Hotel Water Conservation

A Seattle Demonstration

Prepared for:

Seattle Public Utilities
Resource Conservation Section

By:

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July 2002

Seattle Public Utilities (SPU) would like to thank the project team, which collaborated with SPU during the course of this project.

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Terms used in this report:

GPM is gallons per minute and is the unit used to express instantaneous water use.

GPF is gallons per flush and is the unit used to express water use per toilet or urinal flush

GPD is gallons per day and is the unit used to express water use for an identified function over a 24-hour period.

CCF is one hundred cubic feet of water and is equal to 748 gallons.

Cycles of concentration is a measure of the water efficiency of a cooling tower and is the ratio of total water used by the tower vs. water sent to waste. It is commonly computed by dividing the conductivity reading for the sump water by the conductivity reading for the incoming (makeup) water.

Executive Summary

I. Purpose: The purpose of the Hotel Water Conservation Pilot was to evaluate the effectiveness of combining an engineering approach with a behavioral/educational approach and to identify water use patterns and opportunities for water conservation in a selection of Seattle hotels. The project was sponsored by Seattle Public Utilities (SPU) which, in collaboration with its wholesale water partners, provides water to over 1.3 million people and businesses within its service boundaries.

The hotel sector is an attractive target for water conservation for several reasons:

1. The lodging sector, representing less than 1% of commercial accounts, consumes approximately 5% of commercial water in SPU's service area.
2. The Pacific NW is a receptive market for emerging sustainable practices.
3. Hotels are very recognizable to the public and are sensitive to public perception.
4. A sector approach addresses many of the barriers associated with broadly cast conservation strategies covering unrelated industries.

II. National Survey and Case Study Review: The project team identified water conservation measures and behavioral approaches to water conservation, or efficiency, from a representative sample of U. S. lodgings in a national literature and telephone survey. This data indicated that a majority of lodgings had adopted some combination of measures to reduce water consumption, including low flow fixtures, towel-linen exchange programs, ozone laundry systems and staff education and outreach. In some cases, such as The Colony Hotel in Kennebuncport, Maine, water conservation was adopted in the context of a rigorous sustainability platform in which every aspect of the hotel's operation was guided by environmental criteria and decision points.

The project team also reviewed available literature in order to collect baseline data on hotel water use, identify factors associated with increased water use at specific hotels, and collect information on conservation measures proposed for a variety of hotels along with associated savings potential. Total water usage across a wide variety of hotels ranges from under 100 gallons per day per room (gpd/rm) to over 400 gpd/rm. Older, luxury hotels and hotels with full service restaurants and on-site laundry facilities typically exhibit the highest water usage per room. Identified savings potential varied from between 0% - 45% of total usage, with between 10% - 20% taken as typical. (See Case Study Review contained in *Appendix 1*).

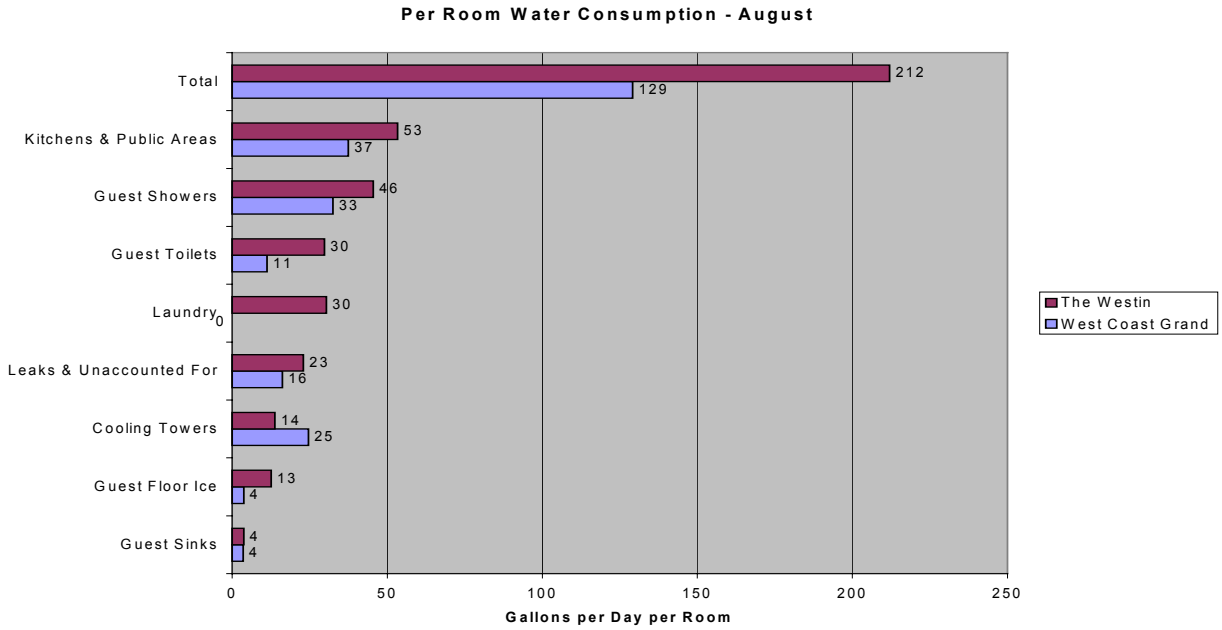
III. Seattle Survey: A local telephone survey was conducted to assess the approach, measurement, and culture of water conservation in area hotels. The surveyed hotels in the sample represented 40% of the selected field (hotels with over 75 rooms) and 25% of all Seattle hotels, the latter of which includes all Seattle hotels regardless of room size. A majority of the hotels surveyed stated they had installed some combination of water conserving measures in the last five years, including 31% that had adopted the well known towel-linen exchange program in which multiple night guests are given the option of not having towels and linens laundered daily.

Ninety percent of the hotels stated they had installed faucet aerators or restrictors and low flow showerheads, while only 50% stated they had installed low flow toilets. Air-cooled ice machines were used in 60% of the surveyed hotels. Only 5% had what they considered to be efficient commercial dishwashers.

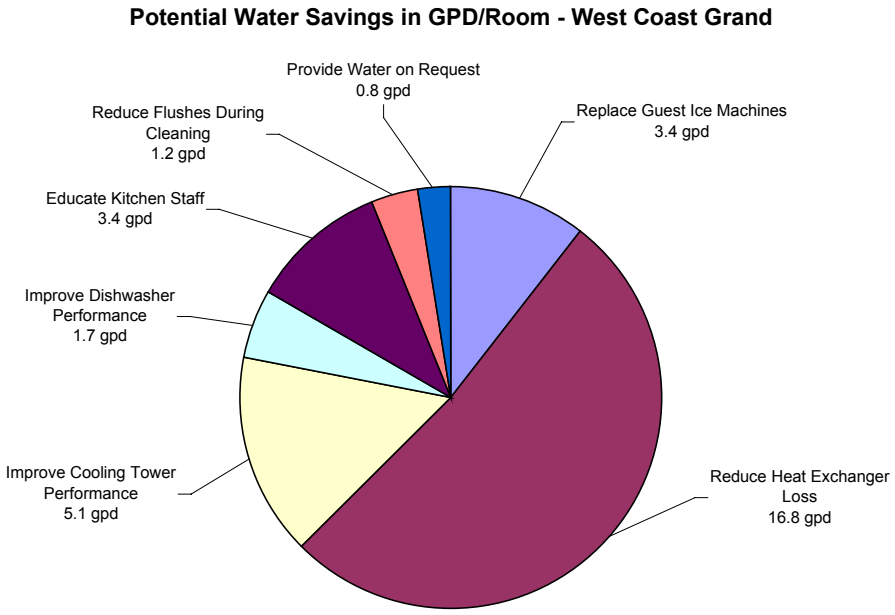
IV. Audit Selection: To facilitate the partnership nature of this project, SPU drafted a Participation Agreement that the participating hotels were asked to sign. Of the twenty hotels with compiled profiles, six were chosen for initial selection based on conservation potential. Factors considered to assess conservation potential included average gpd/room, number of hotel rooms, investment criteria used by the parent corporation, and willingness to participate. After an extensive evaluation and consultation process, the Westin Hotel and the West Coast Grand (WCG) agreed to participate in the pilot.

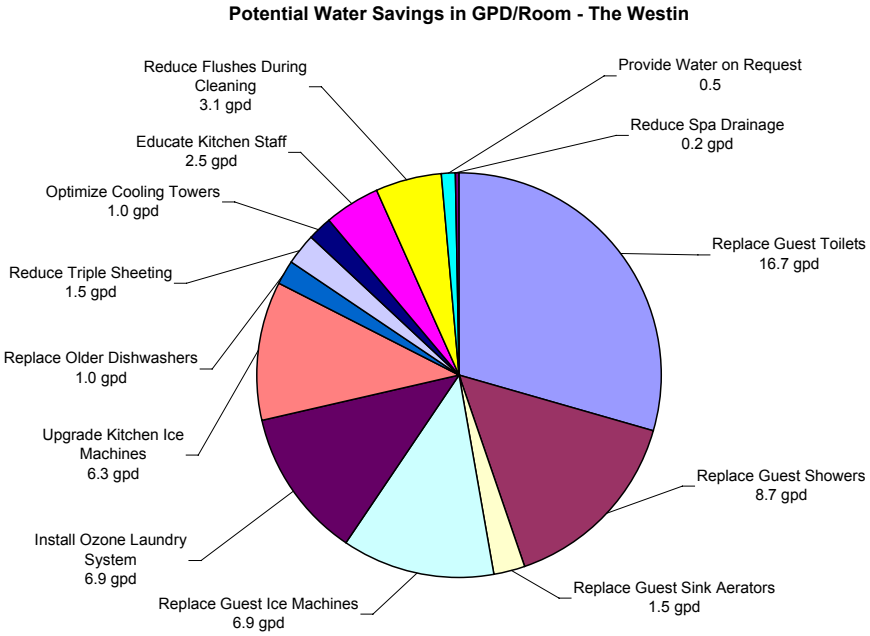
V. Combined Engineering and Behavioral Evaluation: The pilot program investigated water conservation opportunities related both to "Equipment Measures" involving replacement or significant upgrades to existing equipment, and "Behavioral Measures" related to equipment maintenance and to employee/guest education. Many commercial water conservation studies have focused primarily on equipment measures only. However, without adequate employee education and establishment of regular maintenance schedules, water savings projected for equipment replacements may easily be lost or overshadowed.

VI. Findings and Recommendations: Overall water use patterns for the two study hotels fell within the expected range. The Westin, which is an older hotel complete with in house laundry and a variety of banquet and restaurant facilities but with no site irrigation, consumed approximately 212 gpd per room during the August study period. The West Coast Grand, which is a newer facility with low flow toilet fixtures, banquet and restaurant facilities, but no in house laundry consumed 129 gpd per room.


Per Room Water Consumption - August
Total
Kitchens & Public Areas
Guest Showers
Guest Toilets
Laundry
Leaks & Unaccounted For
Cooling Towers
Guest Floor Ice
Guest Sinks
212
129
53
37
46
33
30
11
30
0
23
16
14
25
13
4
4
4
0
50
100
150
200
250
Gallons per Day per Room
The Westin
West Coast Grand

Substantial water conservation opportunities were identified. Many of these water conservation opportunities also provide opportunities for energy conservation. For each of the two hotels audited, potential water savings equaled approximately one-third of current water consumption. For the older Westin Hotel, close to 90% of the projected savings were from equipment measures primarily related to upgrades to restrooms, ice machines and laundry equipment. For the West Coast Grand Hotel, a converted office building, close to 90% were for "behavioral" measures, primarily related to maintenance and operation of heating and cooling equipment.





A. *Equipment Measures*: Considerable water conservation opportunities were identified through replacing or substantially upgrading older equipment. After utility incentives are factored in, most of these upgrades could be made with a simple payback of two years or less. The most significant equipment measures include:

- *Guest Room Toilets*: Replace older 3.5 gpf toilets with more modern 1.6 gpf models. In addition to excessive flush volumes, individual floor metering revealed significant water loss attributed to leaking flappers.

- *Guest Showers*: Replace older 3.5 gpm showerheads with models using 2.5 gpm or less. The Westin Hotel tested 1.75 gpm models on one floor with excellent results.

- *Faucet Flow Restrictors*: Replace existing 2.5 gpm & 3.0 gpm faucet aerators with 1.5 gpm or lower aerators. These lower flow aerators also result in less splashing and associated cleanup, with no discernable difference to the guest. Install 2.5 gpm in-line flow restrictors in kitchen prep sinks commonly used for thawing and rice washing.

- *Single Pass Water-Cooled Ice Machines*: Replace existing water-cooled ice machines or connect to an existing cooling water recirculation system.

- *Laundry*: Install ozone systems and/or rinse water recycle system to reduce laundry water and associated water heating and chemical use.

- *Dishwashers*: Replace inefficient dishwashers with water conserving models. This measure may only be cost effective for dishwashers which are already nearing the end of their expected life.

B. *Behavioral Measures:* In addition to equipment replacement, a number of measures were identified relating to maintenance and other behavioral changes. The most significant behavioral measures include:

- *Toilet Leaks*: Significant sources of leakage were discovered related to deteriorated toilet flappers. Implement a regular toilet flapper replacement schedule.

- *Steam Heat Exchangers*: Install sub-meters on cold water feed lines to all heat exchangers. Regularly log readings and make repairs to heat exchangers as necessary.

- *Other Sub-metering*: Install sub-meters for other significant water consuming operations including dishwashers, pools and spas, laundry, irrigation, and kitchens. Log usage and perform maintenance as necessary to reduce waste.

- *Cooling Towers*: Cooling towers were not being operated at optimum levels. Conductivity readings should be recorded at least weekly. Cooling tower controls should be upgraded as necessary and set to maintain cycles of concentration near 10. Cooling tower maintenance contracts should be amended to ensure the water treatment service provider maintains the target cycles of concentration.

- *Food and Beverage*: Significant excess use was observed in kitchens where continuously running water, often for hours at a time, was used for thawing frozen food and washing rice. Educate kitchen staff regarding correct methods for thawing frozen food and rinsing rice. Frozen food may be thawed in a refrigeration unit and sushi rice should be agitated in a colander. Additionally, sub-metering of kitchen use and back charging costs to the kitchens could help raise awareness among kitchen managers of wasteful practices.

- *Housekeeping*: Publicize towel-linen programs. Educate custodial staff to reduce number of times toilet is flushed during room cleaning.

C. *Continuing Program Developments in Participating Hotels*: During delivery of the project services, the Westin Hotel adopted a towel-linen program. The West Coast Grand Hotel strengthened their delivery of an existing towel-linen program, began to serve water only on request, developed a food donation program, and is working with Seattle City Light to upgrade its energy systems. Starwood Hotels and Resorts Worldwide, Inc., of which the Westin is an affiliate, is in the process of developing an environmental policy and has begun to utilize performance contracting in their implementation of resource conservation projects.

D. *Corporate Environmental Management*: Neither hotel has drafted and implemented a written environmental policy promoting water conservation, although both hotels are under

pressure to respond to budgeting constraints and have adopted water conservation measures. Industry trends and pressures tend to promote "over service" in which quantity and embellishment prevails over tailored service.

It is recommended that both hotels adopt a more broadly cast sustainability program, based on overarching systems frameworks such as The Natural Step (www.thenaturalstep.org), within which to surround their water and other resource conservation efforts. Such a program would require:

- Corporate program adoption,
- Support from upper management, including the CEO, CFO and Board of Directors
- Reporting out to investors regarding adoption and progress, using performance measures
- Environmental criteria written into job descriptions and performance standards
- Adoption of incentive systems to promote conservation measures. Outreach to guests
- Urge chemical suppliers to eliminate certain constituents from cleaning products such as phosphates, SARA 313 listed chemicals, Alkylphenol ethoxylates (APEs) and corrosive substances.

TABLE OF CONTENTS

LIST OF APPENDICES

1.0 Background and Approach

From April 1999 through April 2001, Seattle Public Utilities (SPU) and its consultant team conducted a Hotel Water Conservation Pilot Project in Seattle, Washington. The purpose of the study was to evaluate the effectiveness of combining an engineering with a behavioral, educational, and organizational analysis to reduce water consumption in the participating hotels, and to provide a potential roadmap for other area hotels to utilize in their resource conservation efforts. A further goal was to determine end uses by equipment and behavior for both guests and employees.

For several years SPU has **sponsored** ongoing water conservation programs in the commercial/industrial sector. The programs have approached the sector with a broad message of efficiency, while at the same time have focused **primarily** on large water users. For this pilot project SPU pursued a **tailored** hotel sector approach based on the likelihood that sector-based approaches are more efficient in changing industry standards, normative values and conduct. The Environmental Protection Agency (EPA), Washington State Department of Ecology, and King County Department of Natural Resources have all successfully used sector- based approaches to environmental management. SPU was also looking at the benefits of having a detailed breakdown of end uses in the evaluation of efficiency opportunities in a wide number of hotels.

The hotel sector was chosen based on several factors:

- The lodging sector, representing less than 1% of commercial accounts, represents approximately 5% of commercial water use in SPU's service area.
- The Pacific Northwest is a receptive market for emerging sustainable practices.
- Sustainable tourism is rapidly accelerating worldwide and water conservation is an easy "low-hanging fruit" approach to baseline strategies.
- A sector approach addresses many of the barriers associated with broadly cast conservation strategies covering unrelated industries.

The project team examined the trends, issues of interest, organizing principles, culture, barriers and opportunities to change and trust sources. The team conducted extensive analysis of the hotel sector, contacting international, national and local trade associations, academic institutions, individual hotels, suppliers, certification organizations, non-governmental organizations and EPA programs devoted to sustainable tourism and water conservation. The team also evaluated how water conservation programs might be incorporated into larger sector-based environmental management and sustainability platforms, to increase efficiency and reduce overall natural resource impacts. From April through early July 1999, the project team conducted a national survey of water conservation measures adopted by hotels. A partial list of contacts is included in *Appendix 2.*

The team then evaluated the Seattle lodging market, comprised of hotels with 75 rooms and over. A telephone survey was developed to ascertain which practices Seattle hotels were using to conserve water and addressed issues pertaining to corporate culture, investment

criteria, physical plant and the manner in which billing was handled. Completed survey forms are found in *Appendix 3*.

From the results of the Seattle survey instrument, the team prepared a rough spreadsheet analysis of water use per room prior to selection. Six hotels were then identified as possible candidates for the project. A project of this scope and intensity would require that the selected hotels make available books and records, access to staff and exhibit a willingness to adopt conservation measures in the hotel. The hotels were selected based on:

1. Water conservation potential
2. Willingness to participate
3. Age and condition of physical plant
4. Hotel size and features
5. Whether it was part of a larger company in which adopted measures could be replicated in other properties
6. Payback and investment criteria that would enable the hotel to adopt conservation measures in the next several years

Participation Agreement

The team either personally visited each hotel or spoke extensively with its General Manager regarding participation. Agreement was then made with two hotels for participation in the project. What differentiated this project from many others is that SPU required the participating hotels to sign a bilateral Participation Agreement. This hoped to ensure the participating hotels continued cooperation in the projects methodology which included shadowing and meeting with hotel employees.

Among other things, the agreement requires the project hotels make every effort to:

(i) Implement water conserving hardware and educational programs.
(ii) Implement at least one recommendation annually for the three years following the close of the project.

These will be implemented in accordance with SPU's recommendations as contained in this report and in accordance with the hotel's budget, investment criteria and availability of funds.

Site Visits

Following signing of the participation agreement, a number of site visits were made to each hotel over the course of the project to survey equipment, measure flow to various pieces of equipment and processes, shadow housekeeping and kitchen staff, and meet with representatives from engineering, food & beverage, housekeeping, and laundry operations. Historical billing data was reviewed and an end use allocation calculated. Water conservation measures were then developed and evaluated, including both "equipment measures" and "behavioral measures."

2.0 RESEARCH FINDINGS

2.1 National Survey

From April through early July 1999, the project team conducted a national survey of water conservation measures adopted by hotels. Over 47 hotels, hotel associations, non-profits, suppliers, academic institutions and water authorities were contacted throughout the United States. EPA has several standing programs that address sustainable tourism including the WAVE program- Water Alliances for Voluntary Efficiency (Office of Water)- and EPA's Sustainable Travel and Tourism Program (Office of Policy, Industry Sector Policy Division). They were able to provide additional leads, including hotel properties that were actively engaged in these programs.

Contacts were made through e-mail, telephone calls, and trade associations to secure additional resources. The contacts made are a representative sample of organizations involved in hotel water conservation, but by no means are a comprehensive sample for the United States.
A partial contact list in included in *Appendix 2*.

A. Purpose

The purpose of the survey was to develop a broader understanding of what behavioral approaches were used to reduce hotel water consumption. Of the surveyed organizations, the following approaches were used to promote water conservation:

B. Findings

1. *Policy development:* Several hotels, including La Quinta Inns, Holiday Inns, Hyatt and boutique hotels such as the Boston Park Plaza and Colony Hotel, had adopted water conservation policies. In the case of The Colony Hotel, water conservation programs are developed in the context of more developed sustainability or environmental management plans that involve Ecology Groups (in-hotel green teams responsible for addressing environmental issues and tracking progress), membership in Businesses for Social Responsibility and where the hotel actively promotes its programs.
2. *New Staff Orientation:* Training materials, meetings and employee manuals clearly state the water and other conservation policies of the hotel.
3. *Communication in-house:* Newsletters, bulletin boards, flyers, paycheck stuffers and meetings were all used to discuss water conservation.
4. *Communicating to the public:* Several hotels used their websites, advertising and sales materials to communicate with current and prospective guests about water and other conservation efforts. In many hotels, this is accomplished through towel-linen notices, and in-room reminders to turn off lights and faucets. In the case of the Colony Hotel, sales and marketing packets contain the hotel's *Environmental Responsibility Program,* which includes goals, activities, outcomes and projects.

5. *Incentives:* Several hotels use cash bonus incentives to reduce water use. La Quinta Inns has capitalized on, and motivated staff and managers by advertising their awards, including those received by the American Water Works Association.
6. *Measurement:* Surveyed hotels used a combination of approaches including formal leak detection programs, metering, hiring companies to identify rate errors, and reviewed the water and related bills in-house. A surprisingly large number of hotels review these bills at the corporate offices or comptroller offices, almost always physically removed from the hotel property. Establishing goals and water reduction targets by department, process, and staff function is critical to successful water conservation.
7. *Continuous Improvement:* Related to measurement, many hotels used engineering, cross-departmental and Ecology groups to monitor progress and make programmatic adjustments every quarter. Goal and target setting is essential to tracking improvement.

2.2 Engineering Case Study Review

The team reviewed literature and contacted several municipal and private organizations collecting data from the Greater Vancouver Regional District, American Hotel & Motel Association, Los Angeles Department of Water and Power, East Bay Municipal District and several local water utility studies.

A. Purpose

The purpose of the engineering case study review was to review available literature concerning water conservation opportunities for hotel properties to:

- Collect baseline data on hotel water usage
- Identify factors associated with increased water usage at specific hotels
- Collect information on water conservation measures proposed, with concomitant savings potential
- Provide insight regarding the most useful information that could be gathered by the pilot program

B. Findings

Total water usage across a wide variety of hotels range from under 100 gallons per day/room (gpd/room) to over 400 gpd/rm, with a median range between 144 and 190 gpd/rm. Hotels rated as larger, older, or luxury had median usage close to 250 gpd/rm. Hotels with full service restaurants, large irrigated areas, and on-site laundry facilities typically exhibit the highest water usage per room. Water conservation measures identified as having the highest savings potential include:

- Retrofit or replacement of non-water conserving toilets and urinals
- Replacement of showerheads with low flow models
- Installation of faucet aerators

- Elimination of once-through cooling
- Laundry water recycle
- Dishwasher upgrades
- Leak repair
- Education of staff and guests in water conservation opportunities

Identified savings potential also varied widely, from 0% to 45% of total usage, with between 10% and 20% taken as typical. However, very little documentation was provided regarding actual savings realized. In addition, although process use improvements for cooling, laundry, and kitchen use were occasionally identified as having substantial potential, attention was not consistently given to this potential, or to the potential provided by leak detection and repair. These shortcomings may be largely attributed to the lack of sub-metering data necessary to highlight savings potential in process (non-domestic) usage, as well as a system by which to set targets, performance measures and outcomes from efficiency measures.

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The full case study report can be found in *Appendix 1.*

2.3 Seattle Survey

Using a telephone survey method, the team evaluated the Seattle lodging market comprised of hotels with 75 rooms and over. These hotels would collectively have a more significant impact on water use in the City of Seattle, and in many cases represent the most visible in terms of name recognition. The telephone survey was developed to ascertain which practices Seattle hotels were using to conserve water and addressed issues pertaining to corporate culture, investment criteria, physical plant and the manner in which billing was handled. The completed survey forms can be found in *Appendix 3.*

The surveys took one month to conduct and of the 60 hotels selected, 22 responded to the questionnaire. Questions were categorized as follows:

1. Billing
2. Water Conservation Measures Adopted
3. Water use inventory by department (guest rooms, engineering, Food and Beverage, irrigation, Cooling/HVAC, laundry)
4. Meter use
5. Physical Property characteristics
6. Corporate Culture and Norms
7. Investment criteria
8. Willingness to adopt additional conservation measures

2.3.1 Survey Participation

The following hotels participated in the survey:

1. Best Western Executive Inn

2. Courtyard Marriott
3. Crowne Plaza
4. Days Inn Town Center
5. Edmond Meany Hotel
6. Hotel Seattle
7. Madison Renaissance Hotel
8. Paramount Hotel
9. Ramada Inn Northgate
10. Seattle Inn
11. Sheraton Towers
12. Sixth Avenue Inn
13. The Edgewater
14. The Roosevelt
15. The Warwick Hotel
16. The Westin Hotel
17. Travelodge
18. University Inn
19. W Hotel
20. West Coast Grand Hotel
21. The Alexis Hotel
22. The Four Seasons

The results of the survey were used to create a field of hotels appropriate to participate in the project.

2.3.2 Survey Findings

A. Measures Adopted

A majority of the hotels surveyed stated they had installed some combination of water conserving measures in the last five (5) years, including six, or 31%, that had adopted the well known towel-linen program in which guests are given the option of not having their towels and linens laundered daily. Ninety percent of the hotels stated they had installed faucet aerators and low flow showerheads, while only 50% had installed low flow toilets in guest rooms. Only 35% of the surveyed hotels stated they had installed low flow urinals in public restrooms although 65% had installed faucet aerators in this part of the hotel. Air-cooled ice machines were used in 60% of the surveyed hotels, although only 5% had what they considered to be efficient commercial dishwashers.

Twenty-five percent, or five (5) hotels, had adopted gray water reclamation or wash and rinse reuse systems (in which the water from the last rinse cycle is stored, filtered and then re-used in a subsequent wash cycle for first rinse). The same percentage of hotels also used what they considered to be high-efficiency commercial dishwashers. These hotels did not necessarily adopt both measures, but either one or the other.

A very small number had adopted or had knowledge of using thawing policies in which frozen foods are thawed in a walk-in refrigerator rather than continuously running water over the food to thaw. This could have significant implications for those hotels serving over 1 million meals a year (large convention and banquet operations).

B. Knowledge of, and measuring water conservation potential

A significant number of the hotel staff and managers were not trained specifically in conservation techniques and measures. Ninety percent did not know or did not have access to cost saving data correlating to the water conservation measures already adopted. Related to this finding, none of the surveyed hotels knew, by department or function, how much water was being used and 55% did not have submeters or deduct meters in the hotel.

C. Ownership and culture

Most of the surveyed hotels, or 85%, are part of larger holding companies, real estate investment trusts (REITs), joint ventures, corporate affiliates, or franchises. The trend in many of these companies, including Starwood Hotels & Resorts Worldwide, Inc. (Starwood), Host-Marriott Corporation and the Kimpton Group, is to purchase existing structures and renovate them rather than starting new construction projects. Accordingly, there may be more serious barriers to installing efficient water conserving measures due to the age, original condition or use of the building.

In addition, many of these hotels are publicly traded so there is considerable pressure to provide an attractive return on investment. Most of the hotel's parent corporations clearly state that their primary business objective is to acquire high quality assets with potential for significant capital appreciation, and to maximize earnings and cash flow. The challenge is to educate the hotels regarding the value of natural capital and the financial and environmental benefits of conservation and efficiency, thereby leading to increases in net operating profits.

