

PN-ACC-937  
98311

**EAST**

***Environmental Audits for Sustainable Tourism***

**Environmental Management Audit  
Grand Lido Hotel**

**Negril, Jamaica, W.I.**

---

**Final Report  
EAST Report No 97-198**

**December 1997**

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

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

A project funded by the U S Agency for International Development

## Table of Contents

<b>Executive Summary</b>	3
<b>Summary of Implementation Costs and Paybacks</b>	4
<b>Summary of Initiatives Already Underway</b>	5
<b>1 Introduction</b>	6
1 1 EAST Project	6
1 2 Audit Team	6
1 3 Audit Protocol	6
<b>2 Background Information</b>	7
2 1 Description of the Property	7
2 2 Occupancy Data	7
2 3 Water Consumption and Wastewater Generation	8
2 3 1 Current water use at Grand Lido	8
2 3 2 Real cost of the water used at Grand Lido	9
2 3 3 Impact of water conservation at Grand Lido	10
2 4 Electricity Consumption	11
<b>3 Guidelines for the Development of an Environmental Management System</b>	13
3 1 Environmental Management System (EMS) Overview	13
3 2 Motivation	14
3 2 1 Appoint the environmental program's "Champion"	14
3 2 2 Create a "Green Team"	14
3 2 3 Develop an environmental policy for Grand Lido	15
3 2 4 Motivate the staff	16
3 2 5 Participate in external activities	17
3 3 Planning Action	17
3 3 1 Select and assess the program's focus areas	17
3 3 2 Prepare a plan	19
3 3 3 Set targets	19
3 4 Taking Action	20
3 4 1 Prepare personal action plans	20
3 4 2 Provide support and training	20
3 4 3 Publish results	20
3 4 4 Show leadership	21
3 5 Reviewing Progress	21
3 5 1 Monitor progress	21

3 5 2	Conduct and annual review	21
<b>4</b>	<b>Recommendations for Improving the Property's Environmental Performance</b>	<b>23</b>
	Table 1 Recommendations for Improving Grand Lido's Environmental Performance	24
<b>5</b>	<b>Detailed analysis of selected recommendations</b>	<b>41</b>
Project 1	Install flow aerators on all faucets	41
Project 2	Install low-flow shower heads in the main employee bathroom	43
Project 3	Use rainwater for the hotel's laundry operations	
Project 4	Recover water and heat by processing the laundry effluent through a laundry water recovery system	47
Project 5	Collect and use storm water runoff for grounds irrigation	50
Project 6	Implement additional energy conservation measures in the property's lighting system	52
Project 7	Reduce the time of operation of the pool filter pump	55
Project 8	Implement a property-wide waste management program	56
Project 9	Improve the effectiveness of the towel reuse program	62
Project 10	Improve the guest participation in the linen reuse program	63
Project 11	Expand the hotel's composting program	65
Appendix I	Hotel Environmental Policy	
Appendix II	Summary of Grand Lido's environmental aspects, impacts and EMS objectives	
Appendix III	Action Plan Form	
Appendix IV	Personal Action Plan Form	
Appendix V	Information on Wastewater Resources	

## 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 Grand Lido develop an EMS?

- ▶ An EMS will help Grand Lido 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 Grand Lido with a valuable 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 Grand Lido’s water, energy, chemicals and materials consumption practices, evaluated its policies, procedures and management structure, and identified ways to improve its environmental performance and develop an effective EMS. The audit revealed that Grand Lido could greatly benefit financially by becoming a more environmentally friendly property (see table below)

## Summary of Implementation Costs and Paybacks

The following table summarizes the costs and benefits of 11 of the more than 80 recommendations presented in this report. The detailed analysis of these 11 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"> <li>▶ Reduces water consumption and wastewater generation</li> <li>▪ Saves energy</li> </ul>	5,620 J\$/year for each typical back-of-house faucet	60 J\$/aerator	< 4 days
2) Install low-flow shower heads in employee bathroom	<ul style="list-style-type: none"> <li>▶ Reduces water consumption and wastewater generation</li> </ul>	122 000 J\$/year	2,550 J\$	8 days
3) Use rainwater for laundry operations	<ul style="list-style-type: none"> <li>▪ Reduces water consumption</li> <li>▶ Reduces the use of salt for the water softening system</li> </ul>	377,000 J\$ for each 50 000 ft <sup>2</sup> catchment area	not yet determined	probably < 1 year
4) Use a laundry water recovery system	<ul style="list-style-type: none"> <li>▶ Reduces water consumption and wastewater generation</li> <li>▶ Saves energy</li> </ul>	1,453,000 J\$/year	2,756,000 J\$	< 2 years
5) Collect and use storm water runoff for grounds irrigation	<ul style="list-style-type: none"> <li>▶ Reduces NWC water consumption</li> <li>▶ Improves water quality along Grand Lido's shoreline</li> </ul>	650 000 J\$/year	not yet determined	probably < 1 year
6) Improve energy efficiency of lighting systems	<ul style="list-style-type: none"> <li>▶ Saves energy</li> </ul>	> 79,000 J\$/year	depends on specific application	immediate to < 1 year
7) Reduce the time of operation of pool pumps	<ul style="list-style-type: none"> <li>▶ Saves energy</li> <li>▶ Lengthens service life of the pumps</li> </ul>	58,000 J\$/year	low	< 1 month
8) Implement a waste management program	<ul style="list-style-type: none"> <li>▪ Reduces the volume of solid waste generated by the property</li> </ul>	unknown	moderate	< 1 year
9) Improve the effectiveness of the towel reuse program	<ul style="list-style-type: none"> <li>▶ Saves water energy and laundry chemicals</li> <li>▶ Lengthens service life of laundry equipment</li> </ul>	high	low to moderate	rapid
10) Improve guest participation in the linen reuse program	<ul style="list-style-type: none"> <li>▪ Saves water energy and laundry chemicals</li> <li>▶ Lengthens service life of laundry equipment</li> </ul>	high	negligible	rapid
11) Expand the hotel's composting program	<ul style="list-style-type: none"> <li>▶ Reduces the volume of solid waste generated by the property</li> </ul>	moderate	low	moderate

## Summary of Initiatives Already Underway

The Grand Lido Hotel has already implemented several measures to reduce the environmental impact of its operations. Some of these initiatives are listed below.

- Use of water-saving fixtures in guest bathrooms, including low-flow shower heads, faucet aerators, toilet dams, and toilet tank flow diverters
- ▶ Use of amenities dispensers in guest bathrooms
- ▶ Adoption of a guest room linen and towel reuse program
- ▶ Installation of water-saving “hands-off” faucets in public area restrooms
- ▶ Creation of a preventive maintenance program for major equipment in the hotel. This practice extends the life of the equipment and also allows the equipment to run more efficiently, saving water and/or energy
- ▶ Purchase of a refrigerant recovery system for air conditioning and refrigeration maintenance operations
- Use of solar panels to preheat part of the hot water supply for the laundry, kitchen and employee changing rooms
- ▶ Rainwater collection from the roof of the main building for use in irrigation and certain exterior cleaning operations
- ▶ Creation of a pilot composting program for the property’s garden wastes. Possible expansions to this program are discussed later in this report
- ▶ Preparation of an environmental handbook for the staff. This handbook will be important in showing management’s commitment to this program and setting guidelines for the staff
- ▶ Purchase of local products to reduce packaging waste and transportation costs

## **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, Inc (USA) under the direction of USAID/Jamaica and the Jamaica Hotel and Tourist Association

### **I 2 Audit Team**

The audit of the Grand Lido Hotel was conducted by an interdisciplinary team in August 1997 The team members included Hugh Cresser, EAST Project Coordinator, Peter Illig, Team Leader and EMS Specialist, Hagler Bailly (USA), Patricio Gonzalez, Environmental Engineer, Hagler Bailly (USA), Kimberly Moffitt, Hotel Operations Specialist, HVS International (USA), Adam Abelson, Hotel Marketing Specialist, HVS International (USA), Lloyd Marsh, Senior Energy Engineer, Metrocad (Jamaica), Dinsdale Williams, 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 14000 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

Grand Lido is a five star all-inclusive beachfront resort located on Bloody Bay, at the north end of Negril beach. The 200-room property is owned and managed by the SuperClubs group.

Grand Lido has numerous facilities for its guests' comfort and entertainment, including but not limited to:

- ▶ conference rooms,
- ▶ three restaurants,
- ▶ a main dining room/buffet area and two satellite room service/dining areas,
- ▶ a fitness center,
- ▶ a game room,
- ▶ a water sports center (providing for activities such as scuba diving, sailing and windsurfing),
- ▶ swimming pools and jacuzzis,
- ▶ tennis courts, and
- ▶ a night club

## 2.2 Occupancy Data

The occupancy information given by Grand Lido to the audit team covers a 12-month period from August 1996 to July 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)	Occupancy (%)	Guest Nights (GN)
August 1996	4,958	81.5	9,917
September	4,624	76.0	9,248
October	5,031	82.7	10,063
November	5,372	88.3	10,744
December	4,593	75.5	9,187
January 1997	5,232	86.0	10,464
February	5,689	93.5	11,377
March	5,232	86.0	10,464
April	5,354	88.0	10,708
May	5,445	89.5	10,890
June	5,403	88.8	10,805
July	5,336	87.7	10,671
Annual total	62,270		124,539

Note: The information given in the preceding table assumes an average of 2 guest nights per room night. The occupancy percentage figures are calculated based on 200

available guest rooms

This data yields the following occupancy criteria for the Grand Lido

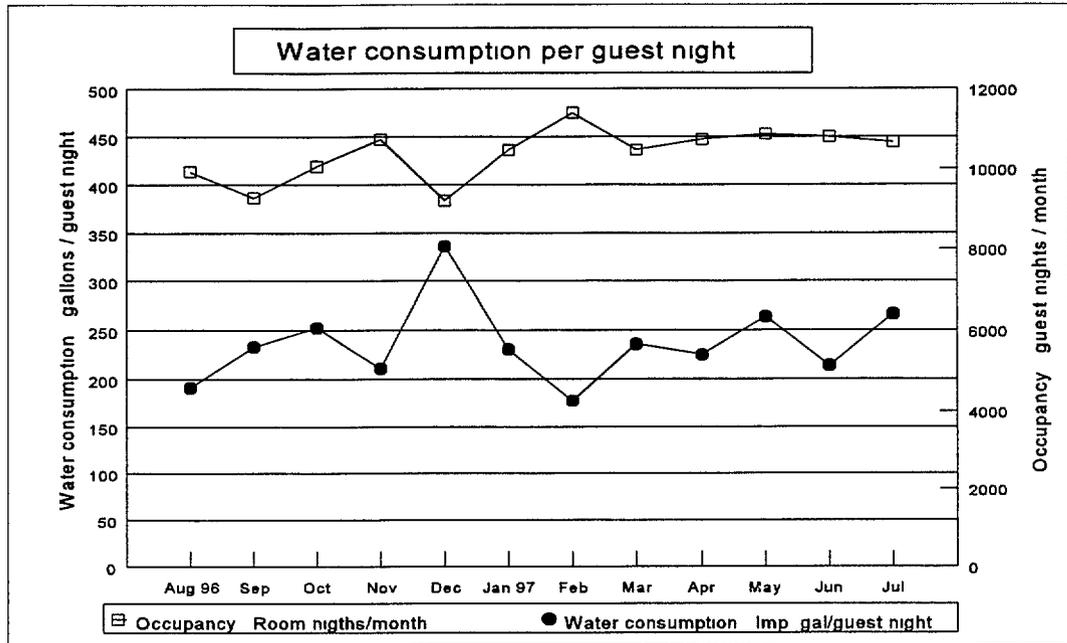
$$\begin{aligned}
 \text{Average occupancy} &= (62,270 \text{ RN/year}) / (12 \text{ months/year}) \\
 &= 5,189 \text{ RN/month} \\
 &= 10,378 \text{ GN/month} \\
 &= 85.3 \% \text{ Occupancy}
 \end{aligned}$$

## 2.3 Water Consumption and Wastewater Generation

### 2.3.1 Current water use at Grand Lido

The water consumption information collected by the audit team from the Grand Lido's NWC's water bills is presented in the following table and graph. This data is used as the basis for the calculation presented in this report.

