Seattle Built Green Portfolio

Single Family Housing

Analysis and Projections: Strategies and Resource Savings



2008 - 2011



www.seattle.gov/greenbuilding

Introduction

The City of Seattle Built Green portfolio is part of a wide-ranging, collaborative effort led by City Green Building to identify and measure the effectiveness of emerging approaches to sustainable development in the city.

The innovative projects included in the Built Green study range from individual single-family homes to large-scale townhome developments. All share a common theme: they are designed and built to respond more efficiently to the environment around them, providing more comfort for occupants while consuming fewer resources.

The report assesses homes within four categories of performance: indoor water use, stormwater control, energy use and construction waste. The projected performance of the homes is measured against an assumption of baseline performance established using available, sourced industry data and projections. Paladino and Company, Inc. developed the database methodology used to generate the report.

We hope the identified trends - in strategies pursued and projected resource savings - inspire, prompt discussion, and help propel innovation in green building. By providing a snapshot of the leading edge of residential green building today, we hope to help further "green" the homes designed for tomorrow.

----- City Green Building



The Seattle Department of Planning and Development City Green Building established this project with the assistance of Built Green.



Credit Achievement Summary: Section 2 - Site & Water (2008 Checklist)

		2-1 Build on Infill Lot to Take Advantage of Existing Infrastructure, Reduce Development of Virgin Sites						
	veral	2-2 Build in a Built Green [™] Development						
	Õ	2-3 Use Low Impact Foundation System, Such as PIN Systems or Post and Pier, for at least 50% of the						
_	s	2-4 Avoid Soil Compaction by Limiting Heavy Equipment Use to Building Footprint and Construction						
	eature	2-5 Preserve Existing Native Vegetation as Landscaping						
	ral Fe	2-6 Retain 30% of Trees On Site						
	Natui	2-7 Retain (or Add) Deciduous Trees South of House						
	ite's	2-8 Do Not Build Near Wetlands, Shorelines, Bluffs, and Other Critical Areas						
	tect S	2-9 If Building Near Wetlands, Shorelines, Bluffs, and Other Critical Areas, Preserve & Protect Beyond Code						
	Prot	2-10 Set Aside Percentage of Buildable Site to be Left Undisturbed						
_		2-11 Install and Maintain Temporary Erosion Control Devices That Significantly Reduces Sediment						
	ite	2-12 Use Compost to Stabilize Disturbed Slopes						
	oo	2-13 Balance Cut and Fill, While Maintaining Original Topography						
	sses	2-14 Limit Grading to 15 Feet All Around, Except for Driveway Access						
	roce	2-15 Amend Disturbed Soil with Compost to a Depth of 10 to 12 Inches to Restore Soil Environmental						
	ural I	2-16 Replant or Donate Removed Vegetation for Immediate Reuse						
NOL	t Nat	2-17 Use Plants Donated from Another Site						
DTECT	rotec	2-18 Grind Land Clearing Wood and Stumps for Reuse						
E PRO	д.	2-19 Use a Water Management System That Allows Groundwater to Recharge						
SITI –	ces	2-20 Design to Achieve Effective Impervious Surface Equivalent to 0% for 5 Acres and Above <10% for Less						
	Surfa	2-20 Sesign to remove Encentre imperious surface Equivalent to 05 for 5 releasing risore, (12) for Economic						
	ous S	2-22 Veretated Roof						
	pervi	2-22 Vegetated Nooi 						
_	<u></u>	2-23 Bonds Folints. Construct No impervious Surfaces Outside House Footprint						
		2-24 Trotect Topson On Site for Redse						
		2.25 Wash out contract thats into storage containers						
	S	2-27 Reduce Hazardous Waste Through Good Johsite Housekeening						
	utant	2.22 Infiltration System for Roofton Runoff		_				
	- Poll	2-29 Construct Tire Wash Establish and Post Clean Lin Protocol for Tire Wash						
	Vater	2-20 Use Slow-Release Organic Fertilizers to Establish Vegetation						
	iate V	2-50 052 500 Herease Organic Fertilizers to Establish Vegetation						
	Elimir	2-51 Use Less Toxic Print Releasers		_				
	ш	2-32 Observation to Low-Toxic Outdoor Materials for Landscaping (e.g. Plastic, Least-Toxic Treated Wood)						
		2-55 Phase Construction so that two More Phan 60% of Site is Disturbed at a Time and to Prevent Adverse						
		2-54 No Cleaning of Glauning During wet weather Periods						
		2-55 NO ZIRC Galvanized Ridge Caps, Copper Flashing, or Copper Wires For Moss Prevention						
		2-36 Multi Lanuscape Beus with 2 Inches of Organic Multin						
	ion	2-37 Limit Ose of Turi Grass to 25% of Less of Landscaped Area						
	ervat	2-38 Bonus Points: No Turi Grass						
	Cons	2-39 Landscape with Plants Appropriate for Site Topography and Soli Types, Emphasizing Use of Plants						
	door	2-40 Plumb for Greywater Irrigation						
N	Out	2-41 Sub-Surface or Drip Systems Used for Irrigation						
ECTIO		2-42 Install Landscaping That Requires No Potable water for Irrigation Whatsoever After Initial						
ROT		2-43 Install Kalnwater Collection System (Listern) for Reuse						
TERF		2-44 Select Bathroom Faucets with GPM Less than Code						
MA	u	2-45 Select Kitchen Faucets with GPM Less than Code						
	rvatic	2-46 Select High Performance Low-Flush Toilets from List in Resources						
	onse	2-47 Install Dual Flush Toilets						
	oor C	2-48 Install Composting Toilets						
	Inde	2-49 Bonus Points: Stub-In Plumbing to Use Greywater Water for Toilet Flushing	I					





Credit Achievement Summary: Section 3 - Energy Efficiency (2008 Checklist)