Only 26% of the surveyed hotels believed that their parent corporations or joint ventures had a written environmental policy or action plan, although several stated that conservation was integral to their property's overall goals. Several of these companies, notably Hilton, Marriott and Starwood, belong to the International Hotels Environmental Initiative (IHEI) with offices in London, so they already have an environmental policy or presence in overseas operations. Whether these policies "trickle down" to individual properties and policies is unclear.

When asked how certain factors or conditions rated when considering whether to adopt water conservation measures, the overwhelming majority were motivated by knowing their actions are important to the community. 75% acknowledged the inherent value in water as well as the limitations imposed by municipal water storage capacity. Less than half (45%) believed the trend towards "green tourism" or value-based purchasing was important in making water conservation decisions, and 70% were motivated by utility rebates.

D. Financial Decision Making

Over half of the engineers surveyed were not familiar with the hotel's investment criteria, but the majority of those who did know used a payback period between 1 and 3 years, with three using 2-2.5 year payback, three using 1-year payback, and one each using 3 and 7-8 year payback periods. Capital limits were reported as variable depending on where the investment fit into priority based budgeting, available funds, competing interests, occupancy rates and other exigencies. Several reported having unlimited capital funds for water conservation projects but an equal number reported having to secure parent corporate approval for capital improvements of any dollar amount.

When reported, capital budgets ranged from $500 to over $20,000, while several chose to maintain confidentiality regarding such figures. 50% of the surveyed hotels reported having funds available to adopt water conservation measures and 60% had space and willingness to beta-test equipment in one or more of their rooms.

E. Conclusions

A majority of the surveyed hotels were generally familiar with water conservation measures, but were unable to more particularly characterize water use within each department or function, or to measure cost savings associated with such measures. Since most of the surveyed engineers had not received specific water conservation training, their hotels would benefit from receiving more specific information regarding available technology and performance parameters, distributors and cost savings associated with each conservation measure.

In particular, these hotels need more information and help to identify areas of greatest water use, and in using software and other tools designed to measure cost savings. These findings in turn can be used to more accurately forecast, budget and set priorities for capital investments, and communicate to managers and investors.

2.4 Recommendations for Further Research

A recurring theme during the project was the need to conduct focus groups. To facilitate acceptance of water conservation approaches involving the guest, it is essential for the hotels to have a better understanding, and hence comfort level, regarding client acceptance of hotel conservation programs.

Focus groups are meetings held in casual settings with self-selected individuals in which ideas, opinions and issues are discussed. In some cases, one-way mirrors are used and the results are used to shape an organization's policies, approach and implementation to any range of issues. Because the format is discussion based rather than a linear written survey, the researcher can clarify on what basis a person expresses an opinion, or why they would take certain action.

The project team recognized the value focus groups would add to the project. Goals, expected accomplishments, screening questions, and a public notice were developed. Given time and budget constraints on the project however, actual sessions were not held.

Nevertheless, the overall reticence regarding direct communication with guests about conservation issues underscores a fear that environmental initiatives, if shared too directly with the guest, will be a nuisance rather than an enabling opportunity. Given this, a series of focus groups with both actual and characteristic leisure and business guests would provide a better sense of how guests respond to hotel environmental initiatives and the ideal manner in which they are shared with the guest. Focus group results would enable hotels to tailor their communications strategies for water conservation, as well as other environmental issues and subsequent program development.

3.0 OUTREACH EFFORTS

During the course of the project, the team used a variety of educational approaches to water conservation directed towards hotel management and staff. Understanding that the provision of information is rarely enough to change behavior, it is nonetheless the first step that must be taken to facilitate a water conservation ethic, as well as a change in knowledge and attitude.

3.1 Promotion of Towel-Linen Program

There are approximately 26,000 hotel rooms, including B & Bs, in the Seattle and King County area. In downtown Seattle there are 9,655 rooms, the area defined north/south as falling between the Space Needle and Pioneer Square. [1]

Towel-linen programs were one of the first attempts by the US hotel industry to reduce environmental impact and have been a relatively easy and successful way in which to reduce the 180 billion gallons of water used each year by US hotels. [2] The US EPA has now joined the American Hotel and Motel Association (AH&MA) to develop the *Good Earthkeeping* program that developed in-room guest cards and promotional content to facilitate water conservation through these programs. It is estimated that over 3,400 hotels in the US offer towel-linen programs.

The program tends to be the most successful with business travelers who are accustomed to hotel life, who typically do not spend much time in their rooms and who may be more familiar with the more aggressive European conservation initiatives adopted by the tourism industry. In an interview with *Lodging* magazine, Ron Berger of the Sheraton Rancho Cordova, remarked that even with a conservative 25% participation rate in the program, the hotel's utility costs had dropped 5%. [3]

Guest response to towel-linen programs: Perceived guest response has been a barrier to program adoption by certain hotels. The project team found that several larger hotels in the Seattle market declined to adopt the towel linen program because they believed that such programs were not commensurate with luxury service, or the level of service expected from a luxury

line. However, interviews with the regional public affairs manager for the Fairmont Banff Springs Hotel in Alberta, Canada revealed that their luxury hotels, in which rates could exceed $700/night, encountered very few problems with the corporation's towel-linen program. [4]

At the same time US hotels were beginning to consider towel-linen programs, surveys were conducted to assess guest reaction to towel-linen programs. A 1994 study revealed that over 87% of the guests surveyed appreciated a towel reuse program, while only 5.2% did not. [5] A majority of those surveyed indicated they would like to see this option offered on an industry-wide basis, and expanded to include sheets. Guests responding to the survey also indicated they would be comfortable using the same sheets for over 3 days and towels 2. 5 days. [6]

Of the hotels having adopted towel-linen programs, all housekeeping staff responded that guests were very supportive of the programs and in one instance, guests had complained when there *didn't* appear to be a program in place at the time of the complaint. The largest hotel having adopted such a program is the Sheraton Hotel with 840 rooms, and in descending order, West Coast Grand (300), the Hotel Edgewater (239), Marriott Residence Inn Lake Union (234), Warwick Hotel (229), Hampton Inn and Suites (198), Holiday Inn Express (195), Hotel Monaco (189) and the Ramada Inn at Northgate (169). During the course of this project, the Westin Hotel, with 891 rooms, also adopted a towel-linen program, and in fact was warmly received.

With the exception of the West Coast Grand, the Sheraton Hotel, and the Westin, most of Seattle's hotels with 300 rooms and over have not adopted a towel-linen program. Discussion with both engineering and housekeeping staff, as well as research conducted in other projects indicates a variety of reasons for not adopting towel-linen programs. These include:

1. Fear that guests will complain;
2. Management interprets the towel-linen program as being "cheap;"
3. Housekeeping values daily washing as part of its excellence in service;
4. Previous guest complaints;
5. Program was instituted in the past without proper accompanying materials explaining the basis for program adoption;
6. Corporate policy against towel-linen programs;
7. Belief that daily linen service is commensurate with room price.

During the pilot, the project team gave presentations to several hotel's housekeeping and laundry staff regarding the procedures and benefits of towel-linen programs. See *Appendix* 5 for supporting materials that were distributed to the hotels. Of great importance is the manner in which the program is introduced to both staff and guests, and the language used on the towel-linen cards. There are a wide range of cards that can be purchased commercially, and some hotels have designed their own graphic layouts.

Issues to consider when developing a towel-linen program are:

1. Distribute question and answer fact sheet to every department, including national sales and reservations offices, setting forth the basis, benefits and attributes of the program. This will ensure the entire staff and corporate offices are well informed and working from the same level of understanding.
2. Incorporate program discussion into new staff orientation and employee manuals. Retrain all housekeeping and laundry staff to ensure acceptance and understanding.
3. Translate towel-linen cards into languages that tend to be represented in the hotel, including those of both staff and guests.
4. Identify a champion or leader within housekeeping to keep the program invigorated and with high participation, including responses that will graciously acknowledge the complaint yet support the program.
5. Discuss and map out the process by which guest compliments and complaints will be handled with respect to the program.

Towel-linen program adoption can be based on the following principles:

1. There are cost savings in water, sewer, heat, chemicals, staff time and life of linens.
2. Even though it appears to rain frequently in Seattle, water conservation is an essential strategy, particularly during a drought. Rainfall does not equal potable (drinking) water.
3. If water storage capacity is exceeded, new sources have to be acquired at great expense, if possible. This will lead to increasing pressure to raise water rates.
4. Salmon Endangered Species Act (ESA) listings, among other factors, already limit future water supplies.
5. Guests support these programs and there is ample evidence of their acceptance. (A Holiday Inn study indicates over 80% of their business and leisure travelers were more inclined to stay at a place where a towel-linen program was in place.)
6. These programs are a simple, voluntary way to save money and show your guests that you care about your community.

Notes

1.Conversation with the News Bureau, Seattle-King County Convention and Visitors Bureau
2. EPA Office of Water and the American Hotel & Motel Association
3. *Lodging Magazine,* February 1994, p66
4. Interview with Holly Wood, regional Public Affairs manager, Fairmont Banff Springs Hotel, Alberta, Canada
5. *Guest's Perception of Water Conservation Options in Hotels: A Case Study.* McDermott, Mark, Conrad H. Hilton College of Hotel & Restaurant Administration, University of Houston. (Dr. Stephen Barth: 713-743-2430)
6. Ibid. 5

3.2 Management and Staff Activities

A. Health Fair at the Westin

Parts of the team, including SPU's environmental educator, participated in the Westin's health fair during 2000 and set up a booth with information covering the 1% Water Conservation Program, sustainable tourism and water resource and conservation education. The team developed a questionnaire designed to test water literacy that had to be answered verbally before prizes were distributed. In addition, a map showing the water conveyance system for the general area was displayed, facilitating a more focused "sense of place" with respect to our water sources. An *Ecoscape*, a relief structure designed to indicate how water flows through a watershed, was also used. The water conservation display enjoyed over 100 visitors making direct contact with booth staff and the Human Resources Department reported that we were well received.

B. Cedar River Watershed Tour

On a stunning October day in 2000, the team took a group of hotel managers and staff from both hotels to the Cedar River Watershed for a half day tour of one of Seattle's primary water sources. The Cedar River watershed is located northeast of Seattle's boundaries and is home to a wide range of wildlife, vegetation and fish.

The tour started at the Cedar River Watershed education center where the group was given a presentation regarding the geography and history of the watershed, its central role in providing drinking water, as well as a discussion and slides regarding wildlife, timber, salmon spawning and related issues. The group then traveled to Landsburg, the physical place where the Cedar River is split between drinking water diversion to Seattle and all its other uses for wildlife, the Ballard Locks and Lake Washington. The tour ended with a visit to Masonry Dam, Chester Morris Lake and Cedar Falls.

The purpose of the trip was to inspire a sense of place and respect for the water used at both home and in the hotel, as well as to provide a relaxed opportunity to ask questions.

C. Presentation at the Puget Sound Hotel and Motel Engineers Association Meeting

The team gathered at the meeting of the Puget Sound Hotel and Motel Engineers Association to describe the goals and implementation strategy for the hotel water conservation project. Given that most conservation projects are both initiated and directed by engineers, it was an appropriate venue in which to share the context of water conservation. The full text of the materials distributed at this meeting are found in the *Appendix 5*.

D. West Coast Grand Staff Meeting

In November 2000, the team held a staff only meeting in which representatives from most of the hotels' departments gathered. The purpose of the meeting was to introduce the

project, ascertain the general level of understanding regarding water and water conservation, and to provide an opportunity for staff to give their opinions and ask questions in an unrestricted setting.

Some of the questions were designed to help the team design a communications and education plan that would meet the needs of the associates. For instance, we asked if they were the utility, how they would design a water conservation program, using which languages, who the most trusted sources would be, and how to motivate associates to develop a conservation ethic. The results confirmed that fashioning "green teams" or "water smart teams" by department and tying successful competition with incentives would be a good way to solicit participation. The findings are reported in *Appendix 5.*

3.3 Educational and Outreach Materials

Throughout the project, materials were disseminated to both hotels regarding sustainable tourism, how engineering fits into sustainable tourism, geography of the Cedar River Watershed, and final documents designed for:

(i) staff and manager orientation (full text in *Appendix 5*)
(ii) sales and marketing staff, including national sales staff (see *Appendix 5*)
(iii) conference brochure for the West Coast for environmental conventioneers
(iv) poster reminding F&B to thaw in refrigerator;
(v) posters reminding associates and managers to report leaks; and
(vi) this final report, which will be distributed to corporate offices as well as these individual properties.

Hotel managers reviewed the materials before being finalized.

4.0 FACILITY FINDINGS AND RECOMMENDATIONS

4.1 The WESTIN

The Westin consists of two towers connected by a five story "Podium," that houses the restaurants and banquet facilities, check-in facilities, pool, and other common and administrative areas. The South Tower and Podium were constructed in 1961, while the North Tower was constructed in 1980. The South Tower contains 429 guest rooms and the North Tower 462 guest rooms, for a total of 891 guest rooms. The hotel is in an urban setting and there are no lawns or other significant irrigated areas.

Over the years, the Westin has implemented a number of water and energy conservation measures. With assistance from SPU, the hotel has replaced all toilets and urinals serving public areas with 1.6 gpf toilets and 1.0 gpf urinals. The hotel has also implemented partial recovery of steam condensate for use in the air scrubbers (rotoclones) serving several kitchen hoods. About 15 years ago the hotel installed a laundry rinse water recycling system, but this has been recently disconnected.

The Westin is served by two City water meters. One meter serves the South Tower, Nikko's restaurant, and Roy's restaurant. The other meter serves the North Tower, laundry, and most of the Podium including the Main (Banquet) Kitchen, Room Service Kitchen, The Golden Bagel, and the Cantina. There are deduct meters located at each of the two cooling towers (one on the North Tower and one on the South Tower). In addition, the Westin purchases steam from Seattle Steam as a source for most of its space and domestic hot water heating needs.

4.1.1 Overall Water Use

Over the twelve month period from January 1999 through January 2000, the hotel was billed an average of 111,307 gpd for the North Tower service and 66,373 gpd for the South Tower service, for a total of 177,680 gpd for the entire hotel, or 199 gpd per room. The hotel had a peak season billing of 188,890 gpd, or 212 gpd per room during the four months of June through September, reflected in bills dated July through October. Higher peak season use reflects higher summer occupancy rates and increased cooling load. In addition, the Westin uses a monthly average of 1,500 mlbs (thousands of pounds) of steam. Since Seattle Steam has no means of returning condensate to its facility, these purchases represent an additional consumption of approximately 6,000 gpd for steam production at Seattle Steam, which is not reflected in the Westin's bill from SPU.

Overall water use for the Westin is at the high end when compared to other hotels in the Seattle area. This may be partially explained by the existence of on-site laundry facilities as well as several large kitchens. The hotel also has a large number of single pass water-cooled ice machines on the guest floors and in the kitchens, and older high consumption toilets and showers in the guest rooms. In addition, it appears that leakage around toilet flappers in the older toilets may be a significant factor.

A chart showing percentages of the Westin's peak season water use attributable to various end uses is included in *Appendix 4.*

4.1.2 Heating and Cooling

Cooling Towers: Usage figures for the two cooling tower deduct meters is available from SPU billing data. The chilled water loops for the two towers are interconnected, so that during periods of light cooling load only one cooling tower need be operated, generally the north cooling tower. For 1999, water use for the cooling towers ranged from a low of 692 gpd during January (0.8 gpd/room) to a high of 19,809 gpd during July (22 gpd/room). As reported earlier, the two cooling towers consumed a combined annual average of only 5,960 gpd (7 gpd per room) and a peak season (June – September) combined average of 12,260 gpd (14 gpd per room). Approximately 75% of this water is consumed at the north cooling tower deduct meter, even during the peak season. Cooling tower use represents 3% of annual use and 6% of peak season use.

In order to keep dissolved solids from building up to unacceptable levels and causing scale or corrosion, controlled amounts of cooling tower sump water are regularly bled to sewer. Cycles of concentration may then be calculated to indicate what percentage of makeup water is evaporated vs. bled to sewer. The higher the cycles of concentration, the higher the percentage of water evaporated vs. bled. For example, for 5 cycles of concentration, approximately 1/5 (20%) of the water is bled while 4/5 (80%) is evaporated.

Discharge of bleed water is controlled automatically through a conductivity controller. A conductivity meter reading taken from a sample drained from the north cooling tower indicated 175 ppm dissolved solids vs. 30 ppm dissolved solids for domestic water. Taken together, these indicate 5.8 cycles of concentration, which is at the low end of acceptability. Increasing the cycles of concentration from 5.8 to 10.0 would result in savings of 8% of cooling water use, equivalent to approximately 1,000 gpd during the peak season.

Air Washers (Rotoclones): Four air washers are used in exhaust air from the kitchen hoods. Replacement of these air washers would require extensive ductwork. In order to reduce the use of potable water, the hotel uses steam condensate and ice machine reject water to provide water for these air washers for most of the year. At approximately 3 gpm each for 16 hours per day, it is estimated that the four rotoclones consume a total of 11,500 gpd, primarily from recycled sources. If the rotoclones were removed, the captured steam condensate and ice machine reject water could probably be routed to the laundry instead.

4.1.3 Guest Floors

Overview of Guest Floor Use

High-pressure water is pumped independently at each tower for use exclusively on the guest floors and by the cooling towers. Guest floor use includes use both within the rooms (showers, toilets, and lavatories,) as well as use by the single pass guest floor self serve ice machines (one per guest floor). Based upon spot checks on the fixtures in use as well as

daily usage data per fixture per room collected at the West Coast Grand (see the WCG room metering description), the following domestic water use per room, not including any leakage, is computed for a typical room at the Westin:

Fixture	**Daily Use Factor**	**Hot, gpd/rm**	**Cold, gpd/rm**	**Total, gpd/rm**
Toilets	7 uses @ 3.5 gpf	0.0	24.5	24.5
Lavatories & Sinks	1.0 min. @ 2.5 gpm	1.0	1.5	2.5
Showers	12 min. @ 3.5 gpm	28.0	14.0	42.0
Total		29.0	40.0	69.0

During July, high pressure water usage for the North Tower was logged, using an ultrasonic flowmeter, at 60,880 gallons for one day. During the time the flowmeter was installed, the north cooling tower deduct meter registered 4,620 gallons, and 8,400 gallons is estimated for guest floor ice machine use (40 ice machines at 210 gpd per machine). This leaves 47,860 gallons for 462 rooms, or 104 gpd/room for North Tower domestic plumbing. Maximum flow averaged over a one half-hour period was 119 gpm (0.26 gpm/room) and minimum was 12 gpm (0.026 gpm/room).

South Tower high-pressure water was then logged at 59,350 gallons per day over a 5-day period. Subtracting an estimated 7,640 gallons for cooling tower use (12,260 - 4,620) and 6,300 gallons for ice machines (30 ice machines at 210 gpd each), this leaves 45,590 gpd for 429 rooms, or 106 gpd/room for South Tower domestic plumbing. Maximum flow was 102 gpm (0.24 gpm/room) and minimum flow was 15 gpm (0.035 gpm/room). When a block of three floors (39 rooms) in the South Tower were logged at 10 second intervals, at no time did recorded usage fall below approximately 1 gpm (0.026 gpm/room), even around 3:00 AM, despite the fact that all individual events such as toilet flushes and lavatory uses were clearly distinct and accounted for separately. As a constant base flow, this would come to 37.5 gpd/rm, which corresponds closely with the figure of 35.6 gpd/rm unaccounted for as calculated in the table below. This observation reinforced the suspicion that this underlying use could be caused by leaks, most likely toilet flapper leaks. It was suggested that hotel staff systematically check for leaks using dye tablets in toilet tanks. When this was done, it was discovered that approximately 15% of the guest toilets in the South Tower were leaking. Engineering staff subsequently reported that these leaking toilets have now been repaired.

July Use (N & S Towers)	Hot & Cold gpd	Hot gpd/rm	Cold Gpd/rm	Total gpd/rm
Cooling Towers	12,260		13.8	13.8
Guest Ice	14,700		16.5	16.5
Dom. Water Estimate	61,479	29.0	40.0	69.0
Total Accounted For	88,439	29.0	70.3	99.3
Total Logged	120,230			134.9
Unaccounted For	31,790			35.6

Toilets

A spot check of toilets in two South Tower rooms indicated usage of approximately 3.5 gpf. Replacement of 3.5 gpf toilets with 1.6 gpf models, with 429 South Tower toilets at 7 flushes per day and 80% occupancy, would result in savings of 4,565 gpd.

Toilets in the North Tower are estimated at 3.5 gpf, dating from 1980. It appears likely that these 20-year-old toilets may also be leaking, though perhaps not to the same extent as those in the South Tower. It is recommended that that these toilets also be checked for leaks. Replacement of 3.5 gpf toilets with 1.6 gpf models for 462 North Tower toilets would result in additional savings of 4,910 gpd.

With estimated peak season use of 7 flushes/day/room, the combined North and South Tower toilets, not including any leakage, should account for approximately 21,800 gpd, or 11.5% of peak season use. Projected savings from replacement of all guest room toilets is 9,475 gpd, or 5% of peak season use, excluding any savings from leak reduction. Taking into account leak reduction, total savings from guest room toilet replacements could be appreciably higher.

Showers

Showers in both towers were calculated by hotel engineering staff at approximately 3.5 gpm. Cost effective savings in both water and energy should be achievable by changing to either 2.5 gpm or 1.75 gpm showerheads. Westin Engineering staff have tested 1.75 gpm showerheads on one floor with excellent results. It is estimated that showers are used an average of 13 minutes per room during peak season. Conversion to 2.5 gpm would save 11,500 gpd, or 6% of peak season use. Estimated energy savings of 3.8 million Btu would also occur.

Guest Room Lavatories

Guest room lavatories were calculated by hotel engineering staff at about 3.0 gpm, although approximately 5% have been changed to 2.0 gpm aerators. Cost effective savings are achievable by installing 1.5 gpm aerators. In addition to reductions in water use, 1.5 gpm aerators may make cleanup easier by reducing splashing, with no perceptible reduction in convenience to the guest. It is estimated that lavatories account for approximately 4 gpd/room, or 3,500 gpd, 2% of peak season use.

Guest Ice Machines

Single pass water cooled ice machines are located on each guest floor (70 in all). Repeated observations were used to establish approximately 7 hours per day of operation at 0.5 gpm, with an estimated daily consumption of 210 gpd per machine. These machines could be readily replaced with air-cooled models, as they are not in enclosed spaces. Guest ice machines represent approximately 14,700 gpd, or 8% of peak season use.

4.1.4 Food and Beverage

The Westin's F&B operation employs over 300 persons and is comprised of eight (8) distinct kitchens and food/bar operations. Over 1 million food covers are served each year. (A "cover" considered any transaction or sale, whether a cup of coffee or a multiple course meal.) Additionally, over 18,000 bar covers are served each year.

Approach:

In February 2000, a "shadow" walkthrough was conducted at the Westin Hotel's Food and Beverage (hereafter "F&B") operations to determine primary uses of water, and for each primary use to inventory equipment used and to highlight human influences affecting water consumption. In addition, hours of operation were electronically logged for the more significant water using equipment, along with instantaneous flow measurements taken with a stop watch and calibrated flow bag.

Primary uses of water for F&B include:

(1) Dishwashers
(2) Garbage disposals
(3) Single pass water cooled ice machines and guest watering
(4) Prep and Clean-up sinks, including rinsing and thawing under running water
(5) F&B cleaning, including water used to rinse down rolling carts and trays

Dishwashers

(a) Equipment & Process: There are nine dishwashers scattered throughout "F&B", including conveyor machines, single rack machines, and under counter machines. Some of the machines are all fairly old, having been installed when the hotel was built, circa 1960. At some point these machines will need to be replaced, ideally with more water efficient models.

Hours of operation were logged for the three larger conveyor type machines, along with instantaneous flow measurements. The Main Kitchen "Rack Champion" Model 23P dishwasher averaged 2.7 hours of operation per day over a seven week period. Instantaneous flow was 0.5 gpm. The Hobart Model CRS-103 dishwasher in Roy's averaged 16 hours per day over a two week period. Instantaneous flow varied considerably with a high of 5 gpm. The Hobart FT 326 dishwasher in the Fifth Avenue Kitchen was logged at 1.6 hours per day, although it appears that this data logger may have malfunctioned. Instantaneous flow for this machine was recorded at 0.5 gpm.

Based on these observations it is recommended that the Roy's dishwasher either be substantially rebuilt or replaced with a new water conserving model. Other dishwashers may be modified to use less water by: (a) installing or repairing an electronic eye that

activates the rinse arms use water only when dishes are present; (b) installing water conserving upgrades which slow the rack speed and reduce the rinse flow; (c) installing or repairing door curtains and; (d) ensuring pressure of the rinse water from the hot water booster is no higher than 20 psi or as recommended by the manufacturer.

(b) Human Influences and recommendations: People who work in the kitchen can facilitate water savings by only running full loads and pre soaking utensils and badly soiled kitchen ware. Either a small number of frequently used pieces of kitchen equipment, or inadvertent lapses in washing schedules may contribute to washing single or few kitchen pans, pots or utensils in a conveyor dishwasher. This would mean using excess water to wash only one piece of equipment. Additionally, maintenance staff should regularly check for excess water exiting the machine to the floor drain.

Garbage Disposals

(a) Equipment & Process: Six garbage disposals are used by F&B. They are rated at 8 gpm each. Based upon observations and interviews with staff it is estimated they each run approximately 30 minutes/day, consuming a total of 1,440 gpd.

(b) Human Influences: Other hotels report greater success in capturing food without using water by using mesh sink drains to capture food. Staff can be trained to empty food into a food grinder, whose contents are subsequently discarded as garbage, or engineering can remove the disposals and install simple mesh drains.

Ice Machines and Watering

(a) Equipment & Process: The Westin has 13 ice machines in F&B, most of which one are single pass, water-cooled machines.

Hours of operation were recorded, using a Pacific Science & Technology, model RTC-M motor logger, for a water-cooled Ice-O-Matic ice machine located in the Mezzanine Kitchen. Over a one month period, this machine ran an average of 10.8 hours per day. At 1 gpm, this single machine would consume approximately 650 gallons per day. It is recommended that all water-cooled ice machines either be replaced with air-cooled models or be connected to an existing closed loop cooling system.

(b) Human Influences and recommendations: It is a common practice for restaurants to serve ice water automatically when a guest is seated. This practice applies to room service as well as seated service. Moreover, water glasses are refilled when only one-third filled and may be refilled just before the customer leaves the restaurant. Many staff may equate quality service with keeping a water glass filled. A single party may be served 3 glasses of water per cover, containing 4 oz. water and 4 oz. ice per glass. Additional ice loading may be variable for subsequent glasses of water. If water-cooled ice machines are used, up to a half gallon of water may be required to make 4 oz. of ice. Based on 1 million covers/year, over 4,500 gallons of water per day could be used just to provide ice water to all guests. An easy solution to this quandary is to provide ice water only on request.

Prep and Clean Up Sinks

(a) Equipment: The Westin's F&B operation has 35 prep and clean-up sinks, a significant percentage of which do not have aerators. At 5 gpm or greater from an unregulated faucet, excessive water can be used for basic cleanup and food preparation. Installing aerators, in-line restrictors or foot pedals near dishwashing areas could help reduce the water used**.**

(b) Human Influences and recommendations:

(1) Thawing: Of particular concern is the practice of continuously running water over frozen food and to rinse rice, for up to 1.5 hours day. Using 2 sinks at 5 gpm each, one restaurant thawing in this manner would use 900 gallons per day for thawing alone.

Other options for thawing are in-refrigerator thawing (bottom shelf only, covered) or use of a stand-alone thawing unit. In-refrigerator thawing increases the operational efficiency of the refrigeration unit and a self-contained system may help ensure that frozen food is not inadvertently thawed above other product or uncovered. A stand-alone thawing unit uses only 20% of the time of in-refrigerator thawing.

