Catalog of State Actions
Agriculture and Waste Management (AW) Working Group

A catalog of state-level, GHG-reducing actions and policy options based on actions undertaken or considered by state, local and private actors.

Key to Future Rankings of Options in the Tables that Follow:

Potential GHG Emission Reductions 1/	Potential Cost or Cost Savings 1/ 2/
High (H): At least 1.0 million metric tons (MMt) carbon dioxide equivalent (CO_2e) per year by 2020 (~1% of current WA emissions)	**High (H)**: $50 per metric ton CO_2e (tCO_2e) or above
Medium (M): From 0.1 to 1.0 $MMtCO_2e$ per year by 2020	**Medium (M):** $5-50/$tCO_2e$
Low (L): Less than 0.1 $MMtCO_2e$ per year by 2020, or 1 MMtCO2e by 2050	**Low (L):** Less than $5/$tCO_2e$
Uncertain (U): Not able to estimate at this time	**Negative (Neg):** Net cost savings
	Uncertain (U): Not able to estimate at this time

1/ Several measures may overlap in terms of emissions reductions and/or cost impacts. Estimates assume measures would be implemented independently from other measures.
2/ Costs are denoted by a positive number. Cost savings (i.e., "negative costs") are denoted by a negative number.

Definition of "Priorities for Analysis":
- **High:** High priority options will be analyzed first.
- **Medium:** Medium priority options will be analyzed next, time and resources permitting.
- **Low**: Low priority options will be analyzed last, time and resources permitting.

Notation of Options:
* **Options marked in bold an asterisk (*)** indicate some of the related state actions that are approved or underway, as described further in the companion options description document. TWG members are encouraged to provide information on other relevant actions.

Agriculture and Waste Management (AW)

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AW-1	**PRODUCTION OF FUELS AND ELECTRICITY IN AGRICULTURE**					
1.1	Expanded Use of Woody Biomass Feedstocks for Electricity, Heat and Steam Production*	M-H	L-M	Level of reductions dependent on whether crop residue is targeted or purpose-grown crops, or both. Costs are primarily dependent on distance to end user. • Increases WA jobs; • Reduces WA fuel imports. Combustion for electricity creates ash that requires further waste management. Application of Beyond Waste and sustainable principles to biomass materials requires systematic full lifecycle benefits. Other energy conversion technologies (gasification, pyrolysis) could yield greater overall benefits, but probably at higher initial costs.		Senate Bill 6001 “Mitigating the impacts of climate change”: Establishes state goals to reduce GHG emissions and establishes a GHG performance standard for electric utilities operating in Washington; Restatement of the Governor’s order (w/ fuel import and job goals); performance standard for base load electrical generation, relevant to options 1.1, 1.3, and maybe 7.2 and 8.3 because all forms of energy production from renewables would be deemed as being in compliance with this standard. House Bill 1303: Encourages the use of cleaner energy through a number of processes; creation of the Energy Freedom Program, with requirement that by 2015 all

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						state agencies will use biofuels exclusively; also relevant to 1.2. The 2006 Energy Independence Act established renewable portfolio standards. Related to F-1.1
1.2	In-state Production of Ethanol and Ethanol Feedstocks*	H	M-H	Level of reduction is dependent on volumes produced, feedstocks and production methods utilized. The CAT emphasized this point in their comments, noting significant differences between starch-based and cellulosic production methods and that analysis should be done separately for different feedstock types. Costs are dependent on the structure of the incentives program. • Increases WA jobs; • Reduces WA fuel imports (when fuels are consumed in-state).		Biomass for ethanol, methanol, or butanol may yield process system results where in non-fuel remainders become process system inputs for other valuable co-products. Current pyrolysis technologies have great potential for a balanced refinery system creating liquid fuels and chemical feedstocks, energy recovery to drive the process and a char product for soils fertility applications WA passed into several requirements/incentives supporting an in-state biodiesel and ethanol industry Ethanol production is about 435 million gallons per year from seven facilities in the