NWC water consumption figures					
Month	Water use IG/month	Water cost JS/month	Unit cost JS/1,000 IG	GN/month	kWh/GN
August 1996	1 882,000	366,550	194.8	9,917	190
September	2 150,000	416,585	193.8	9,248	232
October	2,531 000	492,376	194.5	10,063	252
November	2 270,000	441,751	194.6	10,744	211
December	3 082 000	600,892	195.0	9,187	335
January 1997	2,415,000	471,816	195.4	10,464	231
February	2 027 000	398,768	196.7	11,377	178
March	2,455,000	485,449	197.7	10 464	235
April	2,415,000	480,528	199.0	10,708	226
May	2 860 000	568 713	198.9	10 890	263
June	2,310 000	460 261	199.2	10,805	214
July	2 852 000	570 324	200.0	10 671	267
Annual total	29,249 000	5,754 013		124 539	



Based on this data, the average water figures for Grand Lido are

$$\begin{aligned}
 \text{Average water use} &= (29,249,00 \text{ IG/year}) / (12 \text{ months/year}) \\
 &= 2,437,000 \text{ IG/month} \\
 &= (29,249,00 \text{ IG/year}) / (124,539 \text{ GN/year}) \\
 &= 235 \text{ IG/GN}
 \end{aligned}$$

**2.3.2 Real cost of the water used at Grand Lido**

Grand Lido's effluent is handled by a small wastewater treatment plant operated by the Urban Development Corporation. The fee charged by the Urban Development Corporation for the wastewater treatment service is equivalent to 60.6% of the property's monthly water bill. Given this situation, the real cost of the water used at Grand Lido must include both the fee paid to the National Water Commission and that paid to the UDC for wastewater treatment. Accordingly, the actual cost of the water used at Grand Lido is calculated as follows:

$$\text{Fee paid to NWC (from 7/97 bill)} = 200.0 \text{ J\$/1,000 IG}$$

$$\begin{aligned}
 \text{Sewerage fee paid to the UDC} &= 60.6\% \times (200.0 \text{ J\$/1,000 IG}) \\
 &= 121.2 \text{ J\$/1,000 IG}
 \end{aligned}$$

$$\begin{aligned}
 \text{Actual cost of water used at Grand Lido} &= (200.0 \text{ J\$/1,000 IG}) + (121.2 \text{ J\$/1,000 IG}) \\
 &= 321.2 \text{ J\$/1,000 IG}
 \end{aligned}$$

**2.3.3 Impact of water conservation at Grand Lido**

- ▶ Because of the high cost of water, it is in this property’s best interest to enhance its water conservation program. The comparison made in the following table between Grand Lido 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 Grand Lido achieved the water consumption of a water efficient property	
Location	Water use	Water savings	J\$ savings
Water efficient property	133 IG/guest night	12,700,000 IG/year	4,077,000 J\$/year
Grand Lido	235 IG/guest night		

- Notes
- The figures given in this table are calculated based on the occupancy figures presented in section 2.2 of this report.
  - The International Hotels Environmental Initiative uses the following figures to rate the relative water efficiency of hotels (with gardens and in-house laundry services). It must be emphasized that the following benchmark figures were designed to cover the broadest possible range of property styles and operating conditions. However, even though the benchmark figures proposed by the International Hotels Environmental Initiative may not be entirely applicable to the Grand Lido, they do provide an ideal target towards which this property may direct its water conservation efforts.

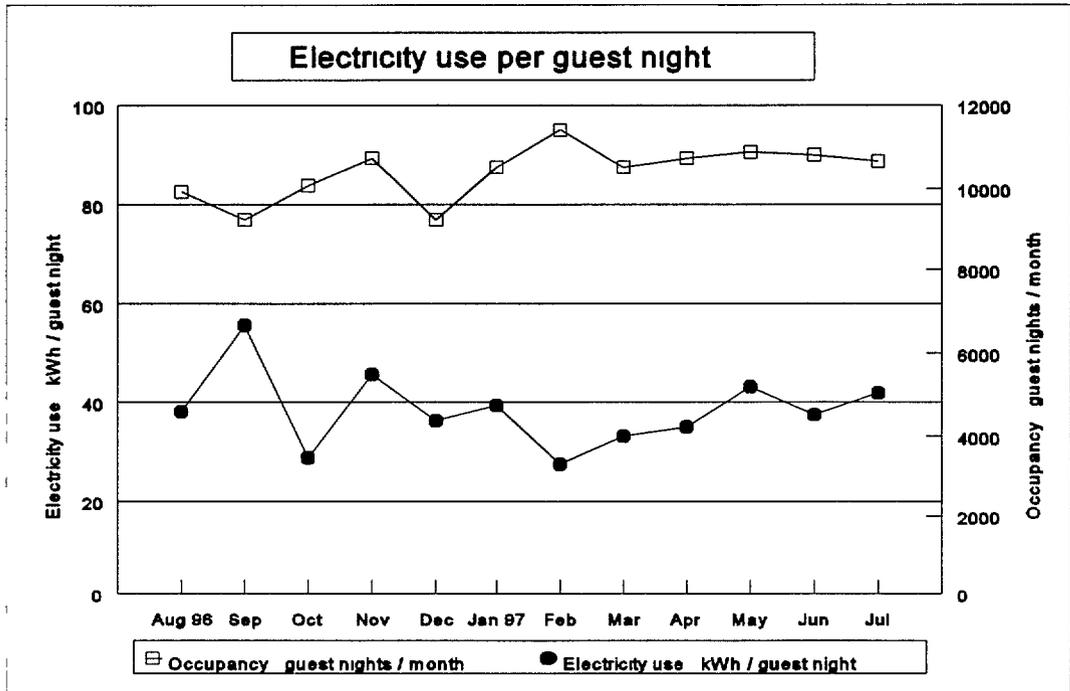
Property size	Water efficiency rating - water use figures are in IG/GN				
	Good	Fair	Poor	Very poor	Grand Lido
> 150 rooms	<133	133 - 169	169 - 193	> 193	235

- ▶ It appears that after the completion of Negril’s new sewer system and wastewater treatment plant in mid-1999, the cost of the water supplied by the NWC will increase by a factor of two, thus increasing the cost of Grand Lido’s water by approximately 25 percent with respect to its current water and wastewater disposal costs. The reader should therefore keep in mind that the water conservation measures proposed in this report will probably have, in the near future, an even greater impact on reducing Grand Lido’s utility costs.

## 2.4 Electricity Consumption

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

Month	kWh/month	JS/month	JS/kWh	GN/month	kWh/GN
August 1996	376,480	1,405,800	3.73	9,917	38.0
September	513,920	1,848,321	3.60	9,248	55.6
October	288,480	1,097,362	3.80	10,063	28.7
November	490,880	1,739,070	3.54	10,744	45.7
December	331,776	1,225,162	3.69	9,187	36.1
January 1997	412,544	1,476,680	3.58	10,464	39.4
February	314,880	1,158,575	3.68	11,377	27.7
March	344,720	1,257,944	3.65	10,464	32.9
April	374,752	1,367,541	3.65	10,708	35.0
May	468,128	1,746,755	3.73	10,890	43.0
June	404,000	1,583,254	3.92	10,805	37.4
July	446,240	1,627,389	3.65	10,671	41.8
Annual total	4,766,800	17,533,853		124,539	



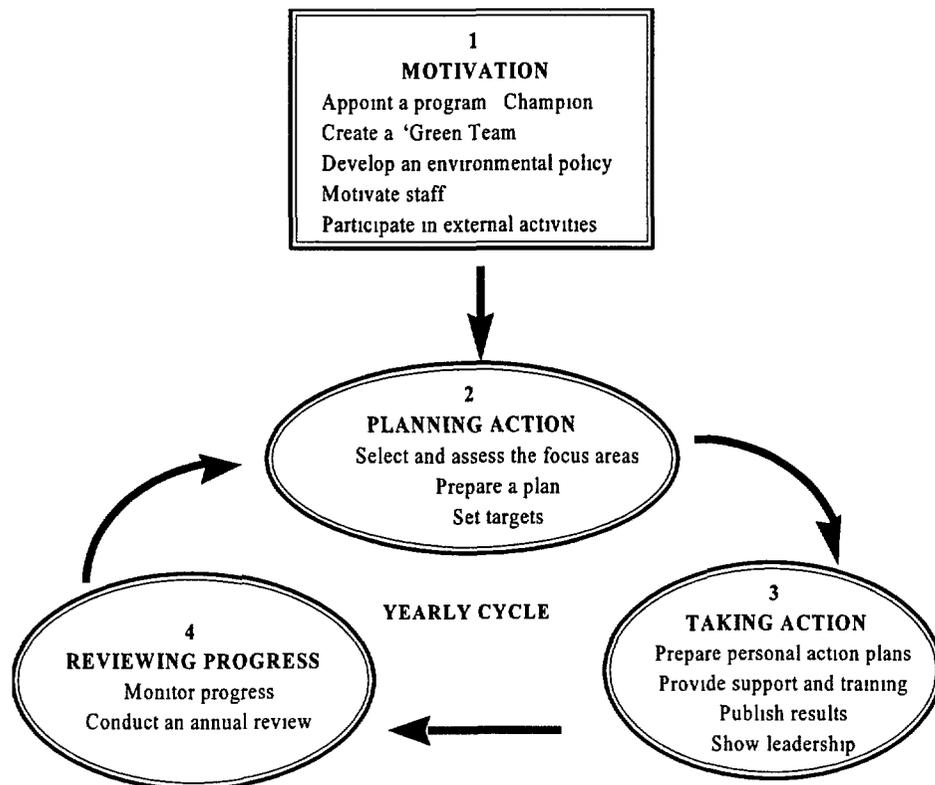
Based on this data, the average electricity figures for Grand Lido are

$$\begin{aligned} \text{Average energy consumption} &= (4,766,800 \text{ kWh/ year}) / (12 \text{ months/year}) \\ &= 397,233 \text{ kWh/ month} \\ &= (4,766,800 \text{ kWh/ year}) / (124,539 \text{ GN/year}) \\ &= 38.3 \text{ kWh/GN} \end{aligned}$$

### 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"

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

### **3.2.3 Develop an environmental policy for Grand Lido**

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, Grand Lido should broaden the scope of its environmental policy and review its objectives and targets. Some examples of complete and comprehensive environmental policies are given on the following page 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 ways to be good stewards of our natural world for this and future generations*

#### **3.2.4 Motivate the staff**

Use staff meetings to inform all employees of the 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**

Grand Lido's 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 Grand Lido to further enhance its environmental program is by developing strong community relationships. By actively participating in local civic and environmental activities, Grand Lido 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 Grand Lido's 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 Grand Lido 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 Grand Lido 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 guest night
  - 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 (i e , less than 1 year)

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.

### 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 2.5 gallons 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**

Grand Lido's 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.

Examples of personal action plans are 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 Grand Lido 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.

### **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.

Grand Lido may also decide to publicize the results of its environmental program in its Supermag publication and in other 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 Grand Lido 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. Grand Lido needs to establish good monitoring procedures to insure that the program is working and achieving its objectives. Monitoring should be regular and scheduled. The monitoring frequency depends on the subject being monitored, but it should be sufficiently frequent to enable corrective action to be taken if there is a major change from targeted performance.

Energy and water consumption should be monitored on at least a weekly basis by checking all of the property's meters. This activity need not take a member of staff more than 10 minutes a week. Examples of water and energy monitoring forms are provided in Appendix V. It is important that the meter reading be recorded and that the consumption since the last reading be noted. This will allow the hotel to identify any significant variances from average daily consumption.

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 Grand Lido 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 Grand Lido 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 Grand Lido. 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. Ideally, the review and plan for the upcoming year should coincide with the property's annual budget cycle.

## 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 step for 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 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 listed in Table 1 are highlighted with the '⊗' symbol. These actions are those which either have a rapid payback (cost effectiveness = H) or have a high environmental benefit combined with a moderate payback (cost effectiveness = M).

**TABLE 1 RECOMMENDATIONS FOR IMPROVING GRAND LIDO'S ENVIRONMENTAL PERFORMANCE**

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)					
<b>MAINTENANCE DEPARTMENT</b>						
General issues	Action's env impact = M	Cost = L	Cost effectiveness = N/A			
Use the maintenance department's detailed water and energy monitoring program to periodically evaluate the progress of the hotel's water and energy conservation efforts						
Water use	Action's env impact = H	Cost = see specific actions	Cost effectiveness = see specific actions			
Water consumption at Grand Lido (235 IG per guest night) is greater than the industry average for a water efficient property of this size (133 IG per guest night). Since the cost of the water used by Grand Lido is extremely high (321 J\$/1,000 IG -- this value includes the fee paid to NWC and to the Urban Development Corporation), it is in this property's best interest to enhance its water conservation program						
<table border="1" style="width: 100%;"> <tr> <td style="width: 33%;">Action's env impact = M</td> <td style="width: 33%;">Cost = L</td> <td style="width: 33%;">Cost effectiveness = H</td> </tr> </table>				Action's env impact = M	Cost = L	Cost effectiveness = H
Action's env impact = M	Cost = L	Cost effectiveness = H				
<p>⊗ Install faucet aerators in the back-of-house areas. Most faucets located in employee or work areas (e.g. kitchen bars, employee changing rooms, linen closets) are not equipped with flow aerators and therefore have high water outputs (from 3 IG/min to 13 IG/min). The use of flow aerators is particularly important in places such as kitchen sinks where taps are left running for long periods of time. Unless a specific location <u>absolutely</u> requires a high flow, all faucets should be equipped with flow aerators which limit the flow to less than 1.7 IG per minute.</p>						
<b>This recommendation is further detailed in Project 1</b>						
<table border="1" style="width: 100%;"> <tr> <td style="width: 33%;">Action's env impact = M</td> <td style="width: 33%;">Cost = L</td> <td style="width: 33%;">Cost effectiveness = H</td> </tr> </table>				Action's env impact = M	Cost = L	Cost effectiveness = H
Action's env impact = M	Cost = L	Cost effectiveness = H				
<p>⊗ In most cases, the water lines that bring water to the faucets are equipped with individual shut-off valves. Generally, these valves are wide-open and thus subject the faucets to the full pressure carried by the hotel's water distribution system. In order to conserve water, these valves should be adjusted to reduce the pressure acting on the faucets and thereby lower the output of the faucets.</p>						
<p>This water conservation measure should be applied especially to all old-fashioned faucets which cannot be equipped with flow aerators (e.g. face basins in the male employee changing room) and which cannot be replaced with new water-efficient fixtures. If deemed necessary, the handles of these shut-off valves should be removed to prevent employees from changing the flow output of the faucets.</p>						