(2) Applicable Law: During the team's outreach to other hotels, we noticed that several F&B staff believed that in-refrigerator thawing was not permitted under the local Food Code, thereby encouraging the use of continually running water. Local Seattle-King County law expressly permits in-refrigerator thawing: "*The food service establishment owner shall ensure that all potentially hazardous foods are thawed… A. In refrigeration units at a temperature of forty-five degrees Fahrenheit (45 F) or less….*"[1]

Consultation with the Director of the Food Protection Program revealed that the only limitations applicable to in-refrigerator thawing pertained to: (i) having the food thaw on the lowest rack possible to prevent dripping on other product; and (ii) ensuring the food was covered. [2]

(3) Rice washing: At Nikko's, rice washing was observed under a flow measured at 10 gpm. We were told that this occurred daily for approximately 2.5 hours per day, which would consume around 1,500 gallons of water per day. Further research indicated that rice washing should be accomplished using an agitation method by which water is sprayed over the rice in a colander, a process that might only take 4 minutes compared to 1.5 hours. It is unclear on what basis rice was being washed in this manner, and may reinforce the need for staff training and orientation to food preparation. Nikko's is a tenant of the Westin and is not directly under Westin staff control, as well as getting no direct billing for their water use.

Notes

1. King County Food Code Title 5: chapter 5.16.020

2. Phone conversation with *Food Protection Program* office, March 2001: (206) 296-4781, 2124 4th Avenue, 4th floor, Seattle 98121

F&B Cleaning

(a) Equipment & Process: Standard mop buckets are used to clean F&B kitchens, as well as pressure hoses for perimeter uses. Water is used to clean loading dock areas, rolling carts, hot carts and other surfaces associated with F&B. For instance, it is estimated that 20,800 gallons water is used each year to pressure wash the loading dock where food deliveries take place. An unspecified percentage of this water is used to clean sticky surfaces occasioned by the hotel's glass recycling program. It is estimated that 40,500 gallons/year is used to wet mop all the F&B kitchen floors and 104,000 gallons/year is used to clean hot and rolling carts. These carts are used to transport food from the kitchen to staging areas and to transport within F&B floors and elevators.

(b) Human Influences and recommendations: Train staff to ensure as little water is used as possible to wash the floors and rolling carts. An entire bucket of hot water may not be necessary to clean nominally clean carts.

Consider using steam table water for initial floor washing and if breakdown of the steam table coincides with cleaning schedules, its higher temperature can facilitate cleaning. Check with the health department to ensure that this subsequent use is in accordance with their policies. This water should be relatively free of sediment and can be poured into mop buckets directly.

If possible, sweep loading docks and only spot wash problem areas rather than power washing the entire surface area. This would ideally become part of an overall water conservation program.

4.1.5 Laundry Operations

The Westin's laundry operation is in-house and consists of 29 staff. Its operations can extend from 12 hours daily to almost 16 hours depending on the occupancy rate, conference and banquet functions and other variables in the hotel.

(a) Equipment & Process: The laundry houses: (i) two (2) 700-lb washers; (ii) one (1) 65-lb washer and (iii) two (2) Maytag top loading washing machines. The 700-lb machines use between 684 and 1,431 gallons per load depending on the type of material being washed and the degree of soil. One load generally equals 640 lbs of material. The 65-lb washers use between 147 and 210 gallons of water per load to wash 50 lbs of material.

The Westin accommodates, on average, 8,000 lbs/day during the slow season (October-April) and 15,000 lbs/day during high season (May-September), meaning that the hotel washes approximately 4.9 million lbs of laundry per year. With an average metered use for

the laundry of 27,000 gpd, approximately 9.8 million gallons of water are used per year, or 2.0 gallons per pound of material washed.

The use of ozone gas, O^3, is an excellent way in which to reduce water use in laundry operations. Ozone systems use air to create ozone gas electrically. The gas then becomes the primary oxidant, or cleaner, for laundry, thereby replacing much of the detergent and bleach, as well as allowing a typical laundry cycle to be completed mostly in cold water. Additionally, fewer rinse cycles are needed to rinse out the remaining chemicals leading to the water savings. During laundering, ozone laundry systems also purify and disinfect wash water; decompose fats, oils and grease (FOG) and soften the wash water with a neutral pH level. [1]

The Westin hotel currently plans to install such an ozone system**.** Other hotels such as the Greenbelt Marriott, saved over $50,000/year in utility and processing costs after installing an ozone system. [2]

(b) Human Influences and recommendations: The hotel discovered that its laundry floors were not sealed, causing inadvertently dropped laundry to be rewashed a second time due to smudging. The hotel plans to seal its floors to reduce second washings.

4.1.6 Westin Housekeeping

The Westin's housekeeping department employs 118 staff and is responsible for cleaning 332,000 rooms annually. In addition, the hotel contracts with an outside company to clean common areas during the late evening, extending from 11 pm through 7 am.

Guest Room cleaning

The team shadowed housekeeping staff for one morning to better understand the relationship between cleaning and water use. We shadowed a senior housekeeper to observe the techniques used to clean and discovered nominal water use. There are up to 42 discrete cleaning steps taken for each room, in which one guest room must be cleaned within a half hour.

*a) Equipment & Process: Water use during room cleaning**

(a) Sink: Sinks faucets ran for 5 seconds during cleaning and at 3.0 gpm, 0.25 gallons of water is used per room. Estimated water use for sink cleaning is 223 gallons/day for all 891 rooms.
(b) Tub/Shower: Shower water ran for 8 seconds during cleaning and at 3.5 gpm, 0.47gallons of water is used per room for this function. Estimated water use for tub/shower cleaning is 419 gallons/day.
(c) Toilet cleaning: Toilets are flushed twice during cleaning; once prior to application of chemicals and scrubbing, and once following this application. The North tower has 3.5 gpf toilets (462) and the South tower has 5 gpf toilets (429). Using an average of

4.25 gallons per flush (gpf), estimated water use is 3,787 gallons/day. Installation of low flow 1.6 gpf toilets would substantially reduce this water use.

Notes

1. *American Laundry News*, Vol. 24, No 11, November 1998
2. EDC Ozone Laundry Systems package: (972) 257-0322
** Total water use for guest toilet room cleaning per year (excluding the use of ice and laundry):* 4,429 gallons/day, for all 891 rooms.
(b) Human influence and recommendations: The initial toilet flush is not necessary if the bowl is clean upon room entry, and by avoiding this step will reduce water use by 1,893 gallons/day. Toilet bowl chemicals should be applied as soon as the housekeeper enters the room, and without an initial toilet flush. Application of the cleaning chemical earlier in the room cleaning process will enable use of a less caustic toilet bowl cleaner (more time to allow the chemical to activate while other cleaning takes place).

Triple sheeting in which three sheets are used per bed, contributes to laundry loads.

The Westin has adopted a towel-linen program in which multiple-night guests are given the choice not to have their linens and towels laundered daily. After tracking average pounds of laundry per occupied room before and after the towel-linen adoption, the results have clearly demonstrated a reduction of over a pound per room average.

Common Area Cleaning

Approach: The team shadowed the graveyard shift to observe partial night cleaning and to ask questions about the process. The hotel contracts with an outside company to provide shift cleaning services that cover:

a. Restrooms
b. Lobby
c. Lobby marble
d. Lobby court bar
e. Entrance and exits
f. Associate restrooms
g. Escalators
h. Public elevators
i. Service elevators
j. Cantina and foyer

Water use applications:

1. Sink cleaning
2. Rotowashing public restrooms
3. Rotowashing pool and spa areas
4. Carpet extraction and buffing

5. Surface cleaning
6. Entry mat cleaning
7. Pressure washing 5th Avenue

(a) Equipment & Process: The contractor is required to bring their own equipment although some may be shared with the hotel. Water using equipment includes rotowashers, mop and bucket systems, carpet buffers, and carpet extractors. Public area shower and toilet cleaning, carpet cleaning and spa draining consume the largest volume of water.

(b) Human influences: The cleaning contract should be amended to require the contractors to be trained in water conservation and energy efficiency, and to actively practice both during the course of their work. Keeping entry areas as clean as possible will reduce the frequency of carpet buffing and extraction, as well as training for F&B staff that are serving in carpeted banquet areas. Unless an area is sticky, the hotel might choose to replace pressure washing with broom sweeping and spot cleaning.

4.1.7 Westin Pool and Spa

The Westin has a 25,000 gallon pool that is drained annually, and two 1,200 gallons spas which are drained twice a week. The team was particularly interested in gauging the basis for such frequent spa drainage as this practice averages 685 gallons/day. The circulation system components of swimming pools, spas and hot tubs are set forth in the National Sanitation Foundation's (NSF's) standard 50-2000, which was designated as an American National Standards Institute (ANSI) standard in January 2000. [1]

The City of Seattle's Department of Health regulates both microbial testing and drainage frequency. The Washington Administrative Code, Chapter 246-260, governs the water balance chemistry of chlorine and pH. This balance determines the frequency of drainage so provided the water chemistry is balanced, spa drainage should be capable of being decreased by half.

Notes

1. ANSI: http://www.ansi.org or (212) 642-4900. The National Sanitation Foundation or NSF standards are ANSI accredited.

4.1.8 Summary of Potential "Equipment Measures"

Seven potentially cost-effective "Equipment Measures" are proposed. Estimated savings potentials and costs are preliminary. It is the responsibility of the hotel to confirm any estimates for their own budgetary purposes. Potential savings from all of these measures combined is estimated at 54,000 gpd, or around 30% of annual average water usage for the hotel. Savings potential could be significantly higher, up to 40%, if reduction in toilet leakage is taken into account.

1. Replace Guest Room Toilets with 1.6 gpf Models

Potential Savings: Savings are estimated at 9,475 average gpd (not including leakage reduction). This would translate into annual dollar savings of approximately $28,000. Savings may be substantially higher after reduced leakage is taken into account.

Potential Cost: Cost will vary with type of toilet selected. For illustration a purchase cost of $90 per toilet is used, plus $30 for in-house installation, minus a $60 per toilet incentive from SPU, for a net installed cost of $60 per toilet, or $53,460 for 891 toilets.

Payback Period: Approximately 1.9 years (not including savings related to leak reduction). Actual payback after accounting for savings attributable to leak reduction could be under one year.

2. Replace Guest Room Showers with 2.5 gpm Showerheads

Potential Savings: Savings are estimated at 8,500 average gpd. Water savings for water and sewer would amount to approximately $28,000 annually. Significant energy savings would also be available. Energy savings resulting from less purchased steam to make hot water will be in the neighborhood of 1,000 mbtu.

Potential Cost: At an estimated $40 installed cost per showerhead, total cost would amount to $35,500. Depending on choice of showerhead, actual cost may be lower.

Payback Period: One year or less when energy savings are included.

3. Replace Guest Room Sink and Lavatory Flow Restrictors with 1.5 gpm Aerators

Potential Savings: Savings are estimated at 2.0 gpd per occupied room, 1,425 average gpd, or $4,800 per year.

Potential Cost: Aerators may be purchased for around $1 each. Total installed cost may be estimated at $2 each, for a cost of $3,564 for 1,782 aerators (2 per guest room). Additional energy savings should apply.

Payback Period: Less than one year.

4. Replace Guest Floor Ice Machines with Air Cooled Models

Potential Savings: 70 machines at 210 gpd per machine equal 14,700 gpd, or $49,000 per year.

Potential Cost: Cost for a replacement 300 lb capacity air-cooled machine, complete with dispenser is estimated at $4,000, minus a $300 per machine incentive available from SPU. Net cost for 70 machines would be $259,000. As existing machines may be nearing the end of their useful life, it may be appropriate to begin a preventive replacement program, scheduled over a number of years. Installation of narrower machines may also allow side by side installation of vending machines, such as for drinks, providing for an increase in revenue. As an alternative, ice machines could be removed from every other floor and replaced with drink machines.

Payback Period: 5.75 years (less if vending machine could be added)

5. Install Ozone Laundry System and/or Rinse Water Recycle

Potential Savings: A 25% reduction in laundry water use would result in saving 6,750 gpd or $19,000 per year for water and sewer. A 20 degree F reduction in average water temperature (27,000 gpd) would result in savings of $18,000 per year for purchase of steam, based on $11 per thousand pounds of steam. Additional savings may be available from reductions in chemical and labor costs.

Potential Cost: Estimated at $79,000.

Payback Period: Approximately 2 years, not counting potential chemical or labor savings.

6. Connect Kitchen Ice Machines to Glycol Loop or Replace with Air Cooled Models

Potential Savings: 5,200 gpd, or $15,000 per year.

Potential Cost: Replacement of 10 machines at an estimated cost of $3500 per machine, minus an incentive of $600 per machine comes to a net total cost of $29,000.

Payback Period: Under 2 years.

Action Taken: Since the initial field work and development of draft recommendations, the Westin has replaced two 600 pound kitchen ice machines with air-cooled models.

7. Replace Dishwasher in Roy's Kitchen with Water Conserving Model

Potential Savings: Projecting average savings of 2 gpm, 16 hours per day, this would result in water savings of 1,920 gpd, with water and sewer savings of around $5,500 per year. Energy savings are estimated at $4,000 per year. Additional chemical savings may also be available.

Potential Cost: Estimated at $15,000.

Payback Period: Under 2 years.

4.1.9 Summary of Potential "Behavior Measures"

Six "Behavior Measures" are proposed. It is difficult to predict exact savings for behavioral measures. However, potential savings from all of these measures combined are estimated at 10,000 gpd, or between 6% of average water usage for the hotel. Savings potential could be significantly higher. Up-front costs are minimal, so the payback for each of these measures should be very attractive.

1. Reduce or Discontinue "Triple Sheeting"

Potential Savings: Approximately 2 gallons of water per sheet, or 1,780 gallons per day for all 891 rooms. Additional savings would be available for labor (both laundry and housekeeping), energy (both for heating water and drying), and laundry chemicals.

Potential Cost: No cost/cost reduction.

Payback Period: Immediate.

2. Increase Cooling Tower Cycles of Concentration to 10

Potential Savings: Water savings are estimated at 500 average gpd (1,000 gpd during peak season). Utility savings would amount to approximately $500 annually. Reduced chemical use may result in additional savings.

Potential Cost: Minimal.

Payback Period: Immediate.

3. Educate Kitchen Staff Regarding Water Conservation

Educate of F&B staff regarding correct techniques for thawing of frozen food, rice rinsing, dishwasher loading and equipment cleaning.

Potential Savings: Water savings estimated at 2,500 average gpd. Utility savings would amount to approximately $7,000 annually. Additional energy savings may be available.

Potential Cost: Minimal.

Payback Period: Immediate.

4. Reduce Toilet Flushes During Room Cleaning

Potential Savings: Water savings attributable to flushing one time less per cleaning are estimated at 3,000 average gpd. Utility savings would amount to approximately $8,500 annually.

Potential Cost: None

Payback Period: Immediate

5. Provide Ice Water Only On Request

Potential Savings: Water savings are estimated at 500 average gpd. Utility savings would amount to approximately $1,500 annually.

Potential Cost: None

Payback Period: Immediate.

6. Reduce Frequency of Spa Drainage

Potential Savings: Water savings from reducing spa drainage to once weekly from twice weekly are estimated at 200 average gpd. Water and Sewer savings would amount to approximately $500 annually. Additional energy savings would be expected.

Potential Cost: Minimal.

Payback Period: Immediate.

4.2 West Coast Grand Hotel

The West Coast Grand consists of a 20-floor tower with 297 guest rooms. All guest rooms are located above the fifth floor. There is an independently operated restaurant in the basement, with it's own water meter, though it appears that hot water to this restaurant is supplied by the hotel. There is also a restaurant and banquet facility operated by the hotel, located on the second and third floors. The fourth and fifth floors are leased as office space to a bank. The hotel is in an urban setting and there are some outside planters, but no lawns.

The building was originally constructed as a bank, but was renovated as a hotel in 1996. As part of the renovation, all guest room and public plumbing fixtures were upgraded to current water efficiency standards.

The West Coast Grand is served by a single City water meter. A separate meter serves The Elephant & Castle, the independent restaurant located in the basement. Deduct meters are in place for irrigation and for the cooling tower. A booster pump provides high pressure hot and cold water to all the guest floors and the cooling tower. A low (City) pressure system provides hot and cold water to the first five floors and basement, including the kitchens, restaurants, public areas, and office areas.

4.2.1 Overall Water Use

Over the twelve month billing period from January through December 2000, the hotel consumed an annual average of 27,600 gpd, or 93 gpd per room. Usage for August 2000 (reflected in the September billing) averaged approximately 37,000 gpd, or 125 gpd per room. Higher peak season use reflects higher summer occupancy rates and increased cooling load.

Irrigation usage as recorded on the irrigation deduct meter averaged only 43 gpd over the two year period, or 0.15 gpd per room.

Overall water use for the West Coast Grand, as measured by gpd per room, is moderate when compared to other hotels in the Seattle area. This may be partially explained by the lack of on-site laundry facilities or large on-site kitchens. Additionally, given the recent renovation, nearly all plumbing fixtures, excluding kitchen sinks, meet current efficiency standards.

4.2.2 Cooling Tower

Cooling tower usage as recorded by a deduct meter is available from SPU billing data. The cooling tower is operated approximately 7 months out of the year. During each of the last three years (1998-2000), peak cooling tower use has occurred during the month of June (July billing). During June of these years, cooling tower use averaged between 8,200 gpd and 11,350 gpd, and accounted for between 24% and 33% of total hotel water use. During

the year 2000, cooling tower use represented 8% of annual use and 16.5% of peak season use (June – September).

Cooling tower usage appears to be much higher than would be expected for a facility such as this. A sample of sump water was taken and cycles of concentration were calculated at 3.3, which is substantially below optimum levels. Hotel engineering staff has indicated that the existing conductivity controller is non-functional and the hotel is interested in installing a replacement, which could be provided by the chemical treatment provider who services the tower. With a properly functioning controller set at optimum cycles of concentration it is projected that cooling tower water use could be reduced by up to 50%.

4.2.3. Steam Heat Exchangers

The West Coast Grand purchases steam from Seattle Steam as an energy source for both space heating and heating of domestic hot water. Recurring problems with malfunctioning steam heat exchangers have been observed and reported by engineering staff. These problems have involved heat exchangers used for space heating as well as heat exchangers used for domestic hot water, and have resulted in periodic dumping to sewer, sometimes on a daily basis, of thousands of gallons of hot water. The exact amount of hot water which has been dumped is not known, but it is estimated that the cost to the hotel is substantial, as costs for water, sewer, and energy are all involved.

Upon our recommendation, the hotel engineering staff has been provided with a submeter from SPU to be installed on the cold water feed line to the heat exchanger for the space heating loop. When this meter is installed it will allow closer monitoring of this heat exchanger. We also recommend that meters be placed on the feed lines leading to both the high pressure and low pressure domestic hot water heat exchangers.

4.2.4 Guest Floors

Guest floor use includes use both within the rooms (showers, toilets, and lavatories) as well as use by water-cooled ice machines that are located on every other guest floor. The booster pump provides high-pressure water to the guest floors as well as to the cooling tower.

Hot and cold water lines leading to a block of four rooms (all occupied) were data logged, with separate logs taken for hot and cold water (on consecutive days) at 10-second intervals for periods in excess of 24 hours. These logs indicated that each room used an average of 22.7 gpd of cold water and 21.0 gpd of hot water, for a total of 43.7 gpd per occupied room.

Close inspection of the data indicated a daily average of 7 toilet flushes per room @ 1.6 gpf, with associated lavatory use of approximately 2.5 gallons per day. Showers were used for an average of 12 minutes per room @2.5 gpm (2/3 hot water, 1/3 cold water) for an average daily use of 30 gpd per room (20 gpd hot, 10 gpd cold).

Fixture	Daily Use Factor	Hot, gpd/rm	Cold, gpd/rm	Total, gpd/rm

Toilets	7 uses @ 1.6 gpf	0.0	11.2	11.2
Lavatories & Sinks	1.0 min. @ 2.5 gpm	1.0	1.5	2.5
Showers	12 min. @ 2.5 gpm	20.0	10.0	30.0
Total		21.0	22.7	43.7

At the beginning of August, usage for combined high pressure hot and cold water was logged at 15 minute intervals, using the ultrasonic flowmeter, at 28,411 gallons for one day (95 gpd/rm). Immediately afterwards, high pressure hot water was logged over a two day period, averaging 5,889 gpd, or 19.8 gpd/rm. During the time the flowmeter was installed, the cooling tower deduct meter registered 450 cubic feet (3,366 gallons) and 1,200 gallons (4 gpd/rm) is estimated for guest floor ice machine use (7 ice machines at 160 gpd per machine).

Assuming 41.5 gpd per room (at 95% occupancy) for domestic plumbing, 16,816 gallons may be accounted for, leaving 11,595 gallons of cold water (39.1 gallons per room) unaccounted for. This unaccounted for use occurred primarily between the hours of 8:30 PM and 11:30 PM.

Aug. Use (High Press.)	Hot & Cold gpd	Hot gpd	Cold gpd	Total gpd/rm
Cooling Tower	3,366	0	3,366	11.3
Guest Ice	1,120	0	1,120	3.8
Dom. Hot Water	5,925	5,925	0	21.0
Dom. Cold Water	6,404	0	6,404	22.7
Accounted For	16,815	5,925	10,890	58.8
Total Logged	28,411	5,889	22,522	95.7
Unaccounted For	11,596	(36)	11,632	39.0

We suggest that further research be done to determine if a specific piece of equipment can be identified contributing to the unaccounted for use. A primary suspect would be the steam heat exchanger used for space heating, as the cold water feed for this heat exchanger comes off this high pressure service.

Toilets

Guest room toilets have been logged at approximately 1.6 gpf. It is understood all toilets are ultra low flush (1.6 gpf) models. Given the low recorded flow around 4:00 AM, it appears that toilet leakage is not a substantial problem. No recommendations are made regarding toilets.

Showers

Showers have been logged at approximately 2.5 gpm, averaging 12 minutes use per room, 2/3 hot water and 1/3 cold water. No recommendations are made regarding showers.

Guest Room Lavatories

From log data, guest room sinks and lavatories are estimated to run approximately 1.0 minutes per day at 2.5 gpm. Cost effective savings may be achievable by installing 1.5 gpm aerators. In addition to reductions in water use, 1.5 gpm aerators may make cleanup easier by reducing splashing, with no perceptible reduction in convenience to the guest. It is estimated that sinks and lavatories account for approximately 2.5 gpd/room, or 740 gpd, 2% of peak season use.

Guest Ice Machines

Single pass water-cooled ice machines are located on every other guest floor (6 in all). During the study period, a residential style 3/4" in line meter was used to measure wastewater from one guest floor ice machine. In addition, a Pacific Science and Technology RTC-M Motor Logger was installed and read following a 13 day period to record hours of operation for the ice machine. The motor loggers were of a type capable of recording total time of operation of an operating electric motor in the vicinity of the logger.

The motor logger recorded operation of the one machine at 7.0 hours per day. Over a 14 day period, the ¾" meter recorded an average of 147 gpd of wastewater from the machine, or approximately 0.35 gpm during operation. Assuming an additional 100 lbs per day of ice production, total water usage would be 160 gpd per machine. The 7 guest ice machines represent 1,120 gpd, or 4% of average annual use. These machines could be replaced with air cooled models, if an exhaust grill were placed in the closets they are in. An existing exhaust duct runs directly over each closet.

4.2.5 Food and Beverage (F&B)

In February 2000, a shadow walkthrough was conducted at the West Coast Grand Hotel's food and beverage (hereafter "F&B") operations. The West Coast Grand's F&B operation employs over 58 staff and includes the restaurant, kitchen and banquet services. Over 146,000 food covers are served each year, a "cover" considered any transaction or sale, whether a cup of coffee or a multiple course meal. Assuming an industry average of around 20 gallons per cover, it is estimated that F&B use is approximately 8,000 gpd.

Primary Areas of Water Use

Primary uses of water are:

(1) Dishwashers and Pre-Rinse
(2) Miscellaneous equipment such as coffee and tea machines, dipwell ice-cream machines and steam tables

(3) Food preparation, including thawing under running water and water used to make soups, stocks, pasta, rice and other menu items
(4) Cleaning, including water used to rinse down rolling carts and trays.

Dishwashers and Pre-Rinse (Hotel only)

(a) Equipment & Process: There is one dishwasher in F&B that is a conveyor C-line type. Upon visual inspection this machine appeared to be operating properly, without excess water draining to the floor sink. However, the pressure gauge for rinse water pressure was missing so that proper setting for the rinse water pressure reduction valve could not be confirmed. It is recommended that a new pressure gauge along with a water hammer arrestor be installed on the rinse line, and rinse pressure checked and set appropriately.

Flow through the manual pre-rinse sprayer was measured at 4 gpm. It is recommended that the spray head be replaced with a new 2.5 gpm unit, very common now in commercial kitchens.

(b) Human Influences: Staff in the kitchen can facilitate water savings by only running full loads and pre-soaking utensils and badly soiled kitchen ware. Either a small number of frequently used pieces of kitchen equipment, or inadvertent lapses in washing schedules may contribute to washing single or few kitchen pots, pans or utensils in a conveyor dishwasher.

Ice Machines and Guest Watering

(a) Equipment: The West Coast Grand has two ice machines in F&B, both of which are air-cooled machines.

(b) Human Influences: It is a common practice for restaurants to serve ice water automatically when a guest is seated. This practice historically applies to room service as well as seated service. Moreover, water glasses are refilled when only one-third filled and may be refilled just before the customer leaves the restaurant. Many staff may equate quality service with keeping a water glass filled. A customer may be served up to 3 glasses of water per cover and contains 4 oz. water and 4 oz ice per glass. Based on 1 million covers/year, over 500 gallons of water per day could be used just for ice water.

This year, the West Coast Grand adopted a new policy whereby for banquet service, they have replace their 12 oz glasses with 8 oz pilsners, placing a pitcher of water on each table. The F&B manager reports that serving water in this manner has reduced water consumption significantly.

The team recommends to both hotels that water only is served upon request for room service and in-restaurant dining, and that coffee and tea press service for one guest be tailored to the amount needed. These presses are typically filled for one-person service, and by the time the guest is ready for a subsequent cup, the liquid has cooled already and must be discarded.

Prep and Clean Up Sinks

(a) Equipment & Process: The West Coast Grand's F&B operation has 11 prep and clean-up sinks, a majority of which did not have aerators and are completely open. At a 5 gpm flow rate, excessive water can be used for basic cleanup and food preparation.

Installing in-line flow restrictors and/or foot pedals in the dishwashing areas would help reduce the water used**.**

Leaks are a common problem for prep and cleanup sinks. Inexpensive ceramic valve retrofits, providing a long term cure for leaks, may be available for many of these faucets.

(b) Human Influences and recommendations

(1) Thawing: Although not specifically observed at the West Coast Grand, thawing frozen food using continuously running water can use significant amounts of water. If water runs continuously over frozen food, assuming a minimum of one hour/week, or 52 hours a year, up to 15,600 gallons of water year is used.

Staff should be educated to use other options for thawing such as in-refrigerator thawing (bottom shelf only, covered) or use of a stand-alone thawing unit. In-refrigerator thawing increases the operational efficiency of the refrigeration unit and a self-contained system may help ensure that frozen food is not inadvertently thawed above other product or uncovered. A stand-alone thawing unit uses only 20% of the time of in-refrigerator thawing.

(2) Applicable Law: During the team's outreach to other hotels, it was noted that several F&B staff believed that in-refrigerator thawing was not permitted under the local Food Code, thereby encouraging the use of continually running water. Local Seattle-King County law expressly permits in-refrigerator thawing: *"The food service establishment owner shall ensure that all potentially hazardous foods are thawed… A. In refrigeration units at a temperature of forty-five degrees Fahrenheit (45 F) or less…."* Discussions with the Director of the Food Protection Program ensured SPU that the only limitations applicable to in-refrigerator thawing pertained to: (i) having the food thaw on the lowest rack possible to prevent dripping on other product; and (ii) ensuring the food was covered.

Miscellaneous

(a) Equipment: F&B also houses a steam table, 4 coffee and tea machines, and the contract restaurant has an ice-cream chiller. The dipper well for the ice cream scoop uses a continuous flow of water to maintain sanitary conditions.

(b) Human influences and recommendations: Ensure that coffee and tea are not over served and that staff is trained to turn off ice-cream chillers and continuous rinse functions when not in use. Dipper well flows can also be reduced by 50%.

F&B Cleaning

(a) Equipment & Process: Standard mop buckets are used to clean F&B kitchens, as well as pressure hoses for perimeter uses.

