SMAQMD Draft GHG Measures December 16, 2009

SMAQMD MEASURE #	Measure Name	Land Use Type	Estimated CO2 Equivalent Point	Measure Description	Reduction Methodology and Source
Bicycle/Pedestrian/Transit Measures					
1	**Bike parking**	C,M	0.625	**Non-residential projects provide plentiful short-term and long-term bicycle parking facilities to meet peak season maximum demand**	As a rule of thumb, the Center for Clean Air Policy (CCAP) guidebook attributes a 1% to 5% reduction associated with the use of bicycles, which reflects the assumption that their use is typically for shorter trips. Based on the CCAP guidebook, the TIAX report allots 2.5% reduction for all bicycle-related measures and a 1/4 of that for this measure alone. Source: CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD.
2	**End of trip facilities**	C,M	0.625	**Non-residential projects provide "end-of-trip" facilities including showers, lockers, and changing space**	The Transportation Demand Management (TDM) Encyclopedia allows a 2-5% reduction for worksite showers ad lockers. The CCAP guidebook attributes a 1% to 5% reduction associated with the use of bicycles, which reflects the assumption that their use is typically for shorter trips. Based on the CCAP guidebook, the TIAX report allots 2.5% reduction for all bicycle-related measures and a 1/4 of that for this measure alone. Source: TDM Encyclopedia May 11, 2006; CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD.
3	**Bike parking at multi-unit residential**	R	0.625	**Long-term bicycle parking is provided at apartment complexes or condominiums without garages**	As a rule of thumb, the CCAP guidebook attributes a 1% to 5% reduction associated with the use of bicycles, which reflects the assumption that their use is typically for shorter trips. Based on the CCAP guidebook, the TIAX report allots 2.5% reduction for all bicycle-related measures and a 25% of that for this measure alone. Source: CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD.

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4	**Proximity to bike path/bike lanes**	R,C,M	0.625	**Entire project is located within 1/2 mile of an existing Class I or Class II bike lane and project design includes a comparable network that connects the project uses to the existing offsite facility**	As a rule of thumb, the CCAP guidebook attributes a 1% to 5% reduction associated with the use of bicycles, which reflects the assumption that their use is typically for shorter trips. Based on the CCAP guidebook, the TIAX report allots 2.5% reduction for all bicycle-related measures and a 1/4 of that for this measure alone. Source: CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD.
5	**Pedestrian network**	R,C,M	1	**The project provides a pedestrian access network that internally links all uses and connects to all existing or planned external streets and pedestrian facilities contiguous with the project site.**	Because this measure also eliminates physical barriers between residential and non-residential uses that impede bicycle or pedestrian circulation, this measure is similar in nature to 6. As cited in the TIAX report, the CCAP guidebook attributes a 1% reduction in VMT. Source: CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD.
6	**Pedestrian barriers minimized**	R,C, M	1	**Site design and building placement minimize barriers to pedestrian access and interconnectivity. Physical barriers such as walls, berms, landscaping, and slopes between residential and non-residential uses that impede bicycle or pedestrian circulation are eliminated**	The reduction is based on the TIAX report, which indicates a 1% reduction, and the CCAP report, which attributes a 1% to 5% reduction. Source: CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD.

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7	**Bus shelter for existing transit service**	R,C,M	.25-1.0	**Bus or Streetcar service provides headways of one hour or less for stops within 1/4 mile; project provides safe and convenient bicycle/pedestrian access to transit stop(s) and provides essential transit stop improvements (i.e., shelters, route information, benches, and lighting).**	This reduction is based on the assumption that the measure applies to providing bus stop route information & benches. Emission reductions are based on conclusion obtained from the TIAX report and the CCAP guidebook. Source: CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD.
8	**Bus shelter for planned transit service**	R,C,M	0.25	**Project provides transit stops with safe and convenient bicycle/pedestrian access. Project provides essential transit stop improvements (i.e., shelters, route information, benches, and lighting) in anticipation of future transit service.**	This reduction is based on the assumption that the measure applies to providing bus stop route information & benches. Emission reductions are based on conclusion obtained from the TIAX report and the CCAP guidebook. Source: CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by TIAX on behalf of SMAQMD.
9	**Traffic calming**	R,C,M	0.25-1.0	**Project design includes pedestrian/bicycle safety and traffic calming measures in excess of jurisdiction requirements. Roadways are designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips by featuring traffic calming features.**	SMAQMD appears to have the best information available as reflected in their Guidance for Land Use Emission Reductions, which allocates reductions by the percent of intersections with traffic calming improvements as indicated in the table below. We were unable to locate more specific information. Source: Draft Update to SMAQMD Guidance for Land Use Emission Reductions.
Parking Measures					
10a	**Paid parking**	R,C,M	1.0-7.2	**Employee and/or customer paid parking system**	Shoupe, 2005. Parking Cash Out. [$5/day reduces drive-alone share by 21% for commuters to downtown LA, with elasticity of -0.18 (e.g., if price increases 10%, then solo driving goes down by 1.8% more (Wilson 1991)] [Reported 1-10% reduction in trips to central city sites, and 2-4% in suburban sites (Urban Institute)].

