

# Energy Management Cohort Puget Sound Region

Energy Projects Presentation  
City of Lewiston  
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December 5, 2012



# Benchmark for Goals

## Oregon Sustainable Energy Management Systems Training

### Spring 2010 through Fall 2012 Update

#### City of Lewiston, Idaho Wastewater Treatment Plant

**Brief Description of Utility and Scope:** The City of Lewiston WWTP is a 5.71 MGD activated sludge facility serving a population of approximately 32,000, with an average daily wastewater flow of 4.0 MGD. The facility location and design requires influent as well as effluent flows to be pumped. The facility also employs a UV disinfection system relying on utility power. The project scope was set as WWTP site specific, with core areas including onsite pumping, aeration, disinfection, and facility lighting. In-house, as well as power utility data collection and analysis were used. Anaerobic digester boiler efficiency was also evaluated during this period as a prime opportunity for upgrade became available.

**Goals:** Goals were approved at the committee level to include; establish an accurate energy baseline, maximize available incentives, promote program awareness throughout the City, develop energy efficiency into daily procedures, and achieve 10% energy savings across core areas within five years.

#### **Goal Reporting:**

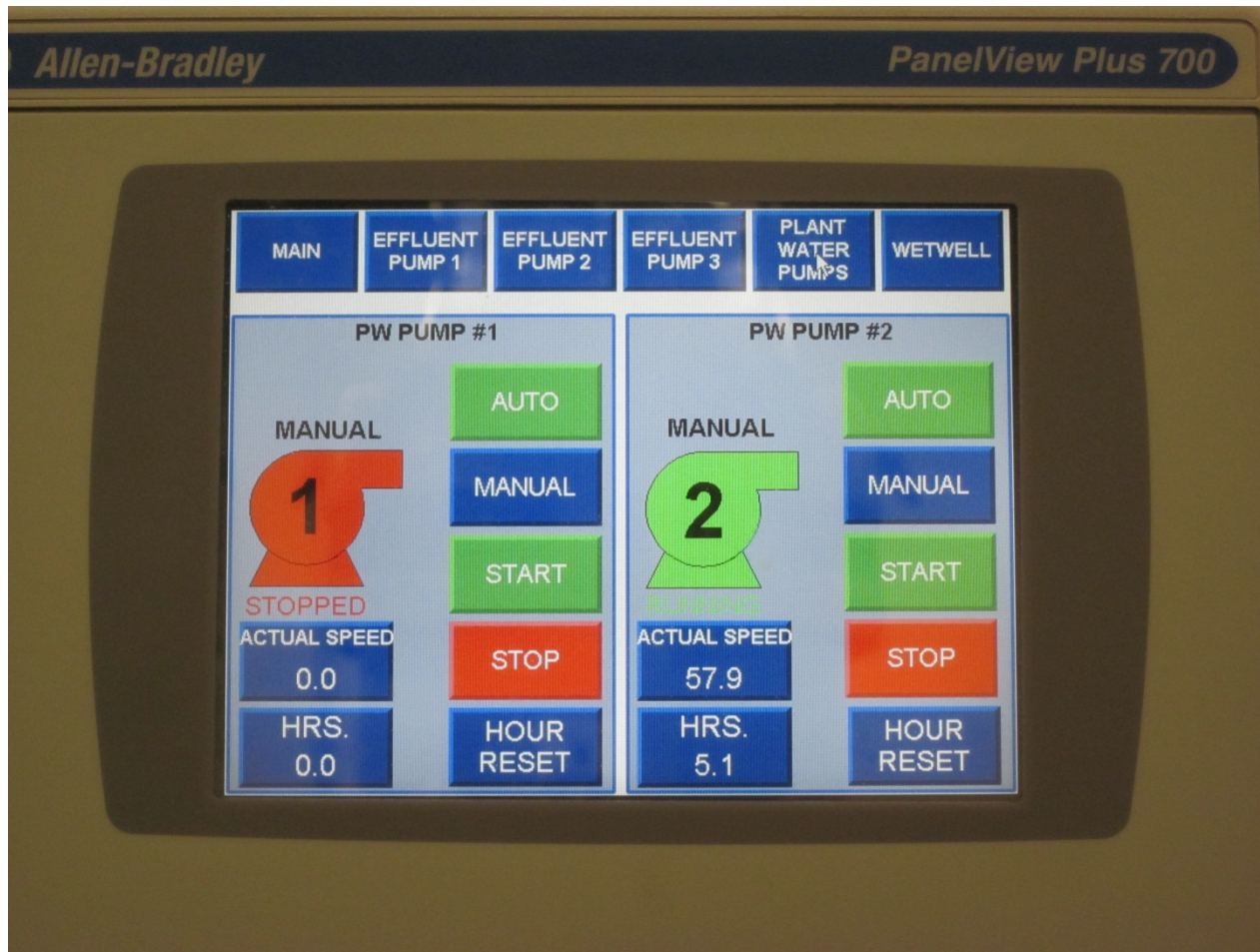
- Accurate baseline energy usage was recorded for major facility processes by onsite data logging. These data were collected, analyzed, and stored with Fluke Power Log software and Excel spreadsheets.
- Utility incentives totaled \$122,505. The City received an additional \$76,211 from a Department of Energy grant to upgrade aeration equipment. In total, two projects qualified for Avista Utilities custom incentives, with two more projects conceptually approved for future incentives. Numerous prescriptive rebates were applied for and received.

