Presentation outline:

1. Sound Transit Primer
2. Agency Sustainability Program
3. Water Use Reduction Strategy
4. Irrigation Assessment Example
5. Lessons-Learned

The Sound Transit district

Making it easier to get around

Serving more riders each year
Tacoma Link Light Rail
- Opened in 2003
- Approx. 1.6 miles long
- Connects Theater District to Tacoma Dome

Central Link Light Rail
- Opened in 2009
- Serves Westlake Station to SeaTac Airport
- 13 Stops
- Approx. 15 miles long

University Link light rail
- 2016 opening
- Stations at: Capitol Hill and Husky Stadium

Northgate Link Extension

South Link light rail Angle Lake (S. 200th)

“ST2”
- 36 miles of new light rail (total 55-mile system)
- Expanded Bus Service
- More Commuter Rail Trips

Planning and Designing North, South, & East Light Rail Extensions
What is ESMS?
Environmental and Sustainability Management System

1. Plan
2. Do
3. Check
4. Act

Sound Transit’s Sustainability Framework

Agency ESMS policies

- Environmental Policy - 2004
- Sustainability Initiative – 2007
- Integrated Pest Management Plan - 2009

Sound Transit’s Sustainability Plan

- Agency resource use
  - Energy & GHG emissions
  - Water use
  - Waste, recycling, composting
- Best practices
- Environmental compliance
- Staff stakeholder process

ESMS certifications
National and international recognition
Water Conservation and Toxic Use Reduction

- Reduce indoor and outdoor water use by 1% per year (avg)
- Reduce the use of toxics in the environment

Integrated Pest Management (IPM) Plan

- Soil
- Design
- Plant installation and maintenance
- Pest knowledge
- Tolerance thresholds
- Monitoring and evaluation
- Record keeping

Landscape Evaluations

Evaluated 25 stations in 2010 and 2011

Biggest Landscape Maintenance Issues

- Lack of mulch
- Bare soil
- Improper tree and shrub pruning/hedging
- Line trimmer damage on trees
- Dead or declining trees
- Invasive plants and noxious weeds
- Poor drainage - overwatering

Water Conservation

Scheduled FREE Irrigation Audits:

- Seattle Public Utilities (Seattle - OMF, Mercer Island)
- Cascade Water Alliance (Overlake Transit Center, Issaquah P&R)

Observations and Recommendations for Sound Transit Mercer Island P&R

John Easley
2014
Informal Poll

1. How many feel underpaid?

2. How many feel overworked?

Informal Poll

3. How many know they could and would do a more complete job given more time and resources?

ASSESSMENT REVIEW

• Four areas were assessed.

1. Full sun turf
2. Full sun tree and shrub
3. Tree and shrub in shade
4. A client selected “problem” area

ASSESSMENT REVIEW

• Each area inspected included an examination of:
  1. Soil
  2. Plant material
  3. Irrigation hardware and management practices
  4. Landscape management practices that affect irrigation efficiency
OVERALL SUMMARY

- The landscaping appears neat and groomed.
- Ground covers are well established.
- The soil on site looked to be imported during construction.
- It consisted of a nice, dark sandy loam ranging from 5” to 14” in depth.

Plant list

- Acer Sp.
- Acer Rubrum
- Rhus Typhina
- Liquidambar Styraciflua
- Cornus Kousa
- Pinus Densiflora
- Pyrus Calleryana
- Chamaecyparis Obtusa
- Viburnium Plicatum Tomentosum
- Vinca Minor
- Euonymus Fortunei

Landscape Design is the Recipe

- Each landscape has a plant water requirement
- If the “recipe” calls for “two eggs”.....
- That’s what is called for to make the recipe work as intended
- That’s the amount of water that needs to be provided for the landscape to grow as intended

Reference Evapotranspiration-Et₀

- Et₀ = how much water a cool season turf will use when it is 4 – 6” high and well watered.
- If you are watering:
  - Cool Season turf: 65-75% of Et₀
  - Trees and shrubs: 60-80% of Et₀
  - Natives: 30-50% of Et₀

Precipitation Rate Averages

- Spray heads 1.5”/hour
- HI-DU Rotary Nozzles 0.4”/hour
- Rotors Heads 0.75”/hour

Three Options for Reducing Site Water Use

1. Improve System Efficiency
2. Reduce Site Net Et₀
3. Improve Scheduling
Focus on Watering Better

- Keeping the water in between the lines
  - Keep water off of hardscapes and in target area
  - Avoid run off, ponding, and deep percolation
  - Timely maintenance

Better Irrigation Scheduling

- Find a source for local $E_{\text{t}}$
  - www.iwms.org
- Take more time to do a better job of manually changing runtimes on the controller
- Invest in some Sensor Based Technology or central control for your system and scheduling

Trees
Several trees were flagging and clearly in a stressed condition.

