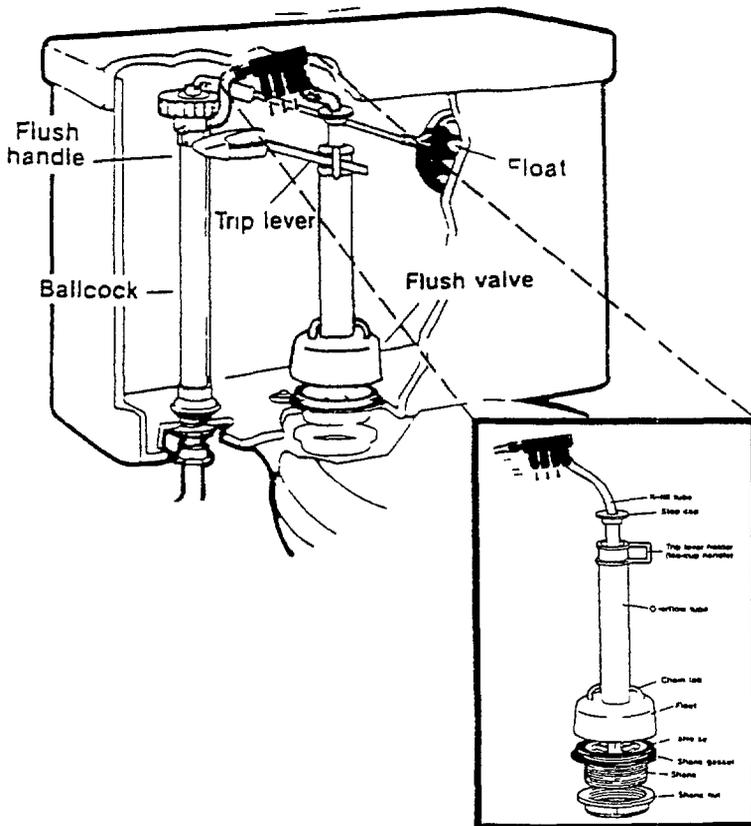
2 Install the AquaSaver in the down spout furthest from the intake spout. If it interferes with the mechanics of flushing, place the first down spout of the AquaSaver in the overflow tube.



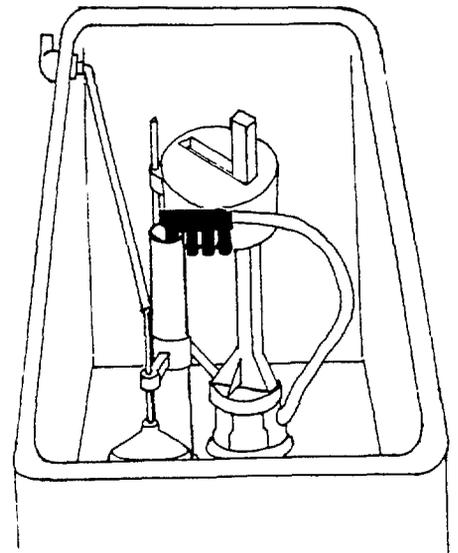
3 You may install the AquaSaver as shown in diagram, if necessary



4 Mansfield toilets that have this type of overflow tube should be installed as shown in diagram



5 Fluid Master - Install as shown in diagram



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