	0	3-1 Document Envelope Improvements Beyond Code (Component Performance Approach)							
	ance	3-2 Document Envelope Improvements Beyond Code (Prescriptive Approach)							
	rma	3-3 Install Rigid Insulation Beneath Any Slabs on Grade							
	srfo	3-4 Install Dense Packed Cellulose (Over 2.5 lhs/inch) or Wet-Blown Cellulose, or Blown in Form or							
	al Pe	2.5. Desus Detisioner in a Desustant that Desuides Third Dest. Desister and locations			<u> </u>				
	rmê	3-5 Bonus Points: Participate in a Program that Provides Third-Party Review and Inspection		+					
	The	3-6 Install No More Than 1% of Floor Space of Skylights		+	+	1			<u> </u>
_	•	3-7 Build a Zero Net Energy Home That Draws Zero Outside Power or Fuel On a Net Annual Basis							
_	ng	3-8 Airtight Drywall Approach for Framed Structures							
	eali	3-9 Use Airtight Building Method. Such as SIP or ICF							
	ir S	2 10 Player Dear Test Desulte Patter than 0 20 ACH (E paints) 0 25 ACH (10 paints)							
_	<	3-10 Blower Door Test Results Better trian 0.30 ACH (5 points), 0.25 ACH (10 points)		+					
	50	3-11 Use Insulated Headers		-					
	gin	3-12 Fully Insulate Corners (Requires 2-Stud Corners Instead of 3-Stud Corners)		1					
	Brid	3-13 Fully Insulate at Interior/Exterior Wall Intersection By Open Cavity Framing (See Reference Guide)		1					
	al E	3-14 Use Energy Heels of 6 Inches or More on Trusses to Allow Added Insulation Over Top Plate							
	ern	2 15 Lice Structural Insulated Papels (SIPs) on Whole House	-						
	Ч								
	nce	3-16 Use Insulated Exterior Sheathing							
	Red	3-17 Use Advanced Wall Framing - 24-Inch OC, With Double Top Plate							
		3-18 Innovative Stick Framing to Reduce Thermal Bridging, by Methods Such as Double Wall Framing and							
	c	3-19 Passive Solar Design, Basic Features Installed							
	ssig res	3-20 Passive Solar Design Advanced Features Installed	1						
ċ	atu								
	Fe	3-21 Model Solar Design Features Using Approved Modeling Software							
	Λ	3-22 Demonstrate a Reduction in Space Conditioning Energy, Using Approved Energy Modeling Software							
		3-23 Centrally Locate Heating/Cooling System to Reduce the Size of the Distribution System		1					
		3-24 Two Properly Supported Ceiling Fan Pre-Wires		1					1
		2.25 Like Advanced Cooling of All Ducts Liking Low Toxic Mastic							
	ion	3-25 USE Auvaliceu Sealing OFAILDUCES USINg LOW-TOXIC Mastic							
	but	3-26 Performance Test Duct for Air Leakage Meets Third-Party Review and Certification							
	stri	3-27 Third-Party Duct Test Results Less Than 6% Loss of Floor Area to Outside/Total Flow	<u> </u>						
	Ō	3-28 All Ducts Are In Conditioned Space							
		3-29 Locate Heating/Cooling Equinment Inside the Conditioned Space		+					1
		2 20 Install Ludronia Losting Customs Daint Darse David an Dailar Sfirstory		+					
		3-50 Instail Hydronic Heating Systems, Point Range Based on Boiler Efficiency							
	5	3-31 Install Thermostat with On-Switch for Furnace Fan to Circulate Air							<u> </u>
		3-32 Install 60-Minute Timers or Humidistat for Bathroom and Laundry Room Fans		1	1				
	ont	3-33 Install Programmable Thermostats		1					
	U	2-34 Select High Efficiency Heat Dumos Instead of Electric Heat							
	œ.								
	I	3-35 Install a Heat Recovery Ventilator	-						
	50	3-36 Select Energy Star [®] Heating/Cooling Equipment							
	gling	3-37 Install Biofuel Appliances							
	ö	3-38 No Gas Fireplaces. Use Direct Vent Gas or Propane Hearth Product		1					
	в /	2-39 No Air Conditioner		+					
	atin				-		I		
	He	3-40 Install On-Demand Hot Water Heating Used for Space Heating	-	+	+				
		3-41 Install Geothermal Heat Pumps							
	ngi.	3-42 Locate Water Heater Within 20 Pipe Feet of Highest Use		1					
1	tio	3-43 Insulate All Hot Water Pipes and Install Cold Inlet Heat Traps on Hot Water Heater		1					
-		3-44 Install Drainwater Heat Recovery System (DHR)	-						
-		2.45. Dessive of On Demand List Water Delivery System Installed at Earthest Leasting From Water Lister							
		3-45 Passive of OII-Delitatio Hol water Delivery System Installed at Partnest Education From Water Heater	-						
	ting	3-46 Install Tankless Hot Water Heater		-	1				
	lea	3-47 Upgrade Water Heater		1					
	er H	3-48 Install Water Heater Inside the Heated Space (Electric, Direct Vent, or Sealed Venting Only)							
	Vat	3-49 Ungrade Electric Water Heater to Exhaust Air Heat Pump Water Heater or De-Superheater: EE 1.9							
	>	2 EQ Install a Timer to Degulate Standby Het Water Less in Het Water Lesser							
		3-50 Install a Timer to Regulate standby Hot water Loss in Hot water Heater							
		3-51 Light-Colored Interior Finishes		-	1	1	1		
ļ	igh	3-52 Use Clerestory for Natural Lighting							
•	ź	3-53 Use Light Tubes for Natural Lighting and to Reduce Electric Lighting							
		3-54 Solar Powered Walkway or Outdoor Area Lighting							1
		2 EE Euroich Eour Compact Fluoressent Licht Dulle to O			-				
	ing	3-56 Use Compact Fluorescents in Three High-Use Locations	-	+	+				-
	ght	3-57 Install Hard-Wired Fluorescents		·					
	τ Li	3-58 Hard Wired Fluorescents on Dimmer							
	cier	3-59 Install Lighting Dimmer, Photo Cells, Timers, and/or Motion Detectors (Interior)							<u> </u>
	Effi,	2.60 Install Dhoto Calle Timere Motion Dotoctore (Exterior)		+	+				
	-								
		3-61 Install LED Lighting							
		3-62 Use Air Lock Can Lights Instead of IC Rated							
		3-63 Provide an Outdoor Clothesline							
		3-64 Install Gas Clothes Drver		- i					
	S	2_65 Install Front Loading or Energy Star® Mashing Mashing							
	nce								
	plia	3-66 Install an Energy Star [®] Dishwasher		+	+				
	Ap	3-67 Install Energy Star® Refrigerator	-						
		3-68 Install Gas Stove/Cooktop (Requires a Carbon Monoxide Detector)		1 					
		3-69 Install Energy Star [®] Exhaust Fan		Í					
	Ē	3-70 Use Building and Landscaning Plans That Reduce Heating/Cooling Loads Naturally							
f	esig	2 74 Install Heat Customs with Constants 7 and for Classical and Utility		-	+				
	۵ ۲	3-71 Install Heat Systems with Separate Zones for Sleeping and Living Areas							
	rgy	3-72 Enroll the Residence in the Local Utility's Electricity Program for Renewable Electricity Sources							
	Ene	3-73 Solar Water Heating System Sized to Provide a Minimum of 40% Hot Water Designed Energy Use	1						
	ve	3-74 Pre-Pipe for Solar Water Heater							
	Ξ.	2-75 House Dowered by Dhotovoltaic							-
	na	5-75 House roweled by rhouovoitait							
	lterna	2.76 Install Innovative Non-Calar Densus his Denvis Costa and That David Att 1 5 4554 5554	. 1	1					
3	Alterna	3-76 Install Innovative Non-Solar Renewable Power Systems That Produce a Minimum of 15%, 30%, or	-				1	1	
III. S. Schutzel	a Alterna	3-76 Install Innovative Non-Solar Renewable Power Systems That Produce a Minimum of 15%, 30%, or 3-77 Extra Credit for Innovation in Energy Efficiency							





Credit Achievement Summary: Section 4 - Health & Indoor Air Quality (2008 Checklist)

