

Port of Portland Living Machine

presentation to

Idaho Water Re-use Conference

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Port of Portland Mission

Charged with promoting the region's aviation, maritime and commercial and industrial interests, the Port's mission is ...

... to enhance the region's economy and quality of life by providing efficient cargo and air passenger access to national and global markets.



Port Properties



Supporting its mission, the Port's vision is ...

... to be a prominent, innovative economic development engine while stewarding the region's community and environmental best interests.



The Port's promotes sustainability as a business model...

... The Port recognizes that our actions today affect and influence the lives of future generations. The Port is operating sustainably when we make business decisions that support long-term economic health, integrate community concerns into our work, and reflect a deep and broad commitment to environmental stewardship.



Port of Portland Headquarters



Guiding Principles

- Create at least 3,000 public parking spaces and 500 rental car spaces
- Design and build a corporate HQ that creates a positive image of the Port to the public, our customers, and employees
- Create a consolidated office that supports a “One Port” environment
- Provide close access to the PDX terminal building for employees
- Create a positive financial impact for both the Port’s General Fund and Aviation

Guiding Principles

- Water use does not exceed that which falls on or flows through the site
- Energy use does not exceed solar energy falling on the site
- Purity of air surrounding and flowing off-site is as pure or purer than air flowing onto the site
- Any vegetation used is compatible with the local natural systems
- All materials are non-persistent, non-toxic and procured from either reused, recycled, renewable or abundant sources
- LEED-NC Gold Certification (exceeded!)



Building Highlights

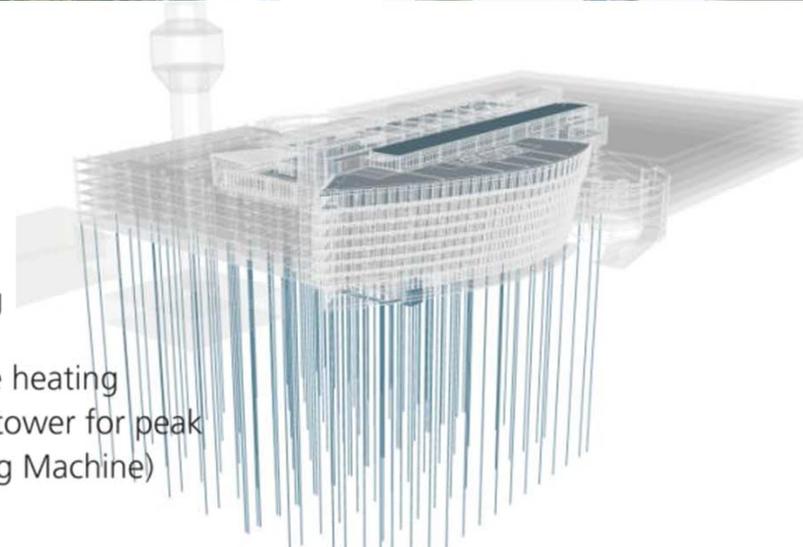


WATER EFFICIENCY

- A.** 8th floor landscape deck with adaptive plants and micromist irrigation
- B.** Low-flow fixtures
- C.** Eco-roof with adaptive plants and micromist irrigation
- D.** Living Machine System

ENERGY EFFICIENCY

- E.** Reflective membrane roof
- F.** High performance glazing
- G.** Radiant heating & cooling ceiling
- H.** 200 wells provide ground source heating & cooling with auxiliary cooling tower for peak periods (augmented by the Living Machine)