Water is used to clean loading dock areas, rolling carts, hot carts and other surfaces associated with F&B. These carts are used to transport food from the kitchen to staging areas and to transport within F&B floors and elevators.

(b) Human Influence: Train staff to ensure as little water is used as possible to wash the floors and rolling carts. A full bucket of hot water may not be necessary to clean nominally clean carts.

Consider using steam table water for initial floor washing and if breakdown of the steam table coincides with cleaning schedules, its higher temperature can facilitate cleaning. Check with the health department to ensure that this subsequent use is in accordance with their policies. This water should be relatively free of sediment and can be poured into mop buckets directly.

If possible, sweep loading docks and only spot wash problem areas rather than power washing the entire surface area. This would ideally become part of an overall water conservation program.

4.2.5 Housekeeping

Guest Room cleaning

Approach

The West Coast Grand has a housekeeping staff of 50 and cleaned 83,037 rooms in 2000. The team shadowed housekeeping staff for one morning to better understand the relationship between cleaning and water use. A senior housekeeper was shadowed to observe the techniques used to clean and discovered water used for room cleaning was nominal. There are up to 20 discrete cleaning steps taken for each room, in which one guest room must be cleaned within a half hour.

*(a) Equipment & Process: Water use during room cleaning**

(d) Sink: Sinks faucets ran for 5 seconds during cleaning and at 2.5 gpm, 0.2 gallons of water is used per room. Estimated water use for sink cleaning is 45 gallons/day.
(e) Tub/Shower: Water from the tub spout ran for 32 seconds during cleaning and at an average rate of 6 gpm, 3.2 gallons of water is used per room for this function. Estimated water use for tub/shower cleaning is 728 gallons/day.
(f) Toilet cleaning: Toilets are flushed twice during cleaning; once prior to application of chemicals and scrubbing, and following this application. Toilets are rated at 1.6

gpf, so 3.2 gallons of water are used for toilet cleaning per room. Accordingly, an estimated water use is 728 gallons/day.

** Total water use for room cleaning per day (excluding the use of ice and laundry):* 1,500 gallons/day (for all 297 rooms).

(b) Human influence and recommendations: Very little water is used during room cleaning but chemicals should be applied to the toilet bowl as soon as the housekeeper enters the room, and without an initial toilet flush. Application of the cleaning chemical earlier in the room cleaning process will enable use of a less caustic toilet bowl cleaner (more time to allow the chemical to activate while other cleaning takes place).

The initial toilet flush is not necessary if the bowl is clean upon room entry, and by avoiding this step will reduce water use by 364 gallons/day.

Towel-Linen Program: The West Coast Grand has adopted a towel-linen program that has a 2% participation rate per month. They expect to increase participation as the program matures and housekeeping staff support increases.

4.2.6 Summary of Proposed "Equipment Measures"

Three potentially cost effective "equipment measures" are proposed. Potential savings from these measures combined is estimated at 1,340 gpd, or approximately 5% of annual water usage for the hotel.

1. Replace Guest Floor Ice Machines with Air Cooled Models

Potential Savings: Seven (7) machines at 147 gpd per machine equals 1,000 gpd, or approximately $3,000 per year.

Potential Cost: Estimated cost to retrofit from water-cooled to air-cooled is $3,500 per machine minus an estimated $300 incentive from SPU, for a net total of $22,400 for all 7 machines.

Payback Period: 7.5 years.

2. Replace Kitchen 4 gpm Pre-Rinse Spray Head with 2.5 gpm Spray Head

Potential Savings: Assuming 60 minutes per day of spray head use, 90 gallons per day of water would be saved, for annual water and sewer savings of $260. With energy reductions, annual savings of over $400 may be expected.

Potential Cost: Estimated installed cost is $40.

Payback Period: Approximately one month.

3. Replace Guest Room Sink and Lavatory Flow Restrictors with 1.5 gpm Aerators

Potential Savings: Potential savings are estimated at 1.0 gpd per occupied room, or 250 average gpd. Taking into account energy reductions, annual savings of around $1,200 may be expected.

Potential Cost: Aerators cost approximately $1 each. Total installed cost may be estimated at $2 each, for a cost of $1,118 for 594 aerators (2 per guest room).

Payback Period: One year.

4.2.7 Summary of Proposed "Behavioral/Maintenance Measures"

Six behavioral and maintenance measures are proposed. Potential savings potential from this measures combined is estimated at over 8000 gpd, or approximately 30% of annual water usage for the hotel.

1. Monitor and Improve Performance of Steam Heat Exchangers

- Install sub-meters on cold water feed lines to all heat exchangers.
- Monitor and log sub-meter readings regularly.
- Perform repairs as necessary to avoid excess use.

Potential Savings: Estimated up to an average of 5,000 gpd. With energy savings included, savings could be in the tens of thousands of dollars per year.

Potential Cost: To be determined

Payback Period: Likely less than one year

2. Monitor and Improve Performance of Cooling Tower

- Install a new conductivity controller.
- Instruct water treatment service provider to increase cycles of concentration to 10.0.
- Log cooling tower water usage and conductivity readings at least monthly.

Potential Savings: A reduction in water use of 25% - 50%, resulting in a peak season reduction in cooling water of 1150 – 2300 gpd, for an annual savings of $1250 - $2500 per year.

Potential Cost: Estimated cost including installation is around $1000. An incentive of up to 50% may be available from SPU.

Payback Period: Less than one year.

3. Monitor and Improve Performance of Dishwasher

- Install a pressure gauge and water hammer arrester on dishwasher rinse water line and adjust pressure per manufacturer's recommendations.
- Install a sub-meter on the dishwasher hot water line and monitor usage. Perform maintenance as necessary to avoid excessive use.

Potential Savings: To be determined

Potential Cost: $500

Payback Period: Likely less than one year

4. Educate Kitchen Staff Regarding Water Conservation

- Educate F&B staff regarding correct techniques for thawing of frozen food, rice rinsing, dishwasher loading and equipment cleaning.
- Install flow restrictors at sinks commonly used for thawing of frozen foods.

Potential Savings: Water savings are estimated at 1,000 average gpd. Utility savings would amount to approximately $3,000 annually. Additional energy savings may be available.

Potential Cost: Minimal

Payback Period: Immediate

5. Reduce Toilet Flushes During Room Cleaning

Potential Savings: Water savings attributable to flushing one time less per cleaning are estimated at 350 average gpd. Utility savings would amount to approximately $1,000 annually.

Potential Cost: None

Payback Period: Immediate

6. Provide Ice Water Only On Request

Potential Savings: Water savings are estimated at 250 average gpd. Utility savings would amount to approximately $700 annually.

Potential Cost: None

Payback Period: Immediate

5.0 Tools for Behavioral Change

5.1 Developing A Water Management Plan

Historically, short-term engineering retrofits and other projects initiated based on peaks in natural resource costs have lead conservation and efficiency efforts. It is preferable to have businesses, including hotels, develop a long-term management plan that addresses broad sustainability principles. Particularly as the Pacific Northwest experiences a regional crisis of both water and energy availability, it is an appropriate time to evaluate the need for such a broad platform.

As a result, (hereafter referred to as "SPU") recommend that the pilot hotels, as well as all area hotels, adopt a water management plan. To optimize performance, this plan should be adopted in the context of a broader sustainability action plan, thereby guiding future resource use and assisting the hotels in integrating economic planning with natural resource use and its impacts.

Why conservation matters

"Water is silky, dense, and poetic stuff. It's cohesive, yet it parts under pressure, eluding touch. On a recent trip to hot springs on the Peninsula, I had the opportunity to think about this. The delicate, sulphorous mist hanging above the pools was a substance that fit no category: Almost liquid, yet airborne, it was inhalable in its thousands of little microdots. The delicate mist's layers captured light and fell into diving currents, pulled by wind. Water is an indelible, continuous link between plants, animals and everything alive; this taut configuration seems at once startling as a dream and astonishingly real. At the same time, water is a frank necessity."

[Stacey Levine; "Watered Down," August 3, 2000. Reprinted with permission from the Seattle Weekly]

How can this be more beautifully stated, yet we treat water like an antiseptic topic, often losing sight of its miraculous qualities. It is the reason why we conserve for without it, nothing lives. Under drought conditions, this sense of urgency will be heightened. We must conserve because there is no "new" water, meaning that rain does not necessarily translate into potable drinking water. The hydrologic cycle is part of an ancient cycle of water of which only .05% is available for human and animal use on Earth.

Local Conditions and Sources

SPU and its purveyors -- the cities that provide water to residents, commercial and industrial businesses in Seattle and its surrounding areas-- protect public drinking water supplies by prohibiting commercial activities from taking place in their watersheds, and ensuring they are protected from outside access. Both the Cedar River and Tolt River watersheds, the

land area draining into these rivers, provide drinking quality water to over 1 million persons each day (estimated 150 million gallons/day).

The Limits to Expanding Water Supplies

In 1996, the Seattle City Council asked SPU to complete a *Water Conservation Potential Assessment (CPPA)* to review conservation potential. According to the Assessment, up to 31 millions gallons per day (mgd), or 16% of the water used between June and August, can be conserved each year within the next 20 years, with no reduction in customer's ability to use water and with satisfaction with services. It is difficult, if not highly unlikely, that SPU can develop new water sources outside existing ones due to geographical, political or financial limitations. Beyond 2013, based on current projections, water demand will exceed supply and conservation initiatives will be mandatory rather than voluntary.[1]

To complicate the region's 2001 drought conditions, the National Marine Fisheries Service (NMFS) the previous year had declared several species of salmon "threatened" under the federal Endangered Species Act (ESA), thereby invoking a series of measures to help in species' recovery. Providing minimum instream flows for salmon migration is essential to their recovery and accordingly, our conservation efforts play a crucial role in this recovery process.[2]

Benefits of Conservation

Since water is a shared resource between individuals, businesses, industry, farmers and wildlife, conservation assists in the development of sustainable communities, including a sound economic base from which to responsibly manage growth in the region.

- *Reliability:* Water efficiency, the same concept as water conservation, extends water resources and provides a measure of reliability for water resources. The time of year in which water demand is highest happens to coincide with the region's dry period, extending from June through September. Conservation measures will make less likely severe water restrictions

- *Postpone Rate Increases*

- *Decrease water costs by decreasing use (including sewer, heat, pretreatment, chemicals, energy)*

- *Ensure habitats for animals and ecosystems are maintained*

- *Your guests are paying attention to the manner in which the hotel uses water*

- *It is a fundamental platform of sustainable tourism*

- *Future generations depend on our intelligent use of water*

Water Management Principles

Water management applies not only to the equipment and physical processes that use water, but also the human and corporate influences on water use. Water management can be categorized as:

1. Loss reduction (leak detection in faucets and pipes)
2. Equipment and process water reduction
3. Water reuse (closed loop systems)
4. Demand reduction (through programs and incentives)

Reduction in water demand and use correlates to savings in chemical use, energy, treatment costs (wastewater), cooling and boiler use, and pretreatment.[3]

Set Goals and Performance Measures

Set forth specific goals that can be achieved within a discrete period of time. For instance, set department level reductions, expressed in gallons per day, gallons per minute and gallons per function (e.g.; cleaning, dishwashing, guest watering). Establish dates to achieve the goals and set priorities such that the easiest, referred to as "low hanging fruit," are accomplished first. Performance measures are the measures the hotel would establish to gauge whether its programs and conservation efforts are actually reducing net water use. Linking them with goals and priorities that are mutually developed can optimize their effectiveness.

Secure Upper Management Support

General managers, regional managers and the Chief Executive Officer **(**CEO) of the parent corporation must make a demonstrable commitment to water conservation and sustainability to ensure a water management plan works over the life of the hotel. This commitment needs to be more than just a generalized notion but ideally should be in writing, with goals, incentives and enveloped in a more comprehensive sustainability plan or EMS.

Please see the discussion below for more information on trends in sustainable tourism.

Develop a sustainability or Environmental Management Plan

Water conservation or efficiency is part of an overall environmental management plan for improving efficiency, reducing operating costs and natural resource impacts, thereby giving the hotel a central point around which to secure loyalty by both managers, staff and returning guests. A sample might be:

The [hotel] is committed to long-term water conservation, in the context of a broader environmental management plan. It is the policy of [ ] hotel to improve efficiency, reduce natural resource impacts and work through its staff, community and investors, to make continuous improvements in environmental performance.

Developing A Water Management Plan

1. Develop a Water Use Inventory

Using the information provided through the SPU pilot, collect all facility information, paying particular attention to meters, submeters, data logger results and review the hotel's facility operating schedules.

Conduct a Facility Survey: Conduct a walk-through of the hotel and:

- List all equipment and processes that use water
- Identify staff functions that use water
- Log consumption for each device and adjust flow rates for fixtures such as faucets to an average or typical flow rate
- Meter large equipment
- Record hours of operation for fixtures, processes and staff related functions (cleaning, thawing)
- From the project data in combination with your own, determine a daily facility consumption rate
- Note issues having an impact on water consumption such as leaks, policies (refilling drinking water when glasses are half full), single-pass cooling flows, outdated equipment. Record these.

Prepare Estimated Water Balance: Use the categories set forth in this report, including the behavioral aspects of water use (water use that is contingent on policy, training, habit or internal rules outside of the equipment itself). Develop a water balance for three periods: May to October; November to April and Annual (January-December).

2. Water Management Options

Evaluate Options: Options may include simple changes such as adopting a vigorous leak detection program, replacing toilet flappers, or changing the frequency in which guests are provided drinking water, or may be more involved, such as closing single pass systems and replacing equipment.

Perform Economic Analysis: You may consider extending your payback period for those management options that will yield longer term value, such as installing an ozone laundry system or replacing inefficient equipment that has a particularly high number of units, such as ice machines.

Estimate Total Cost of Water: Calculate the water, wastewater and sewer charges, seasonal costs, heating and cooling, chemical and other treatment costs (cooling tower, boiler feed) should be calculated using current prices. However, energy related expenses such as pumping and heating may need to be converted into unit costs.

3. Implementing the Plan:

Develop A Water Management Plan and Schedule: Establish priorities for your water management options and develop a work schedule that accounts for budgeting, delays, and seasonal impacts on ability to carry out the action (will high season occupancy interfere with the project?).

Communicating the Plan: Ideally, a letter of support from both the corporate CEO and the property's General Manager, should be distributed to all managers and staff, including the company's Board of Directors. This letter could set forth the priority of water conservation as a cornerstone of the company's environmental policies. Both hotels in the pilot have already adopted a wide range of environmental options, including lighting retrofits, energy management, proposed ozone laundry, changes in providing guests unsolicited drinking water, food donation and recycling. Given this progress, it is not a substantial step to encapsulate this progress and fold it into a broader policy that highlights water conservation.

For instance, Fairmont Hotels (previously *Canadian Pacific Hotels and Resorts*) developed its comprehensive environmental program by asking staff throughout the chain their opinions about the corporation adopting an environmental policy and programs. They overwhelmingly supported program adoption and have been instrumental in refining its policies and implementation over the last ten years. [4]

- Post signs in the back of the house.
- Establish department "green teams" that can engage in friendly competition to reduce water and other natural resource use. Make sure managers are involved, set clearly defined goals and communicate with sales and marketing so they are both engaged and informed about progress.
- Goals should be specific, measurable and achievable.
- Provide incentives to inspire cooperation. These incentives may vary from person to person and could include compensation time, time off, flex time, cash bonuses, gifts, public recognition, or increased control over work.
- Communicate about your progress through staff newsletters, bulletin boards, through paycheck inserts, special events and staff meetings. The West Coast Grand has routinely promoted water conservation and other issues in its associate newsletter, *The Grand Coaster*. In its most recent issue, it highlighted the region's water and energy crisis, giving tips for reducing impacts.
- Work with SPU, Seattle City Light and related agencies to help your associates conserve water and energy at home, as well as work.
- Ensure existing and new associates and managers read the hotels' new Water Orientation Manual.

Implement the Water Management Plan: Ensure that everyone knows what their role is with respect to the water management plan so responsibility is not shifted to other

associates and managers. Everyone in the hotel must have some role in the plan's implementation and success. Display the plan's progress in areas where associates and managers can chart reductions in water use and associated costs.

Monitor the Water Management Plan: Once the plan has been initiated, monitor reduction in water use by: (a) equipment; (b) process; (c) time of day; (d) function and (e) department. Make adjustments to your plan if required and develop internal procedures or implementation, evaluation and revision. These procedures should be shared with associates and managers outside the Engineering Department, and if it creates new work for them, should be developed with their input.

Notes

1. *Water Conservation Potential Assessment,* Seattle Public Utilities, May 1998. http://www.ci.seattle.wa.us/util or (206) 684-SAVE
2. King County Endangered Species Act homepage: http://www.metrokc.gov/exec/esa or 1-877-SALMO
3. *Facility Manager's Guide to Water Management,* Arizona Municipal Water Users Association Regional Water Conservation Committee and Black and Veatch, August 2000. http://www.amwua.org/fmgtwn.pdf and (602) 248-8482 (this report provided the basis for this section's work and SPU gratefully acknowledges AMWUA's work)
4. *The Green Partnership Guide: A Practical Guide to Greening Your Hotel,* Fairmont Hotels and Resorts, 2001. http://www.fairmont.com and (416) 874-2600

5.2 Promotion of Sustainable Tourism

Water conservation measures adopted by lodgings, which include hotels, motels, B & Bs/country inns, bungalows and cottages, are often undertaken coincident with a more comprehensive environmental management program. Agenda 21 for sustainable tourism was born in the wake of the 1992 Rio Earth Summit, occasioned in part by the growing realization that tourism had profound, and incontrovertible, effects on natural resources and economic growth.

Agenda 21 was designed and implemented by the World Travel & Tourism Council (WTTC), the World Travel Organization (WTO) and the Earth Council.[1]

Shortly after Agenda 21 became effective, Inter-Continental Hotels approached the Prince of Wales Business Leaders Forum in London to promote its recently adopted environmental initiative and urged the Forum to create a standing body to address environmental issues within the lodging industry.

It is now known as the International Hotels Environment Initiative (IHEI; www.ihei.org) and is supported by the largest hoteliers in the world, including Marriott Corporation, Hilton, Holiday Inn, Inter-Continental, ITT Sheraton, Starwood Lodging and American Express as its first corporate sponsor. IHEI fosters the development and practical implementation of sustainable tourism practices and enjoys a growing membership. [2]

Many of the domestic examples of environmental management or sustainable tourism practices, are the product of IHEI affiliation and/or the exploding market for ecotourism. The monikers "eco-tourism," "green tourism," "adventure tourism," "responsible tourism," "sustainable tourism" and "green travel" are frequently used interchangeably.

Most of the early models of sustainable tourism development were spurred by desires for foreign exchange as well as to capitalize on the ecotourist market. In many of these developing countries, natural capital is the primary economic base upon which earnings are predicated.

Domestically, largely economic considerations and gentle pressure from federal and state authorities motivate hotel environmental management programs. EPA's Office of Wastewater Management developed Water Alliances for Voluntary Efficiency, or WAVE, to engage hoteliers in water conservation measures. The Department of Energy sponsors the Hospitality Industry Forum on Energy Conservation (HIFEC), administered by Battelle and aimed at introducing energy efficient and effective lighting, equipment and other measures to the lodging industry. It was responsible for financing one-third of the microfiltration system for water re-use by Red Lion Central Laundry in Portland, Oregon (now owned by DoubleTree Inns).

More recent developments include EPA' Sustainable Travel and Tourism Program, [3] Resources for the Future's report on the environmental impacts of tourism, [4] The Conference Board's development of Business Enterprises for Sustainable Travel, [5] and the

Seattle/King County Convention and Visitor Bureau program on tourism and the environment. [6]

In several states, solid waste utilities have developed programs directed at lodgings for solid waste reduction and recycling. Domestic examples include the Green Key program in Portland, Oregon (Metro); waste prevention tips for hotels in New York City (NYC Bureau of Waste Prevention, Reuse and Recycling); pollution prevention tips for inns, hotels and B & Bs in Vermont (Vermont Small Business Development Center); Resort Recycling project in Minnesota (Minnesota Office of Environmental Assistance); Eco-Lodgical Waste Reduction Program (NC Department of Environment and Natural Resources); and the more ambitious Georgia Hospitality Environment Partnership which integrates cooperation from tourism associations, business, tour operators, recreation, arts and environmental groups.

Solid waste reduction taken in isolation is not enough to ensure successful programs. The more successful Asian, Canadian, Caribbean, and European models for sustainable tourism incorporate elements such as pollution prevention, supplier relationships, packaging reduction, energy efficiency, water conservation, materials use and reuse, composting and community relationships. These programs place the lodging in a pivotal role vis-a-vis the cultural and environmental milieu and give us a context through which to implement the hotel education demonstration project.

Finally, the Green Hotels Association, a stable of light manufacturers and distributors for environmental hotel products (e.g.; faucet aerators, bulk personal care dispensers), consulting firms and the few new companies whose Presidents came to their own personal epiphany (usually through a child or reading Paul Hawken's "The Ecology of Commerce") form the remainder of our domestic "green hotel" facilitators.

Placing Water Conservation in Context

"Another way to see [ecotourism] is as a tourism development which is sympathetic to, complements or is employed as a vehicle for conserving and sustaining natural and cultural environments and can be described as sustainable, green, or alternative tourism. Because cultural and natural landscapes are indivisible, ecotourism works at marketing to and attracting tourists to rare and beautiful ecosystem (*sic*) while still including cultural attractions."(Tanya Headley, 1995).

Accordingly, hotel water conservation can be viewed as the first step towards introducing responsible tourism to the tourist, and incorporating the principles of ecotourism into all travel venues. "Tourist" is broadly defined as any person who is experiencing a new sensation, experience or destination outside of their physical home and routine.

In Washington State, most hotel guests actually reside in the State and may therefore be more amenable to linking personal behavior and value-based purchasing with travel. "Value-based purchasing," means the purchase of goods and services by individuals or groups, which reflects the personal value system, beliefs, and morals of the consumer. For

those people unable or unwilling to invest publicly in companies, it is often the only means by which to direct personal destiny, speak through dollars and help to shape business behavior and outcomes. It is a very powerful tool that underscores the proliferation of socially responsible investing and green marketing. [7]
Water conservation ideally must be viewed within the larger context of urban green tourism, or responsible tourism, whereby both the guest and the lodging can play an active, positive role in improving the local environment and reducing tourism impacts.

Defining sustainable tourism and travel

- Planning, development and activities, including purchased products, that will ensure future generations they can meet their own needs
- Requires long term planning and defining a vision
- Involves every person in an organization
- Extends to every facet of the tourism industry, including hotels

Involving tourism and travel sectors in sustainability

- The sector is represented everywhere: lodging, food, recreation, national parks, culture, natural areas, interpreters, retail, transportation, banking and insurance
- It is universally connected to the physical and cultural environment
- Growth patterns are creating pressure on sensitive areas
- Balanced planning ensures long term economic stability and healthy communities
- Growing public demand for accountable, responsible business practices
- Can promote best practices and loyal customer base

Drivers of sustainability

- Enhanced public perception
- Customer appeal in that they can reward those businesses providing environmentally preferable services
- Avoids regulatory pressure if adopted voluntarily
- Individual control over local use of resources
- Economic incentives: green is lean and clean
- Diversifies tourism experience by meeting demand for greater educational experiences
- Public pressure and growing market demand, particularly in the NW
- Lack of interest in touring "devastated landscapes"

Notes

1. *WTTC* is an international organization comprised or 115 of the world's leading tourism and travel CEOs. Its purpose is to raise the level of tourism as a strategic economic and employment priority, develop policy to ensure sustainable development, with dedication to the more accurate analysis of the economic impacts of tourism, barriers to tourism

and promoting competition and open markets. WTTC partners with a related organization known as Green Globe, the environmental management program for travel and tourism companies. It was developed in 1994 by WTTC and has the support of over 20 international industry associations, representing thousands of businesses worldwide, the WTO, the United Nations Environment Programme and the Earth Council.
WTO, an intergovernmental organization, promotes tourism as a significant means towards peace and understanding, fostering international economic development and international trade. Its environmental section works to ensure that new tourism development is properly planned and managed to protect natural and cultural environments. The Earth Council is a non-profit developed to advance the implementation of the Earth Summit agreements. It enjoys support from international members drawn from business, politics, the sciences and non-governmental organizations.

2. *The International Hotels Environment Initiative*: 15-16 Cornwall Terrace, Regent's Park, London NW1 4QP, United Kingdom. 44 (1) 20 7467 3620 and www.ihei.org and info@ihei.org. They publish an excellent magazine, *The Green Hotelier,* which can be ordered by writing: IHEI Order, MMC, PO Box 148, Aldershot, Hants, GU12 4GN, UK or by writing ihei@mmcltd.com.

3. *Environmental Protection Agency*, Office of Policy, Strategic Sector Program, *Sustainable Travel & Tourism Program*, 401 M Street SW, Washington, DC 20460; (202) 260-2765.

4. *Resources for the Future*: http://www.rff.org; (202) 328-5121

5. *Business Enterprises for Sustainable Tourism:* BEST, Conference Board of NY, (212) 339-0335; best@conference-board.org and http://www.sustainabletravel.org

6. *Tourism and Environment Program*: Seattle/King County Convention and Visitors Bureau; http://www.seeseattle.com or tourism@pugetsound.org

7. The Green Money Journal: http://www.greenmoneyjournal.com; (505) 988-7423 and info@greenmoneyjournal.com

5.3 Using behavioral change to create a conservation culture

Creating a conservation culture

Conservation behavior is a learned, shared norm that is developed with the guidance, direction and support of the corporate office and other associates. Although it is fair to say that some unspecified number of people are interested in water resources, that generalized sense does not necessarily translate into direct conservation behavior, particularly at work, unless directly supported and encouraged by the employer.

Overarching Mission Necessary

In addition, piecemeal approaches to conservation can be confusing and reactive, such as when businesses adopt projects and temporary pilots in the absence of an overarching policy, mission, goals and measurable targets. For this reason, an ideal approach is to develop a facility wide conservation and sustainable tourism policy within which water conservation goals are easy to understand, incentivized and supported by the corporate office. To facilitate a conservation culture, one must reach beyond traditional engineering approaches to natural resource issues and evaluate the underpinnings of behavioral change.

Behavioral Change Research Findings

Traditional methods of environmental education, outreach and program activity predicate change based on providing information. The overwhelming body of behavioral science research suggests that information alone is rarely enough to change entrenched habits that have environmental impacts. [2]

The following basic guidelines should be used in developing water conservation projects:

1. Identify both internal and external *barriers* to change and remove or minimize them. If the corporate office has a short return on investment criteria that prohibits more expensive, but highly effective retrofits, work with them to change those criteria. Discuss how sustainable practice is economically preferable and help create a culture of opportunity and change.
2. Give people and the organizations they work in the *tools to change*: what's the issue, who to call, what to do. It can be as simple as giving out phone numbers and the authority to make change in each department, for each person's position.
3. Information must come from a *credible source* the receiving audience will listen to. Based on staff meetings, this might be the chief engineer, their peers, or the hotel magazines and periodicals read for current trends. Despite the trend in anti-governmental sentiment, local government is still considered a good source because it is relatively impartial and objective.
4. *Use champions from the same industry*. For the hotel sector, hotels will be more interested in what other lodging companies are doing. Accordingly, a case method approach would be useful in encouraging change.

5. *Tailor information* specifically to the sector and use the types of persons characteristic of that industry in collateral development.
6. Provide *immediate and regular feedback* to support the desired behavior. Remote feedback is less effective.
7. The *message should be frequent, positive* and the action framed such that the receiving audience believes it is losing something, as opposed to gaining something, as the result of not taking certain action (you lose by not practicing water conservation).
8. Use focus groups to ascertain whether "conservation" and "efficiency" impart the same meaning. Even though they are essentially the same, research findings suggest that the word "conservation" is viewed as having to sacrifice something of value, and therefore people are resistant to the notion.
9. Design methods and tools in such a manner that persons and the organizations they work in can "pay attention" to water efficiency and water demands in the *context of their daily experience*.
10. Gently permit people to recognize their own internal barriers to change and help *create well-designed social pressures and social norms* that favor water efficiency behavior, attitudes and practice.
11. Understand the audience's *unique perspective* and barriers to change.
12. *Use existing social networks* to diffuse information and use effective opinion leaders in the same organization and industry. [3]

Notes

1. *Center for Watershed and Community Health*; http://www.upa.pdx.edu/CWCH/ (503) 725-8101
2. *Environmental Problems and Human Behavior,* Gardner, Gerald and Stern, Paul. Allyn and Bacon, 1996. ISBN 0-205-15605-3
3. *Ibid, Chapter 4*

Blueprint for Getting Started

In addition to establishing a water management plan, take a more integrated approach to what programs, policies and trends the hotel property and its parent corporation have already adopted. Where do you see trends? Most will concern water and energy upgrades, and enhanced recycling. Given our regional water and energy crisis, the time is ideal to assess how these programs are related and to give them both a programmatic umbrella and extend participation to all managers and associates.

