

This presentation premiered at WaterSmart Innovations

watersmartinnovations.com



The Portland Water House

Anne Hill

Portland Water Bureau

Andrew Shepard

Earth Advantage Institute



Bull Run Watershed

Harvesting Rainwater Since 1895

- **Ample Seasonal Rainfall.**
 - Average annual rainfall, 138 inches, with areas as high as 170 in.
- **Excellent water quality.**
 - No development
 - No glacial melt
- **Gravity Flow from source to the city.**
 - Over 80% of the system is gravity flow
- **Protected watershed.**
 - 102 square mile drainage
 - Protected by federal law, restricted access
 - Jointly managed by the US Forest Service and the Portland Water Bureau.

Portland Water Usage (2007-2008)

- Total Population Served = 879,900
- Winter System Production = 85 MGD
- Summer System Production = 135 MGD
 - (peak 180 MGD)
- Residential Per Person = 64 GPD
- Total Portland Usage = 20.9 BG
- Total Wholesale Usage = 14.6 BG (41%)

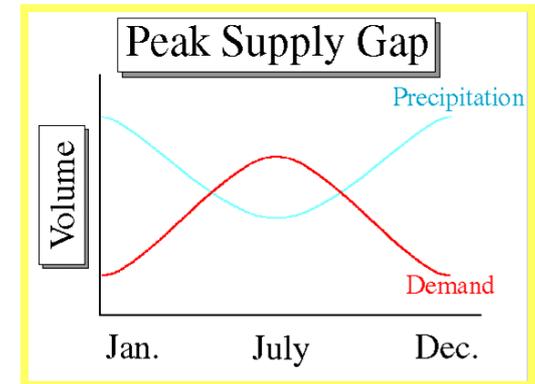
Carbon footprint

2007 = 0.38 MT of CO₂e per MG
(1 cross country flight = 0.69 MT of CO₂e)



Why Conservation?

- It doesn't rain *all* the time in Portland, summers are very dry.
- Increase stream flows for fish.
- Decreases need for future infrastructure expansion.
- Saves customers money.
- Climate change.
- Community values.



Water House: Project Background

- Decommissioned well sites on surplus residential zoned property.
- Neighbors viewed recent flag lot infill development as ugly blight.
- Commissioner saw an opportunity to create a demonstration house.
- Staff worked to develop partners and find sponsors.



The Water House: A Demonstration Project

- First generation green building programs have often focused on energy efficiency rather than water efficiency.
- The Water House is an opportunity for the bureau to build a showplace for innovations in water conservation & local green building.
- Local suppliers have donated generously.
- Be a good neighbor, show eco-infill.





Project Scope

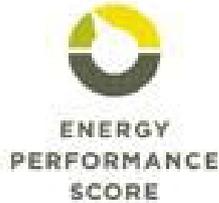
- Located on a 12,500 square foot vacant lot.
- 3 bedrooms, 2 bathrooms (2,119 sq ft) and attached garage (436 sq ft).
- A 600 square foot guest house (Accessory Dwelling Unit) will be a part of the property, and will include 1 bedroom and bath.
- The project will also include water efficient and nature-friendly landscaping.
- The Water House will be open for classes & tours for one year following construction.

Sustainable Features

- Earth Advantage Platinum certified
- Energy Star certified, exceeding 2008 building code by at least 30%
- WaterSense certified, EPA sponsored labeling system for new homes
- Energy Performance Score (EPS) through Energy Trust of Oregon – like mpg rating



Partnerships



Portland General Electric



Thank You Sponsors!

\$15,000 and above

- [Pratt and Larson](#)

\$10,000 - \$14,999

- [Fisher & Paykel](#)
- [Kohler](#)
- [Neil Kelly Cabinets](#)
- [Sapa Profiles, Inc.](#)
- [Daikin Mini Split Heat Pumps/Sun Glow Inc.](#)
- [Western Spray Foam](#)

\$5,000 - \$9,999

- [Cascade Radon](#)
- [General Pacific/Convectair](#)
- [James Hardie Building Products Inc.](#)
- [Marlarkey Roofing / Ecoasis](#)
- [McGee Salvage](#)
- [Life Breath HRV & Comfort Solutions](#)