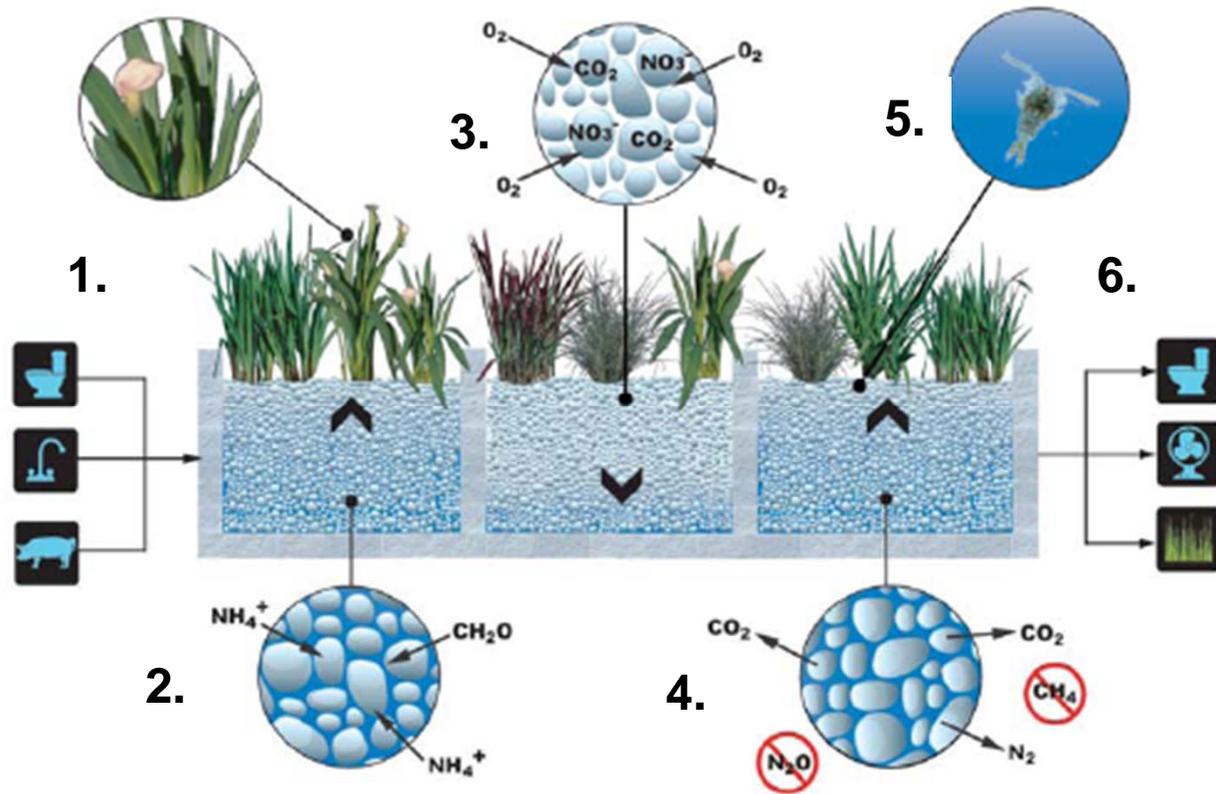


Why A Living Machine?

- **Team Explored:**
 - traditional wastewater solution
 - membrane bioreactor system
 - living machine system
- **Benchmarks:**
 - water goal
 - energy goal
 - maintenance
 - educational tool
- **Hybrid Solution:**
 - traditional for P2
 - living machine for HQ
 - bypass for emergencies