1. *The role of the corporate office*

To give your water conservation and related programs a secure and long life, the corporate offices, including all divisions, must actively support your goals. There may be instances where the corporate office is adopting policies that directly contradict your emerging conservation strategies. This can be avoided by ensuring both corporate and hotel policies support a conservation agenda that is economically sound.

2. Assess your current status

In addition to compiling your water inventory, you will want to answer the following questions:

Attitudes

- What is your current policy towards water conservation and related issues?
- What is the attitude of the corporate offices?
- What are the attitudes of those who support water conservation, those who are indifferent and those against it?
- What is the basis for apathy?
- What are the key issues involved getting commitment from associates to implement change?

Knowledge

- What do managers and associates know about water conservation opportunities?
- What are the barriers to producing a water conservation campaign?
- What are the threats to your plan? What makes it vulnerable?
- How water conservation savvy is other hotels in the state?
- What systems/equipment are hindering water conservation?
- How can you improve communication channels to promote your water conservation program?
- What other channels might you consider? (green teams)

Costs

- How have energy and water costs changed over the last 5 years?
- How have costs been apportioned throughout the organization?
- What would a 10% savings in water and energy costs mean to bottom-line contribution or increased service capacity?
- How are water and energy costs likely to change in the future, assuming no further program development?
- Have you evaluated total cost accounting and other ways to apportion utility costs?

Change

- What authority does each manager and associate have to implement the changes SPU and your hotel propose?
- Who has the authority to make change occur?
- Who has the desire to assist in making that change occur?
- What has happened thus far and failed? Why did it fail?
- What has happened thus far and succeeded? Why did it succeed?
- What influencing agents exist outside the hotel? Can they be harnessed to motivate everyone to conserve and find innovative ways to be efficient?
- Which departments can be helpful in implementing your plan? [1]

3. Define what direction you are going in

All the departments should gather to determine what the hotel's water conservation and related goals would be. After setting forth an environmental policy, work on developing a list of quantifiable, measurable outcomes you can aim for. They should be separated into both short term and long term goals. Set specific targets and implementing strategies for each goal. Make sure you define who will take the lead for each goal, how different leaders will collaborate and the communication methods you will use to achieve coordination.

More specifically, your outcomes should be: (i) simple and specific; (ii) measurable; (iii) achievable; (iv) realistic and (v) timely and track able. Each outcome should be supported by specific objectives.

Outcomes or Goals> Objectives> Targets
Measurement> Feedback loop> Revision

4. Communicate expansively

Water conservation goals cannot be achieved unless each and every associate and manager is aware of what these goals and objectives are. Consider the informal pathways by which associates and managers communicate -- it may be word of mouth, lunchroom conversation, journals, meetings, or outside socializing.

There is a correlation between home conservation and work conservation unless the employer establishes barriers. Work with SPU and City Light to establish small kits for your associates and managers so they can start adopting efficiency behavior at home. This will increase the likelihood of this behavior at work. [2]

1. Establish a written water conservation policy, goals and objectives
2. Distribute to all associates and managers
3. Convene a meeting that focuses specifically on water and energy issues
4. Ask associates for their opinions and whether they support the project
5. Establish green teams, and interdepartmental water wizard teams to help inspire, create, and enable associates to own the project and derive benefits directly when the goals are achieved
6. Ensure that associates, corporate offices and your guests understand what you are doing, why and what the results are
7. Communicate with investors and learn more about how the socially responsible investing community can affect your business and respond to what you are doing [3]

5. Determine your strategy

1. Ensure commitment from top levels
2. Appoint champions
3. Ensure organizational commitment

4. Promote water conservation as a corporate product
5. Reduce water costs without detriment to guests, associates, performance or quality
6. Monitor progress and provide feedback

The hotel's water conservation plan should be introduced in a formal roll-out or launch. Conduct a classic SWOT analysis; strengths, weaknesses, opportunities and threats. [4]

6. Tools to get there

Both hotels already have adopted informal and formal communication channels. The following tools will facilitate program adoption and participation:

- Presentations
- Articles
- Workshops
- Brown bag lunches
- Contests
- Internal training
- Videotape production
- Water and energy newsletters
- Posters
- Promotional gifts and prizes (*A weekend at Sleeping Lady?)*
- Sponsorship
- External publicity
- Public relations
- Support from local groups

Notes

1. *Marketing Energy Efficiency- raising staff awareness."* Good Practice Guide 172. Building Research Establishment: http://www.bre.co.uk/bre/otherprg/eebp/default.htm; brecsuenq@bre.co.uk (*"Brescu")*
2.*Id* at 8-9
3. *Green Money Journal:* (800) 318-5725. cliff@greenmoney.com. Given that sustainably managed companies provide a higher return on investment, investors are increasingly interested in, and acting on, the development of sustainable programs.
4. *Brescu* at 11

5.4 Cleaning Chemicals and Janitorial Pollution Prevention

Approach

During the course of the project, the team evaluated chemical use by both hotels to assess where consolidation, reduction in toxicity and elimination of certain constituents could take place. Several municipalities have adopted programs to reduce the use of toxic cleaning chemicals and are typically referred to as "janitorial pollution prevention" or janitorial "P2."

II. Background

Some of the chemical ingredients found in commercially available cleaning products predate the 1976 federal Toxic Substances Control Act (TSCA), meaning that thousands of industrial chemicals were grand fathered into the law and possibly never reviewed by federal agencies such as the Environmental Protection Agency ("EPA", or the "Agency"). EPA has jurisdiction over newly introduced, or post research and development commercial chemicals, but the current structure of the statute, which requires the Agency to balance the costs associated with toxicity testing with risk factors (cost-benefit), cannot ensure that these substances receive full toxicological review. [1]

Particular chemical substances found in cleaning products may cause a range of human health and environmental effects if exposure exceeds recommended levels. This can easily occur when cleaners are used in poorly ventilated areas and/or in the absence of personal protective equipment, such as gloves and dust masks. Many cleaning chemicals absorb readily through the skin within seconds of exposure.

Of particular concern to both local and national environmental and health agencies are chemicals that act as hormone disruptors, including the larger class of alkylphenol ethoxylates, or APEs. APEs are found in many cleaning chemicals and have been banned in several European countries while the National Science Foundation, EPA, USDA, Centers for Disease Control, NOAA, FDA are working to evaluate the risks associated with APEs.

Accordingly, janitorial P2 programs have been developed by non-profits such as the GreenSeal, Scientific Certification Systems, St. Paul Neighborhood Energy Consortium and the Washington Toxics Coalition; cities such as Santa Monica and Seattle and Massachusetts, Minnesota, and Vermont. [2]

Applicable Law

The use of chemicals and the manner in which the associated risks are communicated to exposed staff is governed by the Washington Industrial Safety and Health Act (WISHA) and the WAC (Washington Administrative Code): 296-62, Chapter C.

This reference is to the Hazard Communication Standard and is intended to:

1. Evaluate risks from chemicals
2. Train and educate the people who are exposed to them about these risks
3. Reduce worker injury and illness; lower insurance; comply with law

Responsibilities of Chemical Manufacturers and Importers

Chemical manufacturers and importers are required under this law to evaluate the hazards of their chemicals. Some of the product formulations may not even contain toxic constituents but this body of law has developed in such a way that they produce information about the product formulations even if they are not considered hazardous. Chemical manufacturers must provide a material safety data sheet, or "MSDS", with each first and subsequent shipment of chemicals.

The Hotel's Responsibility under State Law

The employer, the hotel, does not have to evaluate hazards from the chemicals it uses but it does have to:

1. Develop a Hazard Communication Program:

- Obtain and make available MSDSs 24 hours/day (since employees and contractor may be exposed at any time)
- Make sure the MSDSs are current and updated
- Prepare a written program that outlines: how the program will work at the specific place of work, meaning how the employees will be trained, including new employees, language translation and how staff will understand how to store, mix and use chemicals
- Containers must be clearly labeled, including Ready to Use (RTU) bottles
- Identify person or persons at work responsible for developing and implementing a workplace plan
- Procedures must be articulate regarding how MSDSs will be updated
- How the hotel will respond when MSDSs are not provided by the manufacturer/importer
- Employee education and training must be provided for all new employees, and when the hazard changes. This means that each time a new chemical is introduced into the workplace, training must be conducted for that chemical (storage, handling and use).
- **Training elements include:** (1) How employees can detect the presence of release of chemicals (odor); (2) physical and health hazards of hazardous chemicals in the workplace; (3) how to protect themselves (gloves, face masks, ventilation); (4) details of the Hazard Communication Program you have developed
- **Information you must provide**: (1) the Hazard Communication Standard requirements; (2) operations that involve hazardous chemicals (F&B, laundry, engineering, housekeeping) and (3) location and availability of the written program including MSDSs.

MSDS Requirements

- All spaces must be filled in
- Do not accept chemicals where the chemical identity is proprietary. Legally the company can make trade secret claims but as a matter of policy, you should not purchase chemicals with these claims
- If you do purchase chemicals with such trade secret claims, there must be an 800 number to call 24 hours a day in case of exposure
- Labor and Industries can help provide MSDS translation for Cambodian, Chinese, Korean, Spanish and Vietnamese
- MSDSs must be maintained for 30 years

Contractors must provide MSDS to you for chemicals they bring into the workplace and the hotel must do the same for them Findings

Not unlike most businesses, both hotels use a wide range of cleaning chemicals including toilet bowl cleaners, all purpose cleaners, metal finishers, laundry and F&B chemicals and sanitizing agents. The team, in conjunction with the Washington Toxics Coalition, reviewed the MSDSs for most of the chemicals used in both hotels, and also conducted research at the Hazardous Waste Management Program in King County library databases. Scientists in King County, EPA headquarters and the Washington Toxic Coalition were consulted throughout the process.

Of the chemicals used, approximately sixty-seven chemicals, if analyzed critically, would fail the janitorial cleaning chemical criteria adopted by the City of Seattle. [4] The basis for failure include:

1. corrosivity
2. hormone disruptors
3. flammable
4. phosphates
5. EDTA (chelating agent which attracts heavy metals)
6. carcinogens
7. reproductive toxicants
8. combination cleaner/disinfectant

See *Appendix 10* for the list of chemicals.

Alternatives

Given the national purchasing contracts established by corporate offices, it may be difficult for the hotels to purchase alternative cleaning chemicals. Products that meet the City of Seattle's criteria, which are in turn based on the work of several other jurisdictions, will provide a list of sources. Those sources may be found through the Office of Sustainability

and Environment and can be found on-line at http://www.ci.seattle.wa.us/oem/greenpurchasing/envcritjanitorialservices.doc.

The team recommends that both hotels work with their suppliers and ask them to phase out the constituents the City of Seattle has identified as posing unreasonable risks to human health and the environment.

Washington Toxics Coalition Presentation

In March 2001, Dr. Philip Dickey of the Washington Toxics Coalition gave a presentation to both hotels concerning janitorial chemicals. General managers, housekeeping, laundry, rooms division managers and banquet facilities managers attended the meeting. Dr. Dickey distributed the text below to the hotels.

Chemical Hazards

- Flammability
- Reactivity
- Toxicity (includes human and environmental)
- Corrosivity

Hazard and Risk

Risk = hazard x exposure x susceptibility*
*Populations with increased susceptibility
children
elderly
pregnant women
chronically ill
chemically sensitized

Routes of Exposure
Ingestion
Inhalation
Skin/eye

Ingredients of Concern

Concern	Ingredients	Products	Mitigation
Skin/eye burns	Acids, bases, concentrates	Toilet, oven, drain Floor stripper Conc. laundry & dishwasher detergents Bleaches Rust removers	Product selection Avoid contact with concentrates Gloves & goggles
Resp. irritation and asthma aggravation	Bleach, ammonia, solvents	Laundry bleaches, some bath, toilet cleaners, glass cleaners	Product selection Ventilation Respirator
Cancer	Trichloroethylene Perchloroethylene Silica	Dry cleaning fluids Metal polish, spot remover, scouring powder	Process changes Product selection Dust mask
Reproductive effects	Some glycol ethers:* EGME, EGEE, EGDME DEGME, DEGDME	Many products	Product selection Gloves
CNS effects	Solvents: toluene, glycol ethers*		Product selection Ventilation Respirator
Blood, bone marrow damage	Glycol ethers*	Many products	Product selection Gloves
Water pollution	Phosphates	Laundry, auto dish	Product selection Use reduction
Aquatic toxicity	APE detergents (nonyl, octylphenol ethoxylates)	Many products	Product selection
Air pollution, smog	Volatile organic compounds (VOCs)		Product selection Use reduction

*Note: glycol ethers are readily absorbed through the skin. Skin contact increases exposures levels significantly and can be the major route of exposure.

Criteria for Product Purchasing

(blank cell means no specific criterion)

Criterion	**City of Seattle Janitorial Products**	**Green Seal Standard for I&I Bath, GP, and Glass Cleaners**
Hazardous chemicals	No SARA Title III Section 313 listed chemicals	
Toxicity		Must not be toxic
Corrosivitity	prohibited	May not be irritating or corrosive
Flammability	FP > 140	FP > 150
Reactivity	prohibited	
Carcinogens	Prohibited	Prohibited
Teratogens	Prohibited	Prohibited
Phosphates	<.5%	<.5%
Prohibited ingredients	APEs paradichlorobenzene 1,4-dioxane sodium hypochlorite (except in disinfectants) nitrilotriacetic acid sodium EDTA phosphates >0.5%	APEs dyes fragrances (except if active ingredients) sodium EDTA phosphates >0.5%
Aquatic toxicity		May not be toxic
Biodegradability		>60% max CO2
VOCs	<10%	<5% g.p. and bath <8% glass
Ozone depleters	Prohibited	prohibited
Cleaner/disinfectant	Must be separate	

Risk Reduction Strategies

1. Train workers about chemical hazards (training, MSDS info, injuries)

2. Wear protective devices (e.g. gloves, respirators)

3. Reduce unneeded chemical inventory
    Eliminate duplicate products, consolidate, use up

4. Analyze cleaning procedures
    What is the goal of each procedure?
        Level of cleaning required
        Success, failure, or overkill
    Daily versus weekly cleaning protocols
    As-needed versus timed protocols
    Same guest versus new guest
    Give the guest a choice to skip specific services
    Focus on entryways, keeping soil out of building

5. Purchasing less-hazardous products

6. Contact Business Waste Line (206-296-3976) for more information
    Hazardous waste disposal
    Facility audits
    Alternative products

What's in it for you?

*Less chemical use = lower costs
*Less storage space required for chemicals
*Fewer worker complaints and injuries
*Positive environmental message for guests

6.0 Summary and Follow-up

Substantial water conservation opportunities were identified. Many of these water conservation opportunities also provide opportunities for energy conservation. For each of the two hotels audited, potential water savings equaled approximately 1/3 of current water consumption. However, for the Westin, which is an older facility, close to 90% of the projected savings were from equipment measures, while for the West Coast Grand, close to 90% were for "behavioral" measures, primarily related to operation of heating and cooling equipment.

A comparative chart showing usage in gpd per room is provided in the Appendix. Pie charts are also included showing projected savings by measure for each hotel.

Evaluation:

In six months to one year, it will be necessary for SPU to evaluate the progress the hotels have made with respect to their water conservation programs. Such an analysis will provide SPU with valuable information:

1. Did SPU's pilot work achieve its goals more broadly?
2. Did the report and the activities of the project increase literacy?
3. Is a sector approach more effective in increasing water conservation?
4. Who should SPU work with to enhance water conservation in hotels?

Possible Evaluation Methods:

1. **Surveys:** Develop surveys for hotel managers and associates to assess their reaction to the projects.
2. **Telephone calls:** Call hotel managers to assess whether the project has changed water use in the hotel.
3. **Conduct informal associate meetings:** Ask hotel associates what they think progress has been regarding water conservation, including their reaction to SPU's outreach and education efforts.
4. **Water and sewer consumption:** Compare baseline water, sewer and chemical use to calculate reductions in water use. Calculate every month.
5. **Cooling water conductivity readings:** This measures the total dissolved solids for cooling towers and is an indicia of efficiency and water use.
6. **Record guest observations:** Have the hotels keep records of the verbal and written comments regarding water and energy issues, and specifically with respect to the water conservation programs.
7. **Transmit comments received by the City:** Assess whether there is an increase of comments received by SPU concerning hotel water conservation efforts generally, or more specifically with respect to the pilot hotels. Share with the hotels.
8. **Performance appraisals:** Assess whether adoption of water conservation and related programs has increased the overall satisfaction of managers and associates with their

positions and their attitudes towards the hotel. Determine whether there is any correlation between program adoption and decrease in turnover.

9. **Connection with home water use:** Ask for a representative sample of associates and managers to help SPU assess whether program adoption had any effect on water consumption at home and for personal uses.
10. **Hotel Inquiries:** Record frequency of prospective guest and convention groups that request information on the existence of water conservation programs.
11. **Develop performance indicators and use them:** These are standards for measuring how well any program, including this pilot, has met outcome objectives. Each performance measure should tell SPU when change is expected, how much change is expected and how we will know when change has actually occurred.

Follow-Up

SPU may wish to consider developing a communications strategy to transmit this report to interested parties and collaborate with them to refine the pilot's approach. Potential interested parties include:

1. American Hotel and Motel Association
2. American Water Works Association
3. Business Enterprises for Sustainable Travel
4. EPA Region X and EPA's Sustainable Travel & Tourism Program
5. Fairmont Hotels
6. King County Department of Natural Resources
7. Oceans Blue Foundation
8. Pacific NW Pollution Prevention Resource Center
9. People for Puget Sound
10. Resources for the Future
11. Seattle Hotel Association
12. Seattle-King County Convention and Visitors Bureau
13. Select water utility districts
14. SPU's Water Purveyors
15. Washington State Department of Ecology
16. Washington State Hotel & Lodging Association
17. Washington State Public Utility Districts
18. Water Alliances for Voluntary Efficiency- EPA
19. WaterWiser

Appendix 1

HOTEL WATER CONSUMPTION ANALYSIS PROJECT

CASE STUDY REVIEW

Prepared for

City of Seattle
Seattle Public Utilities

By

The RICE Group, Inc.

September 1999

HOTEL WATER CONSUMPTION ANALYSIS PROJECT

CASE STUDY REVIEW

September 1999

Prepared for

City of Seattle
Seattle Public Utilities

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CONTENTS

EXECUTIVE SUMMARY

The City of Seattle has established as a goal a 1% reduction in water use per capita per year for the next 10 years. As part of this effort, Seattle Public Utilities is initiating a pilot program to demonstrate water savings potential in the Seattle Hotel/Motel industry.

Purpose: The purpose of this Case Study Review is to review available literature dealing with water conservation opportunities for hotel properties in order to:

- Collect baseline data on hotel water usage
- Identify factors associated with increased water usage at specific hotels
- Collect information on water conservation measures proposed for a variety of hotels along with associated savings potential
- Provide insight as to the most useful information which could be gathered by the pilot program.

Selected Studies: Three in-depth studies of water usage at hotel/motel properties were identified, including:

1. 1998 study prepared by the Greater Vancouver Regional District, based on field inventories of water consuming fixtures and equipment at 26 Vancouver, B. C. area hotels.

2. A 1990 study prepared for the American Hotel and Motel Association and the School of Hotel Administration at Cornell University. This study was based on the results of a questionnaire sent out in 1988 to 1600 hotels, with 408 valid responses.

3. A 1991 study prepared for the Los Angeles Department of Water and Power detailing water conservation potential for the downtown L. A. Hilton.

In addition, several baseline studies of water usage at commercial facilities have been identified which provide a breakout of data for the hotel/motel industry. These include:

4. A 1994 study by the East Bay Municipal District which included information from 50 on-site surveys of hotels/motels.

5. Local water utility studies of hotels located in Phoenix (4), Denver(2), and Ventura(1), CA as reported in a 1992 article in the Journal of the American Water Works Association.

Findings and Conclusions: Total water usage across a wide variety of hotels ranges from under 100 gallons per day per room (gpd/rm) to over 400 gpd/rm. Older, luxury hotels and hotels with full service restaurants and on-site laundry facilities typically exhibit the highest water usage per room.

Water conservation measures identified as having the highest savings potential include:

- Installation of faucet aerators
- Replacement of showerheads with low flow models
- Retrofit or replacement of non-water conserving toilets and urinals
- Elimination of once-through cooling
- Laundry water recycle
- Dishwasher upgrades
- Repair of leaks
- Education of staff and guests in water conservation opportunities

Identified savings potential also varied widely, from 0% - 45% of total usage, with between 10% - 20% taken as typical. However, little documentation was provided on savings actually realized. Also, although process use improvements for cooling, laundry, and kitchen use were occasionally identified as having substantial potential, attention was not consistently given to this potential, or to the potential provided by leak detection and repair. These shortcomings may largely be attributed to the lack of sub-metering data necessary to highlight savings potential in process (non-domestic) usage. In this light the following recommendations are made for future studies:

- Process improvements should be given equal consideration with domestic retrofits.
- Leak detection should be more thoroughly performed
- Sub-metering should be used wherever practical to highlight inefficient processes and to document actual savings.

I. INTRODUCTION

1. Background

The Hospitality Industry as a whole is generally considered to be an intense user of resources, consuming large quantities of water, energy, paper, plastics and other products and materials. Resource efficiency has not been a priority in most hospitality operations unless such efficiency can provide a quick return on investment and will not, either by perception or otherwise, compromise guest comfort and satisfaction. Resource efficiency professionals, both internationally as well as domestically, agree that the Hospitality Industry represents a large untapped resource efficiency sector, capable of dramatic progress with the implementation of several cost effective, off the shelf technologies.

2. Project

The Hotel Industry in particular represents significant resource consumption and at the same time tremendous opportunity for efficiency improvements. Seattle Public Utilities recognizes that by working closely with hotel employees and management while providing sound analysis, engineering, product testing and recommendations, and economic justification, many cost effective water conservation projects could be implemented in hotels that would achieve significant water savings and excellent return on investment to hotel owners.

3. Scope of This Report

This Case Study Review is intended to provide a review of available literature dealing with water conservation opportunities for hotel properties in order to provide baseline data for comparison of water use among hotels, to identify criteria which could be used to highlight hotels with higher water savings potential, and to identify water conservation methods which appear to have been most promising in other locations. It is also intended to provide insight as to the most useful information which should be gathered as a part of a pilot implementation.

Specific performance data on fixtures and appliances, as well as identification of new and innovative equipment with applications directly to the hotel industry will be covered in a separate Technical Resource Manual.

II. OVERVIEW OF SELECTED STUDIES

1. Greater Vancouver Regional District, 1998

This report titled "Study of Water Consumption and Conservation Potential in Greater Vancouver's Hotel Industry" was conducted by the Greater Vancouver Regional District, and is based on information collected at 26 self-selected Vancouver, B. C. area hotels. Inventories of water consuming fixtures and equipment were used to estimate water used for various end uses. However, at only three of the hotels was detailed information collected on air conditioning, refrigeration, or other process use. Overall water consumption was provided from billing data. No sub-metering was used.

Data was analyzed based on hotel size, hotel age, and by end use. Five end categories were used: Domestic (35%), Laundry (10%), Kitchen (11%), Irrigation (1%), and Other (43% - attributed primarily to cooling). Larger hotels consumed more water per suite than smaller hotels, attributable primarily to increased usage in the "Kitchen" and "Other" categories. Older hotels consumed more water than newer hotels.

Water consumption per suite ranged from 98 gpd to 423 gpd. For domestic use only, consumption per suite ranged from 57 gpd to 152 gpd. The "Other" category encompassed the widest range, from 5 gpd to 246 gpd, which appeared to be associated with use of once-through cooling water for coolers and ice makers (variously used in 23 of the 26 hotels).

Category	**Min. gpd/rm**	**Max. gpd/rm**	**Median gpd/rm**	**Comments**
Domestic	57	152	73	Includes all staff, public, and guest washrooms.
Laundry	10	72	28	Only those hotels doing all laundry on site included. (17 out of 26)
Kitchen	3	73	17	Only those hotels with a kitchen included. (22 out of 26)
Irrigation	0	14	0	Reflects moderate climate of B. C.
Other (inc. HVAC)	5	246	79	Category with greatest range. High correlation with use of once-through cooling water (OTCW)
Total Use	98	423	190	

Table 1. Water Consumption per Suite by End Use Category, Vancouver B. C.

These figures were derived from inventories of fixtures and equipment multiplied by estimated usage factors, rather than from actual sub-metering. Results are therefore expected to be much more reliable for the "domestic" category, where fixture numbers are large and usage factors are more standard and quantifiable, than for the various other categories which involve smaller numbers of fixtures or pieces of equipment, and for which usage factors are much more difficult to ascertain. This also made it most straight forward to

identify and provide cost/benefit analysis for water conservation opportunities in the "Domestic" category.

The following recommendations were made, followed in parentheses by the number of hotels for which each recommendation applies:

- Request guests have linens washed less frequently (all)
- Install toilet volume reducers (18)
- Install faucet aerators (17)
- Install low flow showerheads (14)
- Replace automatic flush urinals with manual or sensor models (6)
- Reduce or eliminate use of once through cooling water (2)
- Install rain sensor on irrigation system (1)
- Repair leaky faucet (1)

As shown above, most of the identified savings potential appear in the "Domestic" category, despite the face that this category represents only 38% of the mean use. Disregarding the recommendation concerning frequency of washing linens (which is behavioral rather than technical) out of 59 recommendations, only 4 applied to non-domestic use. No follow-up data was provided to show actual savings which may have been realized as a result of this study.

2. American Hotel and Motel Association, 1990

"Water Consumption in the Lodging Industry", prepared for the American Hotel and Motel Association and the School of Hotel Administration at Cornell University, by Redlin and deRoos,1990. The results of this study are included in the book, Water Resources for Lodging Operations, by Stipanuk and Robson, published by the American Hotel and Motel Association.

This study is based on the results of a questionnaire sent out in 1988 to 1600 hotels, with 408 valid responses. This report is particularly interesting in that several hotels also supplied information based on sub-meter readings for laundry, kitchens, irrigation, cooling towers, and pools (generally from deduct meters).

Median water use per room was reported at 144 gallons per day. This ranged from a median of 101 gallons per day (gpd) for smaller hotels (less than 75 rooms) to a median of 208 gpd for hotels with 500 or more rooms. Additionally, Limited Service/Economy hotels reported a median use of 94 gpd while Resort/Casino/Conference Centers reported a median of 254 gpd.

From sub-metering data, the following information was compiled:

On-Site Laundries
Twelve hotels, ranging in size from 251 rooms to 2033 rooms (with a median of 643 rooms) provided sub-metering data for laundries. For this group, laundry water accounted for between 5% and 30% of total water use, with a median of 14%. Efficiency ranged from 1.0 to 5.9 gallons of water per pound of laundry, with a median of 2.4. Daily pounds of laundry per guest room ranged from 6 to 19 pounds, with a median of 10.

Kitchens
Ten hotels provided sub-meter data for kitchens. For this group, kitchen water use ranged from 0.05% to 25% of overall water use, with a median of 6%. Gallons per meal ranged from 2.4 to 15.8, with a median of 12.0.

Irrigation
Thirteen hotels provided data on irrigation, with usage accounting for between 1% and 44% of total water use, with a median of 14%. The one hotel located in Washington State (a 5 acre, 301 room luxury hotel at an airport location), reported using over 5,000 gallons per day, or approximately 18 gallons per room per day (10% of overall use).

Cooling Towers
For 17 hotels, cooling towers consumed between 1% and 21% of total water use, with a median of 9%.