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
	Action's env impact = M	Cost = M	Cost effectiveness = L
	<p>Continue the installation of "hands free" (spring-loaded, infrared, or foot pedal) faucets in locations where the taps are likely to be left running when not in use (e.g., kitchen hand washing stations and employee restrooms)</p>		
	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>Install low-flow shower heads in the male employee changing room. Because of theft problems, the three shower stalls in the men's bathroom are not equipped with shower heads. These "open pipe" showers output more than 6.5 IG/min and therefore significantly exceed the 2.1 IG/min output of standard low-flow shower heads. The hotel should purchase and install "theft-proof" low-flow shower heads in this location.</p> <p><b>This recommendation is further detailed in Project 2</b></p>		
	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>⊗ Promptly fix all leaks in faucets, toilets, pipes and other fixtures. Although the maintenance department has an aggressive leak repair program, the audit team detected several leaks while inspecting the property (namely in the pipes located behind the laundry room's washing machines, in the coffee station of the main dining area, and in several of the hoses used to scrub the pool decks and other exterior paved surfaces). Since even minor leaks can waste thousands of gallons of water per year, the Grand Lido should persevere in its efforts to detect, report, and repair water leaks in a timely fashion. To improve on the detection of these leaks, all staff should be educated on the importance of looking out for leaks and reporting them as soon as they are spotted.</p>		
	Action's env impact = M	Cost = L	Cost effectiveness = M/H
	<p>Whenever possible, equip all hoses with spray guns and repair all damaged hoses to prevent the needless waste of water. Most Grand Lido employees seem to be very much aware of the need to conserve water, and the audit team observed on several occasions that workers would fold the tip of hoses in order to stop the flow of water while scrubbing pool decks and other exterior paved surfaces. However, such a makeshift solution is only partially effective and, when the worker cannot find a suitable support to hold in place the folded hose, the hose is often left running on the ground. High quality spray nozzles can be purchased for less than 700 J\$.  As an inexpensive (but less effective) alternative to a spray nozzle, a standard gate or ball valve can be fitted near the end of the hose to allow the worker to shut off the flow without having to go back to the water tap.</p>		

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
	Action's env impact = H	Cost = M/H	Cost effectiveness = M
	<p>☉ Use rainwater for the hotel's laundry operations Each year, the Grand Lido's laundry room consumes approximately 6.6 million Imperial gallons of water at a cost of 2.1 million J\$. This water is also treated with a water softening system which uses approximately 36,000 pounds of salt per year and consumes a large amount of water in its daily regeneration cycles. Rainwater is naturally soft, virtually free and plentiful in Negril, the laundry operations would therefore be an ideal outlet for the rainwater collected on the hotel's rooftops.</p> <p><b>This recommendation is further detailed in Project 3</b></p>		
	Action's env impact = H	Cost = H	Cost effectiveness = L/M
	<p>☉ Investigate the proposal to recycle the discharge from the laundry with a laundry water recovery system.</p> <p><b>This recommendation is further detailed in Project 4</b></p>		
	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>The hotel is now considering purchasing an irrigation system. If this system is purchased, it should include a timer (to make sure that lawns are only irrigated between 6 pm and 11 am) and a moisture sensor (so that the system will not come on if the ground is sufficiently moist from a recent rain). An irrigation system is much more efficient than using hoses to water, since hoses do not water the grounds evenly. The cost of this recommendation includes that of the timer and moisture sensor.</p>		
	Action's env impact = H	Cost = M/H	Cost effectiveness = M
	<p>☉ Capture and store the storm water runoff which is currently discharged to the sea. The collected storm water runoff should then be used for irrigation. Benefits of implementing this measure include a reduction in the volume of surface runoff discharged to the sea (and a reduction in the excessive growth of algae along the hotel's beaches), the elimination of the unsightly PVC pipes that currently drain the storm water off the beaches, and a reduction in the amount of NWC water used for irrigation.</p> <p><b>This recommendation is further detailed in Project 5</b></p>		

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
Energy use Electricity and lighting	Action's env impact = M	Cost = unknown	Cost effectiveness = unknown
	<p>The main building's service supply has a low power factor (0.85 as measured during the course of the audit). But, in Grand Lido's case, it is not economically feasible to implement conventional PF correction measures. Grand Lido could however investigate the possibility to improve the main building's PF by redistributing the electrical loads on the system. Electrical measurements conducted by the audit team revealed that the main building's electrical system was not balanced.</p> <p>(Note: The overall system power factor for the East and West wings are good.)</p>		
	Action's env impact = M	Cost = M	Cost effectiveness = unknown
	<p>Provide adequate ventilation to transformer stations. Because of improper ventilation, the transformer windings heat up excessively, increasing transformer losses and reducing the load handling capacity of the transformers.</p>		
	Action's env impact = M	Cost = M	Cost effectiveness = N/A
	<p>Insufficient or excessive lighting levels in some areas should be corrected.</p>		
	Action's env impact = M	Cost = M	Cost effectiveness = M
	<p>Many areas are lit with inefficient incandescent lamps. In some of these areas the lights burn for 24 hours per day. In addition, many lights are left on in seldom occupied areas, such as in pool pump rooms, and in areas which received sufficient natural light.</p> <p>The energy efficiency of Grand Lido's lighting system can be improved through the following measures:</p> <ul style="list-style-type: none"> <li>▶ Whenever feasible, replace incandescent lamps with compact fluorescent bulbs.</li> <li>▶ Install photo-switches on corridor lights.</li> <li>▶ Install occupancy sensors or timers for lighting systems in areas that are used only for short periods of time. A less costly (but maybe less effective) solution would be to instruct workers to turn off lights in such areas.</li> </ul> <p><b>This recommendation is further detailed in Project 6.</b></p>		

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)												
	<table border="1" data-bbox="326 321 1453 378"> <tr> <td>Action's env impact = M</td> <td>Cost = L</td> <td>Cost effectiveness = H</td> </tr> </table> <p data-bbox="318 417 1453 634">                     ☉ Maintenance and management should implement a "lights out" training program for the staff and should begin to install occupancy sensors or timers on lighting throughout the property. The audit team found that numerous lights are left on unnecessarily in areas that receive sufficient natural illumination (e.g., SCUBA diving desk, Garden Terrace) or in areas that are often unoccupied (stores, utility rooms, video theater library meeting rooms, Italian restaurant, walk-ins health club). This problem exists property-wide and wastes a great deal of energy.                 </p> <table border="1" data-bbox="326 693 1453 751"> <tr> <td>Action's env impact = M</td> <td>Cost = L</td> <td>Cost effectiveness = H</td> </tr> </table> <p data-bbox="318 783 1453 921">                     ☉ Although pool filter pumps are generally operated continuously, experience at other hotels has shown that pool water quality can be maintained by running the filter pumps for 12 to 16 hours per day, depending on usage. The Grand Lido should therefore shut off its filter pumps at night. This measure will save energy and increase the service life of the pumps.                 </p> <p data-bbox="318 959 951 991"> <b>This recommendation is further detailed in Project 7</b> </p> <table border="1" data-bbox="326 1051 1453 1108"> <tr> <td>Action's env impact = L</td> <td>Cost = L</td> <td>Cost effectiveness = H</td> </tr> </table> <p data-bbox="318 1144 1453 1247">                     Turn off the lobby water fountain pumps between 1 am and 6 am. It is not necessary for these fountains to operate all night, and by turning them off, the Grand Lido can save energy and increase the service life of the recirculating pumps.                 </p> <table border="1" data-bbox="326 1306 1453 1364"> <tr> <td>Action's env impact = M</td> <td>Cost = M</td> <td>Cost effectiveness = L/M</td> </tr> </table> <p data-bbox="318 1395 1156 1427">                     Install photo-sensors on all outdoor lights which do not already have them.                 </p>	Action's env impact = M	Cost = L	Cost effectiveness = H	Action's env impact = M	Cost = L	Cost effectiveness = H	Action's env impact = L	Cost = L	Cost effectiveness = H	Action's env impact = M	Cost = M	Cost effectiveness = L/M
Action's env impact = M	Cost = L	Cost effectiveness = H											
Action's env impact = M	Cost = L	Cost effectiveness = H											
Action's env impact = L	Cost = L	Cost effectiveness = H											
Action's env impact = M	Cost = M	Cost effectiveness = L/M											
Energy use Air-conditioning and refrigeration	<table border="1" data-bbox="326 1491 1453 1549"> <tr> <td>Action's env impact = M</td> <td>Cost = M/H</td> <td>Cost effectiveness = M/H</td> </tr> </table> <p data-bbox="318 1581 1453 1719">                     ☉ The louvered windows and the large gaps under many entrance doors will result in a significant heat gain in the guest rooms and add to the load on the air conditioning units. Install durable weather stripping on the louvered windows (or seal the windows, as proposed by Mr. Robertson) and at the base of the entrance doors to reduce the amount of wasted energy.                 </p> <table border="1" data-bbox="326 1779 1453 1836"> <tr> <td>Action's env impact = M</td> <td>Cost = L</td> <td>Cost effectiveness = H</td> </tr> </table> <p data-bbox="318 1857 1453 1959">                     The air conditioning in some areas of the hotel is set to a below-average temperature. The settings should all be checked and locks should be installed where appropriate to ensure that they are not changed.                 </p>	Action's env impact = M	Cost = M/H	Cost effectiveness = M/H	Action's env impact = M	Cost = L	Cost effectiveness = H						
Action's env impact = M	Cost = M/H	Cost effectiveness = M/H											
Action's env impact = M	Cost = L	Cost effectiveness = H											

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
	Action's env impact = M	Cost = L/H	Cost effectiveness = M/H
	<p>Most of the hotel's guests leave their air conditioning units operating (often at a high cooling setting) after leaving their rooms for their daily activities. The waste of energy resulting from guest room a/c units can be addressed in a number of ways, including</p> <ul style="list-style-type: none"> <li>▶ Place a tactful note in all guest rooms to encourage guests to turn off air conditioners, TVs, and lights whenever they leave their rooms for extended periods of time</li> <li>▶ Request that housekeepers leave the guest room door closed during guest room preparation. If the door must be left open during guest room preparation, ask housekeepers to turn off the a/c units</li> <li>▶ Before leaving the guest room, ask the housekeepers to turn the a/c units off or, if this is unacceptable to the guests, to adjust the a/c thermostat to a "low cool" setting (or the lowest possible setting)</li> <li>▶ Install infrared sensors and magnetic door switches to control the operation of the air conditioners while the room is unoccupied. These controls will either turn the air conditioning completely off or set it back to a lower temperature, depending on the hotel's preference</li> </ul>		
	Action's env impact = M	Cost = M	Cost effectiveness = M
	<p>Rooftop condensers and the kitchen's refrigerators, chill rooms, and freezers are in need of servicing. The hotel should implement a planned maintenance program for the air conditioning and refrigeration equipment. This will reduce energy usage and extend the life of the equipment.</p>		
	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Repair the sliding doors of the main ice machine. At the time of the audit, the single sliding door only covered only half of the opening, resulting in the loss of cold air.</p>		
Energy use LPG	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>Stoves, grills, and ovens are often left on. The kitchen staff should be instructed to turn off any burners that are not in use.</p>		
Energy use Hot water supply	Action's env impact = M	Cost = L	Cost effectiveness = M
	<p>The hot water supply temperature is high (125F). Set the control thermostat to a lower temperature to reduce the heat losses (from the surface of the water heater tanks and the hot water pipes) and eliminate the risk of scalding guests and employees.</p>		

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Solar panels should be cleaned more frequently Since this operation is easy to perform the Grand Lido should keep its solar panels as clean as possible</p>		
	Action's env impact = M	Cost = M	Cost effectiveness = M
	<p>Most water pipes on the rooftop of the main building are insulated regardless of whether they carry hot or cold water, and most of this insulation is in poor condition Damaged insulation on the <u>hot water pipes</u> should be replaced All polyurethane insulation (black foam) should be protected from sunlight</p>		
	Action's env impact = M	Cost = M	Cost effectiveness = M
	<p>The heat exchangers designed to use the waste heat from the rooftop air conditioning condensers are either missing or bypassed The hotel should repair or replace these defective heat exchanger units</p>		
Solid waste generation	Action's env impact = H	Cost = M	Cost effectiveness = M
	<p>☉ The Grand Lido should implement a hotel-wide recycling program to segregate glass, metal, cardboard paper and green waste from its general waste stream</p> <p><b>This recommendation is further detailed in Project 8</b></p>		
	Action's env impact = M	Cost = L	Cost effectiveness = M
Solid waste generation	<p>Whenever possible sell old equipment to the scrap metal dealer rather than throwing it away This will divert the smaller items from the compactor and may even become a revenue-generator for the hotel</p>		

