

SUSTAINABLE ENERGY MANAGEMENT - WALT DISNEY WORLD'S APPROACH

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ABSTRACT

This paper will showcase the energy management program at the Walt Disney World Resort. From innovative intranet-based energy information systems to employee involvement and award programs, Disney's approach to managing utilities has been both successful and sustainable. The focal point of the energy management program is the use of several intranet-based utility monitoring programs which graph and report utility metering information, report on utility plant operation, detail energy management system settings, and track the results of energy saving projects.

ENVIRONMENTALITY

At Disney, the energy management is part of a larger corporate effort called *Environmentality*, which is a way of thinking, acting and doing business in an environmentally conscientious way. Walt Disney World's Energy Star Program is part of that commitment.

On August 27, 1996, the Walt Disney World Co. established a partnership with the Environmental Protection Agency (EPA) to save energy. The EPA's Energy Star Buildings Program was used as a framework and methodology for the Energy Management Program at Walt Disney World. Numerous energy conservation projects have been implemented that have resulted in significant energy and cost savings.

ENERGY STAR PROGRAM HISTORY AT WDW

The Green Lights Program at Walt Disney World was completed in December of 1998. Over 17 million square feet of facilities were upgraded. The annual electrical

savings amounted to 46,000,000 kwh - the equivalent electrical usage at Disney's Animal Kingdom Theme Park during its first year of operation!

In 1997, an innovative intranet-based computer program called the *Utility Reporting System* was developed to publish utility data and make sub-metering more effective. By continuously "shining a light" on utility usage at each facility, utility costs are minimized by providing timely and informative reports. The vision to develop an "intranet-based energy information system" was long before there were comparable commercially available programs and services that are common place today. The *Utility Reporting System* and nine other spin-off programs continue to be used everyday by Users throughout the Walt Disney Company. The Utility Reporting System is now used at the Disneyland Resort in California and the Disneyland Paris Resort, which is a testament to its simplicity, low cost of operation and value to Users throughout the Walt Disney Company.

Next, for the Building Tune-Up step, a systematic process to evaluate building systems and measure their utility usage was developed. Building Tune-Up (BTU) Teams were formed from Engineering and Operations to review the energy management system operation/programming. Fine-tuning the Energy Management System configuration and continuously watching the utility consumption levels through the *Utility Reporting System* resulted in reductions of 3-15% in facilities reviewed to-date.

In October 1998, Walt Disney World Co. began the implementation of numerous cost-effective energy saving projects. Projects included (1) Compressed Air System Optimization (2) Hot Water Boiler Controls (3) Variable Speed Drives (4) Demand Ventilation Control (5) Energy

Management System Upgrades and (6) Utility Submetering Systems. Cost-effective energy saving projects continue to be implemented today, which indicates Walt Disney World's commitment to the Energy Star Program.

Combining all the Energy Star Buildings Program efforts to-date have resulted in a savings of over 3.7 million dollars in avoid energy cost (a 44% Internal Rate of Return (IRR)) and annual reductions of approximately 94,000,000 Kwh's (electricity) and 578,000 Therms (natural gas).

The Walt Disney World Energy Management program has been showcased in over 20 presentations at various conferences and meetings throughout the country. Feedback from the conference participants has indicated that the presentations have been well received.

CONTROL & MEASURE – THE KEY'S TO SUSTAINABLE ENERGY MANAGEMENT

There are two key systems that make the Walt Disney World energy management program a success: (1) energy management system and (2) energy information system. Both systems are needed to have a sustainable energy management program.

Energy Management System

The energy management system (EMS) is used to control energy consuming equipment – primarily used for heating, ventilating and air conditioning (HVAC) equipment. The EMS at Walt Disney World has been upgraded to provide access through our corporate intranet (see figure 1). This has enable the following benefits:

1. Review of EMS field panel programming and real-time operation can be made “globally” through from any Personal Computer (PC) on the corporate network.
2. EMS data is stored on network servers that are maintained by the Walt Disney World Information Services group. Backups of this data are made daily.
3. Automatically reset of equipment time and setpoint schedules is made daily from a server-side control program.
4. Data collection for both EMS point trends and utility meter data can be collected and stored on the EMS Servers. The Energy Information server reads these files on a daily basis.