Energy efficiency savings were 21%.

# Energy Efficiency Measures

- **City of Lewiston WWTP**
- **Energy Efficiency Measures**
- **Return Activated Sludge Pumping Upgrade:**
- Replaced (2) 60hp standard efficiency motors and magnetic resistance drives with (2) 60hp premium efficiency motors and Allen Bradley PowerFlex 753 variable frequency drives. Coupled motors directly to pumps and installed custom programing to run pumps at set flow rates or based on percentage of total plant flow.
- **Aeration Blower Upgrade:**
- Replaced (2) 125hp and (2) 75hp standard efficiency motors and magnetic starters with (2) 125hp and (2) 75hp premium efficiency motors and Allen Bradley PowerFlex 753 variable frequency drives. Replaced associated 1970's switchgear and enclosures. Replaced (6) DO probes with (6) HACH LDO probes and controller. Installed custom programing to run blowers to match desired dissolved oxygen levels in aeration bays.
- **Plant Water Pumping Upgrade:**
- Replaced (1) 40hp and (1) 25hp standard efficiency motor magnetic starters with (1) 40hp and (1) 25hp premium efficiency motors and Allen Bradley PowerFlex 753 variable frequency drives. Installed a pressure sensor and Siemens 5100W mag flow meters to give system pressure and flow feedback to SCADA. Installed custom programing to allow different system pressure set points for different times of day.
- **Ultra Violet Disinfection System O&M:**
- Replaced UV lamps and quartz sleeves per O&M Manual guidelines for IDI Aquaray 40 UV System (1997). Began systematically turning off UV modules based on direct fecal counts to limit the number of modules in operation. Requested quotes on installing hardware and software to allow flow pacing and automatic run time cycling of modules. Began budgeting for full system upgrade.
- **Lighting Upgrade:**
- Replaced all T-12 fixtures with T-8s. Replaced interior HID lights with T-8s or T-5s. Replaced all incandescent exit signs with LEDs. Have begun exterior HID fixture replacement. Exterior LED incentives pay for roughly 75% of the new fixtures with LED power savings estimates at 75%. New staff electrician position allows for in house installations.

# Plant Water Pump





# Plant Water Pump



# UV System





# UV System





# Return Activated Sludge

15-Feb-11		RAS Pump VFD Upgrade		
Quantity	Item	Description	Unit Price	Extension
2 2000		AB-20-HIM-A6 Module	\$107.00	\$214.00
2 2000		AB-20-750-DNET Device Net Comm Module	\$216.00	\$432.00
2 2000		AB Powerflex 753 60Hp VFD	\$3,350.00	\$6,700.00
2 2000		AB 80 Amp Line Reactors	\$485.00	\$970.00
1 3010		Freight	\$345.00	\$345.00
1 SCADA		SCADA Panel	\$14,550.00	\$14,550.00
52 City Labor		Motor Removal and Reinstallation West	\$32.57	\$1,693.64
48 City Labor		Motor Removal and Reinstallation East	\$32.57	\$1,563.36
1 Contract		Machine Work, Laser Alignment West	\$2,490.00	\$2,490.00
1 Contract		Machine Work, Laser Alignment East	\$1,750.00	\$1,750.00
1 Contract		Installing VFDs and Wiring West	\$3,044.19	\$3,044.19
1 Rex 30 HQD Sets		Hubs and Shaft Couplings	\$1,212.32	\$1,212.32
1 Consumables		Grinding discs, welding rod, paint	\$100.00	\$100.00
1 Contract		Wiring East	\$968.51	\$968.51
1 Shipping		Ship East Motor Base to DBM	\$40.40	\$40.40
32 Controls		PLC Design and Construction	\$95.00	\$3,040.00
20 Controls		Program Design	\$95.00	\$1,900.00
16 Controls		PLC Conversion Drawing	\$95.00	\$1,520.00
6 Controls		Remove Old Panel and Install New	\$1,500.00	\$9,000.00
1 Controls		Program Flow Proportioning	\$1,500.00	\$1,500.00
1 Controls		Connect and Program VFDs	\$1,500.00	\$1,500.00
		Total		\$54,533.42