The Living Machine



1. Engineered system

2. Series of discrete cells

3. Drain cycles, allows oxygenation

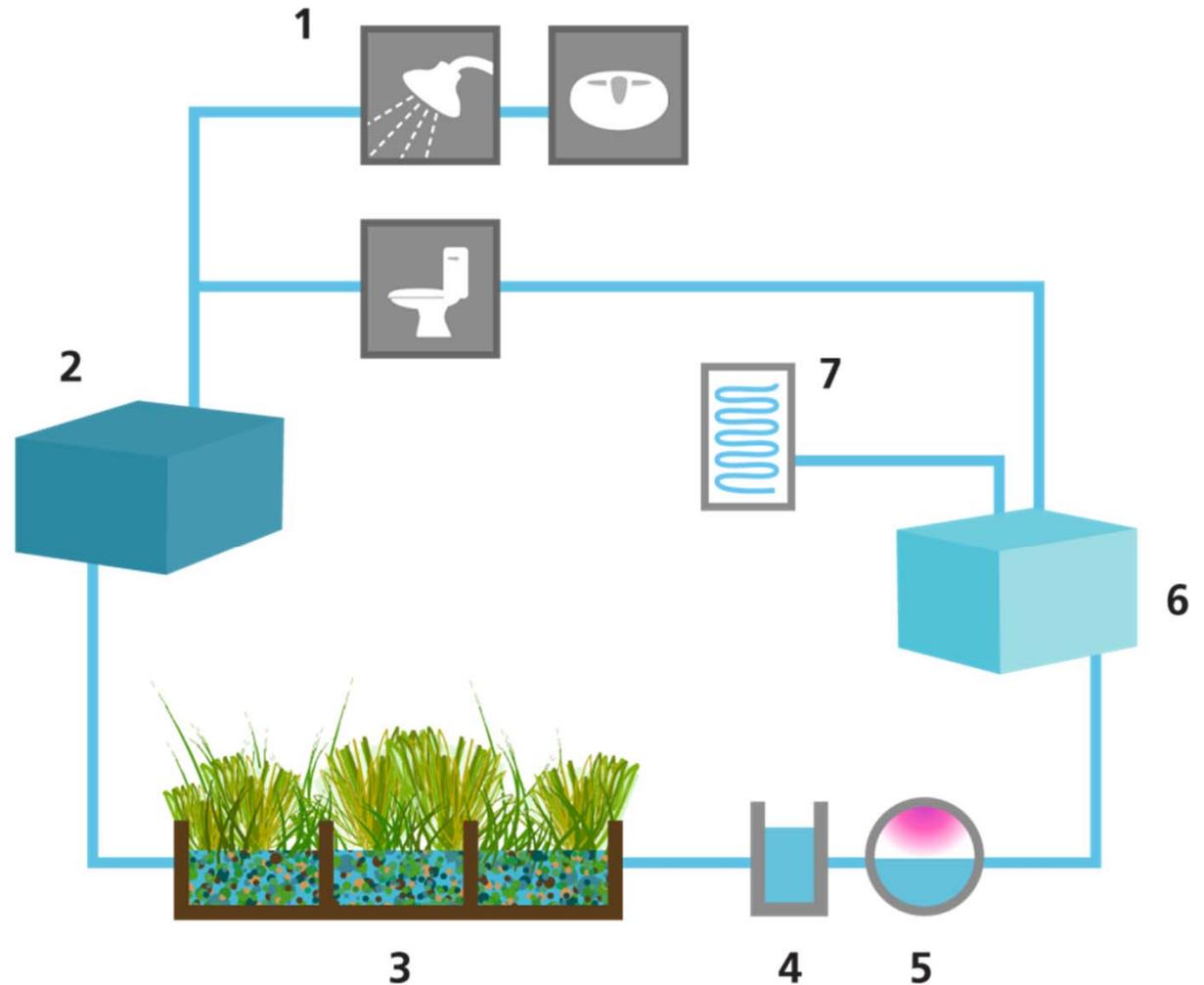
4. Fill cycles, activates bacteria

5. Food chain with variety of microorganisms

6. Complex ecology = water reuse & 1/3 less energy

The Port's Living Machine System

1. Office building: toilet, sink & shower wastewater
2. Primary & equalization tanks
3. Tidal flow wetland
4. Polishing vertical flow wetland
5. UV & chlorine sterilization disinfection
6. Clean effluent tank
7. To office flush valves & HVAC office cooling tower