\$1,000 - \$4,999

- [Atrium Companies](#)
- [AQUS](#)
- [Craft and Design](#)
- [Evolution Paving Resources](#)
- [Gary's Vacuflo](#)
- [InFuez, Inc.](#)
- [Rheem/Marathon Water Heaters](#)
- [MetroPaint](#)
- [Overhead Door](#)

Up to \$1000

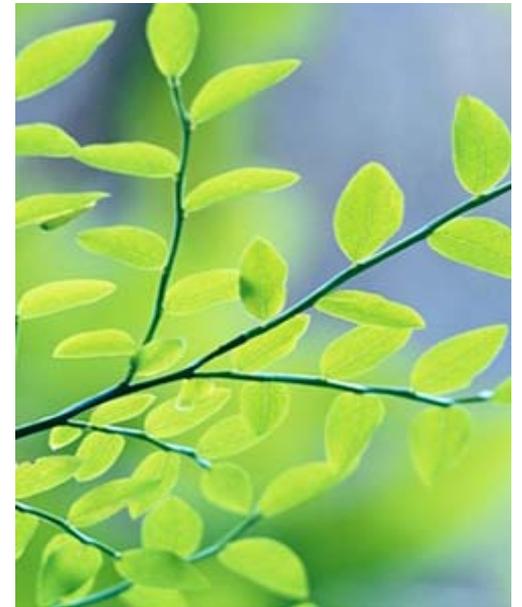
- [Basco](#)
- [Hobbs & Hopkins](#)



Earth Advantage Institute

Mission:

Earth Advantage Institute is a nonprofit organization that works with the building industry to help implement sustainable building practices. Its mission is to create an immediate, practical and cost-effective path to sustainability and reduction of carbon in the built environment.



Earth Advantage Institute (EAI)

Certification programs

- Earth Advantage New Home (single, multifamily)
- Earth Advantage Existing Home
- LEED for Homes
- Earth Advantage Community
- Earth Advantage Commercial



Education programs

- Sustainable Home Professional
- STAR Realtor
- Earth Advantage Appraiser
- What is Green Building?



Carbon Advantage

- Carbon footprint
- Climate change cost benefit/risk assessment



Consulting and Technical services

Energy Performance Score (EPS)



EAI New Homes Program



Energy – Health – Land – Materials - Water





Earth Advantage® New Homes Standard - Points Worksheet 2008 Site Built Residential – Oregon

Energy ❖ Health ❖ Land ❖ Materials ❖ Water

The Earth Advantage® program consists of individual measures that have been evaluated by using the five categories of the Earth Advantage program: Energy, Health, Land, Materials, and Water. This evaluation leads to measure scores in each of the five categories.

For a house to be certified under the Earth Advantage New Homes criteria, each house must meet all 2009 Northwest ENERGY STAR New Homes Program (Oregon BOP) requirements as well as achieve a minimum of the following point totals per each of the other four Earth Advantage Homes categories; Health (25), Land (15), Materials (25), Water (15), plus an additional 10 points, for a total of 90 or more points. In addition, *Core Measures* are required in each of the subsections: 1) Waste Management 2) Infiltration, 3) Insulation 4) Windows, 5) HVAC, 6) Ventilation, 7) Lighting, 8) Water Heating, 9) Appliances, 10) Interior Surface Coatings. Incorporating these Core Measures into your project will ensure that the home being built performs 15% or better than standard building practices in Oregon and reach a higher standard for indoor air quality, environmental responsibility, water conservation, and resource efficiency. Shaded Measures are required; E.G. 1.1.3; Develop and Implement Erosion Control Site Plan.

To complete the worksheet, select measures to install or implement in your project. Then total the number of points in each category to reach the required number of points for certification. In addition to the completed worksheet, each house must have appropriate documentation (when applicable), pass required performance tests (blower door and duct blast tests if appropriate) pass insulation inspection and a final inspection by Earth Advantage Field Technicians.

Please note, in the Energy column where indicated "Model", Energy points are awarded based upon a HERS (Home, Energy, Rating, System) Index model of the home and will vary due to home size and selection of measures. Your Earth Advantage Sales Consultant will discuss with you the point values after a computer-modeling run (if appropriate) of your project. (1) HERS point is equivalent to (1) Earth Advantage Homes point. Please, see Measures Resource Guide for further explanation. Additional charges may apply for detailed plan review and energy modeling.