Mulch piled up around the root flares

Trees planted too deep

Trees planted in wire baskets
Damage to root flares

Mower/weed eater damage to trunks

Evidence of possible chemical use

Overwatering

??????

Trees

• Recommended getting a tree assessment from a certified arborist to determine hazards, remedies, and survivability of the trees on site.
Irrigation Hardware

The irrigation system is controlled by a stand-alone Rainbird ESP-MC 12 controller.

- No rain switch
- No remote control
- Master valve

Irrigation Programming

- Date of assessment was September 14, 2011
  - All zones were programmed for 10 minutes or more, although 1 zone had 7 minutes.
  - Everyday!

Irrigation Heads

- Rainbird 1800 heads
- Rainbird matched precipitation rate and variable angle nozzles
- Rainbird bubbler nozzles

FULL SUN TURF

The turf is parking strip approximately 172’ X 12’ tapering on one end.
The irrigation system used Rainbird 1800 spray heads only on the street-side curb spraying toward the sidewalk. This causes dry spots behind trees, traffic signs and other obstructions.
Maintenance?
There was one bad nozzle and a lateral break causing wash-out and water waste.

Timely maintenance needed

Zone List

Recommendations
• Use 4” heads and cut sod away
• Adjust flow control handle at the valve
• Change nozzles on tapered end of turf to prevent overspray
• If hydraulically possible, install a lateral and heads on the sidewalk side of the area and change all spray nozzles in the zone to high Du rotary nozzles
• Layout heads to minimize spraying the tree trunks

FULL SUN TREES & SHRUBS

FULL SUN TREES AND SHRUBS
The bed area is a mixed planting of trees, shrubs and ground covers in a full sun exposure.
Area had about 1” of mulch covering the bare areas of the bed while the ground covers are still establishing.
The irrigation covered the area well with Rainbird spray heads.
One nozzle was broken and in need of replacement.
FULL SUN TREES AND SHRUBS
RECOMMENDATIONS
Maintain tree wells and mulch rings around trees and woody shrubs even in ground covers to reduce competition for nutrients and water.
Decrease water usage by developing a proper ET-based watering schedule that considers climatic conditions, plant material, and soil.
Consider replacing spray nozzles with High DU rotary nozzles.

TREES & SHRUBS IN SHADE
Area consisted of a mixed planting of trees, shrubs, vines, and ground covers. It’s located on the north side of the garage structure and only receives direct sun a few hours a day. The soil is a sandy loam and wet almost to the point of saturation.

TREES & SHRUBS IN SHADE
RECOMMENDATIONS
Maintain tree wells and mulch rings around trees and woody shrubs even in ground covers to reduce competition for nutrients and water.
Decrease water usage by developing a proper ET-based watering schedule that considers climatic conditions, plant material, and soil.
Consider replacing spray nozzles with High DU rotary nozzles.

CLIENT SELECTED PROBLEM AREA
The problem areas examined were elevated planters and tree pits in the sidewalk.
Several trees in the planters were visibly stressed and there were several stumps where the trees had failed and been removed. The soil in the planters and pits was a sandy loam and wet almost to the point of saturation. The area around the bottoms of the elevated planters had accumulations of mud, water, and moss, evidence of either excessive amounts of drainage or overspray outside the target area.

**Maintenance needed**

**End strip nozzles**

**Side strip nozzles**

**Recommendations**
- Repair stuck heads in elevated planters and bubblers in tree pits
- Decrease water usage by developing a proper ET-based watering schedule that considers climatic conditions, plant material, soil types, and irrigation system efficiency
- Change either the bubblers to spray nozzles or spray nozzles to bubblers to achieve matched precipitation or use 2 valves, one for bubblers and one for spray nozzles
- Consider using drip irrigation in the elevated planters for additional water savings

**Tree pits in the sidewalk**

**MPR NOZZLES**

**BUBBLERS**

**2 Major Factors for Savings**

**Maintenance**
1. Zone list in the controller
2. Biweekly inspection using the test program
3. Fix the broken equipment ASAP

**Scheduling**
1. Find a source for local ET data
2. LA submit a schedule for the design (owner require it in the contract)
3. Document runtimes on Zone list