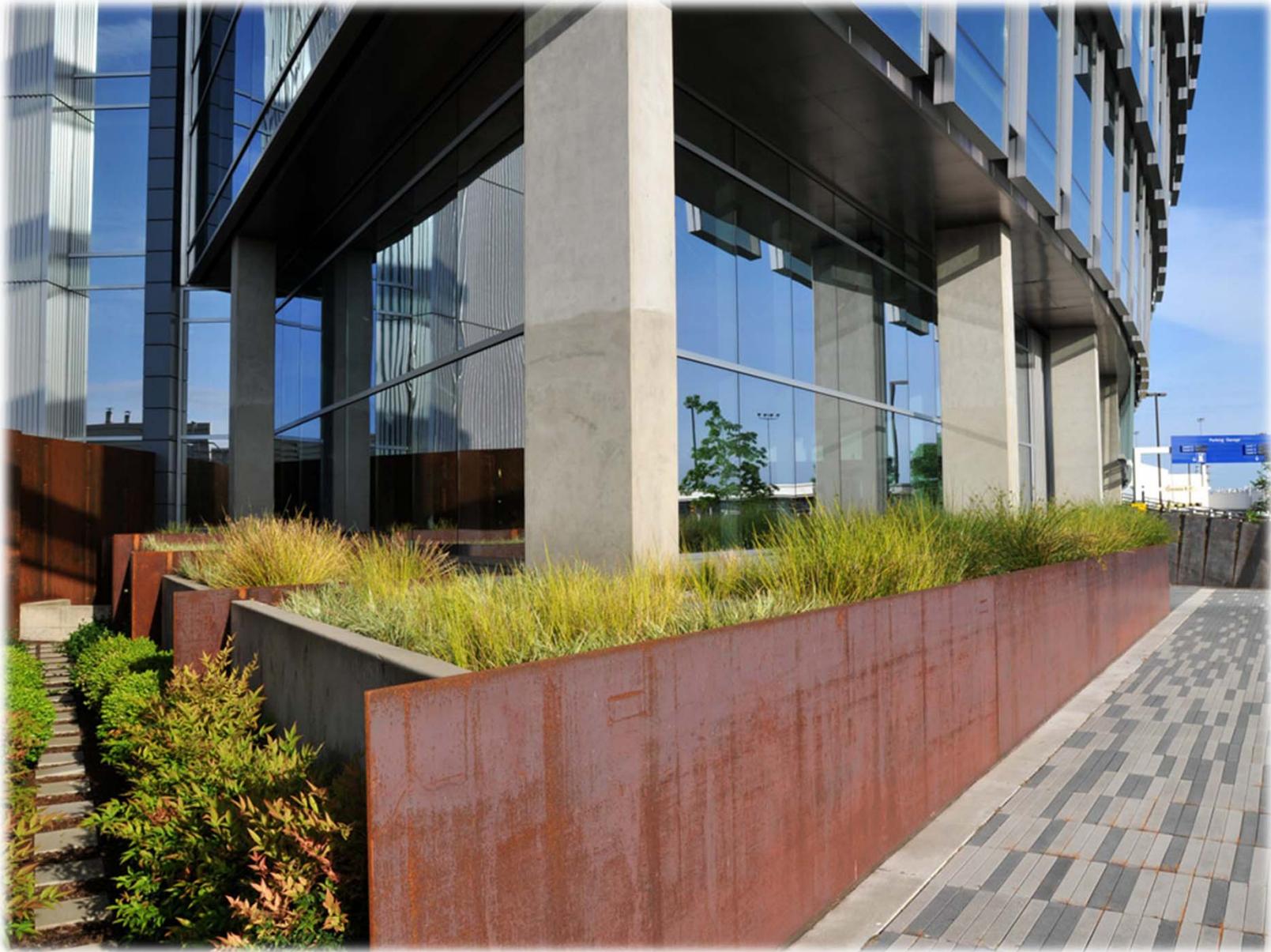
The Living Machine



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Synergy



QTA
~ 38,000 gals/day
~ \$380/day in fees
13,870,000 gal/yr
\$138,500/yr in fees

CUP
~ 22,000 gals/day
~ \$85/day fee
8,000,000 gal/yr
\$11,500/yr in fees

Uses of clean effluent considered

- restroom fixtures
- project mechanical system
- CUP systems
- irrigation water
- rental car wash make up