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
Other	Action's env impact = M	Cost = M	Cost effectiveness = M
<p>The hotel should look into a pool system controller or chlorine-alternative pool treatment system. Pool system controllers take regular readings of the pH and chlorine levels in the pool and then automatically dispense chemicals as needed. These controllers work with virtually any type of chemical system (chlorine salt, or bromine). Because they add chemicals in small doses as needed they reduce the amount that the hotel spends on pool chemicals (generally by 30% to 40%).</p> <p>Ionization systems introduce ions to the pool water to inhibit algae growth and kill bacteria and viruses. The ions do not evaporate under hot conditions like chlorine, but small amounts of chlorine may still have to be added in times with heavy bather loads. Some of these systems are solar-powered, which increases the initial cost but decreases the operational costs. Another option is a chlorine-alternative system, which either generates chlorine or another sanitizer. Bromine is one of the most popular chlorine alternatives, and many hotels have used bromine as a sanitizer with much success. Other hotels have installed salt systems, which create chlorine from salt tablets or granules. Most of these alternative systems will save money, since the sanitizers are less expensive than chlorine. The hotel should consult with several local pool companies to determine which system will best meet its specific needs.</p>			

**FRONT OFFICE/ FRONT DESK**

Energy use	Action's env impact = M	Cost = N/A	Cost effectiveness = H
<p>The staff in the offices should be conscious of the importance of turning lights, air conditioning, and office equipment off at night. The audit team found that front office light were frequently left on.</p>			
Solid waste generation	Action s env impact = M	Cost = M	Cost effectiveness = M
<p>Consider computerizing the reservation system. This will significantly reduce the amount of paper used significantly and streamline labor.</p>			
	Action s env impact = M	Cost = H	Cost effectiveness = L
<p>Consider purchasing a voice-mail message service. The continued use of paper logs is unreliable and creates a significant amount of paper waste and adds undue burden to a five-star hotel phone system.</p>			

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Implement a paper reuse program Once-used paper (i.e., printed on one side only) can be reused as scrap paper, for inter-office memos, or placed in a three-ring binder and given to the telephone operators as notebooks</p>		
	Action's env impact = L	Cost = L	Cost effectiveness = H
	<p>☉ Discontinue the practice of placing guest bills in envelopes which unnecessarily wastes envelopes In order to maintain privacy, bills can be folded and stapled shut</p>		
	Action's env impact = L	Cost = L	Cost effectiveness = N/A
	<p>Consider using biodegradable tissue paper instead of the plastic that is currently used to wrap honeymoon roses</p>		

**LOBBY AND GIFT SHOP**

Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = N/A
	<p>Purchase recycled paper towels for the public restrooms</p>		
	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Whenever feasible, don't automatically give out plastic bags for gift shop purchases instead ask guests if they would like one Replace plastic bags with paper bags</p>		

**PURCHASING DEPARTMENT**

Solid waste generation	Action's env impact = H	Cost = L	Cost effectiveness = N/A
	<p>☉ Purchase as much recycled paper products as possible (office paper toilet paper facial tissues paper towels etc ) Most paper products manufacturer 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</p>		

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>⊙ Implement a policy to track container returns There appears to be great deal of confusion concerning who is responsible for collecting and tracking containers (e g , detergent containers, chemical containers, milk jugs, produce crates, egg cartons, and banana boxes) that should be returned to the distributors Some employees stated that these items where discarded while others claimed they where reused, given away, or collected by the manufacturer Since the Grand Lido receives a rebate for any returned containers, it would be worthwhile to develop a formal policy outlining responsibility for their collection and processing</p>		
Other	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>The material safety data sheets (MSDS) for all cleaning chemicals should be reviewed before these products are purchased The purchasing staff should attempt to purchase the most environmentally-friendly and safest products for each purpose</p>		
<b>HOUSEKEEPING DEPARTMENT</b>			
Water use	Action's env impact = H	Cost = L	Cost effectiveness = H
	<p>⊙ The Grand Lido should improve the effectiveness of the towel reuse program The audit team discovered that the housekeeping staff regularly changes the used bathroom towels that are properly hung by the guests (indicating that they wish to reuse them) Many of the housekeepers feel that the towels will never fully dry in Negril's humid weather and therefore take it upon themselves to replace them even if it goes against the guests' wishes This may be simply an issue of training but if the towels really do not dry fully and this results in guest complaints or reduced guest participation there are several ways in which the Grand Lido could overcome this problem</p> <p><b>This recommendation is further detailed in Project 9</b></p>		
	Action's env impact = H	Cost = L	Cost effectiveness = H
	<p>⊙ Currently guest participation in the line reuse program is very low (approximately 5% according to the laundry and housekeeping department) The Grand Lido should take appropriate measures to improve the effectiveness of this program</p> <p><b>This recommendation is further detailed in Project 10</b></p>		
	Action's env impact = M	Cost = L	Cost effectiveness = M
	<p>Housekeepers should use a bucket when cleaning instead of leaving the water running continuously</p>		

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ Reuse old guest room soap Old bars of soap should be collected and used for cleaning floors and equipment such as water sports equipment Other reuse options for used soap bars are discussed in Project 8</p>			

**GUEST ROOMS**

Energy use	Action's env impact = H	Cost = L	Cost effectiveness = H
<p>☉ Many guests leave the air conditioner running and lights on after leaving the room for the day's activities The Grand Lido 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 Furthermore, housekeepers should ensure before leaving a guest room that the bathroom and balcony windows are firmly closed, all lights are turned off, and the air conditioner is turned off (or at least turned down if turning it off is deemed unacceptable)</p>			

Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = H
<p>☉ Eliminate the use of paper covers on the in-room glasses Simply turning the glasses over will eliminate the need for these wasteful covers</p>			
	Action's env impact = L	Cost = L	Cost effectiveness = M
<p>Eliminate door menus for room service</p>			

**LAUNDRY**

Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
<p>☉ The faucets in the laundry room are often left running or are improperly shut off This problem is mainly due to the fact that the sinks are hidden behind the washing machines and that the faucets are difficult to reach and operate it could probably be minimized by replacing the current faucet fixtures with quick shut-off valves that can be easily operated (i.e. a butterfly valve that can be opened or closed with only a quarter of a turn) On one instance the audit team observed that one of these faucets was left partially open (flow = 0.5 IG/min) overnight To prevent this waste one of the laundry room employees should be made responsible to insure that all faucets are properly closed at the end of the last shift</p>			

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>☉ Whenever possible, reduce the number of rinses in the wash cycle from three to two</p>		
Water and energy use	Action's env impact = M	Cost = L	Cost effectiveness = H
	<p>Heavily-soiled laundry items should be removed from the laundry for pre-washing before they are placed in the washers. It is important that items with stains be soaked in a tub of soapy water and scrubbed if necessary before being placed in the washer, since the washer will likely not remove these stains.</p> <p>During one of its visits to the laundry room, the audit team observed the laundry staff check a batch of freshly laundered and dried bed linens. It was noted that approximately 20% of the inspected sheets were still stained and had to be sent back for reprocessing (we do acknowledge that this may have been a particularly problematic batch of sheets). Identifying so many heavily stained sheets at the end of the washing process wastes water and energy. Furthermore, drying the stained items makes the stain more difficult to remove.</p>		
Energy use	Action's env impact = L	Cost = L	Cost effectiveness = H
	<p>☉ Fix the steam leak on the laundry room's steam generator</p>		
	Action's env impact = L	Cost = N/A	Cost effectiveness = N/A
	<p>Lint screens in the dryers should be cleaned after every 1 - 2 loads</p>		
	Action's env impact = M	Cost = N/A	Cost effectiveness = N/A
	<p>Cold water washes should be used whenever possible. Many hotels have been able to switch to only cold water washes as long as heavily-soiled items are pre-washed.</p>		
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = N/A
	<p>Discontinue the practice of wrapping guest laundry in plastic. Consider returning the items to the guest in a reusable bag or basket instead.</p>		

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)
------------------------------------	--

**KITCHEN**

Energy use	Action's env impact = M	Cost = L	Cost effectiveness = M
------------	-------------------------	----------	------------------------

Turn off all equipment (including pilot lights and coffee makers) when it is not in use Many pieces of equipment were found to be left on for much too long during the audit

Action's env impact = L	Cost = N/A	Cost effectiveness = N/A
-------------------------	------------	--------------------------

All equipment should be cleaned thoroughly at least once per week with griddles scraped after each meal

Action's env impact = L	Cost = L	Cost effectiveness = M
-------------------------	----------	------------------------

Use carts to unload items from the walk-ins to reduce the amount of time the door is kept open

Action's env impact = L	Cost = N/A	Cost effectiveness = N/A
-------------------------	------------	--------------------------

Regularly defrost the reach-in cooler in order to prevent frost build-up which reduces efficiency

Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
-----------	-------------------------	----------	------------------------

⊗ Reduce water consumption by washing vegetables in a basin or a sink with a stopper rather than under running water

Action's env impact = M	Cost = L	Cost effectiveness = H
-------------------------	----------	------------------------

⊗ Prevent the kitchen staff from thawing items under running water Whenever possible use the refrigerator or a basin of water to thaw all items (the water in the basin should be replaced every 20-30 minutes to speed up the defrosting process)

During one of the team's visit to the kitchen the staff of the cold preparation room was defrosting a piece of meat in a sink using a continuous flow of approximately 5 l/g/min

Action's env impact = L	Cost = L	Cost effectiveness = H
-------------------------	----------	------------------------

Whenever possible, clean floors with a mop and bucket instead of a hose

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
	Action's env impact = L	Cost = L	Cost effectiveness = M
Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = L
	Action's env impact = L	Cost = L	Cost effectiveness = H
<b>RESTAURANTS AND BARS</b>			
Water use / Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = H
Solid waste generation	Action's env impact = M	Cost = L	Cost effectiveness = M
	Action's env impact = L	Cost = L	Cost effectiveness = H

Scrape and pre-rinse all dishes before putting them into the dishwasher. If the large food particles are scraped into a trash can or composting receptacle and the plates are quickly pre-rinsed to prevent the food from hardening before the dishwasher is run, the dishwasher will perform more effectively and efficiently.

Discontinue the use of doilies on buffet lines, platters, high-tea service, and in bread baskets. These non-reusable liners can easily be eliminated or replaced with linen napkins.

☉ Control the use of wax/butcher paper in the pastry shop. During the audit, it was noted that plated deserts were unnecessarily set on top of trays lined with this paper.

☉ Discontinue the practice of supplying guests with new glasses for each drink they order while sitting at the bar. If a guest orders the same beverage twice, offer to refill the glass as an alternative to giving a new glass. This measure will cut down on water used for dish washing, chemical use, and the generation of solid waste.

Reduce packaging waste by purchasing sugar, jellies and jams, butter and cereal in bulk.

☉ Do not give straws out automatically with drinks. Guests should be asked if they would like one. The need for straws could be greatly reduced if the bars used ice cubes instead of ground ice. Replace plastic straws with paper straws.

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
	Action's env impact = L	Cost = L	Cost effectiveness = M
	Reuse old and tarnished silverware We recommend that utensils which are not presentable to the guest be used in the employees cafeteria or donated		
	Action s env impact = L	Cost = L	Cost effectiveness = L
	Beach bar employees should provide ashtrays for guests on the beach in order to keep the beaches free of cigarette butts which currently litter the entire property		
<b>MEETING ROOMS</b>			
Energy use	Action's env impact = M	Cost = L	Cost effectiveness = M/H
	<ul style="list-style-type: none"> <li>☉ Turn off the lights when not in use During inspection, the audit team found that the meeting room lights were left on for days Management may consider wiring the lighting controls to the timer which controls the HVAC system Security should double check to ensure lights are off in unoccupied areas in the meantime</li> </ul>		
Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = L
	Purchase a reader board for meeting information Currently, a paper flip chart displays this information We recommend a system similar to the daily scheduling information in the Terrace Dining Room as a paper free alternative		
	Action s env impact = L	Cost = L	Cost effectiveness = H
	<ul style="list-style-type: none"> <li>☉ Reuse note pads left from previous meetings within the offices Currently, the staff discards half empty pads which is an unnecessary waste</li> </ul>		
<b>RECREATIONAL AREAS</b>			
Water use	Action s env impact = M	Cost = L	Cost effectiveness = H
	<ul style="list-style-type: none"> <li>☉ In order to conserve water, the Grand Lido should consider changing its current practice of backwashing the pool filters every day In most cases equipment manufacturers recommend that pool filters be backwashed only after the water pressure inside the filter tank has increased by 10 psi over the clean filter pressure This generally corresponds to a backwash cycle every 3 to 6 days</li> </ul>		

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
Energy use	Action's env impact = L	Cost = L	Cost effectiveness = H
	Instruct the workers responsible for pool pump operations to turn the lights off before leaving the pump rooms. The audit team observed that the lights of the various pump rooms were generally on 24 per day.		
	Action's env impact = L	Cost = L	Cost effectiveness = L
	Place readily visible and accessible switches for the Health Club lights and television. Currently the control switches are difficult to locate and as a result, the television and lights are continuously on.		
Solid waste generation	Action's env impact = L	Cost = L	Cost effectiveness = L
	Purchase new trash receptacles for the beach areas and for the gardens. The ones currently used are ineffective and hard to find. As a result, a fair amount of trash is left on the beach and around the grounds.		
	Action's env impact = M	Cost = L	Cost effectiveness = L
	Implement a program to recycle old batteries and used oil from the motor boats.		
<b>GARDENS</b>			
Water use	Action's env impact = M	Cost = L	Cost effectiveness = H
	⊗ Sweep patios and walkways instead of hosing them down. A continuously running hose is a very costly alternative to a broom.		
Solid waste generation	Action's env impact = H	Cost = L	Cost effectiveness = M
	⊗ Discontinue the practice of compacting green waste. We strongly recommend that the Grounds crew expand the compost facility in order to include all green waste, most of the kitchen waste, and the seaweed collected from the beach. This compost can be used on the hotel grounds in place of chemical fertilizers.		
	<b>This recommendation is further detailed in Project 11</b>		

Env aspect of the hotel's activity	Description and rating of the recommended action (L = low, M = moderate, H = high)		
	Action's env impact = M	Cost = M/H	Cost effectiveness = L
	Consider purchasing a wood chipper for the grounds department. The wood chipper will eliminate the need to dispose of the large branches collected around the property, the wood chips can be used as mulch.		
	Action's env impact = M	Cost = L	Cost effectiveness = M
	Use durable and reusable canvas bags rather than disposable plastic bags to gather green garden waste.		