Energy Information System

The philosophy, "If you can measure it, you can manage it", is a critical to a sustainable energy management program. Continuous feedback on utility performance pinpoints problems in the energy management system that needs attention.

The Energy Information System used at Walt Disney World is based on a standard database management system and uses custom programs to (1) gather the data from all data sources and (2) publish the data on the Disney Intranet. The advantage of this approach is that the programs can be customized to collect all utility data – no matter its source – from a variety of existing EMS and other utility monitoring systems.

The *Utility Reporting System (URS)* was developed to provide a means to "publish" utility metering information and track the results of energy saving efforts using the Disney intranet.

A key feature of the URS is the ability to send a “virtual utility bill” via email showing the monthly utility billing data. This report shows all utilities for one business unit and a comparison to prior-year month data and also to the current month utility budget. The report shows both the current month comparisons and also a year-to-date comparison. By creating an HTML-based report, links to graphs can be embedded into the report to make it more visual (see figure 2).

Hourly data collected from EMS and power monitoring systems is updated daily into the URS. A daily utility report is created for each business unit and emailed to the Users to help them track their utility usage on a daily basis. Using HTML-based email reports allows the tabular report to link to graphs showing daily and monthly utility profiles. Users view the reports using their email program (Microsoft Outlook) and are able to produce graphs by simply clicking on a hot-links in the email. Sending email on utility usage helps to increase employee participation in reducing their facilities energy consumption.

BUILDING TUNE-UP – WHERE THE MONEY IS!

The Building Tune-Up (BTU) is step two in the Energy Star Buildings program and is a process to make sure that all energy-consuming systems are working as efficiently as possible. The BTU process has the following goals:

- Reduce Utility Consumption by optimizing air conditioning and lighting time schedules and setpoints
- Improve EMS Performance by improving Energy Management System Programming & Documentation
- Identify Corrective Action Items by monitoring HVAC System operation
- Measure Utility Savings by using Utility Reporting System

The most effective way to perform a BTU at a facility is to organize a BTU Team. This team is comprised of the following members:

- Facilitator:
Energy Management Engineer
- Team Leaders
Maintenance
Productivity Manager
- Members
Operations
EMS Vendor Support (if needed)

Initially, meetings are held once a week for one hour. This doesn't seem like much time, but a slow and steady pace is best for this type of work. Most of the detailed work actually is spent between the weekly meetings reviewing and documenting the EMS programming, setpoints and operation.

Each building and each HVAC system is evaluated one system at a time until all of the systems have been reviewed and everything is working properly.

Two programs were developed to assist the BTU process. The *Facility Time Schedule (FTS)* program manages the equipment time schedules and temperature setpoints using a server-side program and automatically resets time schedules & temperature setpoints on a daily basis. We have found that without an automatic reset program, the time schedules and setpoints will eventually get changed away from their optimal settings.

The *Building Tune-up System (BTUS)* is a web-based program that was developed to provide Users a view into the EMS control settings, without actually having access to the EMS. The features of this program are shown below:

- HVAC equipment and area serviced (color coded floor plans of area serviced are used, if available)
- Equipment time and setpoint schedules – both desired and actual

- Action items for follow-up repair for each HVAC system.
- Links to EMS trend graphs and utility consumption history

The Building Tune-Up process is one of the most cost-effective energy management projects available. At Walt Disney World, the amount of savings attributed to the Building Tune-Up process was almost equal to the savings resulting from the Green Lights Program at a fraction of the cost (see figure 3).

ENERGY MANAGEMENT PROJECT TRACKING

The *Project Tracking System (PTS)* was developed to keep track of energy conservation project results. This program was created to prepare executive management reports on the cost-effectiveness of the energy projects.

The PTS provides the project scope, the annual energy consumption and dollar savings, the cost of installation and the internal rate of return for the project. Reports can be displayed by business unit or on a particular type of conservation project across all business units.

By developing the PTS as a web-based program, Users using a web-browser can produce reports showing up-to-date energy reports for their areas.

EMPLOYEE AWARENESS PROGRAMS

Energy Star Team Meeting

Cast members that participate in the Walt Disney World Energy Management Program are part of the "Energy Star Team". The Energy Star Team meets on a monthly basis and is comprised of membership from the parks, resorts and support areas throughout the Walt Disney World Resort.

The Energy Star Team meeting provides a great opportunity to share and discuss best practices among the team members. This meeting also provides a good opportunity for vendors to present their products to everyone involved with energy management in one meeting..