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10b	**Parking cash out**	C, M	0.6-4.5	**Employer provides employees with a choice of forgoing subsidized parking for a cash payment equivalent to the cost of the parking space to the employer**	Shoupe, 2005. Parking Cash Out. [2/3 as effective as charging for parking (8 case studies - chapter 4, 13% reduction in solo driver trips, -12% VMT per employee, and -11% in vehicle trips per commuter)].
11	**Minimum parking**	R,C,M	0.1-6.0	**Provide minimum amount of parking required. Special review of parking required.**	Nelson/Nygaard, 2005. pg. 16. (trip reduction = ((actual parking provision - ITE parking generation rate) / ITE parking generation rate) *0.5). (Note: this formula is not verbatim from that cited in the Nelson/Nygaard document, since the formula provided did not make sense for computing trip reductions. This is what EDAW believes was meant, and this method actually works.)
12	**Parking reduction beyond code**	R,C,M	2.5	**Provide parking reduction less than code. Special review of parking required. Recommend a Shared Parking strategy.**	Nelson/Nygaard, 2005. pg. 16. (trip reduction = ((actual parking provision - ITE parking generation rate) / ITE parking generation rate) *0.5). (Note: this formula is not verbatim from that cited in the Nelson/Nygaard document, since the formula provided did not make sense for computing trip reductions. This is what EDAW believes was meant, and this method actually works.)
13	**Pedestrian pathway through parking**	R,C,M	0.5	**Provide a parking lot design that includes clearly marked and shaded pedestrian pathways between transit facilities and building entrances**	The CCAP guidebook attributes between 1% and 4% reduction from all pedestrian measures. There is no specific information related to providing shaded pedestrian pathways between transit facilities and building entrances. It could be said that providing covered carpool/vanpool spaces near the entrance to the buildings has the similar goal of increasing the comfort of the user while walking to the building entrance. The TIAX report assigns a 1% reduction to the covered carpool measure. Transit usage is most affected by the headway times and the proximity to the destination. Therefore, it would seem reasonable to assume .5% Source: CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by Tax on behalf of SMAQMD.

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14	**Off street parking**	R,C,M	0.1-1.5	**Parking facilities are not adjacent to street frontage**	No empirical support for this specific measure; however, range of values is based on other pedestrian-oriented measures. The range recognizes the dependence of this measure on other measures. To be awarded 1.0 points, development must be in an area with density, wide sidewalks, and where other uses are also hiding parking. The efficacy of this measure is reduced to 0.1 if the development does not include other pedestrian and mixed-use measures. Parking structure with ground-floor retail is awarded 0.5.
Site Design measures					
15	**Office/Mixed-use density**	C, M	0.1-1.5	**Project provides high density office or mixed-use proximate to transit**	No empirical support for this measure, beyond that provided by SMAQMD in its draft guidance. According to Nelson/Nygaard, 2005, trip generation at the non-residential end is influenced by density to a much lesser degree, so this is fairly consistent with the transit reductions applied in measure 20.
16	**Orientation toward existing transit, bikeway, or pedestrian corridor**	R,C,M	0.5	**Project is oriented towards existing transit, bicycle, or pedestrian corridor. Setback distance is minimized**	The CCAP guidebook attribute a 0.5% reduction per 1% improvement in transit frequency. Based on a case study presented in the CCAP report, a 10% increase in transit rider ship would result in a 0.5% reduction. Source: CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by Tax on behalf of SMAQMD.
17	**Orientation toward planned transit, bikeway, or pedestrian corridor**	C, M	0.25	**Project is oriented towards planned transit, bicycle, or pedestrian corridor. Setback distance is minimized**	The CCAP guidebook attributes a 0.5 % reduction per 1% improvement in transit frequency. Based on a case study presented in the CCAP report, a 10% increase in transit rider ship would result in a 0.5% reduction. Source: CCAP Transportation Emission Guidebook; TIAX Results of 2005 Literature Search Conducted by Tax on behalf of SMAQMD.