## 5. Detailed analysis of selected recommendations

### Project I: Install flow aerators on all faucets

<b>Summary of results and benefits</b>	
▶	Reduces water consumption and wastewater generation by 17,520 IG/year, corresponding to savings of 5,620 J\$/year for each flow aerator installed in a typical back-of-house faucet
▶	Saves energy by reducing the use of hot water from back-of-house faucets
▶	The payback period of this water conservation measure is typically < 4 days

**Current situation** Although the Grand Lido's water conservation efforts in guest bathrooms are exemplary (i.e., use of faucet aerators, toilet dams, toilet tank flow diverters and low flow shower heads), the same cannot be said about its back-of-house areas. In fact, most faucets in back-of-house areas (e.g., kitchens, bars, employee bathrooms, and linen closets) are not equipped with flow aerators, and therefore have water outputs significantly greater than the 2.1 IG/min limit specified for water-saving faucets. The following table provides a partial list of some of the maximum flows measured by the audit team in various back-of-house areas.

Location	No of faucets	Max flow	Aerator
Main kitchen - dish washing sinks	2	> 10 IG/min each	none
- cold preparation room	2	4.5 IG/min each	none
- bakery room	1	5 IG/min	none
Timber House - kitchen sink	1	5 IG/min	none
- hand washing station	1	3.8 IG/min	none
- bar sink	1	4.2 IG/min	none
Stone House - kitchen sink	1	4.2 IG/min	none
- hand washing station	1	3.3 IG/min	none
- bar sink	1	4.2 IG/min	none
Employee kitchen - dish washing sinks	2	> 5 IG/min each	none
Linen closet (by room 2035)	2	3.8 IG/min each	none
Linen closet (by room 1048)	2	4.2 and > 6 IG/min	none
Male employee changing room	8	2 to 4 IG/min	none

**Recommendations** Since most back-of-house faucets are used much more frequently than guest bathroom faucets, the Grand Lido should make an effort to equip all back-of-house faucets with flow aerators. These water saving devices restrict the output of faucets to 1.3 - 2.1 IG/min. The 1.3 - 1.7 IG/min aerators are generally used for bathroom faucets, and the 2.1 IG/min models are generally installed on kitchen faucets. The use of flow aerators is particularly important in places where taps are used frequently or are left running for long periods of time (e.g., kitchen and bar sinks).

Input, assumptions and calculations

a) Water savings achieved by installing a faucet aerator in an average back-of-house sink

- ▶ Assume the faucet is operated for 20 minutes per day
- ▶ The average flow of a back-of-house faucet with no aerator is 4.5 IG/min. By installing a faucet aerator, this flow can be reduced to less than 2.1 IG/min
- ▶ The cost of the water used at Grand Lido is 321 J\$/1,000 IG

The water savings achieved by installing a flow aerator on a single back-of-house faucet are

$$\begin{aligned} \text{Water savings} &= (20 \text{ min/day/faucet}) \times (4.5 \text{ IG/min} - 2.1 \text{ IG/min}) \times (365 \text{ days/year}) \\ &= 17,520 \text{ IG/faucet/year} \\ &= (17,520 \text{ IG/faucet/year}) \times (321 \text{ J\$/1,000 IG}) = 5,620 \text{ J\$/faucet/year} \end{aligned}$$


---

b) Implementation cost and payback period

- ▶ The cost of a faucet aerator ranges from 30 to 60 J\$. The cost effectiveness of this measure is therefore calculated as follows

$$\begin{aligned} \text{Total implementation cost} &= 60 \text{ J\$/faucet} \\ \text{Payback period} &= (60 \text{ J\$/faucet}) / (5,620 \text{ J\$/faucet/year}) \\ &< 4 \text{ days} \end{aligned}$$

Comments

- ▶ If some of Grand Lido's old fashioned back-of-house faucets cannot be equipped with flow aerators, the savings achieved by aerators could justify in certain cases the purchase of new fixtures. The following table lists the water savings and payback period for the purchase of aerators and new faucets (assumed to cost 3,000 J\$ each)

Faucet use (min/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	4 380	1 406	< 16 days	2.1 years
10	8 760	2 812	< 8 days	13 months
20	17 520	5 624	< 4 days	< 7 months
40	35 040	11 247	< 2 days	< 4 months
60	52 560	16 872	< 2 days	< 3 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 4.5 IG/min reduced to 2.1 IG/min with the use of an aerator or a new fixture equipped with an aerator
  - 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 in the main employee bathroom

### Summary of results and benefits

- ▶ Reduces water consumption and wastewater generation by 380,000 IG/ year
- ▶ Saves the property 122,000 J\$/year in reduced water and sewerage fees
- ▶ The payback period for this recommendation is 8 days

Current situation All guest bathroom have been retrofitted with low-flow shower heads. However, due to theft problems, there are no shower heads in three showers in the male employee changing room. These “open pipe” showers have a maximum output of 6.7 IG/minute.

Recommendations The hotel should identify a theft-proof shower head that will meet its performance requirements and install these shower heads as soon as possible. There are various models of “theft-proof” shower heads available on the market that will reduce the water flow in these showers to less than 2.1 IG/minute. The cost of these shower heads is generally similar to that of high end low-flow shower heads.

#### Input assumptions and calculations

- a) Water savings resulting from the installation of theft-proof, low-flow shower heads in the male employee changing room
  - ▶ Assume that 50% of Grand Lido’s 240 male employees use the changing room showers each day. This results in approximately 120 showers per day.
  - ▶ Assume conservatively that each employee who showers does so for 3 minutes.
  - ▶ A low-flow shower head has an output of less than 2.1 IG/min. Assume conservatively that the “open-pipe” showers consume on average 5 IG/minute.
  - ▶ The cost of the water used at Grand Lido is 321 J\$/1,000 IG.

Given the preceding information, the water savings achieved by this recommendation are

$$\begin{aligned}
 \text{Water savings} &= (3 \text{ min/shower}) \times (5 \text{ IG/min} - 2.1 \text{ IG/min}) \times (120 \text{ showers/day}) \\
 &= 1,040 \text{ IG/day} = 380,000 \text{ IG/year} \\
 &= 122,000 \text{ J$/year}
 \end{aligned}$$

- b) Implementation cost and payback period

- ▶ The cost of a standard low-flow shower head ranges from 300 to 850 J\$. The following calculations will therefore assume that the cost of a theft-proof model is 850 J\$.

The cost effectiveness of this water conservation measure is

$$\text{Total implementation cost} = (850 \text{ J$/shower}) \times 3 \text{ showers} = 2,550 \text{ J\$}$$

$$\text{Payback period} = (2,550 \text{ J\$}) / (122,000 \text{ J$/year}) = 8 \text{ days}$$

### Project 3: Use rainwater for the hotel's laundry operations

#### Summary of results and benefits

- ▶ For each 50,000 ft<sup>2</sup> of catchment area, the property will reduce its purchase of NWC water by 1,176,000 IG/year and save 377,000 J\$/year
- ▶ The use of rainwater for laundry operations will reduce the property's consumption of water and salt used to regenerate the softening columns

Current situation On average, the Negrl area receives 57 inches of rainfall per year, therefore, each ft<sup>2</sup> of rain catchment surface could theoretically collect 29.4 IG/year. At the present time, Grand Lido collects rainwater on the roof of its main building. The rainwater is stored in a 20,000 IG tank and used mainly for irrigation, although some is also used to wash exterior paved surfaces. Since times of peak rainwater supply always coincide with times of minimum irrigation, Grand Lido is often unable to effectively use its collected rainwater.

Recommendations Consider using the collected rainwater to supply Grand Lido's laundry room. Since rainwater is virtually free, plentiful during at least 6 months of the year, and relatively clean, it is an ideal source of water for laundry operations. In addition, the use of naturally soft rainwater in the laundry will greatly reduce, or ideally eliminate, the need to operate the existing water softening system. Grand Lido's water softening columns consume a significant amount of water (30 minutes of open valve flow during the daily backwash and rinse operations) and salt (36,000 lb/year) in the daily resin regeneration cycles. With a properly designed rainwater catchment and storage system and optimized laundry room operations, Grand Lido will need to use its water softening system only occasionally (i.e., when there is not enough rainwater in the storage tank and NWC water must be used).

#### Input, assumptions and calculations

- a) Water savings resulting from using collected rainwater in laundry room operations
  - ▶ The maintenance department estimates that laundry operations consume on average 18,000 IG/day or 6,570,000 IG/year
  - ▶ The following calculations will be based on a catchment area of 50,000 ft<sup>2</sup>
  - ▶ Due to a lack of information these calculations will not take into account the savings (water and salt) resulting from reducing the use of the water softening system
  - ▶ Assume that 80% of the rainfall over the catchment area is collected and stored (i.e., 20% loss)

- ▶ The precipitation data for Negril is given in the following table

Month	1997 precipitation		30 year mean precipitation	
	mm	IG/ft <sup>2</sup>	mm	IG/ft <sup>2</sup>
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

Rainwater collection on a 50,000 ft<sup>2</sup> area = 80% x (29 4 IG/ft<sup>2</sup>/year) x 50,000 ft<sup>2</sup>  
 = 1,176,000 IG/year  
 = 17 9% of the current laundry room's needs

Savings resulting from rainwater collection = (1,176,000 IG/year) x (321 J\$/1,000 IG)  
 = 377,000 J\$/year for 50 000 ft<sup>2</sup> catchment area

b) Implementation requirements

- ▶ Because of the large footprint of Grand Lido's main building and guest room blocks, it is expected that this property could develop a catchment area that is significantly larger than the 50,000 ft<sup>2</sup> used in the preceding calculations

The size of Grand Lido's rainwater storage tank will also need to be increased in order to 1) hold the excess rain water harvested on the expanded catchment area, and 2) supply the laundry room operations with water during dry spells. Given the current laundry practices, the existing 20 000 IG storage tank can sustain the laundry operations for only one day.

- No information is available at the present time on the cost of expanding Grand Lido's rainwater collection and storage system. The property should contact a local contractor to obtain a cost estimate for this system.

Comments

Given the information given to the audit team, it appears that the laundry's water consumption may be high. If the assumption made in the following analysis indeed apply to Grand Lido's operations, the head of the laundry department should be strongly encouraged to investigate and identify the causes of the excessive water use.

- ▶ Based on water monitoring data collected in the past by the maintenance department, Mr Robertson estimates that the laundry room consumes approximately 18,000 IG of water per day
- ▶ Industry surveys show that towel/linen use in hotels range 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 of water per pound of material laundered. The following calculation conservatively assumes that the Grand Lido is at the high end of the industry standards -- i.e., 6 lb of towels & linens per guest night and 2.1 IG of water per pound of material processed through the laundry
- ▶ Grand Lido's average occupancy is 341 GN/day
- ▶ Assume also that guest room towels and linens account for 50% of the total laundry load

Based on this information, if Grand Lido performed within the standard parameters of the hotel industry, the water consumption of its laundry operations could be estimated as follows

$$\begin{aligned} \text{Total load processed in the laundry} &= 200\% \times (6 \text{ lb/GN}) \times (341 \text{ GN/day}) \\ &= 4,090 \text{ lb/day} \end{aligned}$$

$$\begin{aligned} \text{Theoretical laundry water consumption} &= (4,090 \text{ lb/day}) \times (2.1 \text{ IG/lb}) \\ &= 8,600 \text{ IG/day} \\ &= 48\% \text{ of laundry room's actual water consumption} \end{aligned}$$

## Project 4: Recover water and heat by processing the laundry effluent through a laundry water recovery system

### Summary of results and benefits

- Reduces water consumption and wastewater generation by 2,920,000 IG/year
- ▶ Saves the property 1,453,000 J\$/year in reduced water and energy consumption
- ▶ The payback period for this recommendation is 23 months

#### Current situation

At the present time, Grand Lido's laundry effluent is discharged to the sewer, none of the water nor the energy contained in this flow is recovered and reused

#### Recommendations

Consider using a laundry water recovery system (LWRS) to recover part of the water and energy contained in the washers' effluent. A LWRS processes the washers' effluent, reclaims from this flow clean warm water, and uses the reclaimed water (after heating it to the required temperature) as the hot water feed to the washing machines. Thus such a system saves both energy and water.