Also to be noted: measures marked with "AF" require that an Accountability Form be signed and completed by the responsible party, and submitted upon final home review.

Completed worksheets can be submitted via mail, Email, fax or in person.

Earth Advantage Homes Program
16280 SW Upper Boones Ferry Road
Portland, OR 97224
T: 503-968-7160
F: 503-968-6160
Earthadvantage.org



Builder Information

Builder: _____
Contact Person: _____
Contact Phone: _____ Contact Fax: _____
Contact Email: _____

ENERGY STAR® / Earth Advantage measures are minimum requirements if using that building system
© 2008 Earth Advantage Inc., All rights reserved.

Version EA / ES 2008-Final



- Homes Must Earn:
- ENERGY STAR Certification
- 25 Health Points
- 15 Land Points
- 25 Materials Points
- 15 Water Points
- Minimum Grand Total:
- 90 Points

Energy Performance Score (EPS)

- “MPG” for new & existing homes
- Collaboration : ETO, EA, CSG, OSD, NEEA, PECEI, US DOE
- Educate the building trades, real estate professionals and consumers on metrics of energy efficiency and carbon footprint
- Guide improvements to the building’s performance
- Integrate with the US DOE rating scale
- Create baseline for carbon offset creation

Energy Performance Score (EPS)



The EPS is brought to you by Energy Trust of Oregon. Energy Trust makes it easy for homes and businesses to identify ways to use energy more efficiently. We provide cash incentives for everything from energy-saving products to insulation to solar energy systems. For more information visit www.energytrust.org/eps.





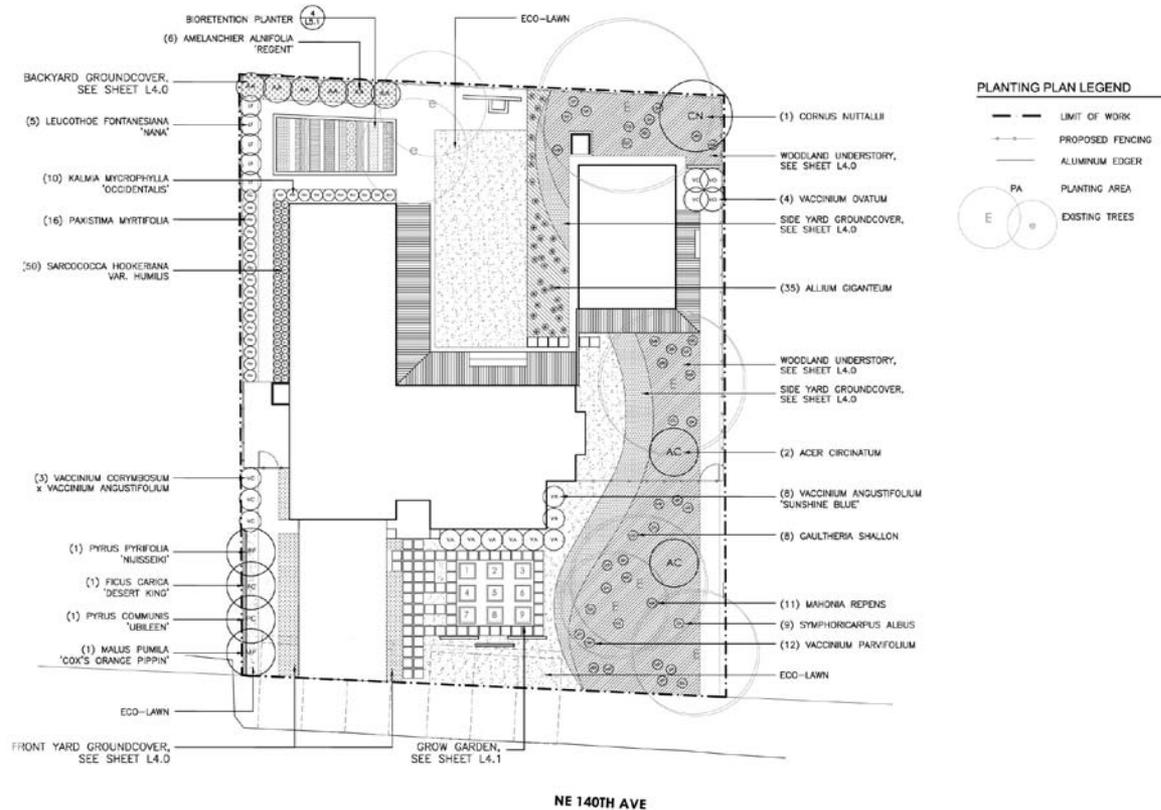
- Requires WaterSense labeled plumbing fixtures, efficient hot water delivery systems, and yards designed for water conservation.
- If included, clothes washers and dishwashers must be ENERGY STAR® qualified models.
- Irrigation systems must be designed/installed and audited by WaterSense partners.
- Should save homeowner 10,000 gallons annually and \$100-200 on utility bills.
- Payback estimated at six years.