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						permitting/planning stage. There are four E-85 fueling stations in the State. Related to F-1.2
1.3	In-state Production of Biodiesel and Biodiesel Feedstocks*	H	M-H	See above		See above
1.4	Manure Digesters/Other Waste Energy Utilization*	L-M	M	Nominal ratings are based on methane conversion to electricity using standard engine/generator technology. Costs for conversion to compressed gas for vehicle use likely to be much higher. • Increases WA jobs; • Potential to reduce WA fuel imports.		Methane as a source for turbine power is a low energy return process. With our relatively low electrical power rates and gasoline approaching $3.50 a gallon, methane for internal combustion engines appears to be a much higher beneficial application. Three anaerobic digester projects were awarded state loans in 2006
AW-2	**AGRICULTURE – LIVESTOCK**					
2.1	Manure Management (handling and storage, and improve application methods; includes hobby-farm and pet waste)	L	L-M	Reductions are limited due to fairly small manure management emissions in the livestock sector. The CAT noted potential additional reductions from the process of biofiltration of digester wastewater, which removes nitrogen compounds. The waste can then be used to fill wetlands and restore other		There is a non-ag activity that is related regarding hobby farm and pet waste. King County documented the amount of hobby farm-produced organic waste and manure. There are also significant concerns about pet waste and water quality. TWG member suspects that if calculations were done, pet waste might be a more

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				types of habitat.		significant factor than one would intuitively believe.
2.2	Changes in Animal Feed (optimize nitrogen for N_2O reduction and/or use supplements to reduce CH4 from enteric fermentation)	L	U	Reductions limited by fairly low emissions in WA for enteric fermentation and manure management.		
2.3	Rotational Grazing/Improve Grazing Crops and/or Management	U	U	The extent of poorly managed grazing lands in WA is unclear.		
AW-3	**AGRICULTURE CROP PRODUCTION & URBAN/SUBURBAN LANDSCAPES**					
3.1	Agricultural Soil Carbon Management	L-M	L	Significant opportunities beyond current practice (e.g. conservation tillage/no-till)?		DNR and WESTCARB produced an inventory of terrestrial carbon sequestration opportunities in WA
3.2	Agricultural Nutrient Management	L-M	L	Significant opportunities beyond current practice (e.g. nutrient management plan requirements)?		
3.3	Agricultural Water Management	L-M	U	Reductions dependent on the extent that pumping can be reduced.		
3.4	Carbon Sequestration in Perennial Systems	L-M	L	Reductions based on increasing WA orchard acreage by 10% by 2020 (17,200 acres).		WA orchards estimated to sequester CO_2 at a rate of 35 lbs CO_2/tree/yr or 28,000 lb CO_2/ac/yr (estimate provided by Alan Lakso via Keith Goehner)
3.5	Urban/Suburban Soil Carbon Management:	U	U	Level of net reductions driven by the amount of urban/suburban land targeted		Recent Actions in WA: Washington State Department of Ecology's

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	DESCRIPTION: The amount of carbon stored in urban/suburban soils can be increased by the adoption of practices such as deep incorporation of compost and other organics in soils undergoing development and the use of organic mulches in new and established landscapes. Other benefits include increased plant health and vigor, reduced need for irrigation, fertilizers and pesticides and less stormwater run-off.			and the GHG emissions associated with incorporating organic material (e.g. compost).		Stormwater Management Manual for Western Washington (WDOE website), used by local jurisdictions for stormwater design, now requires soil protection or restoration (Volume V, Chapter 5, BMP T5.13). A soil depth of 8 inches is required with 10% organics by weight for planting beds and 5% for lawns. For more information see http://www.soilsforsalmon.org/how.htm .
3.6	Urban/Suburban Nutrient Management	L-M	Neg-L	Reductions depend on aggressiveness of policy to achieve land use change or change in fertilization practices; Costs assumed to be low due to the savings associated with avoided fertilizer use.		
AW-4	**AGRICULTURE – LAND USE MANAGEMENT**					
4.1	Land Use Management that Promotes Grassland Cover (e.g., convert cropland to grassland or prevent conversion of grassland to croplands)	M	U	Reductions dependent on the: levels of soil carbon; GHG emissions associated with each land cover type. Costs dependent on the level of incentives required to achieve the desired land use management.		
4.2	Preserve Open	L-M	M-H	Reductions dependent on		Senate Bill 5248 "Preserving