The Energy Star Team is also a good venue for providing small doses of training on the operation of the custom web-based programs.

Energy Star Awards Program

The Energy Star Awards Program was developed to:

1. Increase the awareness of energy usage in our Management and Cast Members,
2. Establish a method for recognizing and rewarding positive energy conservation efforts and,
3. To keep energy conservation simple and fun.

Since the utility meter information is readily available in the *Utility Reporting System*, a report was created to provide feedback on how well each area was doing relative to prior year usage.

A spirit of competition is created by ranking each area based on the percent change from prior year. Those areas that have reduced the most would rise to the top of this list. Relying on the idea that “nobody wants to be on the bottom of the list”, the awards recognize those areas that are at the top of this and identifies those areas on the bottom in need of improvement.

Each year a report is generated to show the award winners (See figure 4). Awards are presented as part of the annual Environmental awards breakfast and the details of the winners efforts are highlighted in the *Eyes and Ears* - the Walt Disney World cast newspaper.

FUTURE PROGRAM ENHANCEMENTS

Utility Analysis Program

Work is being completed on a new web-based program called the *Utility Analysis Program* (UAP). The purpose of the UAP is to allow Users to graph and report building energy consumption patterns based on actual utility submetering data for different types of buildings. The UAP will provide actual utility consumption profiles for validation of utility design parameters and simulation models. The UAP will also allow detailed utility allocations to be made for each facility based on submetering data and/or monthly utility billing data.

Chilled Plant Delta-T Improvement

The delta-t of a chiller plant is defined as the difference between the supply and return temperature of the chilled water. Most chiller plants operate at a lower than designed delta-t and seem to have lower delta-t as time passes. The resulting poor delta-t effectively reduced

the capacity of the chiller plant and also increases the pumping energy required for the higher chilled water flow rates.

Work is underway to study and evaluate ways to increase the delta-t at each facility the central plant serves. In many respects, this is a similar process to what is done during the Building Tune-Up. However, the focus of the delta-t study is to look for excessive chilled water flow and bypass.

Daily reports have been created to continuously monitor the delta-t for each facility served by the central plant. The web-based report is emailed to maintenance cast members so they can focus their attention on poor performing facilities. Like the Building Tune-Up process, routine scheduled meets keeps the process moving forward in a slow and steady pace.

CONCLUSION

Environmentality is part of our way of life at the Walt Disney Company. Energy management is good for the environment and make good business sense too.

The effective use of Energy Management Systems and the development of innovative energy information systems have resulted in a sustainable energy management program at Walt Disney World. As the Walt Disney World Resort continues to expand, these programs will continue to play an important role in lowering energy costs in both new and existing facilities.

ABOUT THE AUTHOR

Paul Allen is the Chief Energy Management Engineer at Reedy Creek Energy Services (a division of the Walt Disney World Co.) and is responsible for the development and implementation of energy conservation projects throughout the Walt Disney World Resort. Paul is a graduate of the University of Miami (B.S. degree's in Physics and Civil Engineering) and the University of Florida (M.S. degree's in Civil Engineering and Industrial Engineering). Paul is also a registered Professional Engineer in the State of Florida. Paul was selected as the 2001 Energy Manager of the Year by the AEE. (paul.allen@disney.com)