 4-2 Project Team Member to Have Taken American Lung Association (ALA) of Washington "Healthy 4-3 Certify House Under ALA Health House Program or Other Program As Approved By Program Director 4-4 Provide Homeowners With Maintenance Checklists (Furnace Filters, Under the Fridge, Etc.) 							
4-3 Certify House Under ALA Health House Program or Other Program As Approved By Program Director 4-4 Provide Homeowners With Maintenance Checklists (Furnace Filters, Under the Fridge, Etc.)				 			
4-4 Provide Homeowners With Maintenance Checklists (Furnace Filters, Under the Fridge, Etc.)				<u> </u>			1
4-4 Provide Homeowners With Maintenance Checklists (Furnace Filters, Under the Fridge, Etc.)						1 1	(
4-5 Use Less-Toxic Cleaners		1	1	1	1		L
4-6 Require Workers to Use VOC-Safe Masks When Applying VOC Containing Wet Products, and N-95		1		1			
4-7 Take Measures During Construction Operations to Avoid Moisture Problems Later (See Handbook		1	1	1			
4-8 Take Measures To Avoid Problems Due To Construction Dust (Perform All Measures Listed In		1	i	1			
4-9. Ventilate With Box Fans In Windows Blowing Out During Druwall Sanding and New Wet Finish		+	-				
4-5 Ventilate with box rais in windows blowing ball burner burners ballance and the weet raising		+					<u> </u>
4-10 No Use of Unvented Heaters During Construction		+	+	1	1		L
4-11 Clean Duct and Furnace Thoroughly Just Before Owners/Tenants Move In		1					
4-12 Train Subs in Implementing a Healthy Building Jobsite Plan for the Project							
4-13 Use Pre-Finished Flooring		1	1	1			
A 14 No Carpat		<u> </u>					
4.45. If Using Council, Despite Counting by Third Darty for Independent		+	<u> </u>				
4-15 If Using Carpet, Specify Products Certified by Third-Party for Indoor Air Quality		+					
4-16 Do Not Install Either Insulation or Carpet Padding With Brominated Flame Retardant		+					
4-17 Install Low Pile or Less Allergen-Attracting Carpet and Pad	1	1					
4-18 Limit Use of Carpet to One-Third of Home's Square Footage		1					
I-19 Optimize Air Quality in Family Bedrooms to Basic or Advanced Level (Perform All Measures Listed in							
4.20 If Using Carpet Install by Day Method							
4-20 in Using Carpet, instan by Dry Wethou		+	1	1			
4-21 Detached or No Garage, or Garage Air-Sealed from House with Automatic Exhaust Fan		1					
4-22 Use Urea Formaldehyde-Free Insulation or Greenguard Certified Product			ļ	ļ			
4-23 Do Not Use Fiberglass Insulation							1
4-24 Inside the House. Use Only Low-VOC. Low-Toxic. Water-Based. Solvent-Free Sealers. Grouts							
4-242 Tile and Grout							
		+					
4-24b Framing							
4-24c Flooring						L	
4-24d Plumbing							
4-24e HVAC							
4-24f Insulation		1	1	1			
4-z4g Drywall							
4-25 Use Plywood and Composites of Exterior Grade or With No Added Urea Formaldehyde (For Interior		+				ļ]	
4-26 Install Cabinets Made with No Added Urea Formaldehyde Board and Low-Toxic Finish							
4-27 Use Ceramic Tile for 5% of Flooring			1				
4-28 Use Only Shelving, Window Trims, Door Trim, Base Molding, Etc., With No Added Urea		i					
A 20 Lico No DVC Dining for Diumbing							
4-30 Install Natural Fiber Carpet (e.g. Wool)						ļ]	ļ
4-31 Use Only Low-VOC/Low-Toxic Interior Paints and Finishes for Large Surface Areas							
4-32 Use Only Low-VOC/Low-Toxic Interior Paints and Finishes for All Surface Areas (Including Doors,							
4-33 Use Only Paints and Finishes Without Cadmium or Lead		1	1	1			
4.34 Grade to Drain Away from Buildings			+				
4-54 Grade to Drain Away from Duratings		+	+		<u> </u>		— —
4-35 Verify Seal at Doors, windows, and Plumbing and Electrical Penetrations Against Moisture and Air		+	+				
4-36 Envelope Inspection at Pre-Installation by a Qualified Professional							
4-37 Slab On Grade, Upgrade Under Slab Moisture Barrier Beyond Code to 10 mil Minimum; Minimum		1					
4-38 Use Ridge Vents for Venting Attic		Î	1				
4-39 Prepare a Roof Water Management Plan Showing Best Practices for the Site Soils and Storm Water		1					
4 40 Doof Overbangs Are at Loost 24" Joshos		<u> </u>					
4-40 KOOT OVERNINGS AFE at Least 24 Incres							
4-41 Protect Windows and Doors on Tall Walls with Additional Overhang Protection							L
4-42 Install a Drain Plane for Walls Between Siding, Trim, and Building Paper or House Wrap							
4-43 Install:							1
4-43a A Sloped Sill Pan with End Dams and Back Dams for All Windows, and Back Dams for All Exterior		i					
4-43b Back Dams or Sloped Sill at All Window Sills							
A AA Jactor Matter at All Windows		+					
4-45 Install Metal Flashing at Door Heads Exposed to the Weather		1	+	<u> </u>			
4-46 Hose Test First Installed Windows to Verify Resistance to Wind Driven Rain							
4-47 Install Working "Radon" Type Vent System to Eliminate Potential Moisture, Methane, and Radon							
4-48 Install A Rigid Perforated Footing Drain at Foundation Perimeter. Not Connected to Roof Drain		1	1				
1-49 Show and Ruild Moisture Management Details for Relow Grade Walk Revond Code, Such as Dimple		-	1				
4 49 Show and Build Wolstelle Management Details for Below Grade Walls Beyond Code, Such as Dimple		<u> </u>	·				
4-50 Perform Calcium Chloride Moisture Test on All Slabs on Grade Prior to Installing Any Finish Flooring							L
4-51 Have Crawl Space, Attic, and Garage Building Performance Tested for Disconnection to the Living							
4-52 Do Not Install Electronic, Metal Mesh, Horse Hair, or Non-Pleated Fiberglass Filters							
4-53 Use Effective Air Filter							
4-53a Lise Medium Efficiency Diastad Filtar MEDV 10			1				
4-550 USE FIGHT ETHCHERCY PLEATED FILTER, MERV 12 OF BETTER, OF HEPA							