Swimming Pools
For 16 hotels, swimming pools consumed between 0.01% and 13.1% of total water use, with a median of 0.16%.

Much has changed in the way of available and mandated plumbing fixtures since the time of this study. It was noted that many of the respondents considered 4-5 gallon per flush (gpf) toilets to be water conserving devices, compared to previous 7 gpf models.

General recommendations included installation of low flow showerheads, faucets and toilets; irrigation improvements,; and control of high-volume uses such as dishwashers, laundries, and cooling towers. However, no follow up was provided to show any actual savings attributable to this study. Nevertheless, given the low number of studies using actual sub-metering data, this portion of the data may still be quite useful for benchmarking especially in laundry and kitchen areas.

3. Los Angeles Department of Water and Power, 1991

"Water Conservation Survey, Hotel Customer Category", (Hilton Hotel, Downtown L.A.), Los Angeles Department of Water and Power, 1991 .

This survey was conducted in October 1990 at the 900 room Hilton Hotel in Downtown L.A. The average daily water consumption from January through December was 241 gallons per room. Of this, 30% was for HVAC (primarily cooling tower evaporation), 27% for Kitchen & Laundry, 20% for Showers, Toilets, Urinals, & Sinks, 8% for Pool & Exterior, 5% for Clean-up, and 10% for Misc.

This hotel had already taken many water conservation measures including replacement of all showerheads with 2.75 gpm models, replacement of toilet and urinal flush valves with low flush models, replacement of high use faucets with auto shut-off models with aerators, replacement of open circuit cooling tower with an air-cooled, closed circuit tower.

Study recommendations included (1) replacement of all remaining 1.5 gpf urinal flush valves with 1.0 gpf models, (2) replacement of all (3.5) gpf toilets with 1.6 gpf models, (3) education of staff on water conserving techniques, (4) replacement of the main dishwasher with a newer, more water efficient model, and (4) retrofit existing washing machines with a mechanism to recycle rinse water. It was estimated that these measures would save 16 million gallons of water per year (49 gallons per room per day), saving $85,000 annually, with a payback of 3.0 years. This would represent a 20% reduction in total use. Limited post-implementation follow-up was provided.

4. East Bay Municipal Utility District, 1994

"Water Conservation Baseline Study", East Bay Municipal Utility District (EBMUD), 1994 (http://www.ebmud.com/watercon/baseln.html)

This study is based on the results of 500 telephone interviews, and on 657 on-site surveys, including 50 on-site surveys of Hotels/motels. For the hotels, it was determined that 46% used water for heating/cooling, 20% used once-through cooling, 88% operated laundry facilities, and 80% operated kitchens. Additionally, 3% of hotel toilets flushed with 1.6 gallons, 61% with 3.5 gallons, and 36% with 5.5 gallons. For showers, 52% used 3.0 gpm or more. For faucets, 39% used 3.0 gpm or more. No measurements or estimates of total water use was made, nor were any conservation recommendations made.

Flush Volume	Distribution - Toilets
1.6 gpf	3%
3.5 gpf	61%
5.5 gpf	36%

Table 2. Flush Volume Distribution for Hotel Toilets, EBMUD

Flow Rate	Showers	Faucets
< 3.0 gpm	52%	39%
≥ 3.0 gpm	48%	61%

Table 3. Flow Rate Distribution for Hotel Showers and Faucets, EBMUD

5. Studies by Other Public Utilities

"Nonresidential Water Conservation: A Good Investment", Jane H. Ploeser et al, Journal AWWA, 1992

This article cites results of site visits to 7 hotels located in Phoenix (4), Denver (2), and Ventura, CA (1). For these 7 hotels, Domestic Plumbing accounted for 24% of use, Cooling towers 14%, single pass cooling 7%, Clean-up 3%, Laundry 12%, Kitchens 12%, Irrigation 22%, and Miscellaneous 6%. No information was given on use per room, nor were any conservation recommendations given.

FINDINGS & CONCLUSIONS

Factors Affecting Overall Usage

The number of hotel specific water conservation studies is somewhat limited. However, considerable variation in water use by various hotels has been documented, with annual averages running from under 100 gallons per day (gpd) per room to over 400 gpd per room. Age, size, class of hotel, type of cooling (especially use of single pass cooling), use of on-site laundry facilities (vs. off site), and the existence or absence of full service restaurants catering have all been shown to have a significant effect on total water use.

	Vancouver Reg. Dist.	AHMA	L.A. Hilton
Smaller	150	101	
Mid Size	135	153	
Larger	260	208	241
Newer	145		
Mid Age	195		
Older	235		241
Economy		94	
Mid Range		153	
Luxury		254	241
Median	190	144	
Range	98 - 423	71 - 339	241

Table 4. Avg. Total Usage in gpd/room by Hotel Size, Age, and Class

Most of these studies involved self-selection of one type or another, rendering them unreliable for establishment of statistical means. Taken together, however, they should provide a reasonable picture of general trends and the range of usage which may be expected.

Consumption by End Use

Percentage of water used by end use category (domestic, kitchen, laundry, etc.) likewise varies considerably, but is less reliably documented. Most studies provide estimates based primarily on a fixture and equipment inventory. In only one study cited here is usage by category based on actual sub-metering, using data from deduct meters already in place. Excess usage caused by leakage or by poorly operated or maintained equipment, though potentially significant, has generally not been addressed.

These studies have also focussed most closely on the "domestic" category, reflecting usage attributed to showers, lavatories, toilets and urinals. Given the large number of these easily countable fixtures at any particular hotel, together with the availability of relatively constant and reliable usage factors which may be applied to each fixture, inventory based estimates appear fairly reliable in this category. However, domestic usage typically accounts for only around one third of total usage.

Other significant end use categories include cooling, with usage ranging from 0% - 50% or more of total usage; laundry, typically ranging from 5% - 25%; and kitchen, ranging from less than 5% to more than 50%. Irrigation may be significant depending on location. Usage for facilities such as pools, spas and fountains generally does not appear to be significant. As mentioned previously, leaks may sometimes be significant but have not been seriously addressed in any of the studies cited here.

	Vancouver (Avg.)	Vancouver (Range)	AHMA (Range)	L.A. Hilton
Domestic	35%	22 – 88%		25%
Kitchen	11%	0 – 18%	0 – 25%	27%
Laundry	10%	0 – 22%	5 – 30%	Combined
Irrigation	1%	0 – 13%	1 – 44%	8%
HVAC/ Other	43%	3 – 58%	1 – 21%	40%

Table 5. Usage in percentage and gpd/room by end use category as reported by 5 sources

Projected Savings

Two of the cited studies provide site-specific recommendations for hotel water conservation measures, but with very little follow up data documenting actual savings. Suggested measures include installation of low flow faucet aerators and showerheads, upgrades to toilets and urinals (addition of displacement devices and replacement of flush valves and/or fixtures), upgrades to process equipment (including washing machines, dishwashers, and cooling towers), elimination of once-through cooling, use of drip irrigation, and detection and repair of leaks.

Savings projections range from 0% to 45% for individual hotels, with most falling within 10 - 20%. (See **Table 3**.) The greatest savings projection (45%) was related to domestic upgrades to one of the oldest hotels, which had implemented no previous water conserving measures. The next greatest projected savings (33%) was related to elimination of once-through cooling, at a different hotel. However, without adequate follow up data it is often difficult to judge how reliable specific projections may be.

	Vancouver Reg. Dist.	L.A. Hilton
Domestic	0 – 45%	13%
Kitchen	0 – 4%	1%
Laundry	0%	5%
Irrigation	0%	0%
HVAC/ Other	0 – 33%	0%
Total	0 – 45%	19%

Table 6. Savings Potential in percentage of total usage, by end use category

(Note: Significant savings potential for specific processes has also been documented elsewhere, including through programs initiated by Seattle Public Utilities regarding laundry water recycling and cooling tower improvements.)

Conclusions

Considerable variation exists in water usage among hotels. Age, size, class of hotel, type of cooling (especially use of single pass cooling), type of laundry facilities, and the existence of full service restaurants catering have all been shown to have a significant effect on total water use. Older, luxury hotels typically use the greatest quantity of water per room.

Annual averages for hotel water use run from under 100 gallons per day (gpd) per room to over 400 gpd per room. End use may be categorized as either "domestic" (toilets, urinals, showers, and lavatories) or "process" (all other uses). Domestic use typically accounts for around 1/3 of total use, and is typically between 50 and 150 gallons per day per room. The remaining 2/3 is attributed to various process uses, primarily: cooling, with usage ranging from 0% - 50% or more; laundry, typically ranging from 5% - 25%; and kitchen, also typically in the range of 5% - 25%. Irrigation may sometimes be significant, depending on location. Usage for facilities such as pools, spas and fountains generally does not appear to be significant. Leaks may be significant but were not seriously addressed in any of the studies cited here.

Projected savings range from 0% to nearly 50% for individual hotels, with around 10 - 20% being typical. However, adequate follow up data was not generally available to show how reliable specific projections may have been. Hotels with the highest savings potential tended to be older. Medium sized hotels generally showed lower potential, with both smaller and larger hotels showing increased potential.

Suggested conservation measures have included installation of low flow faucet aerators and showerheads, upgrades to toilets and urinals, upgrades to process equipment (including washing machines, dishwashers, and cooling towers), elimination of once-through cooling, use of drip irrigation, and detection and repair of leaks. However, the great majority of recommendations in the studies cited are focussed on domestic upgrades.

The most obvious shortcomings in the studies cited include a primary focus on upgrades to "domestic" fixtures (representing around 1/3 of total use), with a corresponding lack of focus on process equipment or leaks. Additionally, there is a lack of follow-up data correlating actual savings with projected savings. Both of these shortcomings appear related to lack of sub-metering data to accurately test specific process equipment or to accurately measure results. Based on this, it is suggested that future studies use sub-metering be used where practical, that process upgrades and leak detection be given equal attention to upgrades of domestic fixtures.

July 27, 1999

Review of Domestic Hotel Water Efficiency Measures

I. Background

This document provides the reader with an abbreviated background on preferred methods of behavioral modification and summarizes the initial contacts made under Task 1 of the Seattle Hotel Education Demonstration Project. During mid-April through early July, 1999, over 47 non-profit organizations, academic institutions, water authorities and hotels were contacted in various parts of the United States to collect raw data on water conservation and what, if any, tools were employed to help change water consuming behavior.

In the context of this project, *water conservation measures* are considered those methods, tools, and hardware used to promote water efficiency that is distinct from and indirectly affected by the attitudes, behavior and other propensities of the human beings who use such hardware or systems. In contrast, for purposes of Task 1, telephone calls were made to assess what behavioral modification methods were effective in changing water consuming behavior. This raw data collection did not address the methods used that might affect organizational propensity to adopt such tools.

Unless otherwise noted, if no information was available or contact could not be made, only a name and/or address will appear.

II. Changing Behavior: Preferred Methods and Tools

What follows are basic guidelines to change behavior based on applied research findings. A basic premise of behavioral change with respect to environmental impact is to link attitude and knowledge with behavioral change. Effective behavioral change is, in part, amplified when the value of the commodity, in this case, water and its representations, are positive values embraced by the individual or organization.

In the absence of an articulate, senior management supported environmental policy, requisite organizational and culture shifts cannot take place or be sustained over a prolonged period of time despite well-intentioned and intelligent individual behavioral change. Education efforts to promote water efficient behavior will be more effective if the methods and tools:

1. Ensure changing behavior is made relatively easy, with external barriers minimized or removed (e.g; cannot find technical information, your management doesn't support change, the equipment required to change behavior is too expensive);
2. Give people and organizations the tools to make change (knowing who to call to promote water conserving policies or to facilitate rewarding those who are responsible for beneficial change);
3. Ensure the information comes from a credible source that the receiving audience will listen to;
4. Use local champions from the same industry;
5. Tailor information specifically to each receiving audience and feature the same "type" of people engaging in the desired behavior;
6. Provide immediate and regular feedback to support the desired behavior. Theories of operant conditioning based on the classic B.F. Skinner studies indicate that remote responses, either negative or positive, are not as effective as immediate feedback;
7. Ensure the message is frequent, positive and the action is framed such that the receiving audience believes it is losing something, as opposed to gaining something, as the result of not taking certain action (e.g.; you are throwing away a sum certain by not using water efficient behavior);
8. Frame the message as "efficiency" as opposed to "conservation" since the latter implies a sacrifice;
9. Are designed in a manner that allows the person or organization to "pay attention" to water efficiency and water demands in a way that speaks to their everyday experiences and overcomes the tendency towards inertia;
10. Are framed such that the recipients believe it was their own idea rather than foisted upon them by an outside regulatory force;
11. Gently permit people to recognize their own internal barriers to change and help create gentle social pressure and social norms that favor water efficiency behavior and attitudes;
12. Are based on an understanding of the audience's perspective and unique barriers to change; and
13. Use existing social networks to diffuse information and use effective opinion leaders.

III. Raw Data Collection

A. Water Districts

1. Alameda County Water District; 43885 South Grimmer Boulevard, Fremont, CA. 94538; (510) 659-1970; acwd@infolane.com;

2. California Urban Water Conservation Council; 455 Capitol Mall #705, 95814; (916) 552-5885;

3. Lisa Helm; Arizona Municipal Water Users Association; 4041 N. Central, Suite 900, Phoenix, AZ. 85012; (602) 248-8482;

4. Bob Montague, Water Conservation Coordinator for City of Virginia Beach Public Utilities, Municipal Center, Virginia Beach, VA. 23456; (757) 427-8035; bmontagu@city.virginia-beach@va.us;

5. Luis Generoso; City of San Diego Water Resources Management Program,, City of San Diego Water Utilities Department; 600 B Street, Suite 1210, San Diego, CA. 92101; (619) 533-5258;

6. California Urban Water Conservation Council, 455 Capitol Mall #705, S Sacramento, CA. 95814; (916) 552-5885;

7. Lisa LeBlanc: Greater Vancouver Regional District, 4330 Kingsway, 3rd floor, Burnaby, B.C. V5H 4G8; (604) 436-6795; http://www.gvrd.bc.ca;

B. Lodgings

1. Jim Ackles; La Quinta Inns, Inc.; 112 East Pecan Street, San Antonio, TX. (210) 302-6570; jackles@laquinta.com.

This chain of inns uses the following combination of tools:

a. They conduct a *rate and utility bill analysis* since they find overbilling errors in over 50% of their bills. They use gallons per guest as a benchmark, with 125 gallons/guest for older properties (undefined) and 95 gallons/guest for newer properties. They do very little submetering and concentrate on, in descending order, showering, laundry and irrigation.

b. *Irrigation:* They use native, adaptive plants to minimize water use and have developed an irrigation training program for staff. For their Texas properties, they installed a computerized system for drip irrigation near the sidewalks with a Texas Water Resource Board certified irrigator

c. *Sub-metering* is also conducted on a limited scale and annually they conduct tests to detect leaks. They see spikes in water use, they will then identify the problem and rectify it.

d. *Conservation and Finance-link training:* Every year, the director of engineering visits each of the chain's 19 regions and gives a briefing about conservation, preventive maintenance and how water bills affect their bonuses.

e. *Awards as incentive:* They capitalized on, and motivated their staff and managers by advertising their awards, including those given by the American Water Works Association.

f. *Building Audits:* Building audits are conducted to help develop demand-side pressures. They have adopted a linen-towel changeout program in which the guest is given the option of not having their linens and towels changed daily, and have saved money in labor.

g. Hardware installation: Like many hotels, they have installed water saving devices such as low flow showerheads and toilets. Mr. Ackles mentioned how important the method of installation is, noting such details as wall insulation and sound batons.

2. Lauren Broder; Inn of the Anasazi, 113 Washington Avenue, Santa Fe, New Mexico: (505) 988-3030; lbroder@confularc.com;

3. Donna Kabay and Janet Byrd; The Colony Hotel, 140 Ocean Avenue, P.O 511, Kennebunkport, Maine 04046; (207) 967-4374 and info-me@thecolonyhotel.com, or http://www.thecolonyhotel.com/maine/environment.html for further information regarding their environmental program.

   This hotel has established a very sophisticated and mature sustainability program and is a leader in Maine Businesses for Social Responsibility. Specific to water use they have:

a. *Advertised and promoted* the hotel's commitment to the environment to all audiences, including the business community, guests, staff, managers and the tourist industry;
b. *Environmental bulletin board:* An environmental bulletin board is used that has a seasonal theme and on it is posted the hotel's environmental policy regarding not watering the lawns and plant beds. Native plants that require less water are used as well;
c. *Guestroom signage* is used to communicate about the towel-linen changeout program and water saving tips are posted;
d. *Energy Star[tm] equipment* is used that is more energy efficient and uses less water;
e. *All bathrooms have water saving tips posted;*
f. *Continuous improvement:* During the year the Ecology Group, an established group within the hotel, looks for better ways to educate staff and guests regarding the environmental policies. Each representative then in turn transmits the information to their department to discuss and implement new strategies and get feedback from staff;
g. *New Staff Orientation:* Hotel environmental policies are discussed at the beginning of each season's staff orientation;
h. *Web site:* The hotel web site contains an environmental programs section; and
i. *Information packets* sent out to inquirers (weddings, corporate, leisure, motorcoach) contain the hotel's environmental policies and a reprint of articles written about the hotel.

4. Danny O'Farrill; Don Shula's Hotel and Golf Club; Main Street, Miami Lakes, FL. 33014; (305) 821-1150;

5. Rocky Paulsen, Embassy Suites Hotel, Seattle-Tacoma International Airport; 15920 West Valley Highway, Seattle, WA. 98188-5547; (425) 228-2517. In addition to using water saving devices, the hotel has developed a "suite care-pm program" so leaks are reported to engineers. Their corporate headquarters have trained staff regarding environmental issues including water conservation. They also have developed an incentive system that financially rewards staff or managers that have noticed a situation or pattern that increases water use.

6. Mark Rugenstein; Halekulani Hotel, 2199 Kalia Road, Honolulu, Hi. 96815; (808) 923-2311; roadkingmark@worldnet.att.net. They have

educated staff regarding water use and the kitchen uses a thawing tub to replace traditional methods of continuously running water over frozen foods;

7. Greg Pushard; Harrah's Las Vegas, 3475 Las Vegas Boulevard South, Las Vegas, NV. 89109; (702) 369-5044;

8. Brent Reynolds; Holiday Inn, Boardman, Ohio; 7410 South Avenue, Boardman, Ohio 44512; (330) 726-1611; hiboard@raex.com;

9. Brian Burke; Hyatt Hotels Corporation; 200 West Madison, Chicago, IL. 60606; (312) 750-8294; bburke@corphqpo.hyatt;

10. Charles Duffner; New York Marriott Marquis; 1535 Broadway, New York, NY 10036; (212) 704-8707;

11. Eric Johnson, Norfolk Airport Hilton, 1500 North Military Highway, Norfolk, VA. 23502; (757) 466-8000;

12. Nick Feola, Ocean Edge Resort and Golf Club; 2907 Main Street, Brewster, MA. 02631; (508) 896-9000, x 1420;

13. John Rizzo; Boston Park Plaza, 64 Arlington Street, Boston, MA. 02116; (617) 457-2269;

14. Paul Hayes, Hyatt Regency at Gainey Ranch, Scottsdale, AZ.; (602) 991-3388; phayes@scottpohyatt.com;

15. Jim Sasiak, Best Western Regional offices; (310) 376-4452

16. John Limbo; ITT Sheraton Corporation, 777 Westchester Avenue, White Plains, NY 10604; (914) 640-8100;

17. Rick Bailey; Quality Inn Suites, 3817 North Pan Am Expressway, San Antonio, TX; (210) 224-3030;

18. Werner Janssen; Sleeping Lady; Icicle Road, Leavenworth, WA. (509) wjanssen@sleepinglady.com;

19. Wayne Campbell; San Diego Hilton Beach & Tennis Resort, 1775 East

Mission Bay Drive, San Diego, CA. 92109; (619) 276-4010 or waynecampbell@hilton.com. This Hilton property installed water conserving plumbing fixtures, removed the kitchen garbage disposals, installed a computer controlled irrigation system that uses local weather patterns to determine irrigation schedule and reused ice meltage for irrigation. The installation of water-conserving plumbing fixtures alone provided the hotel with over $31,000 annual water and sewer savings.

C. Academic Institutions

1. David Stipanuk; Cornell University School of Hotel Administration, Cornell University, Ithaca, NY 14853; david.stipanuk@cornell.edu. They published a study entitled "Water Resources for Lodging Operations" which is published by the Educational Institute of the AH & MA;

2. Florida Atlantic University, Florida Center for Environmental Studies; Northern Palm Beach Campus, 3970 RCA Boulevard, Palm Beach, FL. 33410; (561) 691-8554. The University does not keep this type of data although the FL.Energy Extension is an excellent contact; Pierce Jones, Director; (352) 392-5684 or ez@agen.ufl.edu;

3. Professor Sheryl Fried Kline, Widener School of Hospitality Management, One University Place, Chester, PA. 19013-5792; (610) 499-1101.Sheryl.F.Kline@widener.edu;

4. Professor Ken Teeters, University of Nevada, Tourism and Convention Department; (702) 895-4459.

D. Tourism Related Associations

1. Linzey Coles, International Hotels Environment Initiative; 1516 Cornwall Terrace, Regents Park, London NW1 4QP England, linzey.coles@pwblif.org.uk; (011) 44-171-467-3623;

2. Patty Griffin, Green Hotels Association; P.O. Box 420212, Houston, TX. 77242-0212; green@greenhotels.com; (713) 789-8889;

3. Bob Elliott; Chair of the Engineering and Environment Committee; American Hotel and Motel Association; 1201 New York Avenue NW, Suite 600, Washington, DC. 20005-3931; (202) 289-3100;

4. Dan Bornholdt; Green Suites International; 1551 West 13th Street, Suite 304, Upland, CA. 91786; (909) 920-1277; Grnsuites@aol.com;

5. Education Institute of the American Hotel and Motel Association; 2113 North High Street, Lansing, Michigan 48906; (517) 372-8800; www.ei.ahma.org and info@ei.ahma.org;

6. Scott Wayne, World Travel and Tourism Council; D.C. Business Development Office; 2527 I Street NW, Washington , DC 20037-2211; (202) 463-7394 or ScottWayne@compuserve.com;

7. Alaska Hotel and Motel Association; P.O. Box 104900, Anchorage, Alaska 99510-4900; (907) 272-1229; akhma@alaska.net.

E. Government Programs and Non-Government Organizations

1. Trudy Mason; EcoSmart Properties; (212) 430-4000 x4030;

2. Mark Tetruzzi; Green Seal; 1400 16th Street NW, Suite 300, Washington, DC. 20036-3101; (202) 872-6400;

3. John Flowers and Valerie Martin; EPA's Water Alliances for Voluntary Efficiency; EPA Office of Water (4204), 401 M Street SW, Washington, DC 20460; (202) 260-7288; martin.valerie@epa.gov;

4. Conservation International; 2501 M Street SW. Suite 200, Washington, DC 20037; (202) 429-5660; http://www.conservation.org;

5. **Responsible Tourism Institute; newtourism@newtourism.org;**

6. **Earth Council; Apartado 2323-1002, San Jose, Costa Rica; http://www.ecouncil.ac.cr (formed after Rio Summit in 1992 to promote and advance implementation of the Earth Summit agreements);**

7. **World Resource Institute; 1709 New York Avenue, Washington, DC 20036; (202) 638-6300; info@wri.org;**

8. World Tourism Organization; Capitan Haya 42; 28020, Madrid, Spain; (34) 91 567 8100; omtweb@world-tourism.org.

IV. Conclusion and Designing Successful Programs

Because the data does not represent the full complement of hotels in the United States that might be engaging in environmental practices and education, the reporting in this document is not representative. However, based on applied research in areas of environmental management, sustainability tools, organizational behavior, human behavioral change and a survey of international sustainable tourism practices, it is possible to list those attributes most likely to lead to a successful water efficiency program.

Based on the limited data available, the Colony Hotel in Kennebunkport, Maine appears to have the best comprehensive success in environmental management, although a hotel the size of the San Diego Hilton Beach & Tennis Resort that has installed water-conserving plumbing is saving over $31,000/per annum. However, determining success is based on more than the water saved in any given year. Rather, success might be measured by whether those changes are part of a long-term strategy that is integral to the hotel's philosophy and practice, versus the result of an environmental champion whose departure will impair long term environmental improvement.

Successful water efficiency programs will depend on a number of complex variables including:

1. *Organizational Commitment:* If the CEO/COO of the corporate headquarters, Board of Directors (where applicable), and General Manager of the local property are committed to environmental excellence, have a written environmental policy, and have committed valuable resources to this task, ensuing programs, whether instituted nationally or locally, stand a much better chance of success;

2. *Environmental Programs are integrated into all job functions:* Where the environmental policy is part of every individual's job responsibilities and the organization integrates environmental performance into their indicators

and performance standards, there is an effective built-in incentive to address issues such as water efficiency;

3. *Staff are asked to participate in creative innovation and decisionmaking:* A well informed, empowered staff are essential to any environmental program success;

4. *Messaging is positive:* The environmental program is cast in terms of benefit, lost opportunities and emphasizes that incremental and small measures have profound effects;

5. *Incentive systems are developed*: These can be financial, control over work, time-off, vacations, small prizes such as free nights at the hotel or meals, or public recognition;

6. *Educational tools seek to affirm existing value systems*: All educational programs should be aligned with the value system of the listeners and seek to incorporate case studies, field trips and daily experiences into the curricula;

7. *Credible, local, sources are used to convey information:* Identify trust sources in your targeted sector, ask them to help convey and tailor messages and incorporate the message into existing communication networks.

Source: Gardner, Gerald T., and Stern, Paul C., *Environmental Problems and Human Behavior,* Allyn & Bacon, Needham Heights, MA. 1996.

Appendix 2: Hotel Contact List

-June 15, 1999

Hotel Water Education Demonstration Project

Hotels and other government, NGOs and academic institutions contacted as of June 11, 1999:

3. Lisa LeBlanc: Greater Vancouver Regional District, 4330 Kingsway, 3rd floor, Burnaby, B.C. V5H 4G8; (604) 436-6795; http://www.gvrd.bc.ca Lisa is sending me the list of hotels from their May 1988 Study of water consumption and water conservation potential so I can contact them directly;

4. John Flowers and Valerie Martin; EPA's Water Alliances for Voluntary Efficiency; (202) 260-7288; martin.valerie@epa.gov. The WAVE program had many participants, almost all of which I contacted;

5. Lisa Helm; Arizona Municipal Water Users Association; 4041 N. Central, Suite 900, Phoenix, AZ. 85012 (602) 248-8482. They have not collected hotel specific data but published an excellent document entitled "Facility Manager's Guide to Water Management."

6. Linzey Coles, International Hotels Environment Initiative; linzey.coles@pwblif.org.uk; (011) 44-171-467-3623. US participation in the initiative has been negligible and they won't send hotel names specifically. You might look at a copy of the *Green Hotelier* magazine.

7. David Stipanuk; Cornell University School of Hotel Administration, Cornell University, Ithaca, NY 14853; david.stipanuk@cornell.edu.. They published a study entitled "Water Resources for Lodging Operations" which is published by the Educational Institute of the AH & MA;

8. Jim Ackles; La Quinta Inns, Inc.; 112 East Pecan Street, #200, San Antonio, TX. 78205; (210) 302-6570/jackles@laquinta.com. This hotel chain has a fully developed water conservation program.

9. Patty Griffin, Green Hotels Association; green@greenhotels.com; (713) 789-8889. She doesn't keep water conservation data but they do sell resource saving equipment, placards and tip sheets.

10. Lauren Broder; lbroder@confularc.com: Inn of the Anasazi: (505) 988-3030. Was never able to reach her.

11. Florida Atlantic University, Florida Center for Environmental Studies; Northern Palm Beach Campus, 3970 RCA Boulevard, Palm Beach, FL. 33410; (561) 691-8554. The University does not keep this type of data but the Florida Energy Extension could be quite helpful as it specializes in restaurant efficiency.

12. Conservation International; (no leads)

13. Responsible Tourism Institute; (no leads)

14. Earth Council (no leads)

15. World Resources Institute (no leads)

16. World Tourism Organization (no leads)

17. Bob Elliott; Chair of the Engineering and Environment Committee; American Hotel and Motel Association; (202) 289-3100.