The main processing steps of the LWRS are described below

- ▶ The washing machines' mixed effluent (typically 109°F) is processed through a shaker screen which removes lint and large particles
- ▶ The flow is then processed through a self-cleaning tubular filtration membrane which removes suspended solids larger than 1 micron in size. This membrane does not remove the softening agent nor the water's active alkalinity. More than 50% of the original volume of mixed washer effluent is reclaimed by the LWRS.
- The reclaimed water loses only 2°F with respect to the temperature of the untreated mixed washer effluent. The reclaimed flow typically has a temperature of 107°F.
- ▶ The reclaimed flow is then heated to required hot water temperature (typically 158°F) before being reused in the washing machines.

#### Input, assumptions and calculations

- ▶ Grand Lido's laundry uses 10,000 IG of cold water and 8,000 IG of hot water per day.
- ▶ Since a LWRS recovers more than 50% of the washer effluent, all of the future hot water supply will consist of recovered water. Therefore, the LWRS will save Grand Lido's laundry approximately 8,000 IG/day or 2,920,000 IG/year.
- Cost of water at Grand Lido is 321 J\$/1,000 IG.
- ▶ The laundry's hot water supply is currently pre-heated in the solar array and brought to its final temperature in a LPG-fueled water heater. It is assumed that, if the Grand Lido purchases a LWRS, the capacity of the solar array will be put to use in another

application and will not be wasted. The cost of the energy used to heat the laundry water will, therefore, be based on the cost of LPG.

- ▶ LPG has an energy content of 90,000 Btu/gallon and a cost of 45 J\$/gallon. The unit cost of energy for the laundry is therefore 0.50 J\$/1,000 Btu.
- ▶ The calculations assume the following water temperatures:
  - cold water supply = 70°F
  - hot water supply = 158°F
  - washers' effluent = 109°F
  - reclaimed flow = 107°F
- ▶ The specific heat of water = 1 Btu/lb/°F

a) Water and energy savings resulting from the use of a LWRS

The daily operating costs of the laundry's hot water supply system with and without a LWRS are calculated in the following chart:

Item	Current operations	LWRS operations
Hot water usage	8 000 IG/day (80 080 lb water/day)	8 000 IG/day (80 080 lb water/day)
Temperature rise in the water heater	158 - 70 = 88°F	158 - 107 = 51°F
Energy consumption in the water heater = hot water usage x specific heat x temp rise	7 047 000 Btu	4 084 000 Btu
LPG consumption in the water heater = energy consumption x energy cost	3 524 J\$/day	2 042 J\$/day
NWC water cost of the laundry's hot water supply = NWC water use x (321 J\$/1,000 IG)	2 568 J\$/day	0 (hot water supply is all reclaimed water)
LWRS equipment operating cost = 8.5 J\$/1 000 IG	0	68 J\$/day

Based on this information:

Operating cost of current hot water system = energy cost + water cost  
 = 3 524 J\$/day + 2 568 J\$/day  
 = 6 092 J\$/day = 2 223 000 J\$/year

Operating cost of LWRS hot water supply = energy cost + water cost + equipment op. cost  
 = 2 042 J\$/day + 0 + 68 J\$/day  
 = 2,110 J\$/day = 770,000 J\$/year

Potential savings resulting from the LWRS = 2,223,000 J\$/year - 770,150 J\$/year  
 = 1,453,000 J\$/year

b) Implementation cost and payback period

- ▶ Wastewater Resources Inc of Scottsdale, Arizona manufactures the type of laundry water recovery system described in this recommendation. The cost of a LWRS designed for a washer effluent flow of 20,000 US gallons/day is 2,205,000 J\$ (63,000 US\$) FOB Phoenix, Arizona. If we assume taxes and transportation increase the cost of the system by 25%, the cost effectiveness of this recommendation is

Estimated implementation cost = 2,756,000 J\$

Payback period = (2,756,000 J\$) / (1,453,000 J\$/year)  
= 23 months

Comments

- ▶ The cost effectiveness of LWRS is greatly dependent on economies of scale -- i.e., the greater the volume of washer effluent processed through the LWRS, the lower the unit cost of the system. For example, a LWRS designed to process 20,000 gallons/day costs only 10% more than a system designed for a flow of 10,000 gallons/day.

If Grand Lido decides to invest in such a system, it should seriously consider installing a large LWRS (i.e., more than 18,000 IG/day capacity) in a laundry unit that processes the bulk of the laundry load generated by the two adjacent properties (Hedonism II and Grand Lido).

- ▶ The use of a LWRS will reduce the laundry's overall water consumption by approximately 45%. This will make it easier to supply all of the laundry's water from Grand Lido's rainwater catchment.
- ▶ See Appendix V for more information on the LWRS.

## Project 5: Collect and use storm water runoff for grounds irrigation

### Summary of results and benefits

- ▶ This measure could reduce the property's water consumption by more than 2,000,000 IG/year, corresponding to savings of 650,000 J\$/year
- ▶ Improves the water quality on Grand Lido's beaches by reducing the amount of sediments, nutrients and other undesirable substances discharged by the storm water flows in Bloody Bay

### Current situation

- ▶ Mr Robertson estimates that grounds irrigation consumed 1 8 million IG (20,000 IG/day, 25% of days) in 1997, and 3 6 million IG (20,000 IG/day, 50% of days) in 1996. Grand Lido's grounds are currently irrigated with a combination of collected rainwater and NWC water. It is important to note, however, that the existing 20,000 IG rainwater storage tank can support the hotel's irrigation needs only for the first day of even a short dry spell.
- ▶ During heavy rain showers, the rainwater which runs off the property's impervious surfaces and gardens collects in grass-lined ditches, and eventually drains off into the sea at various points along Grand Lido's shoreline (including two unsightly large-diameter PVC pipes which cut across the hotel's main beaches). The storm water flow contains sediments, nutrients (from fertilizers and decaying organic matter) and other substances which affect water quality in Bloody Bay. In fact, according to Mr Robertson, the storm water runoff fosters the excessive growth of undesirable algae along Grand Lido's shoreline.

### Recommendations

Pump part of the storm water flow from the drainage ditches to one or more large storage tanks or ponds. The collected storm water could then be used as needed to support Grand Lido's irrigation operations. Given the size of the property, the amount of precipitation available in Negril (even during most of the "dry" months) and the apparent volume of runoff generated during storm events, Grand Lido should be able to provide for most, if not all, of its irrigation needs with captured storm water runoff. From a purely technical standpoint, the only factor which could prevent this measure from supplying 100% of Grand Lido's irrigation needs is the size of the storm water storage tank(s).

The benefits of collecting and using storm water runoff for irrigation include

- Reduction in the mass of pollutants and sediments discharged to the sea and improvement in water quality along Grand Lido's shoreline
- By irrigating with collected runoff, Grand Lido will recycle part of the lost nutrients back into its gardens
- Possible elimination of the PVC drainage pipes located on the two principal beaches
- Reduction in the amount of NWC water used for irrigation
- The use of storm water runoff for irrigation will allow the Grand Lido to use its

rainwater collection system for more profitable applications (e.g., laundry water supply)

Input assumptions and calculations

- ▶ On average Grand Lido uses 2.7 million IG/year for ground's irrigation
- ▶ It is expected that a well designed storm water collection and storage system should be able to supply more than 75% of the property's irrigation water requirements
- ▶ The cost of water use at Grand Lido is 321 J\$/1,000 IG

$$\begin{aligned} \text{Potential water savings} &= 75\% \times (2.7 \times 10^6 \text{ IG/year}) \\ &= 2,025,000 \text{ IG/year} \\ &= 650,000 \text{ J\$/year} \end{aligned}$$

---

b) Implementation requirements

The implementation of this recommendation will require

- the construction of a sump on the ditch,
- the installation of a high volume pump appropriately protected with a trash rack (1),
- the laying of PVC piping to carry the water from the sump to the storage tank, and
- the construction of a storage tank or pond

Note 1 High volume trash pumps, designed to pump water containing mud sticks, stones and other solids up to 1.5" in diameter, generally sell in the US for under 1,500 US\$

The full evaluation of the benefits and costs of this recommendation will require an in depth engineering study. However, the financial and environmental benefits of using storm water runoff for irrigation indicate that this measure deserves serious consideration.

## Project 6: Implement additional energy conservation measures in the property's lighting system

### Summary of results and benefits

- ▶ Reduces Grand Lido' energy consumption by more than 24,100 kWh/year and saves the property 79,000 J\$/year
- ▶ The implementation cost and payback period varies depending on the specific application

#### Current situation

- ▶ Many areas are lit with inefficient incandescent lamps In some of these areas the lights burn for 24 hours per day
- ▶ Many lights are left on in seldom occupied areas, such as in pool pump rooms, and in areas which received sufficient natural light

#### Recommendations

- ▶ Whenever feasible, replace incandescent lamps with compact fluorescent bulbs
- ▶ Install photo-switches on corridor lights
- ▶ Install occupancy sensors or timers for lighting systems in areas that are used only for short periods of time A less costly (but maybe less effective) solution would be to instruct workers to turn off lights in such areas

#### Input, assumptions and calculations

a) Sample calculation for the replacement of incandescent to compact fluorescent bulbs

- ▶ The ornamental pool lights consists of 24 x 60W and 4 x 100W incandescent bulbs controlled by a photoelectric cell These incandescent bulbs should be replaced with compact fluorescent bulbs The following calculations only account for the 24 x 60W bulbs
- ▶ Hours of operation = 8 hours/day
- ▶ A 60W incandescent bulb costs 22 J\$ and has a 800 hour service life
- ▶ A 60W incandescent bulb can be replaced with a 17W compact fluorescent bulb A 17W CF bulb costs 500 J\$ and has a 10 000 hour service life
- ▶ The cost of electricity at Grand Lido is 3 28 J\$/kWh

$$\begin{aligned} \text{Incandescent bulb energy cost} &= 8 \text{ hrs/day} \times 365 \text{ days/year} \times 60\text{W/lamp} \times 3.28 \text{ J\$/kWh} \\ &= 575 \text{ J\$/year/lamp} \end{aligned}$$

$$\begin{aligned} \text{Inc bulb replacement cost} &= (8 \text{ hrs/day} \times 365 \text{ days/year} \times 22 \text{ J\$/bulb}) / (800 \text{ hrs/bulb}) \\ &= 80 \text{ J\$/year/lamp} \end{aligned}$$

Inc bulb total operating cost = 655 J\$/year/lamp

CF bulb energy cost = 8 hrs/day x 365 days/year x 17W/lamp x 3 28 J\$/kWh  
= 163 J\$/year/lamp

Inc bulb replacement cost = (8 hr/day x 365 days/yr x 500 J\$/bulb) / (10,000 hr/bulb)  
= 150 J\$/year/lamp

CF bulb total operating cost = 313 J\$/year/lamp

The annual savings achieved by replacing the 60W inc bulbs with CF bulb are

Savings = [(655 J\$/year/lamp) - (313 J\$/year/lamp)] x 24 lamps  
= 8,208 J\$/year

---

a) Sample calculation for switching off and reducing the number of lamps

- ▶ The lights in the terrace pool room are left on for 24 hours per day, even though the room is seldom occupied. Lighting consists of 10 double 40W fluorescent tube fixtures (20 tubes total)
- ▶ The lights in the terrace pool room should be operated only when the room is occupied (at most, 2 hours per day). The number of fixtures used to illuminate this area should also be reduced to 5 (10 tubes)

Current operating cost = 20 tubes x 40 W/tube x 24 hrs/day x 365 days/year x 3 28 J\$/kWh  
= 23,000 J\$/year

Proposed operating cost = 10 tubes x 40 W/tube x 2 hrs/day x 365 days/year x 3 28 J\$/kWh  
= 960 J\$/year

Potential savings = 22,000 J\$/year

---

- The following chart presents some of the existing energy conservation opportunities in Grand Lido's lighting system. This is not meant to be an exhaustive list, but rather to provide an indication of the type of opportunities still available at the Grand Lido.