Figure 1: Disney's Energy Management and Energy Information Systems

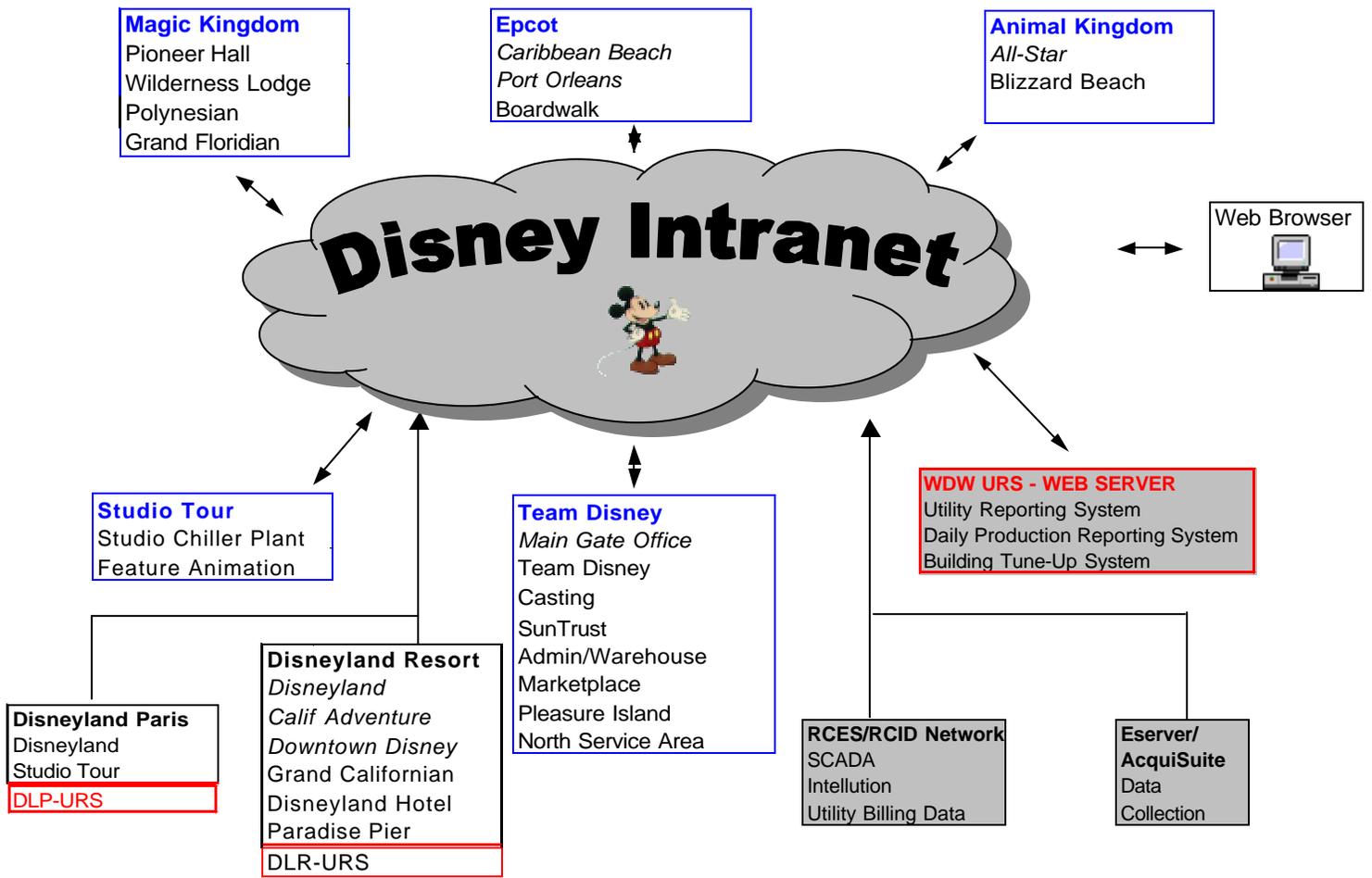


Figure 2: Utility Reporting System – Monthly Utility Analysis

**Cost, Consumption and Budget Comparison, Month Range for May/2001 - May/2001
04/03/2001 - 04/30/2001
AREA - ANIMAL KINGDOM**

COST DATA (DOLLARS)