4-54 Balance Airflow System Based on Filter Being Used						ļ]	l
4-55 Install Central Vacuum, Exhausted to Outside							
4-56 Provide for Cross Ventilation Using Operable Windows		1					
4-57 Flow Test All Fans In the House						[]	
4-58 Use Heating System Controls That Are Free of Mercury		1	1	1			
A_50 Limit Kitchon Exhaust Ean to 200 CEM Maximum							
4-05 Linnic Kitchen Exhaust Fair to Stor Criticity A CO. Josefall CO. Minute Times Children St. Barth F. Barth							
4-bu Install bu-Ivilinute Limer Switches for Bath Exhaust Fans or HRV Override Switch		+				ļ]	l
4-61 Install Quiet (<1.5 sone) Bath Fan with Smooth Ducting, Minimum 4 Inch or Employ Other Quiet				Į			
4-62 Install Exhaust Fans in Rooms Where Office Equipment is Used							
4-63 Install Sealed Combustion Heating and Hot Water Equipment		1					
4-64 Install Power Venting for Combustion Furnaces and Water Heating Equipment (Cannot Be Taken in		1					
4-65 Install Exhaust Fan in Attached Garage On Timer or Wired to Door Opener, or No Garage Attached			1				
4-bb Install Whole House Fan Beyond the Code Requirements						ļ]	
4-67 No Sound Insulation or Other Fibrous Materials Installed Inside Ducting							
4-68 Bonus Points: Provide Balanced or Slightly Positive Indoor Pressure Using Controlled Ventilation							
4-69 Install Timer Control Integrated with Thermostat On Whole House Ventilation System with							
4-70 Install Whole House Radiant Heating System (No Ductod Heating)		+	1				
4.71 Build a Lockable Storage Cleast for Linearday Cleasting of Mathematic Teating System (NO Ducted fielding)							
4-71 Build a Lockable Storage Closet for Hazardous Cleaning and Maintenance Products, Separate from						ļ]	l
4-72 If Installing Water Filter at Sink, Select One with Biodegradable Carbon Filter	•						
4-73 Install Showerhead Filter							
4-74 Do Not Install a Wood-Burning Firenlace Inside House		1	1	1	1		
A 75 Do Not Install Gas Durning Appliance Inside House							
4-75 DO INOL INSTAIL GAS-BURNING APPILANCES INSIGE HOUSE			1				
4-76 Design a Shoe Removal Vestibule at Major Entrances to House (Front, Back, Garage)			1			ļ]	ļ
4-77 Install Floor Drain or Catch Basin with Drain Under Washing Machine and/or Water Heater							
4-78 Install Moisture Alarms Under Sinks and Dishwasher							
4-79 Extra							
	1	1	1	1		<u> </u>	
	 4.10 No Use of Unwetted Healers During Construction 4.11 Clean Unat Turnace Throughly Lust Before Owers/Terains Nove In 4.12 Train Subs in Implementing a Healthy Subling Jobste Plant for the Project 4.13 No Carpet 4.14 No Carpet 4.15 If Using Carpet, Specify Products Certified by Trich-Party for Indoor Aria Quality 4.16 Do Not Install Either Insulation or Carpe Padding With Brominated Finame Retardant 4.17 Install Low Plance Less Allegen Aria Tracking Carpet and Pad 4.18 Limit Use of Carpet to Carpet To Environ MI Nessures Used In. 4.20 Optimize Aria Caality in Family Bedroms to Basic on Advanced Level (Perform All Nessures Used In. 4.21 Detached or No Grage, or Garage Aria Seadel from House with Automatic Ethicatos Fan 4.22 Low Detached or No Grage, or Garage Aria Seadel from House with Automatic Ethicatos Fan 4.22 Low Deray Formaldelyde Free Insulation or Greengand Certified Products 4.22 Detached or No Grage, or Garage Aria Seadel from House with Teingelass Insulation 4.24 Inside the House, Use Drily Low VOC, Low Tooic, Water Based, Solvent Free Sealers, Grouts 4.24 Inside the House, Use Drily Low VOC, Low Tooic, Water Based, Solvent Free Sealers, Grouts 4.24 Purphilit 4.24 Inside the House, Use Only Low VOC, Low Tomic, Mater Based, Solvent Free Sealers, Grouts 4.24 Use Only Devide Arteria Grade ar With No Added Urea Formaldelynde Rote (Fan Insider) 4.24 Use Only Iow VOC/Low Toring Trim, Base Moding, Etc., With No Added Urea Formaldelynde Rote (Fan Insider) 4.24 Use Only Low VOC/Low Toring Trim, Base Moding, Etc., With No Added Urea Formaldelynde Rote (Fan Insider) 4.31 Use Only Low VOC/Low Toring Trim Base Moding, Etc., With No Added Urea Formaldelynde Rote (Fan Insider) 4.32 Use Only Low VOC/Low Toring Trim Base Moding, Etc., With No Added Urea Formaldelynde Rote (Fan Insider) 4.33 Use Only Low	4 -11 Clean Data di Turnare Turnorgi Nue de Carlo Vietners Marte Carlo Vietners Marte Carlo Vietners Anno 14 - 12 Train Subs in implementing a Iseathy Building Joste Parishade Thorong 4 - 13 Une Parishade Thorong 4 - 14 Une Careet 4 - 31 Une Parishade Thorong 4 - 14 Diang Carpet, Specify Praduits Certified by Thie Parky for Maxers Stated - 4 - 15 Unag Carpet, Specify Praduits Certified by Thie Parky for Maxers Stated - 4 - 15 Unag Carpet, Jonala by On Maxers Stated - 4 - 15 Unag Carpet, Jonala by On Maxers Stated - 4 - 16 Diang Andrea Careet and Anno 14 - 17 Diana 16 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -	4 11 Chen Lou and Famae Throogy Machine Derived Hards Source 1 4 21 Chen Lou and Employment of Hards Source 1 4 21 Chen Lou and Employment of Hards Source 1 4 21 Chen Lou and Employment of Hards Source 1 4 21 Chen Lou and Lou mount of Hards And Source 1 4 21 Chen Lou and Lou mount of Hards And Source 1 4 21 Chen Lou and Lou mount of Hards And Source 1 4 21 Chen Lou and Lou mount of Hards And Source 1 4 21 Chen Lou and Lou mount of Hards And Source 1 4 21 Chen Lou and Lou and Lou Machine And Lou And Source 1 4 21 Chen Lou and Lou and Lou And Source 1 4 21 Chen Lou and Lou a	4 11 Can and and makes Throng Jose 2 provided the dark to berry Constructions of the second s	 4-11 can be not a 6-12, be not a 6-12, be not a finance intervent i	4.1 Sub number of protocols and protocols an	4.11 Sub per set of a