The Water House: Innovative Indoor Design

- Plumbing fixtures donated by Kohler
- Marathon hot water heater
- Structured plumbing
- Gray water system will be designed to allow for reuse for toilet flushing.
- Monitoring system will provide homeowner with real time statistics - info will increase water & energy consumption awareness

Water House: Innovative Outdoor Design



Water Sense: Water Budget Calculator

WaterSense Single-Family New Home Specification: Water Budget Tool (V 1.01)

This water budget tool shall be used to determine if the designed landscape meets Criteria 4.1.1.1 of the specification. Please refer to the WaterSense Water Budget Approach for additional information.

Your Name:
Builder Name:
Lot Number/Street Address:
City, State, Zip Code:



Peak Watering Month:
Obtain from Water Budget Data Finder at www.epa.gov/watersense/nhspecs/wb_data_finder.html

Is an irrigation system being installed on this site?

This worksheet determines the baseline and the landscape water allowance (LWA) for a site based on its peak watering month.

The baseline is the amount of water required by the site during the peak watering month if watered at 100 percent of reference evapotranspiration (ET_o). The following formula is used to calculate the baseline:

$$Baseline = ET_o \times A \times C_u$$

Where:

ET_o = Local reference evapotranspiration (inches/month)

A = Landscaped area (square feet)

C_u = Conversion factor (0.6233 for results in gallons/month)

The LWA is the water allotment for the site. The following formula is used to calculate the LWA:

$$LWA = 0.70 \times Baseline$$

Where:

LWA = Landscape water allowance (gallons/month)

Baseline = $ET_o \times$ landscaped area \times 0.6233

To calculate the Baseline and LWA for a site, enter the designed landscaped area and average monthly reference evapotranspiration for the site's peak watering month. (Enter data in white cells only.)

STEP 1A - ENTER THE LANDSCAPED AREA (A)

Area of the designed landscape (square feet)

STEP 1B - ENTER THE AVERAGE MONTHLY REFERENCE EVAPOTRANSPIRATION (ET_o)

Average monthly reference ET (inches/month) for the site's peak watering month

Obtain from Water Budget Data Finder at www.epa.gov/watersense/nhspecs/wb_data_finder.html

OUTPUT - BASELINE FOR THE SITE

Monthly baseline (gallons/month) based on the site's peak watering month

OUTPUT - WATER ALLOWANCE FOR THE SITE

Monthly landscape water allowance (gallons/month) based on the site's peak watering month



Water Sense: Water Budget Calculator

This worksheet determines the monthly landscape water requirement (LWR) for a site based on its peak watering month.

The monthly LWR is the water requirement specific to the designed landscape. The sum of the LWRs for each hydrozone equals the site LWR.

The following formula is used to calculate the LWR for each hydrozone:

$$LWR_H = \frac{1}{DU_{LQ}} \times [(ET_o \times K_L) - R_a] \times A \times C_u$$

Where:

LWR_H = Landscape water requirement for the hydrozone (gallons/month)

DU_{LQ} = Lower quarter distribution uniformity

ET_o = Local reference evapotranspiration (inches/month)

K_L = Landscape coefficient for the type of plant in that hydrozone (dimensionless)

R_a = Allowable rainfall, designated by WaterSense as 25% of average peak monthly rainfall (R)

A = Area of the hydrozone (square feet)

C_u = Conversion factor (0.6233 for results in gallons/month)

To calculate the LWR for the site, enter the information requested below for the site's peak watering month. (Enter data in white cells only.)