**Return Activated Sludge**



**Return Activated Sludge**

# Blower Upgrade Phase 1

EEM #1 – Lewiston's Waste Water Treatment Facility (WWTF) employs a coarse bubble aeration system. The EEM replaces the coarse bubble system with a fine bubble system. Historically fine bubble aeration systems consume ~40% less energy than coarse bubble systems. The Lewiston header and piping system is not sized to supply air for a fine bubble system. **Due to the cost to upgrade the supply system the customer wants to break the project into three phases.**

- o **Phase 1** (Spring 2011) – **Install Variable Frequency Drives (VFDs) and premium efficient motors on the existing system's four blowers.** The EEM will also include a Dissolved Oxygen (DO) sensor, controls and infrastructure required to operate the VFDs and control blower speed/air flow rate and regulate DO to desired set-point. Due to the integrated nature of the individual EEMs in phase 1 (premium motors VFDs) the entire project, including motors, will be evaluated as a site specific project.

- o **Phase 2 – Update air distribution system** including piping and headers to serve fine bubble system; fine bubble components to be installed and commissioned in phase 3.

- o **Phase 3 – Install fine bubble diffuser components,** and commission system.

Customer plans to begin phase 1, during the spring of 2011, with phases 2 and 3 undertaken in the future. All the projects will be evaluated based on actual performance over a 6 month period. It is expected that each phase of the overall project will result in energy savings. Due to the multi-year schedule of the overall project, each phase will be evaluated individually. Phase 2 and phase 3 to be evaluated based on the incremental savings. A copy of the MCAD model to evaluate savings is appended to this document. Site measured blower power, blower curves, and header pressures are also appended to this document for reference purposes.



# Blower Upgrade Phase 1

## Blower Upgrade Phase 1

Quantity	Item	Description	Company	Unit Price	Extension	Account	PO #	Invoice #
1	TM	Technical Memorandum	Keller Assoc.	\$5,000.00	\$5,000.00	863	34029	210007-003-2
1	DO Probe Package	HACH: Initial DO Probe System	HACH	\$7,696.95	\$7,696.95	929	35049	6910941
1	Motor Couplings	Rex Couplings	AIT	\$560.17	\$560.17	821	37550	41556027
1	DO Probe Adder	HACH: Remaining 4 Probes	HACH	\$7,923.95	\$7,923.95	938 #03-097	36594	7014753
1	DO Probe Connections	Probe Connectors	HACH	\$553.45	\$553.45	938 #03-097	38965	7266445
1	Motor Alignment	DBM: Laser Alignment	DBM	\$1,600.00	\$1,600.00	938 #03-097	37447	1030
1	MCC	CST: East & West MCC Replacement	CST	\$38,700.00	\$38,700.00	938 #03-097	37238	6485
1	VFDs	CST: (2) 75hp, (2) 125hp VFDs	CST	\$31,750.00	\$31,750.00	02-100-104-303-925 # 6-136	37227	6484
1	Contract Labor	Mount Drives, Assemble PLC, Fans & Screens	CST	\$8,160.00	\$8,160.00	02-100-104-303-925 # 6-136	37226	6483
1	Wire	Wire for Temporary Controls	CED	\$756.00	\$756.00	938 #03-097	39050	4153-534801
1	Contract Labor	MCC Reinstallation and Setup	CST	\$28,535.00	\$28,535.00	02-100-104-303-925 # 6-136	39289	6500
27	Contract	Room and Board	CST	\$150.00	\$4,050.00	938 #03-097	39268	6512
40	Documents	Control Drawings	CST	\$105.00	\$4,200.00	938 #03-097	39267	6515
1	Parts	Electrical Parts	CST	\$4,214.00	\$4,214.00	938 #03-097	37226	6504
1	Controls	Control Service and Programming	CST	\$5,500.00	\$5,500.00	938 #03-097	39594	6533
1	O&M	O&M Documents	CST	\$912.00	\$912.00	938 #03-097	39386	6522
1	Lock Outs	Lock Out Devices	CST	\$146.00	\$146.00	938 #03-097	39386	6521
6	Lights	Panels Lights	CST	\$110.00	\$660.00	938 #03-097	39053	6492
1	Controls	Design and Layout	CST	\$1,920.00	\$1,920.00	938 #03-097	37938	6416
4	Electrical Service	MCC Construction	CST	\$85.00	\$340.00	938 #03-097	38299	6444
32	Electrical Service	Mount Equipment	CST	\$85.00	\$2,720.00	938 #03-097	38292	6427
1	Parts	Steel to Fab MCC Base	Pacific Steel	\$460.49	\$460.49	938 #03-097	37896	2595741
1	Rewire	Rewire Motors	Valley Electric	\$2,559.98	\$2,559.98	02-100-104-303-925 # 6-136	39429/37283	2011-199
194	Labor	Blower Project	City of Lewiston	\$32.57	\$6,318.58			