Credit Achievement Summary: Section 5 - Materials Efficiency I (2008 Checklist)

5-2 Design and Build for Deconstruction Concept5-3 Eliminate Materials and Systems That Require Finishes on a Minimum of 100 Square Feet5-4 Provide Weather Protection for Stored Materials5-5 Substitute Products That Require Solvent-Based Cleaning Methods with Solvent-Free or Water-Based5-5 Substitute Products That Require Solvent-Based Cleaning Methods with Solvent-Free or Water-Based5-5 Substitute Products That Require Solvent-Based Cleaning Methods with Solvent-Free or Water-Based5-5 Substitute Products That Require Solvent-Based Cleaning Methods with Solvent-Free or Water-Based5-6 Create Detailed Take-Off and Provide as Cut List to Framer5-7 Use Central Cutting Area or Cut Packs5-8 Require Subcontractors and Contractor's Employees to Participate in Waste Reduction Efforts5-9 Use Deconstruction to Dismantle and Reuse Existing Building(s) On Site5-10 Sell or Give Away Wood Scraps, Lumber, and Land Clearing Debris5-11 Donate, Give Away, or Sell Reusable Finish Items5-12 Reuse Building Materials {(Suggestion: Move Section Here as Primary for new Breakouts)}5-12 Reuse Building Materials {(Suggestion: Move Section Here as Primary for new Breakouts)}5-12 Reuse Building Materials {(Suggestion: Move Section Here as Primary for new Breakouts)}5-12 Reuse Building Materials {(Suggestion: Move Section Here as Primary for new Breakouts)}5-12 Reuse Building Materials {(Suggestion: Move Section Here as Primary for new Breakouts)}5-12 Reuse Building Materials {(Suggestion: Move Section Here as Primary for new Breakouts)}5-12 Reuse Building Materials {(Suggestion: Move Section Here as Primary for new Breakouts)}5-12 Reuse Building Materials {(Su						
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5-16 Recycle Package Wrap						
5-17 Recycle Drywall						
5-18 Recycle Concrete, Asphalt, Masonry, etc.						
5 10 Poquelo Point						
5-20 Recycle Roofing						
5-21 Recycle Carpet Padding and Upholstery						
5-22 Recycle Glass		•				
5-23 Recycle Land Clearing and Yard Waste						
5-24 85% Jobsite Waste to 50% Recycling						
5-25 85% of Jobsite Waste to a 75% Recycling						
5-26.85% of Jobsite Waste to 90% Recycling						
E 27 E0% of Johnie Tobele to Solve the Solve Recycling						
5-28 Overall Recycling Rate						
5-29 Use Standard Dimensions in Design of Structure		-				
5-30 Install Materials with Longer Life Cycles		1	1	1		
5-31 Install Locally Produced Materials		1				
5-32 Use Building Salvaged Lumber, Minimum 200 Board Feet						
5-33 Use Urban or Forest Salvaged Lumber, Minimum 250 Board Feet						
5-35 In Three Applications. Use Rapidly Renewable Building Materials and Products Made From Plants						
5 26 Ropus Daints: Rouse Salvaged Materials						
5-37 Use No Endangered Wood Species						
Use Environmentally Preferable Products with Third-Party Certification, such as SCS, Greenguard, Green						
Use Dimensional Lumber that is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1						
Use Dimensional Lumber that is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 2						
5-41 Use Sheathing That Is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1						
5-42 Use Sheathing That Is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 2						
5-43 Use Beams That Are Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1						
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5-45 Use Factory Framed Wall Panels (Panelized Wall Construction) 5-46 Use Stacked Floor Plan 6-47 Use Engineered Structural Products and Use No Dimensional 2xs Larger Than 2x8, and No 4xs Larger 5-48 Use Structural Insulated Panels (SIPs) 5-49 Use Insulated Concrete Forms (ICFs)						
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-3	4 Use Any Amount of Rapidly Renewable Building Materials and Products Made From Plants Harvested 5-35 In Three Applications, Use Rapidly Renewable Building Materials and Products Made From Plants 5-36 Bonus Points: Reuse Salvaged Materials 5-37 Use No Endangered Wood Species Use Environmentally Preferable Products with Third-Party Certification, such as SCS, Greenguard, Green Use Dimensional Lumber that is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1 Use Dimensional Lumber that is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1 5-41 Use Sheathing That Is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1 5-42 Use Sheathing That Is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1 5-43 Use Beams That Are Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1 5-44 Use Beams That Are Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1 5-44 Use Beams That Are 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Credit Achievement Summary: Section 5 - Materials Efficiency II (2008 Checklist)

	5-52 Use Regionally Produced Block						
-	5-53 Use Flyash or Blast Furnace Slag For 25% by Weight of Cementitious Materials for All Concrete (20% for.						
i L	5-54 Use Recycled Concrete, Asphalt, or Glass Cullet For Base or Fill						
Sub- Floo	5-55 Use Recycled-Content Sub-Floor						
Door	5-56 Use Domestically-Grown Wood Interior Doors	_					
	5-57 No Vinyl Flooring	-					
	5-58 Use Any Amount of Rapidly Renewable Flooring Products With a Ten-Year Harvest Cycle or Shorter.						
	5-59 On More Than 250 Square Feet, Use Rapidly Renewable Flooring Products With a Ten-Year Harvest.						
	5-60 Use Recycled-Content Carpet Pad	-					
	5-61 Use Recycled, Renewed Carpet or Wool Carpet						
	5-62 Use Benlaceable Carnet Tile						
T T	5.62 Use 40% Pecuded Ceptent Hard Surface Tile, 100 Square East Minimum						<u> </u>
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	5-65 Use Locally Salvaged Wood Flooring	-					
	5-66 Use Flooring that is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1.						
	5-67 Use Flooring that is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 2.						
	5-68 Use Durable/Spot Repairable Floor Finish		• •				
	5-69 Use Concrete Slab or Sub-Floor as a Finished Floor in Living Space						
	5-70 Use Drywall with a Minimum of 90% Recycled-Content Gypsum or Flue Gas Substitute for Recycled.						
=	5-71 Use Recycled or "Reworked" Paint and Finishes						
	5-72 Use Recycled Newspaper or Cork Expansion Joint Filler						
-	5-73 Use Natural Wall Finishes, Like Lime Paint and Clay						
	5-74 Reduce Interior Walls Through Open Plan for Kitchen, Dining, and Living Areas						
	5-75 Use Siding with Reclaimed or Recycled Material On At Least 20% of Solid Wall Surface						
	5-76 No Vinvl Siding or Exterior Trim						+
	5-77 Use 50-Year Warranted Siding Product	-		-			
	5-78 Lise Wood Siding that is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1						
	5 70 Use Wood Siding that is Third Party Certified Sustainably Harvested Wood that Meets the Tier 2						<u> </u>
- L	E 20 Lice Schoold Mesonny Driek or Diack E00/ Minimum						<u> </u>
							<u> </u>
	5-81 Use Regionally-Produced Stone or Brick	-					
	5-82 Use Straw Bale Walls, Minimum R-28						<u> </u>
	5-83 Use Wood/Composite or Fiberglass Windows						<u> </u>
!	5-84 No Vinyl Windows						
(7 :	5-85 Use Finger-Jointed Wood Windows						
	5-86 Use Wood Windows that are Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1.						
	5-87 Use Wood Windows that are Third-Party Certified Sustainably Harvested Wood that Meets the Tier 2.						
	5-88 If Using Trim:						
	5-88a Use Regional Trim Products, 50% Minimum						
	5-88b Use Trim That Is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1.						
	5-88c Use Trim that is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 2 Requirements.						
	5-89 Use Finger-Jointed or MDF Trim With No Added Urea Formaldehyde, 90% Minimum						-
	5-90 Use Wood Veneers that are Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1.						
	5-91 For Cabinets:						
i H	5-91a Lise Regional Products 90% Minimum						
1	5-91h Lise Wood that is Third-Party Certified Sustainably Harvested Wood that Meets the Tier 1						
4	Control Line Wood that is Third Party Certified Sustainably Harvested Wood that Meets the Tier 2						
יי ר ן	5-910 Ose wood that is finite-Party Certified Sustainably Harvested wood that Meets the Her 2.	•					
	5-92 Use Cabinet Casework and Sneiving Constructed of Agricultural Fiber with No Added Urea Formaldenyde		•				
	5-93 Use Countertops That Are Salvaged, Recycled, or Third-Party Certified Sustainably Harvested Wood that.						
	5-94 Use Recycled-Content Roofing Material						
	5-95 Use 30-Year Warranted Roofing Material	-	-				
	5-96 Use 40-Year Warranted Roofing Material						
	5-97 Use Solar Shingles						
	5-98 Install a Metal Roof						
1	5-99 All Insulation to have a Minimum of 40% Recycled-Content						
	5-100 Use Environmentally Friendly Foam Building Products (Formaldehyde-Free, CFC-Free, HCFC-Free)						
	5-101 Use Reclaimed or Salvaged Material for Landscaping Walls						1
	5-102 Use 100% Recycled Content HDPE, Salvaged Lumber or Lumber that is Third-Party Certified.						1
Ľ	5-103 Use No Pressure Treated Lumber						
ç	5-104 Points for B20 Biodiesel or Better Equipment (5 Points for 100% Excavation Equipment on Rindiesel 1						
, c	5-105 Provide Ruilt-In Kitchen or Litility Room Recycling Center						
tr Re							
	D-100 EXIIA						<u> </u>



Seattle Built Green Single Family & Townhome Projects 2008 - 2011

INDOOR WATER USE

Introduction

Achievement of these credits maximizes water efficiency within the home to reduce the burden on municipal water supply and wastewater systems. This analysis evaluates the percentage of projects achieving the credits and estimates the total water savings (in gallons per year). The analysis also categorizes the strategies implemented and estimates water saved by each strategy (in gallons per year).