18. Luis Generoso; San Diego Hilton and Tennis Resort through the City of San Diego Water Resources Management Program; (619) 533-5258; and Wayne Campbell, Director of Property Operations; waynecampbell@hilton.com . I received a write up concerning this hotel which is known for its conservation efforts but have not reached Mr. Campbell

19. Dan Bornholdt; Green Suites International; Grnsuites@aol.com

20. John Boynton; Green Suites International; (206) 781-3499. John worked for the Seattle Sheraton for many years and will be a good contact, particularly for focus groups

21. Bob Montague, Water Conservation Coordinator for City of Virginia Beach Public Utilities, Municipal Center, Virginia Beach, VA. 23456; (757) 427-8035 (no leads); bmontagu@city.virginia-beach@va.us

22. Education Institute of the American Hotel and Motel Association; www.ei.ahma.org and info@ei.ahma.org

23. Trudy Mason; EcoSmart Properties; (212) 430-4000 x4030

24. Donna Kabay; The Colony Hotel, (207) 967-3331; http://wwwthecolonyhotel.com/maine/environment.html. I received a lengthy e-mail from Donna outlining their very ambitious and broad environmental program

25. Danny O'Farrill; Don Shula's Hotel and Golf Club; Main Street, Miami Lakes, FL. 33014; (305) 821-1150.
26. Rocky Paulsen, Embassy Suites Hotel, Seattle-Tacoma International Airport; 15920 West Valley Highway, Seattle, WA. 98188-5547; (425) 228-2517

27. Mark Rugenstein; Halekulani Hotel, 2199 Kalia Road, Honolulu, Hi. 96815; (808) 923-2311; roadkingmark@worldnet.att.net.

28. Greg Pushard; Harrah's Las Vegas, 3475 Las Vegas Boulevard South, Las Vegas, NV. 89109; (702) 369-5044

29. Brent Reynolds; Holiday Inn, Boardman, Ohio; 7410 South Avenue, Boardman, Ohio 44512; (330) 726-1611; .hiboard@raex.com.

30. Brian Burke; Hyatt Hotels Corporation; 200 West Madison, Chicago, IL. 60606; (312) 750-8294; bburke@corphqpo.hyatt

31. Charles Duffner; New York Marriott Marquis; 1535 Broadway, New York, NY 10036; (212) 704-8707

32. Eric Johnson, Norfolk Airport Hilton, 1500 North Military Highway, Norfolk, VA. 23502; (757) 466-8000

33. Nick Feola, Ocean Edge Resort and Golf Club; 2907 Main Street, Brewster, MA. 02631; (508) 896-9000, x 1420

34. John Rizzo; Boston Park Plaza, 64 Arlington Street, Boston, MA. 02116; (617) 457-2269
35. Professor Sheryl Fried Kline, Widener School of Hospitality Management, One University Place, Chester, PA. 19013-5792; (610) 499-1101

36. Paul Hayes, Hyatt Regency at Gainey Ranch, Scottsdale, AZ.; (602) 991-3388; phayes@scottpohyatt.com

37. California Urban Water Conservation Council, 455 Capitol Mall #705, S Sacramento, CA. 95814; (916) 552-5885

38. Scott Wayne, World Travel and Tourism Council; (202) 463-7394. Scott referred me to the Green Globe sustainable tourism program

39. Mark Tetruzzi; Green Seal; (202) 872-6400. In conjunction with Green Globe, they have adopted lodging standards

40. Professor Ken Teeters, University of Nevada, Tourism and Convention Department; (702) 895-4459

41. Jim Sasiak, Best Western Regional offices; (310) 376-4452.

42. John Lembo; Starwood Hotels and Resorts Worldwide, 777 Westchester Avenue, White Plains, NY 10604; (914) 640-8100

43. Rick Bailey; Quality Inn Suites, San Antonio, TX; (210) 224-3030

44. Alaska Hotel and Motel Association; P.O. Box 104900, Anchorage, Alaska 99510-4900; (907) 272-1229; akhma@alaska.net

45. Werner Janssen; Sleeping Lady; wjanssen@sleepinglady.com.

Appendix 3: Phone Survey Results

Results of Telephone Survey Instrument:
Seattle Hotels and Water Conservation Measures

Hotel Demonstration Project

September 1999
Prepared for: Seattle Public Utilities, Conservation Program
By Heidi Siegelbaum, O'Neill & Siegelbaum, Seattle, WA.
Contract DC 99022; Property of Seattle Public Utilities

Background

Between August 17th and September 23rd, 1999, over 60 Seattle hotels were contacted with respect to the Hotel Demonstration Project. This project title refers to the combined efforts of Seattle Public Utility's (SPU's) Resource Conservation Section and several consultants specializing in mechanical engineering and sustainable tourism, respectively. This group constitutes the project team.

Out of the hotels surveyed, 20 responded to the questionnaire designed to collect baseline raw data concerning the use of water conservation measures. The hotels were classified into four (4) categories based on room size. All hotels with 74 rooms and under were excluded from the survey instrument process, as SPU wanted to focus on larger hotels to maximize its effectiveness and reach into this commercial sector.

The sample field chosen represents all hotels known in Seattle which have 75 rooms and over. The surveyed hotels in the sample represent 40% of the selected field and 25% of all Seattle hotels, the latter of which includes all Seattle hotels regardless of room size.

Interviews with hotel engineers were taken in the following hotels:

A. 75-149 rooms: *

Alexis Hotel: Mike Devine, Engineer: 624-4844
Best Western Executive Inn: George Tomosvari, Engineer: 448-9444
Days Inn Town Center: John Oravitz, Maintenance Engineer: 448-3434
Hotel Seattle: Joel Neyhart, Engineer: 623-5110
Paramount Hotel: Bob Bolstead, Engineer: 292-9500
Starwood's Edmond Meany Hotel: Erik Bodeau, Engineer: 634-2000
Travelodge by the Space Needle: Chris Tudor, General Manager: 441-7878
University Inn: Mike Doyle, Engineer: 632-5055

* 39% of the hotels in this room size category

B. 150-299 rooms: *

Edgewater Hotel: Lloyd Van Horn, Engineer: 728-7000
Courtyard Lake Union by Marriott: Henriques Ramson, Engineer: 213-0100
Ramada Inn at Northgate: Chris Adams, Maintenance Engineer: 365-0700
Roosevelt Hotel: Frank Arnold, Engineer: 621-1200
Seattle Inn: Tim Chiles, Engineer: 728-7666
Starwood's Sixth Avenue Inn: John Oravitz, Engineer: 441-8300
Warwick Hotel: Scott Anderson, Engineer: 443-4300

* 40% of the hotels in this room size category

C. 300 rooms and over: *

Crowne Plaza Hotel Seattle: Bob Johansen, Engineer: 464-1980
Four Seasons Olympic Hotel: Steve Robinson, Engineer (Bruce Jarrad, Chief Engineer): 621-1700
Stouffer's Madison Hotel: Larry Robins, Engineer: 583-0300
Sheraton Seattle Hotel & Towers: Scott Marshall, Engineer: 621-9000
Westin Hotel: Rodney Schauf, Engineer: 728-1000

* 83% of the hotels in this room size category

Findings

C. Measures Adopted

An overwhelming majority of the hotels surveyed had installed some combination of water conserving measures in the last five (5) years, including six, or 31%, that had adopted the well known towel-linen program in which guests are given the option of not having their towels and linens laundered daily. 90% of the hotels had installed faucet aerators and low flow showerheads, while only 50% had installed low flow toilets. Many of the hotels reported complaints from guests or internal dissatisfaction with the toilet and showerhead performance. Only 35% of the surveyed hotels had installed low flow urinals in public restrooms although 65% had installed faucet aerators in this part of the hotel. Air-cooled ice machines were used in 60% of the surveyed hotels although only 5% had what they considered to be efficient commercial dishwashers.

25%, or five (5) hotels, had adopted gray water reclamation or wash and rinse reuse systems (in which the water from the last rinse cycle is stored, filtered and then re-used in a subsequent wash cycle for first rinse). The same percentage of hotels also used what they considered to be high-efficiency commercial dishwashers. These hotels did not necessarily adopt both measures, but either one or the other.

A very small number had adopted or had knowledge of using thawing policies in which frozen foods are thawed in a walk-in refrigerator rather than continuously running water over the food to thaw. This could have significant implications for those hotels serving over 1 million meals a year (large convention and banquet operations).

D. Knowledge of, and measuring water conservation potential

An overwhelming number of the hotel staff and managers were not trained specifically in conservation techniques and measures, and 90% did not know or did not have access, to cost saving data correlating to the water conservation measures already adopted. Related to this finding, none of the surveyed hotels knew, by department or function, how much water was being used and 55% did not have submeters or deduct meters in the hotel.

C. Ownership and culture

Most the surveyed hotels, or 85%, are part of larger holding companies, real estate investment trusts (REITs), joint ventures, corporate affiliates, or franchises. The trend in many of these companies, including Starwood Hotels & Resorts Worldwide, Inc. (Starwood), Host-Marriott Corporation and the Kimpton Group, is to purchase existing structures and renovate them rather than starting new construction projects. Accordingly, there may be more serious barriers to installing efficient water conserving measures due to the age, original condition or use of the building.

In addition, many of these hotels are publicly traded so there is considerable pressure to provide an attractive return on investment. Most of the hotel's parent corporations clearly state that their primary business objective is to acquire high quality assets with potential for significant capital appreciation, and to maximize earnings and cash flow. The challenge is to educate the hotels regarding the value of natural capital and the financial and environmental benefits of conservation and efficiency, thereby leading to increases in net operating profits.

Only 26% of the surveyed hotels believed that their parent corporations or joint ventures had a written environmental policy or action plan, although several stated that conservation was integral to their property's overall goals. Several of these companies, notably Hilton, Marriott and Starwood, belong to the International Hotels Environmental Initiative (IHEI) with offices in London, so they already have an environmental policy or presence in overseas operations. Whether these policies "trickle down" to domestic operations and policies is unclear.

When asked how certain factors or conditions rated when considering whether to adopt water conservation measures, the overwhelming majority were motivated by knowing their action are important to the community. 75% acknowledged the inherent value in water as well as the limitations imposed by municipal water storage capacity. Less than half (45%) believed the trend towards "green tourism" or value-based purchasing was important in making water conservation decisions, and 70% were motivated by utility rebates.

E. **Financial Decision Making**

50% of the engineers surveyed were not familiar with the hotel's investment criteria but 90% of the remaining sample used a payback period between 1 and 3 years, with three using 2-2.5 year payback, three using 1-year payback, and one each using 3 and 7-8 year payback periods. Capital limits were reported as variable depending on where the investment fit into priority based budgeting, available funds, competing interests, occupancy rates and other exigencies. Several reported having unlimited capital funds for water conservation projects but an equal number reported having to get parent corporate approval for capital improvements of any dollar amount.

When reported, capital budgets ranged from $500 to over $20,000, while several chose to maintain confidentiality regarding such figures. 50% of the surveyed hotels reported having

funds available to adopt water conservation measures and 60% had space and willingness to beta-test equipment in one or more of their rooms.

D. Recommendations

A majority of the surveyed hotels were generally familiar with water conservation measures, but were unable to more particularly characterize water use within each department or function, or to measure cost savings associated with such measures. Since most of the surveyed engineers had not received specific water conservation training, their hotels would benefit from receiving more specific information regarding available technology and performance parameters, distributors and cost savings associated with each conservation measure. In particular, these hotels need more submeters or deduct meters to identify areas of greater water use, and to use software and other tools designed to measure cost savings. These in turn can be used to more accurately forecast, budget and set priorities for other capital investments, and possibly lead to using longer payback periods.

Appendix 5: Drivers of Sustainable Tourism

March 16, 2000

What is driving sustainable tourism and travel?

Prepared for Seattle Public Utilities by:

Heidi Siegelbaum
O'Neill & Siegelbaum
(206) 784-4265
wastenot@speakeasy.org

WHAT is sustainable tourism and travel?

- Planning, development and activities, including purchased products, that will ensure future generations they can meet their own needs
- Requires long term planning and defining a vision
- Involves every person in an organization
- Extends to every facet of the tourism industry, including hotels

WHY involve tourism and travel sectors in sustainability?

- The sector is represented everywhere: lodging, food, recreation, national parks, culture, natural areas, interpreters, retail, transportation, banking and insurance
- It is universally connected to the physical and cultural environment
- Growth patterns are creating pressure on sensitive areas
- Balanced planning ensures long term economic stability and healthy communities
- Growing public demand for accountable, responsible business practices
- Can promote best practices and loyal customer base

WHAT drives environmental sustainability?

- Enhanced public perception
- Customer appeal in that they can reward those businesses providing environmentally preferable services
- Avoids regulatory pressure if adopted voluntarily
- Individual control over local use of resources
- Economic incentives: green is lean and clean
- Diversifies tourism experience by meeting demand for greater educational experiences
- Public pressure and growing market demand, particularly in the NW
- Lack of interest in touring "devastated landscapes"
- Soul of business and its staff say it's the "right thing to do"

RESPONDING to questions about the towel-linen program (sound bites)

- The program is voluntary; you may choose to launder your towels and linens daily if you wish
- We believe that environmental management, of which this program is an important first step, is consistent with changing views of corporate responsibility
- There are many competing uses for water locally and the hotel wants to do its part in responding to the issues raised by the Salmon ESA (Endangered Species Act) listing

- Despite the amount of rainfall we may receive in winter months, there is no such thing as "new water." Hence, in order to ensure there is adequate water for all competing uses, we believe this voluntary towel-linen program is a remarkably effective tool for being a good community actor
- The local environment is the centerpiece of what draws visitors to Seattle and Washington State. Water efficiency/conservation is part of our way of expressing our commitment to this community and to ensure we protect it for everyone's children and grandchildren
- We are proud to work for a hotel that is starting to evaluate its impact on the environment and adopt programs to address environmental conservation

PROCESS ensures success

- Distribute the SPU fact sheet to everyone on staff or ensure they see it through a distribution circuit (or post it on-line)
- Ensure your sales and marketing representatives have a copy and understand the program's basis- use this program to market the hotel and find new ways to increase your environmental performance (e.g.; packaging reduction, toxic use reduction, organics management, lighting/equipment efficiency)
- Include bell service, concierge and off-site reservationists in this effort
- Read about water conservation locally by calling SPU at 684-7560 or 684-7600 or see www.ci.seattle.wa.us/util/spumain.htm.
- Learn about local salmon challenges at 1-877-Salmon 9 or www.salmoninfo.org
- Urge your corporate offices to adopt a long-term environmental strategy and start to address sustainable travel and tourism

ORIENTATION

Water, the Westin and YOU, you Water Smart person!

Uwe ka lani ola ka honna

[When the heavens weep, the earth lives]

This document was prepared in connection with a Hotel Water Demonstration Project, managed by Seattle Public Utilities (SPU), that was conducted from April 1999 through March 2001.

The pilot project was designed to increase water efficiency and conservation opportunities for the hotel industry, leading to cost savings, improved water quantity and quality, added value to staff and guests, thereby reflecting Washington's conservation and community values.

Further information? Philip Paschke, Resource Conservation Section, Community Services Division, 710 Second Avenue, 5th floor, Seattle, WA. 98104
(206) 684-5883 or 684-SAVE
phil.paschke@ci.seattle.wa.us
URL: http://www.ci.seattle.wa.us/util/rescons

I. The Mystical Qualities of Water

"Water is silky, dense, and poetic stuff. It's cohesive, yet it parts under pressure, eluding touch. On a recent trip to hot springs on the Peninsula, I had the opportunity to think about this. The delicate, sulphorous mist hanging above the pools was a substance that fit no category: Almost liquid, yet airborne, it was inhalable in its thousands of little microdots. The delicate mist's layers captured light and fell into diving currents, pulled by wind. Water is an indelible, continuous link between plants, animals, and everything alive; this taut configuration seems at once startling as a dream and astonishingly real. At the same time, water is a frank necessity."

[Stacey Levine; "Watered Down," August 3, 2000. Reprinted with permission from the Seattle Weekly]

Water is amazing stuff. It can break boulders the size of cars, has more dimensions that any other substance, allows nutrients to pass through organ membranes in our bodies, and sustains everything that is alive. No water? Nothing lives.

Us? 70% water. Ice cream? 88%. Your cat? 62%, The family dog 63%.[1]

When you put water in context, you look at its practical value, sometimes overlooked, and may once again create wonder in your perspective. Why do we pay so much more money to live with a view of the water?

II. Protecting What We Love and Need

In 1854, London suffered a cholera epidemic that killed thousands of people when the bacteria, *vibrio cholerae bacterium,* traveled from India to London when a ship dumped contaminated water into the Thames River—the city's water source. From this outbreak was born water treatment systems and protection of water as a drinking water source. In developing countries throughout the world, only 35% of the population has access to clean water and cholera epidemics continue in 2001. [2] Many postulate that future wars will be waged over water availability.

In Washington State, or more specifically, in Seattle and its surrounding areas (places North to Edmonds and Woodinville, East to Bellevue, Duvall, and Kirkland, south to Auburn, Federal Way, Renton and Tukwila), SPU and its partner utilities (called "purveyors") protect public drinking water supplies by prohibiting commercial activities from taking place in these watersheds and ensuring they are protected from access by anyone except utility folks. The Cedar River and Tolt *watersheds,* the land area draining into these rivers, are our collective source for drinking water. **These two sources alone provide 150 million gallons a day to the over 1 million people living and working in Seattle and surrounding cities.** Big water for a big utility!

The road to you…or where your water comes from…

Rain and snow falls in the Cascade Mountains, flowing into mountain reservoirs and rivers, where it goes through a circular pattern from sky to land, back to sky again. This is the ancient water cycle that essentially recirculates the same water from the millennium. The water falling on your back probably fell on a black bear in 1652, meaning that there is no such thing as "new" water- another reason to protect it from waste. It's historical!

After it's collected, the water is screened, then fluoride, lime, soda ash (Tolt only) and chlorine are added. It is then sent to finished reservoirs and split into several pipelines—one to the commercial/industrial sector and the other to residents.

The road from you… or where your water goes…

When water is flushed in a toilet, or goes down a drain inside a building, it is going into the sanitary sewer system where it travels to Renton or the West Point Treatment Center. At these locations, the wastewater goes through primary treatment—screening, settling and disinfection—followed by secondary treatment which removes most, but not all, solids, toxic chemicals, metals and biological oxygen demand. It is then discharged into open water or used for fuel or as farm soil amendments.

III. Can we please have more water?

In 1996, the Seattle City Council asked SPU to complete a *Water Conservation Potential Assessment (CPPA)* to review conservation potential. Up to 31 million gallons per day (mgd), or 16% of the water used between June and August, can be conserved within the next 20 years with no reduction in customer's ability to use water and with satisfaction with services. It is difficult, if not highly unlikely, that SPU can develop new water sources outside existing ones due to geographical, political or financial limitations. Beyond 2013, based on current projections, water demand will exceed supply and conservation initiatives will be mandatory rather than voluntary. [3]

Rain does not mean drinking water!! In fact, if you put the world's water in a pitcher, only a tablespoon would be available for human use (.05%).

Not just us…. The area's water supply is also a shared resource: it is used for irrigation of crops and landscaping, wildlife habitat and consumption, cleaning up at home, cooking, farming, industrial sources, and salmon. No water, no salmon spawning. The Cedar Habitat Conservation Plan (HCP) commits to releasing [x] millions of gallons in the fall to facilitate salmon migration and is part of the region's growing problem with declines in salmon population.[4]

Under the City's proposal, fish habitat and water supply planning would be more certain and would provide instream flows (water to swim) for Chinook, sockeye and coho salmon, as well as steelhead trout.

In addition to balancing competing interests for water and making sure everyone has what they need, SPU recently announced its **1% for Water Conservation Program- go team go! The 1% water conservation program** is a recently adopted SPU program in which the City is challenging its citizens and businesses to conserve 1% each year, over 10 years, of the water it's currently using.

ARE YOU GAME? The challenge is equivalent to using one gallon less per person every day. You already use about 78 gallons per day. Just you.

What is this thing we call the challenge? Call 684-SAVE (684-7283) or see http://ci.seattle.wa.us/util/onepercent/default.htm

IV. Being Water Smart at the Hotel

You can think of water conservation or efficiency (the same thing) like a savings account: you save now so you are safe later when you really need it (shortages, drought, natural disasters like earthquakes).

Why be water smart?

- Save on water bills! Those savings can be used for different purposes
- Postpone rate increases
- Improve water reliability and quality
- Meet the needs of your kids and grandkids and other people you love
- Ensure habitats for animals and ecosystems are maintained
- Protect drinking water
- Reduce pollution: less water used means less hot water heating (energy means natural resource use; not just hydropower, but coal and oil burning which is a very dirty process) and less water going to the wastewater treatment plants
- *Your guests are paying attention!* The City receives letters at the Mayor's office and SPU expressing concern that hotels are using too much water
- It's a basic part of greening your hotel, a worldwide trend which the US is slowly catching up with
- You can't live without it!
- We drink it, are mesmerized by it, play in it, are entranced by its forms

Dimensions of the water bill at the hotel:

- *Water, just water*
- *Sewer charges for treatment*
- *Heating*
- *Taxes*
- *The language of water: Water bills are expressed in cubic feet of water or* ***ccf,*** *which equals 748 gallons*
- *One gallon of water weights 8.34 lbs*
- *For national reporting, millions of gallons per day are used (Mgal/d). This is the same as having a pool the length of a football field, 50 feet wide and 10 feet deep.*

Average water use per hotel room:

Over 500 rooms: 164-254 gallons/day or, over 92,000 gallons/year for a 500-room hotel
Deluxe hotel: 232 gallons/day on average

Other averages:

1. *Toilets:* **The good**… 4 flushes/day using a 1.6 gallon per flush (gpf) toilet=6.4 gallons/day/per person/per room
   The bad… 4 flushes/day using a 3.5 gpf toilet= 14 gallons/day/per person/per room
   And the ugly… the wrong low flow toilet for the hotel

Toilet Mania or "give pee a chance": Don't give up on the idea of low-flow toilets because earlier technology didn't work as well as expected. Earlier models from the mid 80s were poorly designed or installed. A good flapper will list as long as five years- a cheaper one may wear out in 6 months.

2. *Laundry:* 12 lbs/room
3. *Showers:* Up to 3.5 gallons/minute; shower length may be 10 minutes=35 gallons/shower
4. *Sink or wash basin:* 1.5 gallons/minute flow; 3 minutes/per person/day= 4.5 gallons/per person/day

1. **Front of the house:**

   - If you shave or brush your teeth at work, turn off the faucet while you work away. **Wasted shaving water=a person's drinking water for one week!**
   - If you see a leak, tighten the faucet and if you can't fix it call engineering at x5782

2. **Housekeeping and Laundry:**

- If you shave or brush your teeth at work, turn off the faucet while you work away**. Wasted shaving water=a person's drinking water for one week!**
- If you see a leak, tighten the faucet and if you can't fix it, call engineering at x5782
- Don't leave water running while you are cleaning
- Don't flush the toilet before it is cleaned
- Be careful not to drop linens on the floor to avoid double washing
- Work with engineering to test toilets and showers for leaks
- Make sure that towels and linens are not washed if the guest is participating in the towel linen program. Ask Donna Stemme and Angelica Ramsey about this great program
- Keep entry mats and doorways very clean: you can prevent a lot of carpet shampooing by stopping dirt at the door

3. Food and Beverage:

- If you shave or brush your teeth at work, turn off the faucet while you work away. **Wasted shaving water=a person's drinking water for one week!**
- If you see a leak, tighten the faucet and if you can't fix it, call engineering at x5782
- Shut off recirculating water for beverage islands
- Wash only full loads of dishes unless you need the item right away; if you do need it right away, consider handwashing that one item instead of turning the machine on
- Don't thaw food under running water! Prepare in advance and thaw in the walk-in refrigerator! You also make the refrigerator work less hard when you thaw this way! Food will also not become supersaturated with water
- Wash vegetables in sinks or tubs and not under running water (F&B uses over 136,000 gallons/year just to prepare food)
- Rinse sushi rice in a colander and not in deep tubs
- Discuss with engineering whether steam table water might be put to some good second use, rather than putting it down the drain
- When you are serving water, don't kill the guest with water and don't fill their glass just before they are getting their check. Ice production alone uses astounding amounts of water! **Ice machines in the hotel use almost 2 million gallons/year**
- If coffee of tea is served in a press, make sure the water level is correct for the number of people being served. Don't fill up a huge press for one person who wants one cup of coffee
- If you are making espresso, don't let circulating water run all day to rinse one spoon

4. Engineering and Maintenance

- If you shave or brush your teeth at work, turn off the faucet as you work away. **Wasted shaving water=a person's drinking water for one week!**
- If you see a leak of any kind, fix it immediately or report it to engineering at x5782
- Sweep if possible, don't power wash. Besides, sweeping will make you strong!
- Keep in touch with the company's energy and water efficiency programs and remember that SPU is there with great ideas to save water; call 684-SAVE
- When you have water saving ideas or read something about a new water saving technology, share it with Rod Schauf; x 5782 or raise it at a staff or manager's meeting

V. The Big Picture of Sustainable Tourism

Tourism, Washington State's fourth largest industry, creates jobs, revenue and generally contributes to the lovely quality of life here. However, like all people and industries, tourism is not without its negative impacts. 40% of all the world's natural resources are used in what is called the "built environment," those structures made by people. The hotel is one such structure and typically uses what an average of 100 households would use.

Impacts include:

- **Materials use**: primary impacts come from transportation like getting to the hotel, driving around, van pick-ups, energy (which uses water, coal, oil and sometimes nuclear sources) and virtually everything the hotel buys. Every thing you see- the napkins, linens, doilies, bar napkins, to-go coffee cups, banquet tables, wall covering-- represents a very complex and very polluting process – **its life cycle-** and by choosing products with the same quality but with less toxic materials, metals, disposable parts and so on (part of green purchasing), you can really reduce your impact. Vote with your wallet at home too.
- **Energy**: HVAC, all the equipment in the hotel from chillers to compressors, motors, fans, and cooling towers, to TVs, espresso and vending machines, have to be powered from some source, and that source, outside the Pacific NW, has been dirty power. This power choice causes acid rain and climate change (disappointed in this year's ski season?). Even here, we are almost maxed out on hydroelectric power (which carries its own plagues like chopped up salmon and decreased in-stream flows) that means we will have to make difficult choices for regional power needs.
- **Water**: Water is used like mad in hotels, from power washing, pool/spa drainage, ice machines and serving large amounts of ice water, guest rooms, cleaning and cooling towers**. Look for the Final SPU report and recommendations about the Westin. Comments? Contact the person on the front of this document.**
- **Transport:** Air travel, railcars, cruise ships, driving and 2-stroke engines used for recreation (jet skis, snowmobiles) all create tremendous air pollution not to mention the embedded and other energy used to construct the vehicle, ship, railcar.
- **Solid Waste:** There is no doubt that we are amongst the biggest hogs on earth, generating over 7 pounds of garbage/per person/per day, when much of this could

be reused, recycled or perhaps not used at all. In a hotel, guests may feel entitled to even ramp up their consumption, generating up to 28 pounds of waste/per room/per day. What is it? Shopping bags, coffee cups, paper, take out food waste and so on. The good thing is that the Westin has in-room recycling. Make sure your guests know what you are up to.

So, what is sustainable tourism and travel?

- Planning, development and activities, including purchased products, that will ensure future generations they can meet their own needs
- Requires long term planning and support from the corporate offices
- Involves every single person in the organization, including you
- Extends to every facet of the tourism industry, including hotels

Why involve tourism and travel in sustainability?

- The sector is represented everywhere: lodging, food, recreation, national parks, cultural attractions, natural areas, transportation, retail, banking and insurance
- It is universally connected to the physical and cultural environment
- Growth patterns are creating pressure on sensitive areas
- Balanced planning ensures long term economic stability and healthy communities
- Growing public demand for accountable, responsible business practices
- Can promote best practices and loyal customer base

What drives environmental sustainability?