Uses of clean effluent chosen

- restroom fixtures
- project mechanical system

Coordination Issues

- Primary & effluent tank size and location
- Mechanical room and garage floor drains bypass direct to city sanitary sewer
- Electrical system device ratings for hazard classifications
- Team coordination: wastewater designer, civil, plumbing, mechanical, electrical, signage, landscape, architectural, structural
- Disinfection system piping
- Make-up water connection, city & standalone
- Emergency bypass to city sanitary sewer
- Education of odor control in area of tidal tanks
- Emergency power
- Signage in occupied space for reclaim water usage
- Plant types



Regulatory Requirements and Permitting

Use of Recycled Water - (OAR Division 55)

Class “B” Recycled Water

Category III WPCF Permit - (OAR Division 45)

no surface water or subsurface discharges

two “outfalls”

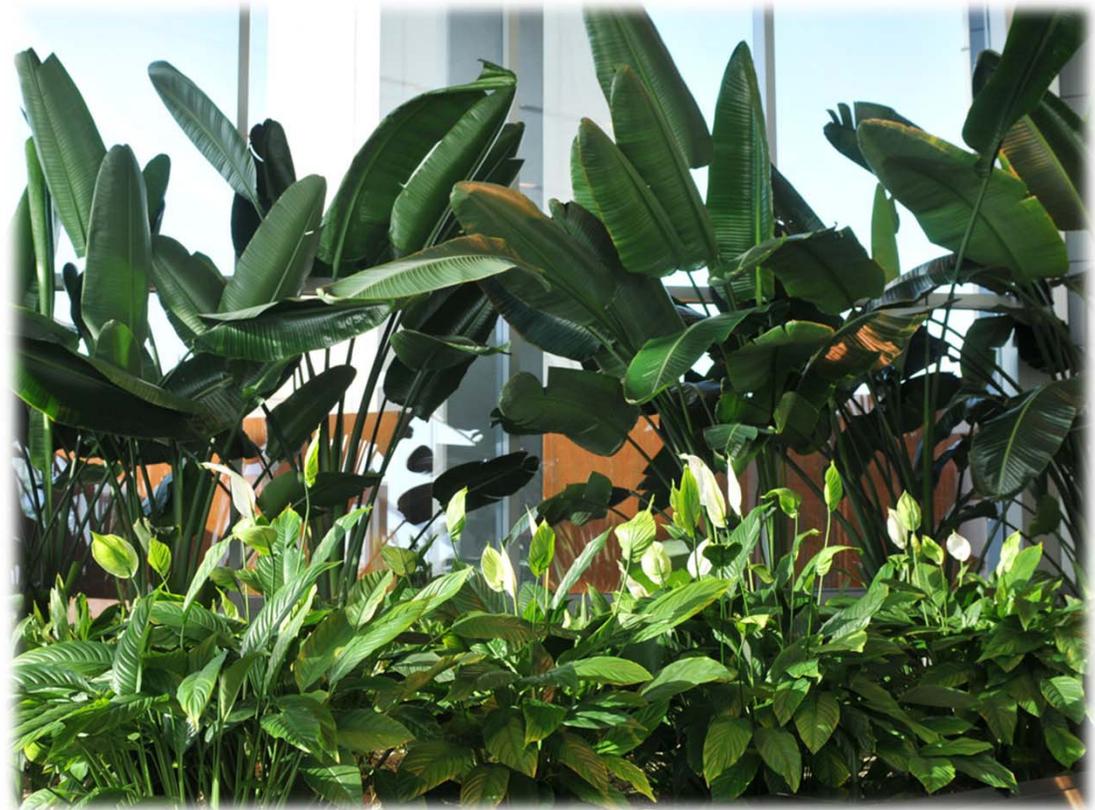
coliform monitoring

Recycled Water Use Plan

City Requirements

DEQ/DHS Clarification Letter

Signage



treatment system

Recycled Water Policy

Regulatory Hurdles

Municipalities Dilemma

decentralized v. centralized treatment

Future Uses

Public Acceptance



Recycled Water Policy

The “Yuck Factor” – Get over it!