UTILITY	Current Period Cost	Prior Period Cost	Cost Variance	Cost Variance %	Current Period Budget	Budget Variance	Budget Variance %
<u>ELECTRIC</u>	\$ xxxxxx.xx	\$ xxxxxx.xx	\$ xxxx.xx	3 %	\$ xxxxxx.xx	\$ -xxxx.xx	-2 %
<u>CHILLED WATER</u>	\$ 0.00	\$ 0.00	\$ 0.00	0 %	\$ 0.00	\$ 0.00	0 %
<u>HOT WATER</u>	\$ 0.00	\$ 0.00	\$ 0.00	0 %	\$ 0.00	\$ 0.00	0 %
<u>GAS</u>	\$ xxxxxx.xx	\$ xxxxxx.xx	\$ xxxxxx.xx	45 %	\$ xxxxxx.xx	\$ xxxxx.xx	20 %
<u>WATER</u>	\$ xxxxxx.xx	\$ xxxxxx.xx	\$ -xxxxx.xx	-12 %	\$ xxxxxx.xx	\$ -xxxxx.xx	-12 %
<u>SEWER</u>	\$ xxxxxx.xx	\$ xxxxxx.xx	\$ -xxxxx.xx	-3 %	\$ xxxxxx.xx	\$ -xxxxx.xx	-3 %
<u>REFUSE</u>	\$ xxxxxx.xx	\$ xxxxxx.xx	\$ -xx.xx	0 %	\$ xxxxxx.xx	\$ -xxxxx.xx	-9 %
<u>REUSE</u>	\$ xxxxxx.xx	\$ xxxxxx.xx	\$ xxxxx.xx	6 %	\$ xxxxxx.xx	\$ xxxxx.xx	1 %
<u>OIL</u>	\$ 0.00	\$ 0.00	\$ 0.00	0 %	\$ 0.00	\$ 0.00	0 %
TOTAL	\$ xxxxxx.xx	\$ xxxxxx.xx	\$ xxxxxx.xx	2 %	\$ xxxxxx.xx	\$ -xxxxx.xx	-2 %

CONSUMPTION DATA

UTILITY	UNITS	Current Period Use	Prior Period Use	Use Variance	Use Variance %	Current Period Budget	Budget Variance	Budget Variance %
<u>ELECTRIC</u>	KWH	xxxxxxx.xx	xxxxxxx.xx	-xxxxxxx.xx	-5 %	xxxxxxx.xx	xxxxxxx.xx	3 %
<u>DEMAND</u>	KW	xxxxxx.xx	xxxxxx.xx	-xxx.xx	-2 %	0.00	0.00	0 %
<u>CHILLED WATER</u>		0.00	0.00	0.00	0 %	0.00	0.00	0 %
<u>HOT WATER</u>		0.00	0.00	0.00	0 %	0.00	0.00	0 %
<u>GAS</u>	THERMS	xxxxxx.xx	xxxxxx.xx	-xxxxxx.xx	-18 %	xxxxxx.xx	-xxxxxx.xx	-18 %
<u>WATER</u>	KGAL	xxxxxx.xx	xxxxxx.xx	-xxxx.xx	-15 %	xxxxxx.xx	-xxxx.xx	-15 %
<u>SEWER</u>	KGAL	xxxxxx.xx	xxxxxx.xx	-xxxx.xx	-3 %	xxxxxx.xx	-xxxx.xx	-3 %

ANIMAL KINGDOM AREA Cost, Consumption and Budget Comparison, Month Range Jun FY 2000 to May FY 2001

AVG ELECTRIC PER DAY (KWH)