Location	Lamp type	Lamp watt.	Qty	Hours of current operation	Hours of proposed operation	Energy conservation measure	New lamp wattage	Annual savings
Ornamental pool deck	Inc	60	24	8	8	Retrofit to CF	17	8 208
Ornamental pool deck	Inc	100	4	8	8	Retrofit to CF	27	2 797
Porte cochere wall	Inc	75	14	8	8	Retrofit to CF	25	6,704
Porte cochere wall	Inc	60	2	8	8	Retrofit to CF	17	824
Lobby linkway	Inc	60	6	8	8	Retrofit to CF	17	2 471
Water sports R/rooms entry	Inc	60	4	8	8	Retrofit to CF	17	1 647
Water sports R/rooms	Inc	60	4	24	24	Retrofit to CF	17	4 942
Waterwheel pump room	Fluo	40	1	24	2	Switch off	same	1 050
Booster pump station	Fluo	40	4	24	8	Switch off	40	4 597
Nudist pool room	Fluo	20	4	24	2	Switch off	40	4 200
Pool table lighting	Inc	60	6	24	18	Switch off & retrofit	17	1 853
Game room R/rooms	Inc	60	6	24	24	Retrofit to CF	17	7 413
Corridor to conference room	Inc	60	1	24	8	Switch off & retrofit	17	824
Beach house pool room	Fluo	40	2	24	2	Switch off	40	2 107
Terrace pool room	Fluo	40	20	24	2	Switch off & reduce to 10 tubes	same	22 000
Terrace buffet	Inc	20	26	24	12	Switch off	same	7 470
Total savings								79,100

## Project 5: Reduce the time of operation of the pool filter pump

### Summary of results and benefits

- ▶ Reduces Grand Lido's energy consumption by 17,520 kWh/year, resulting in savings of 58,000 J\$/year
- ▶ This recommendation has a payback of less than 1 month

Current situation The swimming pools' filtration systems are equipped with 2 x 3HP and 1 x 2HP pumps. These pumps operate 24 hours per day.

Recommendations Experience shows that in most cases pool water quality can be maintained by running the filter pumps for 12 to 16 hours per day. Grand Lido should therefore shut off its filter pumps at night in order to save energy and to increase the service life of the pumps. The pumps can either be shut off manually or the hotel can install an inexpensive timer to perform this function automatically.

### Input assumptions and calculations

- ▶ Assume that the pool filter pumps are shut off from 10 PM to 6 AM
  - ▶ The cost of energy at Grand Lido is 3.31 J\$/kWh
  - ▶ The total power demand of the 3 pool filter pumps is 8 HP or 6 kW
- a) Energy savings resulting from shutting off the pumps during nighttime

$$\begin{aligned}
 \text{Energy savings} &= 8 \text{ hr/day} \times 6 \text{ kW} \times 365 \text{ days/year} \\
 &= 17,520 \text{ kWh/year} \\
 &= 58,000 \text{ J$/year}
 \end{aligned}$$

b) Implementation cost and payback period

- ▶ If Grand Lido decides to manually control the operation of the pool pumps, the implementation cost of this recommendation is negligible, resulting in an immediate payback. Even if the hotel chooses to install inexpensive timers to control the pump hours, the recommendation would payback in less than one month.

### Comments

- ▶ Grand Lido should also consider extending this recommendation to its Jacuzzis/spas. The filter pumps of the property's 5 Jacuzzis run 24 hours per day and have a total power demand of 9 HP or 6.8 kW.

## Project 8: Implement a property-wide waste management program

A comprehensive waste management program will help Grand Lido reduce the amount of waste it produces, save materials, resources, energy and money, and reduce the property's impact on the environment by drastically reducing the amount of solid waste disposed in its dump or other locations. The principal elements of an effective waste management program include what is generally called the three R's: reduce, reuse and recycle. These three elements are detailed below.

A waste management program begins with a waste review, where the quantity and type of waste produced in the property are examined. Once this review is completed, the possibilities for the waste management program can be assessed by considering each kind of waste and deciding whether it is possible to avoid the generation or the disposal of this waste through the reduce, reuse, and recycling options. Whatever waste cannot be avoided through the reduce, reuse, and recycle components of Grand Lido's waste management program will have to be discarded. In most cases, however, an effective waste management program can have a significant impact in reducing the amount of waste generated by a property.

### Reduce

Reduce the quantity and the impact of the waste produced by the property by avoiding natural wastage, by using more durable goods that will need to be disposed less frequently, by avoiding the purchase of excessively packaged goods, and by minimizing the use of hazardous materials or other products which have a significant impact on the environment. The reduce component of the waste management program is obviously the first option that should be considered by the property. By reducing the generation of wastes, Grand Lido will conserve resources, reduce its use of natural resources, and reduce the amount of materials its employees will need to handle and the volume of waste the property will need to dispose.

The bulk of the responsibility for the 'reduce' element of the waste management program lies with the purchasing department, since the less material that is brought into the property, the less the property will have to discard (be it by disposal to a dump site, donation, or recycling). Employees who have the authority to decide what is discarded as waste also play an important role in reducing the property's waste output. The type of actions which can be taken by the property to reduce the production of waste and to lower the impact of the generated waste include:

- Avoid purchasing items (e.g. foods, chemicals, appliances, parts, maintenance items) that are excessively packaged. In North America, 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/jellies, condiments, butter, cereals, syrup, cream, juice, etc.). Bulk items are less expensive and create less waste.
- Reduce or eliminate the use of disposable plates, place mats, wares, and cups. Inexpensive reusable plastic plates, tableware, and glassware can be used at guest and employee functions held outside.

- Use refillable containers for chemicals, cleaners and foods
- Minimize the use of straws, and replace plastic straws with paper straws
- Do not automatically supply guests with new glasses or paper cups for each drink ordered at the bar, but offer to refill the glass if a guest orders the same beverage twice
- Eliminate the use of paper wrap for guest room drinking glasses. Instead, store the drinking glasses upside-down
- Discontinue the use of door menus for room service orders. The room service menu should instead instruct guests to call to place their room service orders. If a large number of the hotel's guests like to place their breakfast orders in advance using the door menu, the hotel may want to add a note at the bottom of the breakfast room service menu indicating that guests can call in their orders in advance to a special number (the number needs to be constantly staffed). Eliminating door menus will result in lower costs and less waste
- Use cloth rather than paper towels and napkins
- Use cloth napkins instead of disposable doilies for buffet lines, platters, high-tea service, and in bread baskets
- Purchase durable coasters for use in the bar and restaurants instead of using paper napkins and replacing them with each drink
- Use cloth or canvas bags or a small basket to collect and return guest laundry, towels, and linens
- Use a wheelbarrow, yard cart, or cloth or canvas bag to collect garden waste rather than disposable plastic bags
- Install soap dispensers in guest bathrooms, public bathrooms, and employee locker rooms
- Purchase reusable plastic containers for food in the refrigerators and freezers and covers for the pastry racks in the kitchen. The hotel currently uses a great deal of plastic wrap for both of these purposes, which wastes money and creates additional waste
- Avoid using laundry, kitchen or housekeeping detergents which contain phosphates
- Minimize the purchase and keep track of the use of harsh or hazardous chemicals (e.g., drain cleaning agents, solvents, bleach)
- Purchase rechargeable or mercury-free batteries
- Buy stickers to use on the Super Clubs luggage tag for noting the guest's room number instead of using a separate tag
- Reduce the number of garnishes purchased for drinks by saving them for several days before throwing them away. The bar staff currently throws leftovers away at the end of each day
- Coordinate the purchasing process to reduce the number of orders placed with each vendor. This will likely save money and will also reduce packaging
- Reduce the amount of paper used in the guest services/ reservations area by installing a computerized reservation system, installing a voice mail system for both guests and staff and discontinuing the practice of placing guest bills in envelopes (they can instead be stapled shut for privacy)

## Reuse

Reuse items in their original form for the same or a different purpose rather than disposing of them. If an item cannot be reused by the property, Grand Lido should investigate the possibility of selling or donating them to employees, outsiders, charitable organizations, local schools and businesses. Examples of reuse actions are listed below

- Reuse computer or other paper (i.e., printed on one side only) as scrap paper for taking notes and writing internal memos
- Purchase soft-drinks and water in reusable rather than disposable bottles
- Reuse leftover pads/pencils from meeting rooms The restaurant staff can use the pads to take orders
- Give preference to vendors which supply their products in returnable/refillable containers For example, one hotel in Negril indicated that Country Bucket will provide ice cream in 3-gallon reusable containers with a deposit of 200 J\$ each This should save the hotel money and will reduce the amount of waste disposed of by the hotel
- Designate someone in each department to be responsible for returning packaging to the supplier There appears to be some confusion as to who is responsible for seeing that laundry detergent containers, pool chemical containers, milk jugs, produce crates, egg cartons, and banana boxes are sent back to the supplier Some hotels indicated to the audit team that these items were to be discarded, meaning that the hotel is missing out on some rebates
- Only remove used soaps from guest rooms at checkout and then save these bars for use in cleaning floors and equipment (such as the water sports equipment)
- Give used amenities to any interested parties (e.g., charities, local schools, employees) rather than discarding them
- Replace the trash can liners only when these are soiled or unsuitable for further use
- Repair and reuse damaged furniture or donate it to interested parties (e.g., charities, schools, employees, businesses)
- Use a bucket to collect water from restaurant tables to use in watering plants
- Offer all leftovers foods, including the soup of the day, to employees in the employee cafeteria Food should only be disposed of when it can no longer be served to the staff

## Recycle

Many items that cannot be reused in their original form can be sold or given away to processors for recycling Even if the hotel cannot make a profit from its recycling efforts, diverting items from the waste stream should allow the hotel to reduce the frequency of trash collection, which will save the hotel money The type of products which can generally be recycled include

- Green waste from kitchen and garden (this material can be composted on site or given to a local composting program)
- White paper and mixed paper
- Glass bottles and jars
- Plastic bottles and containers made of PET (typically used for soft-drink and water bottles) and HDPE (typically used for milk jugs and chemical containers)
- Aluminum cans and foil
- Steel cans or tins
- 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 only one company (RYCO-JA, a recycler of waste oil and grease) collects recyclable materials in the Negril area. However, the EAST project, in collaboration with the Negril Chapter of the JHTA and the Negril Area Environmental Protection Trust (NEPT), will strive to organize a recycling project for the Negril area by acting as a link between the interested hotels and the recycling companies based on the island. 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 Grand Lido 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 any color glass available at any site. Many of the glass bottles sold in Jamaica can be returned to the bottler for reuse, which should be the first priority. However, if the hotel produces enough other glass that is suitable for recycling (drink bottles or food jars and containers), a glass recycling program should be implemented. Recycling bins should be placed under the bars and in the kitchen to collect this glass separate from other recyclables. The bins should be clearly labeled as to what color glass can be placed in them, and the signage should strongly discourage staff from contaminating the bin with other non-glass items. A heavy plastic or cloth bag should be used inside of the bin so that the bag can easily be removed when the bin is full and the hotel will not have to worry about tearing if the glass breaks. The West Indies Glass Company can help the hotel to estimate visually when five tons have been collected. The hotel can then determine if it wants to deliver the glass itself or accumulate the glass in the loading dock area until there is enough to qualify for the free pickup.

### Plastics

**Wysinco Environmentals, Ltd** Contact- Mrs Pat Wright, (809) 943-9800 As of October 1997, this company only collects plastic (PET) bottles from schools and specific media-announced pickup points. Therefore they ask that plastic bottles be donated to a school in the community, which earns "points" for kilograms of plastic and trades them in for computers, videos, paint, tools, etc. If the hotel wishes to drop off PET bottles at the Wvnsinco Recycling Plant (located at PO Box 367 White Marl, Spanish Town, St. Catherine, Jamaica) the company will pay the hotel 8 J\$ per kilogram for them. If the hotel produces a significant amount of plastic and wishes to begin collecting either for a local school or for profit, recycling bins should be placed in the areas where the majority of the plastic waste is produced (i.e. the kitchen). These bins should also be properly labeled so that the staff will know what can and cannot be placed in them. Once enough plastic has been collected the hotel can either take it to a local school or transport it to Spanish Town.

### Plastic/Metal Drums

**Kemcan Development Company** Contact - Ms Usherwood, (809) 922-5270 At present,

this company is only recycling plastic and metal drums, which it will pick up provided there are 30-50 drums. Again, the hotel's first resort should be to return these drums to the supplier for reuse whenever possible. However, any drums that cannot be returned should be collected in the loading dock area until there are enough to warrant a pickup.

### 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, guest cards, etc. made out of the paper that the hotels recycle. The cost of the paper recycling is negotiable.

**JA Pottinger & Co, Ltd** Contact - Mr Pottinger or Ms Nadine Higgins, (809) 926-8957. This company picks up paper products from hotels – provided there is one truck load full (50 large garbage bags) – and exports the paper for recycling. The price for this service is negotiable and the company is prepared to meet with EAST/ JHTA to discuss a program for the Negril area. Recycling bins for paper should be placed in the housekeeping area (to collect paper from guest rooms), at the front desk, and in offices at a minimum. Each desk in the office area should receive its own recycling bin. It is important, especially with paper, to collect the recyclables as close to their source as possible. Paper must be clean and dry to be recyclable. The hotel should first reuse paper whenever possible and then should collect the paper for recycling. If the bags of paper are exposed to the elements, it is important that plastic bags be used and that the bags be properly sealed to prevent the paper from getting wet. If the bags are to be stored in a weather-proof area, the hotel should talk to JA Pottinger & Co about using reusable cloth bags that are returned to the property for reuse after the recycler collects the paper.