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18	**Residential density**	R	1.0-12	**Project provides high-density residential development**	Nelson/Nygaard, 2005. pg 11. (trip reduction = 0.6*(1-(19749*((4.814+households per residential acre)/(4.814+7.14))^-.639)/25914) (Holtzclaw et al 2002). Asymptote of 60% reduction. **Relative to a 3 du/ac development.** Note that there is no direct empirical support for the added reductions for proximity to transit; the 60% asymptote in this equation is to correct for double-counting from transit services, mix-of-uses, and bicycle and pedestrian connections (which could contribute another 40% reduction).
19	**Street grid**	R, C, M	1	**Multiple and direct street routing (grid style)**	Reductions are based on CCAP estimates for similar measures. Source: CCAP Transportation Emission Guidebook.
20	**Neighborhood Electric Vehicle access**	R,C,M	0.5-1.5	**Make physical development consistent with requirements for neighborhood electric vehicles**	No direct empirical support for this measure available. May not be relevant/applicable in the near term, until NEVs become more common/inexpensive. Current studies show that for most trips, NEVs do not replace gas-fueled vehicles as the primary vehicle. For the purposes of providing incentives for developers to promote NEV use, assume that a neighborhood with internal NEV connections only receives 0.5 points, with external connections to other surrounding uses, 1.0 point, with external connections to other NEV networks, 1.5 points.
21	**Affordable Housing Component**	R	0.6-4.0	**Residential development projects of 5 or more dwelling units provide a deed-restricted low-income housing component on-site (as defined in Ch 22.35 of Sacramento County Ordinance Code) [Developers who pay into In-Lieu Fee Programs are not considered eligible to receive credit for this measure]**	Nelson/Nygaard, 2005. pg. 15. (trip reduction = % units deed-restricted below market rate housing * 0.04).
Mixed-use measures					

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22	**Urban mixed-use**	M	3.0-9.0	**Development of projects predominantly characterized by properties on which various uses, such as office, commercial, institutional, and residential, are combined in a single building or on a single site in an integrated development project with functional interrelationships and a coherent physical design.**	Nelson/Nygaard, 2005. pg. 12. (trip reduction = (1-(ABS(1.5*h-e)/(1.5*h+e))-0.25)/0.25*0.03) where h = study area housing units, e = study area employment (Criteron & Fehr & Peers, 2001). Asymptote of 9% reduction, and an ideal 1.5 jobs per household.
23	**Suburban mixed-use**	R,C,M	3	**Have at least three of the following on site and/or offsite within ¼ mile: Residential Development, Retail Development, Park, Open Space, or Office**	By definition, this type of land use implies that housing availability is greater than employment availability. On a project-by-project basis, use formula :Nelson/Nygaard, 2005. pg. 12. (trip reduction = (1-(ABS(1.5*h-e)/(1.5*h+e))-0.25)/0.25*0.03) where h = study area housing units, e = study area employment (Criteron & Fehr & Peers, 2001) to obtain higher than 3% reduction. Otherwise, assume 3% max reduction.
24	**Other mixed-use**	R, M	1	**All residential units are within ¼ mile of parks, schools or other civic uses.**	This measure has less to do with employment/housing balance. No empirical support for this measure, but logic from measures 24 and 25 still applies.
Building Component Measures					
25	**Reserved**				This space is reserved for future measures
26	**Reserved**				This space is reserved for future measures
27a					Reductions are based on the credits documented in the SMAQMD Guidance for Land Use Reductions and consistent with the point rating now set at 0.5 for qualified roof products. Baseline conditions assume indirect emission reduction through more even temperature control of environmental space. Approach is enforceable and may be monitored through site review and/or consultation with lead agency that roofing materials match those described in the SMAQMD Guidance for Land Use Reductions.

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27b	**Energy Star roof**	R,C,M	0.5-1.0	**Install Energy Star labeled roof materials**	Additional emission reductions are available based on use of Energy Star compliant (highly reflective) and high emissivity roofing (emissivity of at least 0.9 when tested in accordance with ASTM 408) for a minimum of 75% of the roof surface. Based on the quantification methodology used by the SMAQMD Guidance for Land Use Reductions, an additional 0.5 point, for a total of 1.0 points, is available for qualified roof products that meet ATSM high emissivity requirements. Approach is enforceable and may be monitored through site review and/or consultation with lead agency that roofing materials match those described in the SMAQMD Guidance for Land Use Reductions.
28	**Onsite renewable energy system**	R,C,M	1.0-3.0	**Project provides onsite renewable energy system(s)**	Reductions are based on the Energy & Atmosphere credits (EA Credit 2) documented in the Leadership in Energy & Environmental Design (LEED), Green Building Rating System for New Constructions and Major Renovations, Version 2.2, October 2005. The reduction assumes that at least 12.5% of the buildings total energy use (as expressed as a fraction of annual energy cost) is supplied through the use of on-site renewable energy systems. Alternatively a project may use the Department of Energy (DOE) Commercial Buildings Energy Consumption Surevy (CBECS) database to determine the estimated electricity use. Non-polluting and renewable energy potential includes solar, wind, geothermal, low-impact hydro, biomass and bio-gas strategies. When applying these strategies, projects may take advantage of net metering with the local utility. The measure is enforcable through LEED Letter certification and building design calculations demonstrating that at least 12.5% of total energy costs are supplied by the renewable energy system(s).