Available for  
Incentive

\$165,236.57

# Blower Upgrade Phase 1

- Available for Incentive \$165,236.57
- Custom Incentive - Avista (\$82,683.00)
- Grant – Department of Energy (\$76,210.58)
- Subtotal \$6,342.99

# Blower Upgrade Phase 1



# Blower Upgrade Phase 1





# Blower Upgrade Phase 1



# Blower Upgrade Phase 1





# Blower Upgrade Phase 1



# Blower Upgrade Phase 1





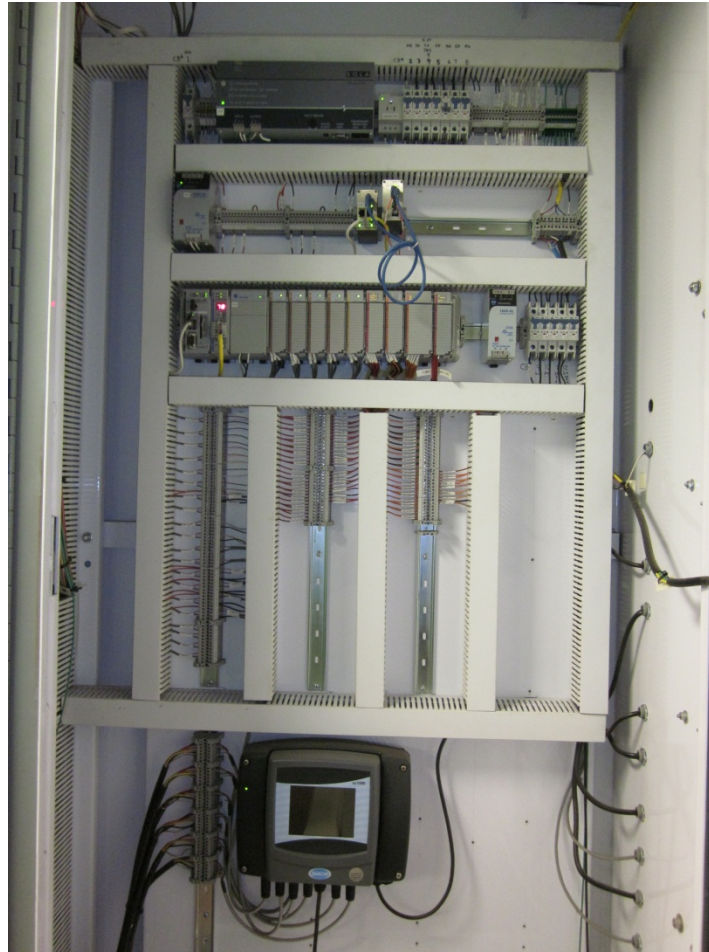
# Blower Upgrade Phase 1



# Blower Upgrade Phase 1



# Blower Upgrade Phase 1





# Blower Upgrade Phase 1

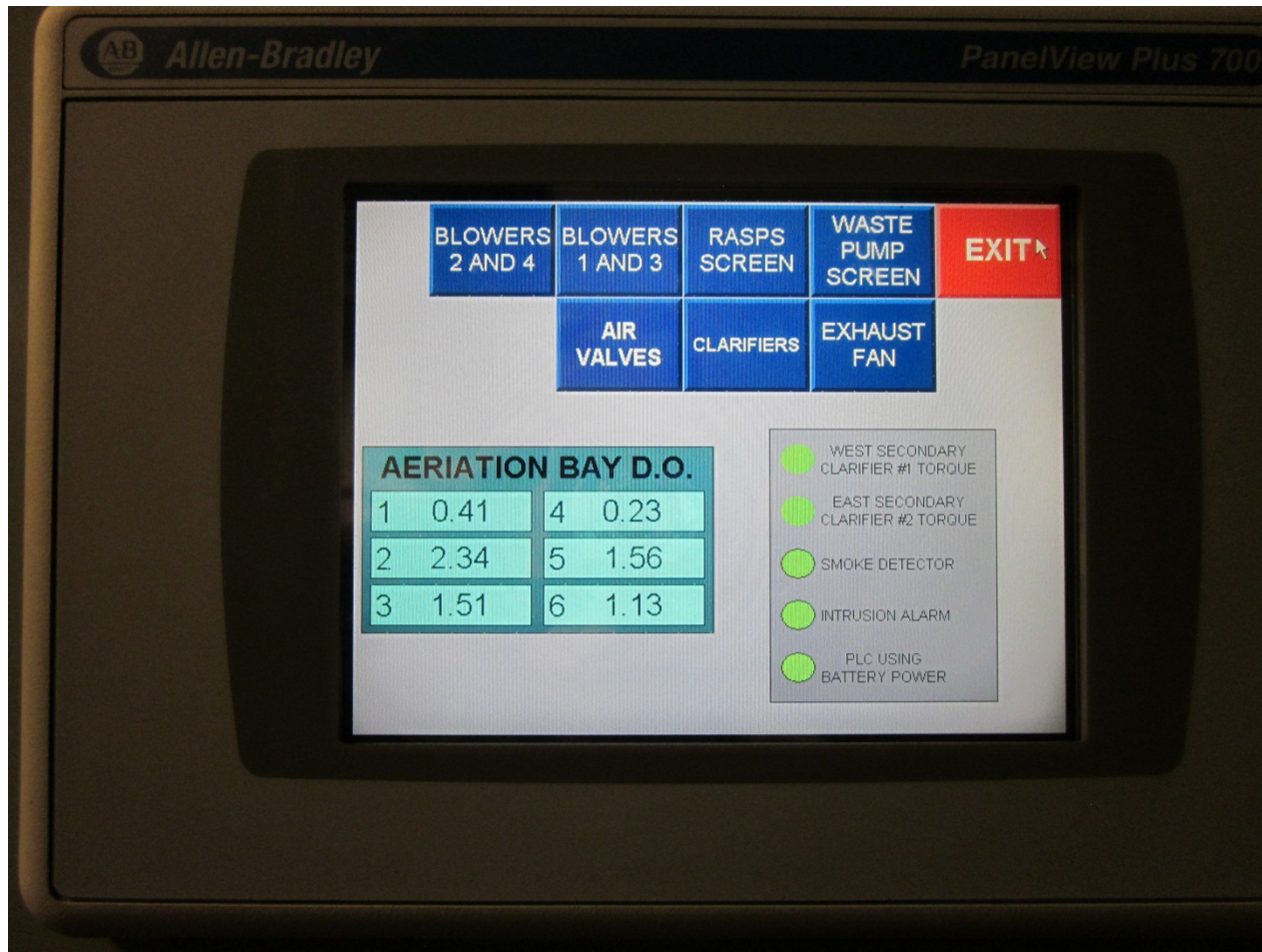




# Blower Upgrade Phase 1



# Blower Upgrade Phase 1



# Portfolio Manager Data

## Electricity

<i>Column</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	
<b>Time</b>	<b>Monthly High kWh/month</b>	<b>Average kWh/year</b>	<b>Average kWh/month (Column 2/ 12)</b>	<b>Total Flow: Million Gallons /year</b>	<b>Average kWh/million gallons  (Column 2/ Column 4)</b>	<b>Portfolio Manager Score</b>
5/2010- Baseline	411,600 (12-09)	4,271,987	355,999	1460	2904	26
11/2012	355,600 (6-10)	3,376,303	281,358	1460*	2312	59
<b>% improvement</b>		21%				
<b>\$\$ saved</b>	\$55,021/yr					