STEP 2A - ENTER THE AVERAGE MONTHLY RAINFALL (R) AT THE SITE FOR THE PEAK WATERING MONTH IDENTIFIED IN PART 1

0.59 Average monthly rainfall (inches/month) for the site's peak watering month

Obtain from Water Budget Data Finder at www.epa.gov/watersense/nhspecc/wb_data_finder.html

STEP 2B - COMPLETE TABLE 1 BELOW (enter data in white cells only)

Enter the area of the hydrozone (square feet). The total area must equal the landscaped area entered in Step 1A.

Choose the plant type from the dropdown list (source data is displayed in Table 2).

Choose the irrigation type from the dropdown list (source data is displayed in Table 3, guidance is displayed in Table 4 and Table 5).

Table 1. Landscape Water Requirement

| Zone | Hydrozone/Landscape Feature Area (sq. ft.) | Plant Type or Landscape Feature | Landscape Coefficient (K _L) | Irrigation Type | Distribution Uniformity (DU _{LQ}) | LWR _H (gal/month) |
|---------------------|--|-------------------------------------|---|-----------------|---|---|
| 1 | 1,760 | Turfgrass - Low water requirement | 0.6 | No Irrigation | NA | - |
| 2 | 2,545 | Groundcover - Low water requirement | 0.2 | No Irrigation | NA | - |
| 3 | 930 | Shrubs - Low water requirement | 0.2 | Drip - Standard | 70% | 903 |
| 4 | 260 | Shrubs - Low water requirement | 0.2 | Drip - Standard | 70% | 252 |
| 5 | 100 | Trees - Low water requirement | 0.2 | No Irrigation | NA | - |
| 6 | 1,235 | Permeable Hardscape | | No Irrigation | | - |
| 7 | 1,255 | Nonvegetated Softscape | | No Irrigation | | - |
| 8 | | | | | | - |
| 9 | | | | | | - |
| 10 | | | | | | - |
| 11 | | | | | | - |
| 12 | | | | | | - |
| 13 | | | | | | - |
| 14 | | | | | | - |
| 15 | | | | | | - |
| Total Area = | 8,085 | | | | | Landscape Water Requirement for the Site (gal/month) 1,156 |



Water Sense: Water Budget Calculator

WaterSense Single-Family New Home Specification: Water Budget Tool (V 1.01)

This water budget tool shall be used to determine if the designed landscape meets Criteria 4.1.1.1 of the specification. Please refer to the WaterSense Water Budget Approach for additional information.

Your Name:
Builder Name:
Lot Number/Street Address:
City, State, Zip Code:

Peak Watering Month:

Is an irrigation system being installed on this site?



This worksheet determines if the designed landscape meets the water budget.

If the landscape water requirement is LESS than the landscape water allowance, then the water budget criterion is met.
If the landscape water requirement is GREATER than the landscape water allowance, then the landscape and/or irrigation system needs to be redesigned to use less water.

STEP 3A - REVIEW THE LWA AND LWR FROM PART 1 AND PART 2

LWA (gallons/month) LWR (gallons/month)

STEP 3B - REVIEW THE TOTAL AREA OF TURFGRASS* IN THE DESIGNED LANDSCAPE FROM STEP 2B

The designed landscape contains square feet of turfgrass.* This is of the landscaped area.

*This includes the area of any pools, spas, and/or water features, designated by WaterSense to be counted as turfgrass.

OUTPUT - DOES THE DESIGNED LANDSCAPE MEET THE WATER BUDGET?

If YES, then the water budget criterion is met.

If NO, then the landscape and/or irrigation system needs to be redesigned to use less water.

The designed landscape water requirement is a reduction in water use from the baseline calculated in Part 1.



Lessons Learned:

- Utilities are not in residential construction business
- Companies are eager to showcase green building products
- Partnering with Earth Advantage Institute made it easy to meet certification measures
- We're still learning!



Stay in Touch:

Anne Hill – Principle Management Analyst

Portland Water Bureau –

www.portlandoregon.gov/water/waterhouse

(503) 823-4807

Andrew Shepard – Green Building Consultant

Earth Advantage Institute –

www.earthadvantage.com

(888) EARTH33