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29	**Exceed title 24**	R,C,M	1.0	**Project Exceeds title 24 requirements by 20%**	Reductions assume at least a 20% over Title 24 requirements, as calculated by the Sacramento Municipal Utility District (SMUD, 2006 Advantage Home Program Overview). The proposed point value for this operational mitigation measure is 1.0, consistent with the rating assigned to this measure by SMAQMD Land Use Mitigation Measures. Total compliance margin is based on energy savings relative to the total energy budget and cooling energy budget of the Title 24 Standard design home. Proponent shall provide information demonstrating compliance with measure requirements including, but not limited to, specifications and any available manufacturer's documentation on the devices to be used. This measure's successful implementation may be verified by a site review following construction to confirm that the project as built contains ozone destruction catalysts as described in the Air Quality Plan.
30	**Solar orientation**	R	0.5	**Orient 75 or more percent of homes and/or buildings to face either north or south (within 30 degrees of N/S)**	Reduction assumes that proper solar orientation can produce a total energy savings of 11% to 16.5% and reduce heating fuel consumption by up to 25% (Local Government Commission, 1998). Mitigation measure points are based on the credits documented in the SMAQMD Guidance for Land Use Reductions and consistent with the point rating now set at 0.5 for proper orientation. Reduction methodology will be based on quantification of the difference in solar radiance from development with designed orientations (75 or more percent of homes and/or buildings to face within 30 degrees either north or south) compared to evenly distributed orientations. Project compliance will be based on the percentage of orientation buildings designed with proper design features (overhangs, landscaping).

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31	**Non-Roof Surfaces**	R,C,M	1.0	**Provide shade (within 5 years) and/or use light-colored/high-albedo materials (reflectance of at least 0.3) and/or open grid pavement for at least 30% of the site's non-roof impervious surfaces, including parking lots, walkways, plazas, etc.; OR place a minimum of 50% of parking spaces underground or covered by structured parking; OR use an open-grid pavement system (less than 50% impervious) for a minimum of 50% of the parking lot area. Unshaded parking lot areas, driveways, fire lanes, and other paved areas have a minimum albedo of .3 or greater**	Reductions are based on the Sustainable Site credits (SS Credit 7.1) documented in the Leadership in Energy & Environmental Design (LEED), Green Building Rating System for New Constructions and Major Renovations, Version 2.2, October 2005. The reduction assumes that the project provides any combination of the following strategies for 50% of the site landscape (including roads, sidewalks, courtyards nd parking lots): Shade (within 5 years of occupancy); paving materials with a solar Reflectance Index (SRI) of at least 29; open grid pavement system.
32	**Green Roof**	R,C,M	0.5	**Install a vegetated roof that covers at least 50% of roof area**	Reductions are based on the Energy & Atmosphere credits (EA Credit 2) documented in the Leadership in Energy & Environmental Design (LEED), Green Building Rating System for New Constructions and Major Renovations, Version 2.2, October 2005. The reduction assumes that a vegetated roof is installed on a least 50% of the roof area or that a combination high albedo and vegetated roof surface is installed that meets the following standard: (Area of SRI Roof/0.75)+(Area of vegetated roof/0.5) >= Total Roof Area.
TDM and Misc. measures					

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33	**Transportation Management Association membership**	R,C,M	5	**Include permanent TMA membership and funding requirement. Funding to be provided by Community Facilities District or County Service Area or other non-revocable funding mechanism.**	TCM Encyclopedia estimates a 6-7% reduction. Urbemis specifies percent reductions based on the number of elements adopted. CCAP estimated reductions from 3% to 25% for TDMs with complementary transit and land use measures. TDMs have been shown to reduce employee vehicle trips up to 28% with the largest reductions achieved through parking pricing and transit passes. The impact depends on the travel alternatives. Sources: TCM Encyclopedia, May 11, 2006; CCAP Transportation Emission Guidebook; Nygaard, 2005' Urbemis.
34	**Electric lawnmower**	R	1	**Provide a complimentary electric lawnmower to each residential buyer**	Reduction is based on a 0.5% reduction in total airshed VOC emissions, as attributable to the Lawn Mower Buy-Back program (Portland, Oregon, ten-year ozone maintenance plan). Mitigation measure points are based on the credits documented in the SMAQMD Guidance for Land Use Reductions and consistent with the point rating now set at 1.0 for electric lawnmowers. Approach is enforceable and may be monitored through site review and/or consultation with lead agency that roofing materials match those described in the SMAQMD Guidance for Land Use Reductions.
99	**Other**	R,C,M	TBD	**Other proposed strategies, in consultation with project lead agency and SMAQMD**	TBD