Another paper recycling option is to sell it to companies needing packaging materials, such as Exotic Flowers of Montego Bay. If the hotel decides to pursue this option, it should purchase a shredder to ensure that confidential documents are not released from the property.

### 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 used vegetable oils and grease from kitchens which is then recycled in the production of chicken feed. RYCO provides free of charge covered steel drums for the storage of 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 potential clogging problems in the tile field) and helps the country by reducing the amount of yellow grease imported into Jamaica for the production of animal feed. If the hotel chooses to recycle its cooking grease, it is important that the drum be kept covered (to prevent the rainwater

dilution) and be kept free of contaminants, which will make the grease non-recyclable

## **Other Waste Management Issues**

The hotel should ensure that there are adequate trash receptacles and ash trays at the beach, around the grounds, and throughout the public areas so that guests can easily find one when they need it. The audit team found a great deal of waste and cigarette butts on the ground in these areas because there are not enough receptacles. Guests will usually make an effort to dispose of trash and cigarette butts properly if they can easily find a receptacle.

## **Project 9: Improve the effectiveness of the towel reuse program**

The audit team found that many housekeepers believe that used towels will not dry fully within 24 hours and are therefore changing the towels even if the guest has left them hanging for reuse. This may be simply a training issue, but if the towels do not dry quickly, the hotel can consider some easy changes to make this program more effective.

First, there is only one towel rod in the room, and it is used for fresh towels. There is no place for the guests to hang the towels so that they will dry more easily. The hotel should either install another towel rod in the bathroom or should replace the current rod with a towel rack instead (where the clean towels are folded on top and there is a bar underneath for the guest to hang used towels). If the guests have room to air dry their towels, the towels should be fully dry within 24 hours.

If the towels still do not fully dry, the hotel may want to consider anchoring a small microwave oven to each housekeeper's cart. An extension cord would allow the oven to be plugged in from outside of the guest room. If the housekeeper goes into a room where the guest has hung a towel to dry, the towel can easily be placed in the oven for a few minutes to get it completely dry.

The cost of a few "portable dryers" and of the energy consumed in their operations should be largely offset by the savings (labor, water, chemicals and energy) achieved by avoiding the need to wash each year tons of towels simply because they were slightly damp.

There are likely a variety of creative solutions to this problem, but the point is that if the hotel has indicated that the guests have the option of reusing their towels, and the guests are trying to comply, the hotel is losing money by not following through.

## Project 10: Improve the guest participation in the linen reuse program

The current materials purchased from the Green Hotel Association have two disadvantages

- ▶ They ask the guest to notify the hotel if they wish to reuse their sheets. Many guests who would otherwise participate may forget to leave the card on the bed in their haste to leave the room in the morning.
- ▶ The cards are somewhat plain and may not even be noticed by some guests. If the guests do not pay attention to the cards, they have no opportunity to participate.

The hotel can improve participation in this program by purchasing attractive, colorful materials such as those sold by the Caribbean Hotel Association. The CHA cards offer two key advantages:

- The design of the materials will capture the guests' attention better than the current cards.
- The materials have the opposite message from those currently being used. They indicate that the hotel has implemented a water conservation program to help protect the environment and that it is the hotel's policy to change sheets every three days unless the guest would like to have them changed more often. If the guest wants the sheets changed on any given day, the card indicates that the guest should place it on the bed.

Hotels that have implemented this type of program (using materials with this message) in conjunction with the towel reuse program have found that their laundry expenses are reduced by as much as 30%.

If this new program is implemented, housekeepers need to be properly trained to carry it out effectively. Most hotels have found the greatest success with one of the following procedures:

- Designating certain days as sheet changing days. Under this format, all of the sheets in the hotel are changed on certain days of the week (for example Tuesdays and Fridays) instead of every three days. This method makes it easy for the hotel to increase housekeeping and laundry staff on those days if necessary and also gets the housekeepers in the habit of recognizing those days as sheet change days. On the other days, the housekeepers will only change sheets in checkout rooms and rooms where the guest has requested a change.
- Actually counting off every three days and posting a notice in the housekeeping area on the sheet changing days. This ensures that the sheets are changed on the exact schedule noted on the in-room materials and still makes it relatively easy for the housekeepers to know when to change the sheets. As mentioned in the paragraph above, on the other two days the sheets would only be changed in the checkout rooms and rooms where the guest has requested a change.

Hotels have had difficulty tracking the length of time that each guest has actually been in the room so that each guest's sheets are changed three days after they check in and then every three days after that. Unless the hotel has a very complex reservation system, this method of tracking sheet changing is nearly impossible. If this method is possible, it results in the greatest savings, since either of the above alternatives will often result in changing a guest's

sheets one of the two days following check-in when they technically are not yet ready to be changed

The hotel will have to determine which method it believes will work best and then make modifications as needed. Regardless of the method chosen to implement the program, it is important that all of the housekeepers be fully trained to understand their role in the initiative. If they do not do what they are supposed to do, the program cannot be successful.

Two other issues are key to the success of this program:

- ▶ Even if the guest does not request that the sheets be changed on a given day, if the housekeeper determines that the sheets are soiled, they should be changed anyway. 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 designated to change the sheets before a new guest checks in. One way to know for sure whether the sheets were changed is to leave the bedspread in a turn-down type of configuration when the 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.

This program can result in tremendous savings for the hotel but only if it is implemented properly. It is important that the proper materials be used, that the housekeepers be fully trained, and that everyone is left feeling good about the program.

## Project II: Expand the hotel's composting program

Composting has become the increasingly popular method by which to dispose of food scraps, floral waste and garden waste. The hotel has implemented a pilot composting program that could be made considerably more effective. Now that the basic program is in place, improvements can be made that will allow the hotel to further reduce its waste stream, increase the speed of the composting process, and produce more compost for use around the property.

A well-run composting program yields significant benefits including

- a reduction in the cost of waste handling and disposal,
- a reduction in the environmental impact resulting from the disposal of wastes in dumps or landfills,
- it provides the property with a high-profile program which can be advantageously used in public relations and media efforts,
- it provides the property with a constant supply of high quality fertilizer and soil conditioner.

Studies have revealed that up to 75% of 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 cuttings left from vegetable preparations, as well as complete servings of food which have been prepared, left unserved, and cannot be reused. Post-consumer scraps are food left on dishes after meals have been served. Although food scraps will be numerous and diverse, other wastes can be composted as well. Below is a list of commonly composted wastes.

- Produce – vegetables, fruits, peels, rinds, salads, etc
- 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 will be located close to public

or work areas, Grand Lido should exclude these items from its composting program. If these items are composted, the compost pile should be kept covered.

Not everything is compostable, and some materials can lower the quality of the finished compost or hamper the composting process. The staff should be educated on the importance of preventing the following items from being placed in the composting receptacles and the composting pile:

- Garden waste contaminated with pesticides
- Weeds with heads/ seeds (these will reproduce quickly in the compost heap)
- Glass
- Metals
- Unsoiled paper (if it can be recycled)
- Cardboard
- Plastics
- Aluminum foil or plastic wrap
- Batteries
- Diseased plants
- Wood chips from chemically treated wood products

Contamination of compostable material 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.

Hotels and resorts often find it easier to have the composting program evolve slowly, that is, to start with flower and garden wastes and pre-consumer food scraps from prep stations in the kitchens, then add additional materials like paper, and finally add post-consumer leftovers from guests' and employees' plates. This is the process that is recommended for the Grand Lido. The hotel is already composting most of its yard waste and should now slowly phase-in the other elements that will make the program even more successful.

The Grand Lido may find it beneficial to purchase a wood chipper and paper shredder to allow even more items to be composted. Large pieces of wood (branches, lumber) and full pieces of paper cannot be added to the compost pile. The chipper and shredder can be used to convert these items to a more manageable size (less than one inch) so that they will decompose more readily.

In addition, the current composting site should be modified slightly to improve the program. The site needs to be expanded to make a space large enough for all phases of composting (unloading materials, storing items before they are added to the compost, aerating/ mixing the compost, storing equipment such as the chipper, and storing the finished compost before it can be used). There is currently not enough space for all of these activities to take place. The hotel should also build a fence around the composting site to hide it from guest view and to prevent rodents and other animals from entering the area. Some items used in a compost pile will be unattractive or will attract animals, making this fence necessary. The hotel should also ensure proper drainage from the site, quickly clean up any food spills, and add

food waste to the center of the pile to prevent bad odors

It is especially important to ensure that the compost pile is properly aerated. Aeration helps the bacteria in the pile to grow faster, which speeds the decomposition process. The staff overseeing the composting program should aerate the pile, either manually or with a small bulldozer (depending on the size of the pile), at least once each week. Without proper aeration, the compost pile will develop a rotten-egg odor and will take much longer to fully decompose.

It is important to keep the program simple and efficient, in the long-run, it should not require additional staff time. In fact, the system, in coordination with a comprehensive recycling program, can streamline the entire disposal system from both a labor and a space efficiency standpoint.

Once the compost is ready for use (usually in about one month if the pile is managed properly), the resulting product should be used on the grounds. Compost is classified as a soil conditioner, not a fertilizer, because its levels of nitrogen, potassium, and phosphorus are not as high as commercial fertilizers. Finished compost will add these elements to the soil but will add them much more slowly and in lower quantities than fertilizers. Unlike fertilizers, compost also adds organic material to the soil, increases the water-retaining capabilities of sandy soil, and promotes root growth. The compost should be used over grassy areas or as a mulch around plants.

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

### Appendix III

<b>ACTION PLAN FORM</b>			
<b>MAINTENANCE DEPARTMENT - WATER CONSERVATION ISSUES</b>			
Action	By whom	Target date	Actual date
<p>Implement a leak detection and prevention program</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• Develop the checklist forms that will be used to track the preventive maintenance work conducted by this program</li> <li>• 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</li> <li>• Begin the first round of inspections Repeat the cycle of inspection each month</li> <li>• After each round of inspection present summary of findings to general manager</li> </ul>	<p>J Doe</p> <p>J Doe</p> <p>G Bush</p> <p>Maint staff</p> <p>J Doe</p>	<p>12/1/97</p> <p>1/1/98</p> <p>1/15/98</p> <p>2/1/98 - onw</p> <p>3/1/98 - onw</p>	
<p>Install 1 6 gallon/flush toilets in the beach-side public restrooms</p> <ul style="list-style-type: none"> <li>• Identify the type/brand of 1 6 gal/flush toilets which have given satisfactory results in Negril Get recommendations from maintenance staff of other hotels</li> <li>• Contact vendor and place order for 4 units</li> <li>• Install the units</li> <li>• Monitor weekly to insure proper performance Continue the weekly monitoring for two months following installation</li> </ul>	<p>P Peters</p> <p>S Holmes</p> <p>P Peters</p> <p>P Peters</p>	<p>2/1/98</p> <p>3/1/98</p> <p>&lt; 1 mth after receipt</p> <p>after installation</p>	
<p>Water consumption monitoring program</p> <ul style="list-style-type: none"> <li>• Prepare the forms that will be used to collect data from the property s 3 meters</li> <li>• 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</li> <li>• Begin collecting the water consumption monitoring program</li> <li>• On the first day of each month calculate the total water consumption and collect total guest night figures for the previous month Calculate gallon/GN value for the previous month Provide the gallons/GN figure to the Green Team</li> </ul>	<p>T Rex</p> <p>T Rex</p> <p>Maint staff</p> <p>P Peters</p>	<p>12/1/97</p> <p>12/15/97</p> <p>1/1/98 - onw</p> <p>2/1/98 onw</p>	

## Appendix IV

<b>Personal Action Plan - Housekeeping staff</b>		
<b>Action</b>	<b>By whom</b>	<b>Date</b>
<p><b>Guest room preparation checklist</b></p> <ul style="list-style-type: none"> <li>• 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</li> <li>• Do not replace the trash can liners (plastic bags) unless these are soiled or otherwise unacceptable for further use</li> <li>• Report all malfunctioning equipment to the hotel operator -- contact the maintenance department directly only if the need for repair is urgent</li> </ul> <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"> <li>• Collect all recyclable items placed in the guest room green recycling containers Recyclable item consist of                             <ul style="list-style-type: none"> <li>◦ clear green and amber glass bottles</li> <li>◦ plastic beverage bottles</li> <li>◦ aluminum beverage cans</li> <li>◦ metal cans</li> <li>◦ newspaper</li> <li>◦ white paper</li> </ul> </li> <li>• At the end of your shift place all collected recyclables in the appropriate recycling bins located by the laundry room</li> <li>• Before leaving the guest room                             <ul style="list-style-type: none"> <li>◦ turn off all lights televisions and radios</li> <li>◦ turn the a/c unit to the low cool setting if the guests have left the a/c running</li> <li>◦ if the a/c is left on make sure that all windows and louvers are properly closed</li> <li>◦ ensure that faucets and toilets are not running</li> </ul> </li> </ul>	<p>All house-keeping staff</p>	<p>Start on 12/01/97</p>
<p><b>Towel and linen reuse program</b></p> <ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> </ul>		

## Appendix V

### Information on Wastewater Resources'

#### Laundry Water Recovery System