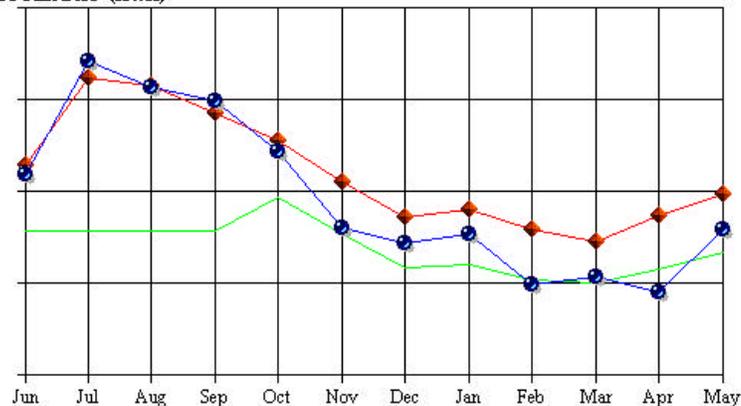


Figure 3: Walt Disney World's Energy Star Program Results

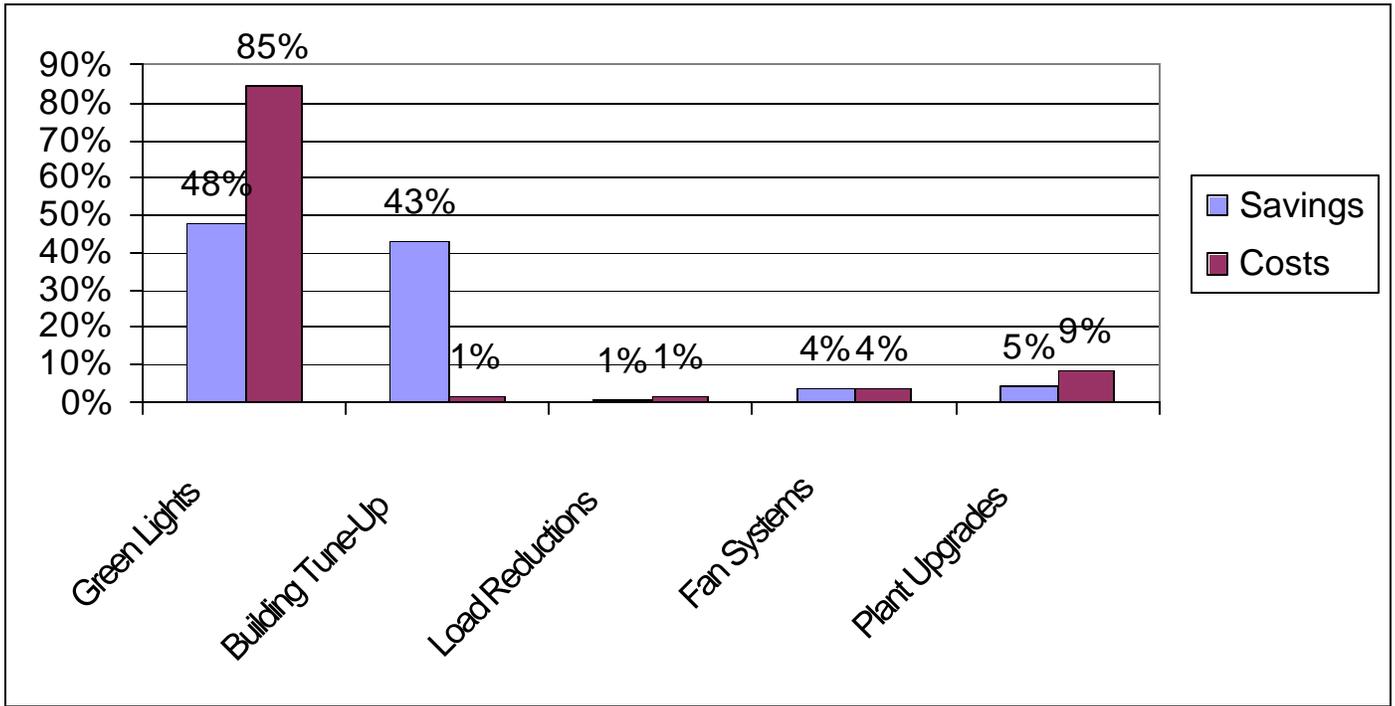


Figure 4: Walt Disney World's Energy Star Awards Program

DATE: 04/30/2001

ENERGY STAR AWARD FOR YEAR 2001

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AREA	AVERAGE CONSUMPTION/DAY - % CHANGE FROM PRIOR YEAR(S)							PERCENT CHANGE
	ELEC	CHIL	WAT	HOT WAT	GAS	WATER	SEWER REFUSE	
DIVISION: PARKS								
MAGIC KINGDOM	-5.1%	-13.8%	-2.1%	-11.9%	55.1%	4.2%	3.8%	-3.34%
STUDIO	2.0%	-7.1%	0.0%	-6.7%	1.9%	4.1%	6.3%	-1.51%
EPCOT CENTER	0.1%	-4.7%	18.1%	-7.4%	-7.3%	-7.3%	7.4%	-1.01%
ANIMAL KINGDOM	-2.2%	0.0%	0.0%	-9.9%	9.7%	13.8%	5.9%	3.53%
DIVISION: RESORT ENT								
MARKETPLACE	-4.0%	0.0%	0.0%	10.8%	2.9%	2.9%	-3.3%	-1.62%
TYPHOON LAGOON	-0.9%	0.0%	0.0%	32.5%	-3.3%	-3.3%	8.3%	3.27%
DISNEY QUEST	4.3%	0.0%	0.0%	0.0%	14.5%	14.5%	-16.5%	3.35%
WDW SPORTS	2.6%	0.0%	0.0%	0.0%	1.7%	1.7%	16.4%	3.48%
CIRQUE DU SOL	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	4.36%
PLEASURE ISLAND	7.2%	0.0%	0.0%	-1.7%	14.1%	11.4%	12.8%	8.51%
DIVISION: RESORTS								
BOARDWALK	-5.3%	0.0%	0.0%	-2.3%	-8.1%	3.5%	18.3%	-2.21%
CARIBBEAN BEACH	-2.4%	0.0%	0.0%	-2.0%	2.2%	-2.6%	5.9%	-1.69%
POLYNESIAN	2.2%	-6.3%	0.0%	-3.5%	0.6%	0.6%	2.9%	-1.59%
CONTEMPORARY	4.4%	-3.8%	-5.7%	19.2%	-5.1%	-5.9%	25.8%	-1.39%
YACHT & BEACH	-1.1%	0.0%	0.0%	-5.1%	1.7%	-1.7%	3.0%	-1.32%
VILLAGE RESORT	-1.0%	0.0%	0.0%	12.1%	0.0%	0.0%	9.4%	-0.31%
CORONADO SPGS	0.9%	0.0%	0.0%	-1.3%	-6.7%	-6.7%	15.1%	-0.24%
GRAND FLA	0.7%	-2.7%	0.0%	5.9%	2.0%	2.8%	3.0%	0.64%
DIXIE LANDINGS	4.4%	0.0%	0.0%	-3.4%	0.1%	-4.5%	1.6%	1.18%