KEY FINDINGS

Baseline	
Total Projects	629 units
Indoor Plumbing Faucet Fixtures	226
Units with Built Green Bathroom Faucet Credit	236 units
Units with Built Green Kitchen Faucet Credit	196 units
Units with Both Faucet Credits	181 units
Units with Lither or Both Faucet Credits	251 units
Baseline Bathroom Faucet Volume	5,346,400 gallons per year
Baseline Kitchen Faucet Volume	5,346,400 gallons per year
Total Baseline Faucet Volume	10,692,800 gallons per year
Installed Bathroom Faucet Volume	4,544,000 gallons per year
Installed Kitchen Faucet Volume	4,680,000 gallons per year
Total Installed Faucet Volume	9,224,000 gallons per year
Savings Due to Built Green Faucets	1,468,800 gallons per year
Indoor Plumbing Toilet Fixtures	105
Units with Built Green High Eff Credit	195 units
Units with Built Green Dual Flush Credit	241 units
Units with Built Green Composting Credit	0 units
Units with Built Green Grey Water Credit	16 units
Pasalina Tailat Valuma	4 266 600 college per ver
Baseline Tollet Volume	4,200,000 gallolis per year
Total Installed Toilet Volume	3,743,600 gallons per year
Savings due to Built Green Toilets	523,000 gallons per year
Indoor Water Appliances	
Units with Built Green Clothes Washer Credit	166 units
Units with Built Green Dishwasher Credit	586 units
Units with Both Appliance Credits	131 units
Baseline Clothes Washer Volume	3,017,400 gallons per year
Baseline Dishwasher Volume	4,192,500 gallons per year
I otal Baseline Appliance Volume	7,209,900 gallons per year
Installed Clothes Washer Volume	2.579.400 gallons per year
Installed Dishwasher Volume	2,795,000 gallons per year
Total Installed Appliance Volume	5 374 400 gallons per year
rotar instance Appliance volume	
Savings due to Built Green Appliances	1 835 500 gallons per year
Savings due to built differi Appliances	1,000,000 galloris per year

Indoor Plumbing Fixtures Water Savings	
--	--

Annual Percent Water Savings	17%
Annual Water Savings	3,827,300 gallons per year







CREDIT ACHIEVEMENT SUMMARY

					Ν	lumber	of Units				
		0	100	200)	300	400	500	600	70	0
2-44	Select Bathroom Faucets with GPM less than Code										
2-45	Select Kitchen Faucets with GPM less than Code										
2-46	Select High Performance Low-Flush Toilets										
2-47	Install Dual-Flush Toilets										
2-48	Install Composting Toilets										
2-50	Use Greywater for Toilet Flushing										
3-65	Install Front Loading or Energy Star Washing Machine										
3-66	Install an Energy Star Dishwasher			1							



ASSUMPTIONS AND CONSTANTS

Constant	Value	Units	Source
Dwelling Occupancy	2.3	occupants per dwelling	Seattle Public Utilities
Dwelling Faucet Use	8.1	flow minutes per day per dwelling	AWWARF ¹
Percent Kitchen Faucent Use	Paladino Assumption		
Toilet Use	5.05	flushes per occupant-day	AWWARF ¹
Standard Faucet	2.5	gallons per minute	Seattle Municipal Code
Built Green Faucet	1.5	gallons per minute	US EPA Water Sense
Standard Toilet	1.6	gallons per flush	Seattle Municipal Code
High Efficiency Toilet	1.28	gallons per flush	US EPA Water Sense
Dual Flush Toilet	1.28	average gallons per flush	US EPA Water Sense
Composting Toilet	0	gallons per flush	US EPA Water Sense
Greywater for Toilets	0	gallons per flush	Paladino Assumption
Calendar Occupancy	365	dwelling-days per year	Paladino Assumption

Derived Constant	Value	Units	Source
Percent Lavatory Faucet Use	50%	ratio of lavatory faucet use to total faucet use	Paladino Assumption
Lavatory Faucet Use	4.05	flow minutes per occupant-day	AWWARF ¹
Kitchen Faucent Use	4.05	flow minutes per occupant-day	AWWARF ¹

Toilet Assumptions for Calcuations	Source
Greywater credit: all toilets are considered greywater	Paladino Assumption
Composting credit: one toilet is composting	Paladino Assumption
High Effeciency credit: all toilets are high effeciency unless other credits are taken	Paladino Assumption
Dual Flush credit: calculate # of DF toilets based on number of points achieved	Built Green Rating System
Remaining toilets, if any, are considered standard flush	Paladino Assumption

Constant	Value	Units	Source
Clothes Washer Use	0.1	Washes per day per occupant	Elex Your Power:
Standard Clothes Washer	40.0	gallons per wash	CA Energy Efficiency Marketing Outreach Campaign Product
Ave Energy Star Clothes Washer	18.0	gallons per wash	Guidas for Washers & Dishwashers
Dishwasher Use	0.9	Washes per day per occupant	Guides for Washers & Distiwashers
Standard Dishwasher	9.0	gallons per wash	
Ave Energy Star Dishwasher	6.0	gallons per wash	www.rypower.org

¹ American Water Works Association Research Foundation

Seattle Built Green Single Family & Townhome Projects 2008 - 2011

STORMWATER

Introduction

Achievement of these credits limits disruption of natural hydrology by reducing impervious cover and stormwater runoff from buildings. This analysis evaluates the percentage of projects achieving the credits and estimates the total stormwater runoff savings (in gallons per year). The analysis also categorizes the strategies implemented and estimates water saved by each strategy (in gallons per year).

KEY FINDINGS

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TOWNHOME PROJECTS STORMWATER PERFORMANCE

The following key findings are for townhomes only. Seattle Municipal Code was used to estimate the area of the site required for building footprint and landscaping, when that information was not available. It is assumed that any remaining area of the site was impervious. Savings are a reduction of impervious area based on Built Green credits achieved.

baseline	
Total Number of Townhome Units	457 units
Building Runoff	
Townhomes with vegatative roofing	25 units
Townhomes with roof infiltration system	85 units
Baseline Building Runoff	4,760,445 gallons per year
Savings in Runoff from Installed Vegetative Roofing	143,883 gallons per year
Savings in Runoff from Installed Roof Infiltration System	1,516,481 gallons per year
Non-Roof, Impervious Surface Runoff	
Townhomes with at least one third pervious surfaces	162 units
Baseline Runoff for Patio, Path, Driveway Impervious Surfaces	2,052,008 gallons per year
Savings from Installed Pervious Surfaces	669,264 gallons per year

Total Stormwater Runoff Savings

Percent Savings to Baseline	34%
Annual Stormwater Savings	2,329,628 gallons per year



CREDIT ACHIEVEMENT SUMMARY

ALL PROJECTS

The credit achievement summary graph is for both project types: single-family houses and townhomes.