\*Benchmarked with previous year

# Audit Data

**Energy Audit:** The most recent energy audit prior to this workshop series was performed by Avista Utilities in 2000. Although a full audit was not performed, Avista Utilities were involved throughout this process providing technical support, and helping guide the Energy Team through their incentive process. Onsite data logging was performed at six different locations throughout the facility during this program covering major energy consuming processes. A facility wide lighting audit was performed with pending results and recommendations. Planned SCADA integration of online power monitors will provide facility wide real-time data for future data collection and analysis.

## Efficiency Measures:

Project	Initial Power (kW*hr/yr)	Initial Cost (\$/yr)	Measure	Final Power (kW*hr/yr)	Final Cost (\$/yr)	Savings (\$/yr)	% Savings
RAS	209,491	\$14,245	VFDs/Controls	38,223	\$2,599	\$11,646	82
UV	333,336	\$22,667	Optimization	190,477	\$12,952	\$9,714	43
PW Pumping	174,586	\$11,872	Optimization	85,191	\$5,793	\$6,079	51
Aeration	2,435,280	\$165,599	VFDs/Controls	1,797,746	\$122,247	\$43,352	26
						\$70,791	

### Facility Totals

kW*hr / year	Total Cost / year
4,240,600	\$288,361

Theoretical % Savings
24.5*

\*Difference in Theoretical versus Actual % savings is due to additional process loads being brought online.



# Project Payback

Project	Project Cost	Electric Savings kWh/yr	Annual Energy Cost Savings	Project % Savings	Simple Payback Before Incentive (yrs)	Incentive	Simple Payback After Incentive (yrs)	Grant	Simple Payback After Grant
Return Activated Sludge Pumping Controls	\$54,533	171,268	\$11,646	82	4.7	\$22,199	2.8	N/A	N/A
Blower Controls	\$165,367	637,534	\$43,352	26	3.8	\$82,683	1.9	\$76,211	2 months

# Avista Rebates

			Avista Rebates				
Purchase Date	Application Date	Item	Description	Applied Amount	Projected Amount	Received	Notes
3/31/2010	5/12/2010	RAS Pump Motors	60hp Premium Motor Rebate	\$2,320.00	\$2,320.00	\$2,320.00	
10/16/2008	6/17/2010	#2 Blower Motor	125hp Premium Motor Rebate	\$1,070.00	\$0.00	\$0.00	Past 90 day deadline for application
8/25/2009	6/17/2010	#2 PW Pump Motor	40hp Premium Motor Rebate	\$670.00	\$670.00	\$670.00	
10/21/2010	10/25/2010	Occupancy Sensor	Lighting Rebate	\$50.00	\$50.00	\$50.00	
11/16/2010	11/16/2010	Control #1 Motors	2,2,3,20hp Premium Motor Rebate	\$150.00	\$150.00	?	
11/22/2010	11/29/2010	Exit Signs	Lighting Rebate	\$50.00	\$50.00	?	
11/22/2010	12/7/2010	Blower Motors	75,75,125hp Premium Motor Rebate	\$1,630.00	\$1,630.00	\$1,630.00	
1/17/2011	1/17/2011	DAFT Motor	25hp Premium Motor Rebate	\$350.00	\$350.00	?	
1/17/2011	1/17/2011	Effl Motor Rewind	100hp Green Motor Rewind	\$100.00	\$100.00	\$0.00	Did not pass test
3/31/2011	4/20/2011	Effl Motor #2	100hp US Motor	\$1,170.00	\$1,170.00	\$1,170.00	
2/15/2011	2/15/2011	RAS	Return Activated Sludge Pumping Controls	\$22,199.00	\$22,199.00	\$22,199.00	
6/20/2011	6/20/2011	Blower	Blower Controls	\$82,683.00	\$82,683.00	\$82,683.00	Plus DOE Grant \$76,211
5/21/2012	5/21/2012	Lighting	Harrison Electric T-12 Conversions	\$11,783.00	\$11,783.00	\$11,783.00	
9/10/2012	11/16/2012	Lighting	2 Exit Signs, 3 SSPS LEDs, 6 AB LEDS	\$1,675.00	\$1,675.00		

Questions?