10,000 dogs can't be wrong

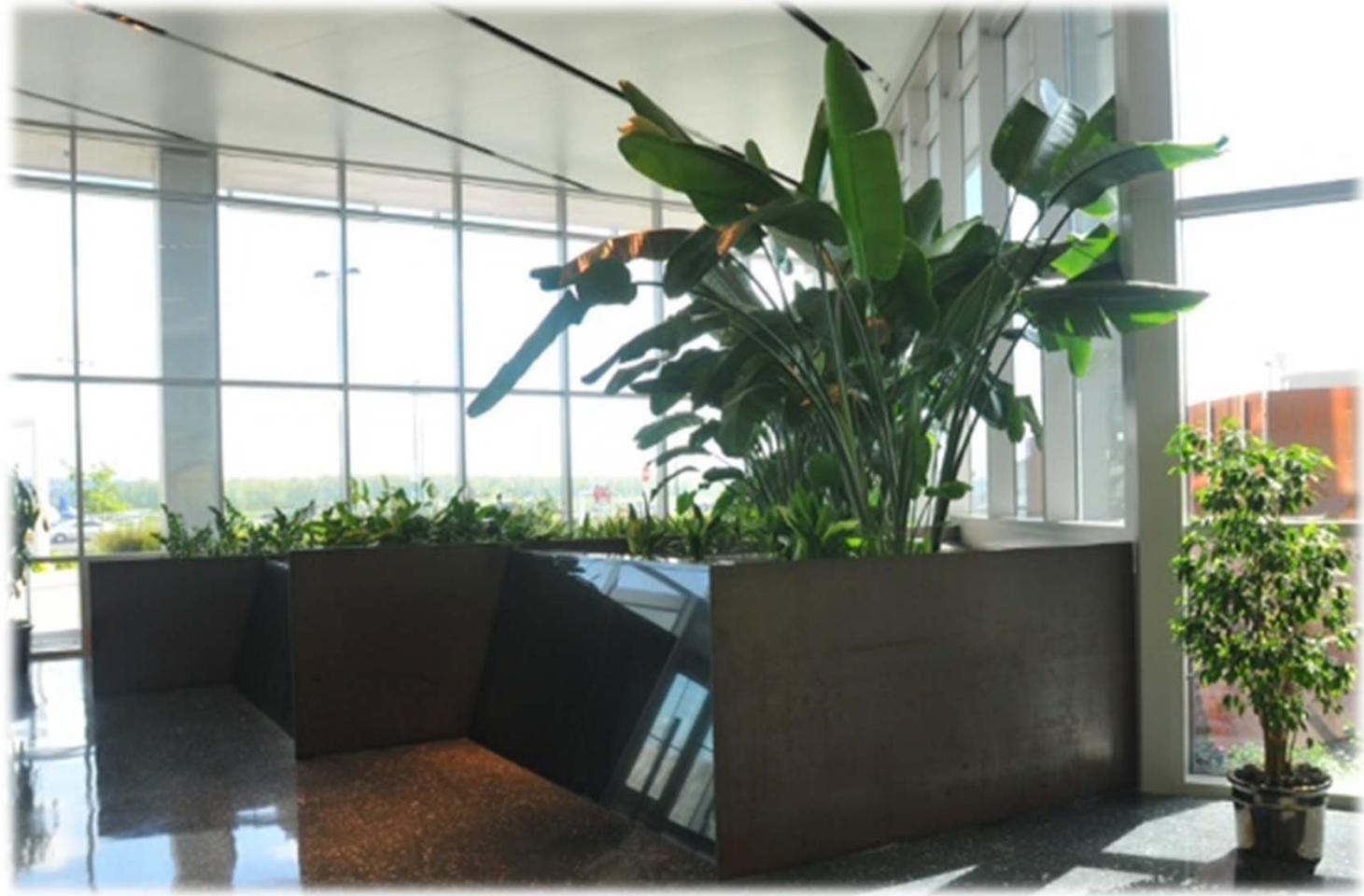


System Operation

System Performance

Cost of Operation

Lessons Learned



Questions?