ASSUMPTIONS AND CONSTANTS

Constant	Value	Units	Source
Maximum Lot Coverage (for structures)	50%	Percent	SMC 23.45.010
Ratio of width to depth	1.0	(Lots assumed square)	V/////////////////////////////////////
		Square Feet Per Linear Foot of	CNAC 22 45 045
Minimum Landscape area per perimeter	3.0	Perimeter (feet ² / foot)	SIMC 23.45.015
Percent of non-building non-landscaped covered by nervious	220/	Percent	Built Green Minimum
referred by pervicus	5578	reicent	Requirement
Percent of non-building, non-landscaped covered by impervious	67%	Percent	Built Green Minimum
referred by impervious		rereent	Requirement
Percent of water infiltrated for a green roof	50%		Built Green Handbook
Percent of water infiltrated for a pervious surface	70%	Percent	U.S. EPA NPDES ¹
Average footprint coverage of green roof installations	30%	Percent	
Average percipitation for King and Snohomish County	39	inches per unit area	NOAA Climate Data for Seattle
Percent overflow of roof infiltration systems	0%	Percent	1//////////////////////////////////////

 1 U.S. EPA National Pollutant Discharge Elimination System (NPDES) - Infiltration

 $\underline{http://cfpub}.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=137&minmeasure=5.pdf$

Represents a Placeholder Value

Seattle Built Green Single Family & Townhome Projects 2008 - 2011 ENERGY

Introduction

Achievement of these credits reduces overall energy use and improves energy efficiency to meet the heating/cooling load more effectively. The analysis estimates the average savings per unit (in MWH per year), the total energy savings provided by all participating units (in MWH per year), and also estimates the energy saved by each strategy (in MWH per year or k Therms per year). For overall comparisons the energy savings are reported in MBTU (million BTU).

KEY FINDINGS

4-STAR & 5-STAR RATED UNITS ENERGY PERFORMANCE

The following energy savings information is reported only for 4-Star and 5-Star rated units. Projects achieving a 4-Star or 5-Star rating must meet Energy Star performance requriements, and the savings from these types of homes has been quantified in a report by Ecotope (please see Assumptions and Constants).

Number of 4-Star Units	177	Ī
Number of 5-Star Units	57	
		-
Total Energy Saving from 4-Star Units	695 MWh per year	2370.6 MBTU per year
Total Energy Saving from 5-Star Units	451 MWh per year	1539.8 MBTU per year

Average Saving per 4-Star Unit	3.9 MWH per year
Average Saving per 5-Star Unit	7.9 MWH per year



2-STAR & 3-STAR RATED UNITS: ESTIMATED ENERGY SAVINGS FROM INDIVIDUAL CREDITS

The following key findings show estimated energy savings from specific credits for units achieving a 2-Star or 3-Star rating. There are no Ecotope energy saving calculations for 2-Star or 3-Star units and therefore savings for these units were estimated using the following calculations and assumptions.

Equipment

high Enricency near Pumps (5-54)			
Units Achieving Credit	59		
Lowest Estimated Savings	44.4 MWH per year		
Average Estimated Savings	173.1 MWH per year		

Tankless Hot Water Heater (3-46)

Units Achieving Credit	226
Estimated Savings	16.7 k Therms per year

High Efficiency Hot Water Heater (3-47)
Units Achieving Credit	119
Estimated Savings	7.6 k Therms per year

Lighting

Use CFL in Three High-Use Areas (3-56)			
Units Achieving Credit	223		
Estimated Savings	22.1 MWH per year		

Appliances

Install Front Loading or Energy Star® Washing Machine (3-65)

Units Achieving Credit	85
Lowest Estimated Savings	2.2 MWH per year
Average Estimated Savings	15.3 MWH per year

Install an Energy Star® Dishwasher (3-66)

Units Achieving Credit	363
Lowest Estimated Savings	3.6 MWH per year
Average Estimated Savings	28.3 MWH per year

Install Energy Star® Refrigerator (3-67)

Units Achieving Credit	188
Lowest Estimated Savings	17.1 MWH per year
Average Estimated Savings	43.4 MWH per year

Lowest 2-Star & 3-Star Units Estimated Energy Savings 2736.5 MBTU per year

Estimated Total Energy Savings

(4 & 5 Star Units Total Energy Savings + Lowest 2-Star & 3-Star Units Estimated Energy Savings from Individual Credits)

6646.8 MBTU per year

ADDITIONAL SAVINGS CALCULATIONS

4-STAR & 5-STAR RATED UNITS: ESTIMATED ENERGY SAVINGS FROM INDIVIDUAL CREDITS

The following key findings show estimated energy savings from specific credits for units achieving a 4-Star or 5-Star rating.

Equipment

High Efficiency Heat Pumps (3-34)		
Units Achieving Credit		17
Lowest Estimated Saving	gs	12.8 MWH per year
Average Estimated Savin	igs	49.9 MWH per year

Tankless Hot Water Heater (3-46)

Units Achieving Credit	107
Estimated Savings	7.9 k Therms per year

High Efficiency Hot Water Heater (3-47)

Units Achieving Credit	142
Estimated Savings	8.2 k Therms per year

Lighting

Use CFL in Three High-Use Areas (3-56)	
Units Achieving Credit	208
Estimated Savings	20.6 MWH per year

ALL UNITS: ESTIMATED ENERGY SAVINGS FROM INDIVIDUAL CREDITS

The following key findings show estimated energy savings from specific credits for all units

Equipment

High Efficiency Heat Pumps (3-34)	
Units Achieving Credit	76
Lowest Estimated Savings	57.2 MWH per year
Average Estimated Savings	223.0 MWH per year

Tankless Hot Water Heater (3-46)

Units Achieving Credit	333
Estimated Savings	24.6 k Therms per year

High Efficiency Hot Water Heater (3-47)

Units Achieving Credit	261
Estimated Savings	16.5 k Therms per year

Lighting

Use CFL in Three High-Use Areas (3-56)	
Units Achieving Credit	431
Estimated Savings	42.7 MWH per year

Appliances

Install Front Loading or Energy Star® Washing Machine (3-65)

Jnits Achieving Credit	81
owest Estimated Savings	2.1 MWH per year
Average Estimated Savings	14.6 MWH per year

Install an Energy Star® Dishwasher (3-66)

Units Achieving Credit	223
Lowest Estimated Savings	2.2 MWH per year
Average Estimated Savings	17.4 MWH per year

Install Energy Star® Refrigerator (3-67)

Units Achieving Credit	145
Lowest Estimated Savings	13.2 MWH per year
Average Estimated Savings	33.5 MWH per year

Appliances

Install Front Loading or Energy Star® Washing Machine (3-65)