VACATION CLUB	2.8%	0.0%	0.0%	-4.6%	-11.2%	0.5%	24.9%	1.50%
FT. WILDERNESS	0.7%	0.0%	0.0%	0.7%	2.7%	2.7%	4.3%	1.66%
DISNEY INST	-1.5%	0.0%	0.0%	-0.7%	34.3%	12.7%	0.6%	2.57%
WILD LODGE	1.9%	0.0%	0.0%	-0.4%	6.5%	6.0%	16.9%	3.31%
ALL-STAR	0.5%	0.0%	0.0%	13.7%	0.6%	0.6%	38.7%	3.58%
DIVISION: SUPPORT								
CELEBRATION	-10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-10.03%
DISNEY UNIVER	1.1%	-3.6%	-8.6%	-6.9%	-43.6%	-43.6%	7.1%	-8.99%
MAINGATE MALL	-6.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-6.59%
WAREHOUSE-DC6	1.1%	0.0%	0.0%	0.0%	-39.9%	0.0%	-49.9%	-5.65%
TEAM DISNEY	-2.2%	0.0%	0.0%	-14.5%	-24.2%	-11.4%	-10.8%	-5.34%
CELEBRATION PL	-4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-4.58%

TEXTILE - NSA	-2.4%	-27.5%	0.0%	1.9%	7.0%	7.0%	-27.3%	-3.95%
SUNBANK BLDG	2.5%	0.0%	0.0%	0.0%	-17.4%	-17.4%	13.7%	-1.76%
CENTRAL SHOPS	-0.3%	-4.4%	0.0%	-9.3%	-24.6%	92.2%	5.3%	-1.70%
MONORAIL BLDG	-0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.70%
TEXTILE - ADMIN	-0.8%	0.0%	0.0%	-4.1%	9.8%	10.4%	17.6%	1.64%
WAREHOUSE-DC1	7.3%	5.4%	0.0%	-10.6%	-26.1%	29.2%	0.0%	1.64%
DISC BLDG	8.4%	-1.8%	0.0%	0.0%	0.0%	0.0%	-9.5%	3.81%
WAREHOUSE-DC2	3.8%	0.0%	0.0%	0.0%	49.3%	1.5%	11.8%	6.18%
RIDE & SHOW	1.7%	0.9%	0.0%	9.7%	0.0%	0.0%	11.0%	6.54%
WAREHOUSE-ENTER	11.5%	0.0%	0.0%	0.0%	-5.3%	-5.3%	-11.1%	7.27%
CASTING BLDG	9.3%	0.0%	0.0%	0.0%	-5.3%	-4.0%	-11.2%	7.55%
RESORT ENTER	5.9%	0.0%	0.0%	0.0%	-12.4%	-17.8%	33.9%	7.79%
WAREHOUSE-XMAS	-3.3%	58.2%	0.0%	0.0%	0.0%	0.0%	0.0%	9.69%
AAU BUILDING	10.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.82%
WAREHOUSE-DCG	4.4%	0.0%	0.0%	0.0%	151.0%	151.0%	16.8%	13.19%