**Mercer Island Irrigation Audit - Follow Up**
- Create a detailed Scope of Work
- Budget for upgrades
- Did work actually occur?
- Installation this year (…..persistence is the key)
Irrigation Audit Findings and Water Strategy

Major Findings:
• Watering areas more than necessary
• Broken lines

General Recommendations:
• Develop evapotranspiration (ET) based watering schedule to match plant requirements (adjust controller)
• Replacing nozzles and spray heads; add flow sensors and rain gauge
• Add mulch or compost to conserve water
• Use drought tolerant plants
• Meter and track water usage separately

Water Conservation

The Central Link Operations & Maintenance Facility (OMF) used the most water of any single facility and had the highest percentage of water costs.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Water Usage (CCF)</th>
<th>Water Cost ($)</th>
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<tbody>
<tr>
<td>Central Link Operations &amp; Maintenance Facility</td>
<td>6,233</td>
<td>118,331</td>
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<tr>
<td>Decatur Transit Center</td>
<td>3,347</td>
<td>54,495</td>
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<tr>
<td>Everett Station</td>
<td>1,986</td>
<td>31,997</td>
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<td>Shoreline Station</td>
<td>1,514</td>
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<tr>
<td>Federal Way Transit Center</td>
<td>1,411</td>
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<tr>
<td>Kent Station and Garage</td>
<td>1,208</td>
<td>20,765</td>
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<tr>
<td>Monroe Road Park and Arts Place</td>
<td>1,059</td>
<td>17,205</td>
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<tr>
<td>Kirkland City Hall</td>
<td>990</td>
<td>15,970</td>
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<tr>
<td>Bellevue Station and Garage</td>
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<tr>
<td>All Other All Facilities combined*</td>
<td>7,174</td>
<td>125,129</td>
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<tr>
<td>Total</td>
<td>36,575</td>
<td>584,089</td>
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</tbody>
</table>

Top 10 Facilities by Water Cost in 2011

Water Conservation – C-Link OMF Deduct Meter

Before the deduct meter was installed at the C-Link OMF in 2012, wastewater sewer fees were the largest contributor to water expenditures at the facility, historically costing an average of $2,616 per month.

In the first two invoice periods after the deduct meter was installed, sewer costs decreased an average of $1,733 per month.

Overlake Transit Center

• Decommission irrigation in established plantings
• Decreased Water usage by 17%
• Saving $2,500 in 4 months

Recommendations-Water Reduction Strategy

Mulch

• Maintain soil moisture
• Suppress weeds
• Help prevent compaction
• Help prevent erosion
• Provide nutrients to the soil
• Prevent damage from mowing equipment

Mulch

Photo by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida
Where and How to Mulch

• Apply mulch to entire planting bed where possible
• Apply mulch to outer drip line of the tree canopy
• Apply a 3-4" layer of mulch
• Pull mulch away from trunk

Landscape Training program - 2013

• Make observations
• Ask lots of questions
• Created assessment field “Cheat Sheets”

Howard Stenn Irrigation Training

• Cascade Water Alliance Provided Consultant Assistance to Sound Transit
• Trained Facilities Staff
• In-house Slide presentation
• Site Evaluation and practice

Turf Assessment

Check For:

- Yellowing
- Weeds
- Soggy Areas
- Dead Areas
- Dead Patches

Best Maintenance Practices

- Build healthy soil
- Mow height 2”-3”
- Mulch mow
- Irrigate 1” per week
- Aerate and thatch
- Overseed & compost

Abiotic

- Soil compaction
- Poor grading
- Lack of nutrients
- Lack of water/too much water

Biotic

- Plant diseases
- Fleas
- Lack of nutrients
- Animals

Human

- Over fertilizing
- Misapplication of pesticides
- Scalping – mowing too short
- Over-irrigation/under-irrigation

Lessons Learned

• Landscapes require constant attention
• Simple Fixes – big impact
• Water use can be reduced – if managed
• Educated staff and Consultants
• Budgeting / Planning for upgrades

Updated Agency - Design Criteria Manual

Drought Tolerant Plant Species
Rain Sensors
Flow control valves
Deduct meters

Limit the use of Turf
Water Budget
Maintenance Plan
Rainwater Harvesting
ST Sustainable Landscape Program

- Integrated Pest Management (IPM) Plan
- Landscape Site Assessments
- Irrigation Site Assessments
- Training Program
- Revise Contractor Scope of Work
- Updated Design Criteria Manual
  - Water Budget
  - Maintenance Plans
- Site Checklist

Questions?

Thank you and Happy Trails!

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