- Enhanced public perception
- Customer appeal in that they can reward those businesses providing environmentally preferable services
- Avoids regulatory pressure if adopted voluntarily
- Individual control over local use of resources
- Economic incentives: Green is always lean, clean and less expensive!
- Diversifies tourism experience by meeting demand for greater educational experiences
- Lack of interest in touring "devastated landscapes"
- Soul of business and staff say it's the right thing to do
- Do good by doing well

VI. Ouch! My brain hurts!

For more information, see the following:

1. **Seattle Public Utilities (SPU), your friendly sponsor of this fabulous document:** Resource Conservation Section, 710 Second Avenue, Seattle, WA. 98104; 684-7283 or http://www.ci.seattle.wa.us/util/rescons
2. **SPU 1% water conservation program:** (206) 684-SAVE (7283) or http://www.ci.seattle.wa.us/util/onepercent/default.htm
3. **Water glossary:** http://water%20glossary/glossary%2096-water.html
4. **SPU's Natural Lawn care program:** (888) 860-LAWN (5296)
5. **Home and garden hints for Healthy Streams and Salmon:** http://www.metrokc.gov/exex/esa/hometips.htm
6. **Urban Creeks Legacy volunteer program:** (206) 684-7655 (covers Pipers Creek, Longfellow Creek, Taylor Creek and Thornton Creek)
7. **King County Volunteer calendar, "the Dirt."** http://dnr.metrokc.gov/wlr/p:/calendar.htm
8. **Salmon Information Center:** A searchable salmon events calendar: www://salmoninfo.org/scripts/eventsearch.asp
9. **US Geological Survey (facts and quizzes):** http://ga.water.usgs.gov/edu/wateruse.html
10. **Puget Sound Water Quality Action Team:** (800) 54-SOUND (76863) or http://www.wa.gov/puget_sound
11. **Safe Drinking Water Hotline:** (800) 521-0327
12. **Environmental Protection Agency Public Information Center:** (206) 553-4983 or 1200 Sixth Avenue, Seattle 98101
13. **To report water contamination:** (206) 684-1231
14. **Department of Ecology Hotline for recycling and hazardous waste issues:** 1-800-Recycle
15. **International Hotels Environment Initiative:** ihei@pwblf.org.uk; or http://www.oneworld.org/pwblf/ (Prince of Wales Business Leaders Forum is the umbrella organization- hence, pwblf) or www.ihei.org
16. **Toronto Green Tourism Association:** (416) 338-5084 or http://www.greentourism.on.ca
17. **Green Hotels Association:** (713) 789-8889 or http://www.greenhotels.com
18. **Green Business Network:** http://www.greenbiz.com
19. **TravelMole:** http://www.travelmole.com/item/21063/101
20. **Coalition for Environmentally Responsible Economies:** (617) 247-0700 or http://www.ceres.org
21. **Sustainable Tourism Roundtable:** US Environmental Protection Agency, The George Washington University, and the World Travel & Tourism Council: (202) 994-8197
22. **West Point Treatment Center:** For tours call (206) 296-8286 (Tuesday-Thursday for groups) and http://dnr.metrokc.gov/wtd/. Personal tours are also given through the Discovery Park Visitor Center: (206) 386-4236
23. **U.S. Geological Survey in Washington: (253) 428-3600, x2604; http://wa.water.usgs.gov/otherdata.html**

Prepared by: Heidi Siegelbaum, O'Neill & Siegelbaum; Seattle, Washington

Appendix 8: Guest Environmental Letter and Survey

26 November, 2003

Dear «Title» «LastName»

I trust your stay so far has been comfortable and enjoyable - hopefully in part because of the openable windows, 'breathe easy' paints and natural fabrics used in your room.

We've made a serious commitment to care for the environment. We need you to tell us if we are succeeding in meeting your expectations and needs for comfort, and care for the environment.

Please take 5 minutes to complete the enclosed questionnaire and give to your reception staff. By way of thanks for your time we would like to offer you a complimentary beverage* in Arena Wine Bar.

Thank you again for your time.

Yours sincerely

Gabrielle van Willigen
Environmental Manager

* One voucher per room redeemable for soft drink, beer or wine

1. Please indicate which group you belong to (*please tick*):-

(a) Age ☐ Under 16 ☐ 16 – 25
☐ 26 – 35 ☐ 36 – 45
☐ 46 – 55 ☐ 56 – 65
☐ 66 – 75 ☐ Over 75

(b) Gender ☐ Male ☐ Female

2. The main reason for your stay with us (*please tick one*)

| | Holiday

| | Business

| | Other _____

3. Do you live in Australia?
Yes / No (please circle one) If no, which country? _____

4. What was the main reason for choosing to stay with us?

| | Corporate decision

| | Price

| | Location

| | Other _____

5. How concerned are you about the environment?

| | Very

| | Moderately

| | Not at all

6. With the current issues facing our environment, how concerned are you for your children or future generations?

| | Very

| | Moderately

| | Not at all

7. Would you prefer more to stay at an environmentally friendly hotel than one which was doing little or nothing to care for the environment?

| | Yes

| | No

| | Makes no difference to me

8. a) Did you read the Hotel's green environmental booklet placed in your room?

| | Yes | | No

b) Did you find it informative? Y / N

9. a) Were you aware that this hotel donates $1.00 to the World Wide Fund For Nature (WWF) for every room sold?

| | Yes | | No

b) Do you think this is a worthwhile initiative?

| | Yes | | No
(please explain) _____
_____

10. Which of the following environmental initiatives did you utilise while staying in this hotel?

| | Organic food (eg. Free-range eggs) on the menu

| | Recycling bin in your room for glass, paper, plastic and cans

(*Please turn over*)

Q.10 Cont'd

| | Soap and shampoo dispensers instead of plastic bottles

| | Reusing bath towels

| | Openable windows

| | Indicating bed sheets need not be changed (using green postcard provided)

11. Do you care for the environment at home |h| or at work |w|? If so, please indicate which ones

| | Solar power

| | Use cloth shopping bags

| | Recycling

| | Re use plastic bags

| | Use products with less packaging

| | Composting

| | Other _____

12. What other initiatives would you suggest for guests to participate in, to assist us in efforts to care for the environment? (For example, dry cleaning returned without plastic covering.)

_____

_____

_____

13. Did any of the above initiatives positively *or* negatively affect the quality of your stay? Please explain.

_____

_____

_____

_____

Thank you for helping us care. We look forward to seeing you again soon.

The Green Team

ENVIRONMENT QUESTIONNAIRE

How much do you care?

Your feedback is essential to further develop the environmental programme of this and future Accor hotels. Please help by answering this questionnaire and returning it to Reception.

Appendix 9: Chemical Use Inventory

The following inventory was collected at the time the project was active. It is possible that either hotel has changed their inventory since the time the data was collected.

Definitions:

CAS is the Chemical Abstracts Service that assigns identifying numbers to discrete chemical substances. Chemicals having CAS numbers are easier to search in toxicological databases.

City of Seattle Criteria for Janitorial Products: The City of Seattle, in conjunction with its emerging Environmental Management Policy, has adopted criteria by which it will purchase and use janitorial cleaning chemicals. "Basis for failure" at the top of the pages below means the chemical would fail the criteria adopted by the City.

See: ***http://www.ci.seattle.wa.us/seattle/oem/greenpurchasing/envcritjanitorialservices.doc***

EDTA is ethylene diamine tetraacetic acid and it is a chelating agent, which means it attracts heavy metals that adsorb to soils and sediments. Heavy metals are injurious to human health and their presence in wastewater poses formidable problems for operators, hence raising your sewer charges**.**

SARA 313 is part of the Comprehensive Environmental Response, Compensation and Liability Act and is intended to help communities plan for emergency response where chemicals are manufactured, stored and used. Many of the SARA listed chemicals are corrosive, flammable and have certain characteristi/cs scientists have deemed potentially dangerous for humans and the environment. See 40 Code of Federal Regulations, Part 355.

Chemical	Use	CAS*	Basis for failure
Sod. Hypochlorite	Laundry	7681-52-9	
Sod. Hydroxide	Laundry	1310-73-2	
RustGo/	Laundry		- corrosive
Hydrofluoric acid		7664-39-3	- SARA
Ammonium Bifluroide		1341-49-7	
PermaGo	Laundry		
2-2 butoxy ethoxy ethanol		112-34-5	
2-2 Propoxyethoxy ethanol		6881-94-3	
Alkylbenzene		70693-06-0	
2 butoxy ethanol		111-76-2	
TarGo	Laundry		
d-Limonene		5989-27-5	
sod. Alkyl diphenoxide		36445-71-3	
surfactant		70146-13-3	
TarGo DryCleaning	Laundry		
Ethanol 2 (2-butoxy ethoxy)		112-34-5	
Methyl Isoamyl Ketone		110-12-3	
TCE		79-01-06	- SARA, carcinogen
Nonylphenol ethoxylate		9016-45-9	- APE
Ethoxyl Ethanol		110-80-5	
YellowGo	Laundry		- corrosive
Titanous sulfate		13130-44-4	
Sulfuric acid		7664-93-9	
Citric Acid		7732-18-5	
Ammonium Bifluroide		1341-49-7	
VitalSize	Laundry		
Tetrachloroethylene		127-18-4	- SARA, carcinogen
Liquid Insure (Ecolab)	Laundry		- corrosive
Hydrogen Peroxide 7722-84-1			
Konite (Ecolab)	Laundry		- corrosive
Sod Hydroxide		1310-73-2	

Chemical	Use	CAS*	Basis for failure
Alert (Ecolab)	Laundry		- corrosive
Sod Carbonate		497-19-8	
Sod. Metasilicate		6834-92-0	
Nonylphenol ethoxylate		9016-45-9	- APE
Rejuvate (Ecolab)	Laundry		
Sod Percarbonate		15630-89-4	
Sod Phosphate		7758-29-4	- phosphate
Sod Carbonate		497-19-8	
Exec 120 (Ecolab)	Laundry		- corrosive
Sod.Carbonate		497-19-8	
Sod. Metasilicate		6834-92-0	
Sod. Perborate		4/4/7632	
Tri-Liqui Sour (Ecolab)	Laundry		
Hydrofluosilicic Acid		16961-83-4	
Turbocharge (Ecolab)	Laundry		- corrosive
Sod. Hydroxide		1310-73-2	
Ethylenediamine		64-02-8	
Tetraacetic acid, tetrasodium salt		- EDTA	
Triethanolamine		102-71-6	
Turbolifter (Ecolab)	Laundry		
Nonylphenol ethoxylate		9016-45-9	- APE
Butoxyethanol		111-76-2	
Builder 300 (Ecolab)	Laundry		- corrosive
Sod.Hydroxide		1310-73-2	
Karagami Waxkleen	Laundry		
Faultless Starbright Powder	Laundry		
Faultless Regular Spray Starch	Laundry		
Butane		106-97-8	
Propane		74-98-6	
Isobutane		75-28-5	
Perchloroethylene	Laundry		
Tetrachloroethylene		127-18-4	- SARA, carcinogen

Chemical	Use	CAS*	Basis for failure
Ecolab Dacotex Dual Spotter	Laundry		
Nonylphenol Ethoxylate		9016-45-9	- APE
Ecolab Erustacator	Laundry		- corrosive?
Hydrofluoric Acid			
Ammonium Bifluoride			
Westport Supply Exit Dry Cleaning Fluid	Laundry		
Stoddard Solvent		8052-41-3	- flammable??
Trade secret			
Ecolab Fabric Brightener	Laundry		
Hydrogen Peroxide		7722-84-1	
Nonylphenol Ethoxylate		9016-45-9	- APE
Ecolab Injection Sour	Laundry		- corrosive?
Formic Acid		64-18-6	
Nehaus Chemicals	Laundry		
Isopropyl Acetate		108-21-4	
Ecolab Liquid Force	Laundry		
Isopropyl Alcohol		67-63-0	
Nonylphenol Ethoxylate		9016-45-9	- APE
Ecolab Liquid Lusterfixe	Laundry		- corrosive?
Hydrofluosilicac acid		16961-83-4	
Liquid Hi-Chlor	Laundry		
Sod. Hypochlorite		7681-52-9	
Ecolab Liquid Texsoft Concentrate	Laundry		
Isopropyl Alcohol		67-63-0	
VanWaters & Rogers PERC	Laundry		
Carbon tetrachloride		56-23-5	- SARA, carcinogen
Epichlorohydrin		106-89-8	- SARA, repro
PERC		127-18-4	- SARA, carcinogen

Chemical	Use	CAS*	Basis for failure
Buffered Sour	Laundry		
Hydroxyacetic acid		79141	
Van Waters and Rogers	Laundry		
Streetar,Streetex and Streepro	trade secret claim for all constituents		
Strike	Laundry		
Isopropanol		67-63-0	
Alkaline Silicate		683-492-0	
Butoxyethanol		111-76-2	
Swan-Cote Spray	repellent		
PERC		127-18-4	- SARA, carcinogen
Shell Solvent		64741-65-7	
Aluminum Alcoholates		2269-22-9	
Non-Phosphate Tide	Laundry		
Sodium Silicates			
Alumine-silicates			
Sod. Carbonate			
Sod. Sulfate			
Westpo	Laundry		
Butyl Cellusolve		111-76-2	
PERC		127-18-4	- SARA, carcinogen
Aromatic 100		64742-95-6	
Pot. Hydroxide		1310-38-3	
(no contact with skin, eyes, clothing)			
MikroQuat Sanitizer	Roomclean		- corrosive
		11/6/9003	
amm. alkyl dimethylbenzyl chloride		68424-85-1 *	
		64-02-8	
monoethanolamine		141-43-5	
		7732-18-5	
Lemon Tub & Tile (Oasis) Roomclean			
Phosphoric acid		7664-38-2	
Citric acid		77-92-9	
Butoxyethanol		112-34-5	
Dimethyldodecamine oxide		1643-20-5	
Nonylphenol ethoxylate		9016-45-9	- APE

Chemical	Use	CAS*	Basis for failure
Formulator Multipurpose Cleaner	Roomclean		
Tetrasodium EDTA		64-02-8	- EDTA
		68439-57-6	
trisodium phosphate		7601-54-9	- phosphate
		9004-92-1	
Supershine Foaming Cleaner	Roomclean		
And Lemon Oil (Allstar)			
		8052-41-3	
isobutane		75-28-5	
propane		74-98-6	
General Purpose Spray Cleaner	Roomclean		
Butyl Cellusolve		111-76-2	
Isobutane		75-28-5	
Aqua Ammonia		01336-21-8	
Surfactant		09036-19-5	- APE
Sanitizer MikroBac (Ecolab)	Roomclean		
Isopropyl alcohol		67-63-0	
Pot. O-phenylphenate		13707-65-8	
Pot. O-benzyl-P-Chlorophenate		35471-49-9	
Sod. Dodecylbenzenesulfonate		25155-30-0	
Pot. P-T-amylphenate		53404-18-5	
Amazing	Room clean		- corrosive?
Phosphoric acid		7664-38-2	- SARA
Oxalic acid		144-62-7	
Crusader	Room clean		
2-butoxyethanol		111-76-2	
Whisper	Room clean		
Isopropyl alcohol		67-63-0	
Sparkle	Kitchen		
Dyna Foam Oven	Kitchen		- corrosive?
		1310-58-3	
		131-73-2	
2-butoxyethanol		111-76-2	
Diversey Stainless Steel Polish	Kitchen		

Chemical	Use	CAS*	Basis for failure
Ms. Muscle Oven and Grill	Kitchen		
(Drackett)		112-34-5	
Bleach	Kitchen		
Americlean encapsul	Kitchen		
Americlean low energy	Kitchen		
Sanitizer			
Sod. Hydroxide		1310-73-2	
Sod. Hypochlorite		7681-52-9	
Mildew Stain Remover	general area		
Sod. Hypochlorite		7681-52-9	
3M Carpet Spray Cleaner	general area		
2-butoxyethanol		111-76-2	
Fluroaliphatic acid salt		trade secret	
Styrene maleic anhydride resin		trade secret	
Ammonium Salt		26022-09-03	
Isopropyl Alcohol		67-63-0	
Coco Concentrated Lotion Hand Soap	Public restrooms		
Sod. Olefin Sulfonate		68439-57-6	
Sod. Lauryl Sulfonate		151-21-3	
Supershine Aerosol (wax polish)	general area	flammable?	
Petroleum Distillates		8052-41-3	
Isobutane/Propane		75-28-5	
		74-98-6	
3M Trouble Shooter Cleaner	general area		
2-Butoxyethanol		111-76-2	
Isobutane		75-28-5	
Ethanolamine		141-43-5	
Propane		74-98-6	
3M Liquid Carpet Cleaner	general area		
2-Butoxyethanol		111-76-2	
Fluroaliphatic acid salt		trade secret	
Isopropyl Alcohol			
RIM Bowl Cleaner	toilets		
Phosphoric acid		7664-38-2	- SARA
Ethoxylated Nonylphenol		9016-45-9	- APE

Chemical	Use	CAS*	Basis for failure
Vanguard Graffiti Remover	outside walls		- flammable
Isopropyl Alcohol		67-63-0	
Toluene		108-88-3	- SARA, repro
Acetone		67-64-1	
Methanol		67-56-1	- SARA
Glycol Ether		111-78-2 (misprint?)	
Gum off Chewing Gum	spot clean		
Remover			
Isobutane		75-28-5	
Propane		74-98-6	
Marble Cleaner RTU	marble clean		
Isopropyl Alcohol		67-63-0	
QMC Marble Cleaner	marble clean		
Isopropyl Alcohol		67-63-0	
Ecolab Oasis 282/275	deodorizer		
Nonylphenol ethoxylate		9016-45-9	
Ecolab FX-3 Multisurface	common areas		
Maintenance			
Monoethanolamine soap		11/9/2272	
Ethanolamine (MEA)		141-43-5	
Ethylenediamine tetraacetic acid,		64-02-8	- EDTA
Tetrasodium salt			
Sod. Dodecylbenzenesulfonate		25155-30-0	
Nonylphenol ethoxylate		9016-45-9	- APE
Ecolab FX-Quarry Tile Shock	Tile Clean		- corrosive?
Citric acid		77-92-9	
Sulfonic acid		5329-14-6	
Ecolab General Spray Cleaner	common areas		
Butoxyethanol		111-76-2	
Isobutane		75-28-5	
Ecolab Air Strike	common areas		
Nonylphenol ethoxylate		9016-45-9	- APE

Chemical	Use	CAS*	Basis for failure
Ecolab Multipurpose Liquid Cleaner	common areas		
Nonylphenol ethoxylate		9016-45-9	- APE
Baseshooter	wax stipper		
Glycol butyl ether		111-76-2	
Isobutane		75-28-5	
Monethanolamine		141-43-5	
3M Extractor	carpets		
Butoxyethanol		111-76-2	
Polyoxyethylene monooctylphenyl ether		9036-19-5	- APE
Sod. Tripolyphosphate		7758-29-4	- phosphates
Sod. Metasilicate		6834-92-0	
Sod. Xylene Sulfonate		1300-72-7	
3M Carpet Protector	carpets		
Butoxyethanol		111-76-2	
Isopropyl Alcohol		67-63-0	
1,1,2-trichloro-1,2,20trifluroethane		76-13-1	- SARA, ozone depletion
3M Carpet Spray Cleaner carpets			
Butoxyethanol		111-76-2	
Fluroaliphatic acid		trade secret	
Isopropyl Alcohol		67-63-0	
3M Carpet Stain Remover	carpets		
2-Butoxyethanol		111-76-2	
Cinch	carpets		
2-Butoxyethanol		11-76-2	
Monethanolamine		141-43-5	
Color Brite	unknown		
Sodium Bisulfate		7681-57-4	
(*not for people with asthma)			
Cornerstone Floor Sealer	floors		
Modified acrylic polymer	trade secret		
Diethylene glycol ether		111-77-3	
Styrene Butadiene Polymer		9003-55-8	
Tri (butoxyethyl) Phosphate		78-51-3	- phosphate?

Chemical	Use	CAS*	Basis for failure
Enzyt Bowl Cleaner	toilets		
Sod. Carbonate		497-19-8	
Citric Acid		77-92-9	
Emergency CleanUp	Spot clean		
Diatomaceous Earth			
Cristobalite		144-64-1	
Quartz		14808-60-7	- carcinogen
Expert Marble Refinisher	marble		
Petroleum Distrillate		805-24-13	
Sorbitan Monolaurate		5959-89-7	
Expert Marble Maintainer	marble		
Diethylene glycol ethylether		111-90-0	
Expert Marble Activator	marble		- corrosive???
Oxalic Acid		144-62-7	
Ecolab First Impression	metal polish		
Metal Polish			
Ammonium hydroxide		1336-21-6	
Ecolab FX-3 Quarry Tile	tiles		
Degreaser			
Caustic soda		1310-73-2	
Ethylenediamine tetraacetic acid,		64-02-8	- EDTA
Tetrasodium salt			
MEA		141-43-5	
Ecolab Solid Acid Quarry Tile	tile		- corrosive???
Floor Cleaner			
Citric Acid		77-92-9	
Sulfonic Acid		5329-14-6	
Gold-N-Glow			
Mineral Spirits			
Toluene			- SARA, repro

Chemical	Use	CAS*	Basis for failure
Ecolab Glass Cleaner	glass clean		
Butoxyethanol (40%)		111-76-2	
Isopropyl Alcohol		67-63-0	
Ecolab Formulator Multipurpose General area			
Cleaner			
Ethylenediamine		64-02-8	
Ecolab Formulator Glass glass clean			
Cleaner			
Butoxyethanol (3%)		111-76-2	
Ecolab Formulator Bathroom guestroom			- corrosive?
Cleaner			
Phosphoric Acid		7664-38-2	- SARA
Butoxyethanol		111-76-2	
Ecolab Formulator Concentrate #3			- corrosive
(severe chemical burns)			
Sod. Hydroxide		1310-73-2	
Gum-Off	general		
Isobutane		75-28-5	
Ice Foe	perimeter		
Calcium Chloride		10043-52-4	
John Bowl Cleaner	toilets		- corrosive???
Hydrochloric Acid		7647-01-0	
alkyl demethylbenzyl amm. chloride		68391-01-5	
Kare-N-Shine			
Petroleum Spirits		8030-30-6	
Nonylphenol ethoxylate		9016-45-9	- APE
Isobutane		75-28-5	
Ecolab Lemon-Eze	bathroom		
Tub & Tile Cleaner			
Dodecylbenzene sulfonic acid		27176-87-0	

Chemical	Use	CAS*	Basis for failure
Lemon Polish	wood clean		- flammable?
Isoparaffinic hydrocarbons		64742-48-9	
Isobutane		75-28-5	
Propane		74-98-6	
Ecolab Lime-A-Way	toilets		
Phosphoric Acid		7664-38-2	- SARA
Husky 400	deodorant		
Detergents		25155-30-0	
		26027-38-3	
Ecolab Medallion Metal Polish	metal polish		
Mineral Spirits		64742-48-9	
Diethyleneglycol monobutyl ether		112-34-5	
Mineral oil		64742-80-9	
Ecolab MikroQuat	Disinfectant		
Alkyldimethylbenzyl amm. Chloride		68424-85-1	
MEA		141-43-5	
MSR Mildew Stain Remover	bath/spa		
Calcium hypochlorite		7778-54-3	
Professional Spotter	spot clean		
Diethylene glycol ethyl ether		111-90-0	
2-butoxyethanol		111-76-2	
Ecolab Oasis 255 Glass Cleaner	glass clean		
Butoxyethanol		111-76-2	
Isopropyl alcohol		67-63-0	
Ammonium hydroxide		1336-21-6	
3M Rinse Free Stripper	floor stripper		
2-butoxyethanol		111-76-2	
Ethanolamine (MEA)		141-43-5	
Ethoxylated secondary alcohols		68551-14-14	
Sulfonate		1300-72-7	
Ecolab Institutional Strength Scrub Free	toilets		
Phosphoric acid		7664-38-2	- SARA

Chemical	Use	CAS*	Basis for failure
Stance Floor Finish	floor finish		
Syrene Acrylontride polymer		9003-54-7	
Diethyleneglycol ether		111-77-3	
Tri (butoxyethanol) phosphate		78-51-3	
Dibutyl Phthalate		84-74-2	- SARA
Ecolab Top Quartile	floor cleaner		
Phosphoric acid		7664-38-2	- SARA
Butoxyethanol		111-76-2	
3M Trouble Shooter Cleaner			
Butoxyethanol		111-76-2	
Ethanolamine (MEA)		141-43-5	
Isobutane		75-28-5	
Propane		74-98-6	
Ethoxylated Secondary Alcohols		68131-40-8	
Wright's Brass Polish	brass clean		
Isopropanol		67-63-0	
Ammonium hydroxide		1336-21-6	
Oxalic Acid		144-62-7	
Steamette Liquid Extraction	fabric		
Nonyl Phenol Ethoxylate		9016-45-9	- APE
Tetrapotassium diphosphate		7320-34-351	- phosphate
Professional Spotter	fabric		
Diethylene Glycol ethylether		111-90-0	
2-butyoxyethanol		111-76-2	- APE
Kil-Oder Lemon Burst	Deoderizer		
Alkoxylated fatty alcohol		69227-21-0	
Linear primary alcohol ethoxylate		34398-01-1	
Step-Off			
Sod. Hydroxide		1310-73-2	
MEA		141-43-5	
Sod. Silicate			
Carefree			
Styrene acrylic polymer			
Diethylene glycol ethyl ether		111-90-0	
Ethylene glycol 2-ethylhexyl ether		1559-35-9	

Chemical	Use	CAS*	Basis for failure
Freedom Speed Stripper	floor		- corrosive?
Diethylene glycol ethyl ether		111-90-0	
MEA		141-43-5	
Sod. Metasilicate		6834-92-0	
Ethylene glycol phenyl ether		122-99-6	
Sod. Xylene Sulfonate		1300-72-7	
Noxon Metal Polish	metals		
Oxalic acid		144-62-7	
Silica		14808-60-7	- carcinogen
Ethyl alcohol		64-17-5	
Isopropyl Alcohol		67-63-01	
Ammonium hydroxide		1336-21-6	
Ecolab Oasis SF	glass cleaner		
2-butoxyethanol		111-76-2	
Propylene glycol n-propyl ether		1569-01-3	
Ammonium hydroxide		1336-21-6	
MEA		141-43-5	
Amphoteric and anionic surfactants			
Ecolab Oasis 301-NP	bath cleaner		
MEA		141-43-5	
Sod. Lauryl ether sulfate		9004-82-4	
Dipropylene glycol methyl ether			
Ethylenediamine tetraacetic acid		60-00-4	- EDTA
Ecolab Oasis 277	Deoderizer		
Nonylphenol ethoxylate		9016-45-9	- APE
Ecolab Rinse Dry	F&B rinse aid		
Nonanionic surfactants			
Ecolab First Impression	metal polish		
Ammonium hydroxide		1336-21-6	
Ecolab Lime-A-Way	delimer		- corrosive?
Phosphoric acid		7664-38-2	- SARA
Ecolab Klenz-Glide 10	conveyor lube		
Potassium soap			
Ethylenediamine tetraacetic acid, tetrasodium salt 64-02-8			- EDTA

Chemical	Use	CAS*	Basis for failure
Ecolab Mikroklene	detergent disinfectant		- corrosive
Phosphoric acid		7664-38-2	- SARA
Butoxyethanol		111-76-2	
Ecolab Antibacterial Clean and Smooth	comb clean/disinf		
Ecolab Grease Cutter	oven degreaser		- corrosive
Sodium hydroxide		1310-73-2	
Butoxyethanol		111-76-2	
MEA		141-43-5	
Solitaire Hand Dish Detergent	Dish		
Sodium dodecylbenzenesulfonate		25155-30-0	
Sodium lauryl ether sulfate		9004-82-4	
Ecolab Maxi-Clean	multi purpose		
MEA		141-43-5	
Tetrasodium EDTA		64-02-8	- EDTA
Nonylphenol ethoxylate		9016-45-9	- APE
Ecolab Spray Cleaner	general purpose		
Butoxyethanol		111-76-2	
Isobutane		75-28-5	
Ecolab Automatic Drain Relief	drain cleaner		
2-Propanol		67-63-0	
Ecolab Solid Power	auto dish detergent		- corrosive
Sodium hydroxide		1310-73-2	
Ecolab Solid Insure	detergent (chlorinated) - comb clean/disinf		
Sodium hypochlorite		7681-52-9	
Ecolab Silver Power	silver pre-soak		
Sodium carbonate		487-19-8	