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	Space/Agricultural Land			levels of above and below ground carbon on the agricultural land vs. developed land; additional indirect benefits of supporting smarter growth in some cases (and the associated GHG reductions). Costs dependent on the cost of conservation easements.		the viability of agricultural lands": Counties and cities may not amend or adopt critical areas ordinances as they specifically apply to agricultural activities until July 1, 2010. House Bill 1636; creation of a regional transfer of development rights: Subject to amounts appropriated, CTED is required to fund a process to develop a regional TDR program. The program must encourage King, Pierce, Snohomish, and Kitsap counties, and the cities within these counties, to participate in the development and implementation of a regional framework to make TDR viable.
AW-5	**AGRICULTURE – FARMING PRACTICES**					
5.1	Reductions In On-Farm Energy Use and Improvements in Energy Efficiency*	M	U	Level of reduction assumes that the agricultural industry consumes 25% of industrial petroleum and that 50% reduction could be achieved via the policy. Additional GHG emissions would also come from electricity consumption in the ag sector.		Renewable Energy System Cost Recovery (RCW 82.16.110) and Tax on Manufacturers or Wholesalers of Solar Energy Systems: provides incentives for the purchase of locally-made renewable energy products. Incentive payments are provided by electric utilities

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						to customers generating renewable energy (i.e., solar, wind) on their property. The federal Energy Policy Act of 2005 provided several renewable energy incentives.
5.2	Organic Farming	U	U	Reductions are dependent on the net difference in lifecycle GHG emissions between the organic cultivation systems implemented and conventional cultivation systems.		
5.3	Programs to Support Local Farming/Buy Local	M (note rating adjusted up based on input from TWG member, see notes for details)	L-M	Reductions based on those quantified in other states (e.g. AZ, NM). These may only capture a portion of the total benefit due to difficulties in quantification. Costs dependent on implementation mechanisms (e.g. incentive programs for processing or distribution systems). The CAT noted sensitivity to impacting food import/exports both in terms of not wanting to limit opportunities to import low-cost goods and not impacting agricultural exports, which are a viable part of WA economy.		Transportation accounts for ~20% of food system wide energy use . . . Alternative options for improving efficiencies in transportation need to be explored (ie. rail, etc.). If taking energy consumed in food processing, storage, and final preparation into account, the potential opportunities to reduce emissions may be higher. Food production system is estimated to consume 10% of total US energy use.
AW-6	**WASTE MANAGEMENT – WASTE MANAGEMENT STRATEGIES**					
6.1	Significantly Expand Source Reduction, Reuse,	M-H	L-M	Given WA's current high levels of diversion,		Under current state strategy (see below), WA has already

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	Recycling and Composting DESCRIPTION: includes a broad range of actions, i.e., increase and expand existing programs, develop new programs, increase participation and recovery rates, expand infrastructure, reduce the toxicity and increase the recyclability of products, develop markets for recyclable materials, and encourage and utilize tools and techniques such as product stewardship, closed loop recycling and cradle-to-cradle manufacturing. Full implementation of the State's Beyond Waste Plan and incentives and partnerships with the private sector and local governments will be elements of implementing this action.			incremental benefits may tend to be toward the lower end of the range; costs likely to be toward the higher end of the range, as many of the less costly alternatives have been exploited.		achieved a recycling and diversion rate of slightly over 47% in 2005. Recent Actions in WA: Department of Ecology issued the Beyond Waste plan in November 2004. It is a long-term strategy for systematically eliminating wastes and the use of toxic substances. For more information, see http://www.ecy.wa.gov/beyondwaste/about.html. Washington State Legislature recently passed two laws related to this activity: Washington's Electronic Products Recycling Law (2006) http://www.ecy.wa.gov/programs/swfa/eproductrecycle/ establishes a product stewardship system for the recycling of computers and televisions in 2009. HB 1024 http://apps.leg.wa.gov/billinfo/summary.aspx?bill=1024&year=2007 passed in 2007. It phases out the use of Polybrominated Diphnyl