Units Achiev	ng Credit	166
Lowest Estim	ated Savings	4.3 MWH per year
Average Esti	nated Savings	29.9 MWH per year

Install an Energy Star® Dishwasher (3-66)

Units Achieving Credit	586
Lowest Estimated Savings	5.9 MWH per yea
Average Estimated Savings	45.7 MWH per vez

Install Energy Star[®] Refrigerator (3-67)

Units Achieving Credit	333
Lowest Estimated Savings	30.3 MWH per year
Average Estimated Savings	76.9 MWH per year

CREDIT ACHIEVEMENT SUMMARY (ALL PROJECTS)



ASSUMPTIONS AND CONSTANTS

Units achieving the 3-46 Tankless hot water heater are gas

2008 Town Homes (TH) are assumed to be 1400 square feet

2008 Single Family (SF) homes are assumed to be 1850 square feet

Based on data from Ecotope Report¹, a linear relationship between energy savings and building square footage is assumed for 4-Star and 5-Star projects. 4-Star projects assume 2 kWh/sf/year and 5-Star projects assume 4 kWh/sf/year savings



Constant	Value	Units	Source
4-Star Savings per SqFt	2.1	Kilowatt Hours per Year Savings	Ecotope Report (2008) ¹
5-Star Savings per SqFt	4.0	Kilowatt Hours per Year Savings	Ecotope Report (2008) ¹
kWh to BTU	3,412	BTUs per kWh	
BTU to Therm	100,067	BTUs per Therm (100 ccf of natural gas)	
Lowest-Saving of the High-Eff Heat Pump	752	Kilowatt Hours per Year Savings	RTF Forum ²
Average-Savings of the High-Eff Heat Pumps	2934	Kilowatt Hours per Year Savings	RTF Forum ²
Savings per gas tankless hot-water heater	74	Therms per year	Energy Star ³
Savings per unit achieving any credits for 3-56 CFL lighting	99	kWh savings per unit	Seattle City Light
Lowest-Saving of the Eff Clothes Washers	26	Kilowatt Hours per Year Savings	RTF Forum ²
Average-Savings of the Eff Clothes Washers	180	Kilowatt Hours per Year Savings	RTF Forum ²
Lowest-Saving of the Energy Star Dishwashers	10	Kilowatt Hours per Year Savings	RTF Forum ²
Average-Savings of the Energy Star Dishwashers	78	Kilowatt Hours per Year Savings	RTF Forum ²
Lowest-Saving of the Energy Star Refrigerators	91	Kilowatt Hours per Year Savings	RTF Forum ²
Average-Savings of the Energy Star Refrigerators	231	Kilowatt Hours per Year Savings	RTF Forum ²
Water Heater Upgrade Savings 3-47, 2 Credits	18	Therms per year	Energy Star ³
Water Heater Upgrade Savings 3-47, 4 Credits	74	Therms per year	Energy Star ³
Water Heater Upgrade Savings 3-47, 7 Credits	74	Therms per year	Energy Star ³

¹ Ecotope Residential Energy Comparison: Built Green and LEED; prepared for the City of Seattle; October 16, 2008

² Regional Technical Forum - Planning, Tracking, and Reporting System v2.0

³ Energy Star Residentail Water Heaters: Draft Criteria Analysis

 $http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/WaterHeaterDraftCriteriaAnalysis.pdf$

Seattle Built Green Single Family & Townhome Projects 2008 - 2011

CONSTRUCTION WASTE

Introduction

Achievement of these credits diverts construction and demolition debris from disposal in landfills and incinerators. Recycling waste reduces disposal fees and overall construction costs, and provides "stock" for new materials to be manufactured. This analysis categorizes the method of recycling (source separated or commingled), the percentage of each waste stream diverted, and estimates the total waste diverted from the landfill (in tons).

KEY FINDINGS

COMMINGLED RECYCLING CREDITS

Construction Waste Recyled	
Unit Diverting Waste to 50% Recycling Facility (5-24)	120 units
Unit Diverting Waste to 75% Recycling Facility (5-25)	123 units
Unit Diverting Waste to 85% Recycling Facility (5-26)	93 units

Construction Waste Recyled

Square Footage of Units Diverting Waste to 50% Recycling Facility (5-24)	210,825 Sq Ft
Square Footage of Units Diverting Waste to 75% Recycling Facility (5-25)	233,452 Sq Ft
Square Footage of Units Diverting Waste to 85% Recycling Facility (5-26)	181,696 Sq Ft
Actual Construction Waste to Landfill *	E78 Tons

Total Waste Diverted from Land Fill and Recycled

From 50% Recycling (5-24)	202 Tons
From 75% Recycling (5-25)	336 Tons
From 85% Recycling (5-26)	296 Tons
Total	834 Tons



* Does not include information on projects not achieving any credits related to construction waste

Calculation Method: 85% x (Unit Area x Unit Waste Rate x Facility Recycling Rate)/(Pounds Per Ton)

CREDIT ACHIEVEMENT SUMMARY

COMMINGLED RECYCLING CREDITS



SOURCE SEPARATED RECYCLING CREDITS

						Numbe	r of Uni	ts			
		0	50	100	150	200	250	300	350	400	450
5-13	Recycle Cardboard by Source Separation, 85% Minimum Recycling Rate										
5-14	Recycle Metal Scraps by Source Separation, 85% Minimum Recycling Rate										
5-15	Recycle Clean Scrap Wood and Broken Pallets by Source Separation, 85% Minimum Recycling Rate										
5-16	Recycle Package Wrap and Pallet Wrap by Source Separation, 85% Minimum Recycling Rate										
5-17	Recycle Drywall by Source Separation, 85% Minimum Recycling Rate										
5-18	Recycle Concrete/Asphalt Rubble, Masonry Materials, or Porcelain by Source Separation, 85% Minimum Recycling Rate										
5-19	Recycle Paint by Source Separation, 85% Minimum Recycling Rate										
5-20	Recycle Asphalt Roofing by Source Separation, 85% Minimum Recycling Rate										
5-21	Recycle Carpet Padding and Upholstery Foam by Source Separation, 85% Minimum Recycling Rate										
5-22	Recycle Glass by Source Separation, 85% Minimum Recycling Rate										
5-23	Recycle Land Clearing and Yard Waste, Soil, and Sod by Source Separation, 85% Minimum Recycling Rate										

ASSUMPTIONS AND CONSTANTS

Constant	Value	Units		So	urc	e												
Unit Waste Rate	4.5	Pounds per Square Foot							U	.S.	EP	A	1					
5-24 Recycling Rate	50%	Percent			Ζ	7,	Ζ,	Ζ,	Ζ,	7,	//	//	//	//	7	\overline{Z}	7	2
5-25 Recycling Rate	75%	Percent			7,	$^{\prime}$	7		7,		7	7	7	7	7	7	7	7
5-26 Recycling Rate	85%	Percent		//	7	7	7	1	/	7	Ζ	7	Ζ	Ζ	Ζ	Ζ	Ζ,	7
Pound to Ton Conversion	2000	Pounds per Ton		7	7	7	7	7	7	7	7	Ζ	7	Ζ,		Ζ,	Ζ,	7

¹ EPA Characterization of Building Related C&D Debris in the United States, December 2005