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						Ethers which will reduce the toxicity of certain products in the future, making them more recyclable.
6.2	Resource Management Contracting	U	U			Contract system can reward desired outcomes. Benefits to local waste management include reduced need for fuel energy to haul material (see also 8.1). Systematic assessments can be used to create a resource model.
6.3	Waste Coal and Petroleum Coke Recapture	U	U	Reductions depend on the volumes of material available and the net difference in lifecycle GHG emissions for its use versus virgin coal or petroleum		
6.4	Divert Organic Waste from Landfill Disposal	M	M	Reductions based on landfill methane emissions levels in the draft I&F and assuming 50% control statewide. • Could be an increase in jobs associated with composting or energy conversion technologies; • Could reduce WA energy imports, if organics are used to generated energy.		One of the five major initiatives of Beyond Waste Plan "Organics" is not limited to yard debris or food waste in the municipal solid waste stream and includes all biomass materials such as landclearing, construction and demolition debris, wood waste, food waste, fabric, and paper (in some cases carbon-based plastics)
6.5	Establish Local Reuse, Recycling/Processing and	M	U	Costs dependent on the level of incentives required to establish these businesses.		

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	Organics Management Businesses and Facilities DESCRIPTION: Currently much of the State's waste is moved long distances by truck or train for disposal. Materials destined for recycling are also often transported long distances. Establishing local businesses and industries that can refurbish, remanufacture and process reusable and recyclable products and materials creates a market for those items and reduces the transportation GHG emissions related to long distance movement of waste and recyclables. Incentives and other actions can be taken to establish local markets and local businesses.					
6.6	Solid Waste Collection Efficiencies	U	U	Reductions dependent on the level of transportation reduction that can be achieved. Costs dependent on implementation mechanisms selected.		There is an issue with emissions from trucks, trains and other equipment utilized to transport and process waste. Some examples of actions include reducing diesel emissions through techniques covered in the Transportation TWG and more waste industry specific actions. For instance, establishing weekly

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						collection of organics and every other week collection of garbage and recyclables will likely result in GHG emission reductions and increased diversion of organics from landfilling. May also include reducing the amount of materials that need to be transported (potential link to 6.1, in terms of source reduction).
AW-7	**WASTE MANAGEMENT – LANDFILL GAS STRATEGIES**					
7.1	Flare Landfill Methane at non-NSPS (smaller) Sites	L	H			Federal and State performance criteria; regulations set emissions standards and gas control requirements for landfills that pass a threshold of waste amounts. Most landfills in WA have installed gas collection systems with flares or electrical generation. Implementation on small landfills is not feasible due to low emissions and high costs.
7.2	Methane & Biogas Energy Programs	U	U	Reductions dependent on industries/municipal processes targeted and technologies employed. • Potential for additional in-state job creation;		Linked to Options 1.3 (Manure Digesters) but directed at municipal/industrial waste streams

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				• Potential for reducing WA energy imports.		
7.3	Landfill Methane Energy Programs	L	U	Appears to be limited potential for new LFGTE projects. Reductions and costs dependent on technologies employed and end use of methane. • Potential for additional in-state job creation; • Potential for reducing WA energy imports.		For anaerobic digesters to be added to an operating landfill, the landfill would also need a MRF to separate out the organic fraction. In WA, there has been a focus on developing collection programs that divert materials rather than building MRF facilities to process mixed waste. Other relevant technologies that can capture and use methane gas include microturbines or production of liquid biofuels.
7.4	Use of Bioreactor Technology	L	U			Refers to a in-landfill degradation activity to achieve rapid stabilization of food, greenwaste, and paper-waste Bioreactor landfill approach works against source separation and processing of organics that are clean of other waste materials and contaminants.
AW-8	**WASTE MANAGEMENT – WASTEWATER ACTIVITIES**					
8.1	Energy Efficiency Improvements	L-M	L	Reductions assume that WW treatment consumes 10% of commercial sector electricity		

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				and that 25% improvement could be achieved. Costs are assumed to be low due to avoided electricity costs over the life of the improvement.		
8.2	Programs to Lower Waste Water Processing Needs	L	L	Similar assumptions to the emission reductions and costs for the option above, although only assuming a 10% reduction in water consumption statewide.		
8.3	Install Digesters and Energy Conversion Technologies	U	U	Reductions and costs are dependent on the incremental gains in efficiency above current practice and the costs associated with new/retrofit technology.		see also comments for 7.3 Wastewater facilities across the state operate digesters to treat waste solids. There is large opportunity to create higher power outputs, upgrade digestion capability and facilities to higher efficiency gas generators.