Staff Analysis of the ESTF-2 Recommendations

This attachment contains the full staff analysis of the Environmental Sustainability Task Force 2 (Task Force) recommendations. The recommendations are listed in the order in which they appear in the original Task Force report, following a summary table. This analysis details any changes made to the methodologies or the assumptions or variables used in the calculations for the Task Force cost/benefit estimations.

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Summary Table: Staff Analysis of the ESTF-2 Recommendations

ESTF-2 Recommendation	MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environ-mental Benefits	Health Benefits
Revolutionize transportation in Mountain View (**T1**)	**0**	**$0**	**$0**	**N/A**	■□□	■■□	□□□	□□□	■■■	■■■
Solve the local solo-trip problem: pilot discounted pooled ridesharing (**T4B**)	**-142–142**	**$103k**	**$0**	**N/A**	■■□	■□□	■□□	■□□	□□□	□□□
Solve the local solo-trip problem: MV Shuttle 2.0 and 3.0 (**T4A**)	**34,498**	**$912K**	**$122M**	**$3,563**	□□□	■■■	■■□	■■■	■■□	■■□
Support bicycling as a primary mode of transportation (**T5**)	**13,783-50,536**	**$28M+**	**$0**	**N/A**	■□□	■■□	■■□	■■■	■■■	■■■
Expand EV charging infrastructure on public property and right-of-ways (**T3**)	**137K**	**$1.09M**	**$0**	**$7.94**	■■□	■■□	■■□	■■□	■■■	■■□
Expand transportation demand management (TDM) to all of Mountain View (**T7**)	**1,263**	**$667K**	**Unknown**	**$528**	□□□	■□□	■□□	■□□	■□□	■□□
Implement group-buy programs to expand personal EV adoption (**T2**)	**3,762**	**$160K**	**$0**	**$42.53**	■■■	■■□	■■■	■■□	■□□	■□□
Adopt a decarbonization policy for buildings (**B1**)	**0**	**$150K**	**$0**	**N/A**	■■□	■■■	■■□	■■□	■□□	■□□
Create financial and non-financial incentives for new above-code buildings (**BN3**)	**1,468**	**$0-$65K**	**N/A**	**$0-$51.09**	■■□	■■□	■■□	■■□	■■□	■■□
Update green building code to move towards low-carbon buildings (**BN1**)	**54,283**	**$180K**	**$0**	**$3.32**	■□□	■■□	■■□	■■□	■■□	■■□
Measure effectiveness of housing near transit (**BN8**)	**Unknown**	**$90K**	**$0**	**N/A**	■■□	■□□	■■■	■□□	■■□	■■□
Incentivize switching residential HVAC and water heaters from natural gas to electricity (**BE1**)	**3,332**	**$100K**	**$0**	**$30.01**	■□□	■■■	■□□	■□□	■■■	■■■

ESTF-2 Recommendation	MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environ-mental Benefits	Health Benefits
Encourage installation of EV chargers in existing multi-unit dwellings (**BE7**)	**10,216**	**$280K**	**$0**	**$27.41**	■□□	■■□	■■□	■□□	■□□	■□□
Adopt a revenue-neutral differential utility tax encouraging low-carbon energy use (**BE9**)	**0-18,279**	**$204K-$279K**	**$0**	**$15.26**	□□□	□□□	■□□	□□□	■□□	■□□
Increase efficiency of existing buildings through voluntary programs & city ordinances (**BE4**)	**28,540**	**$2.04M**	**$11M**	**$458.30**	■□□	■■□	■■■	■■■	■□□	■□□
Use city buildings to demonstrate leadership in electrification and energy efficiency (**BE12**)	**1,083**	**-$538K**	**$0**	**-$497**	■■■	■■■	■□□	■□□	■□□	■□□
Require LEED Platinum for city-owned new construction or major renovation (**BN6**)	**439**	**$480K**	**$0**	**$1,092**	■■□	■□□	□□□	■□□	■■□	■■□
Reduce embodied carbon in building construction and maintenance (**BN4**)	**29,000***	**$1.3M**	**$300K**	**$54.21**	■□□	■■□	■■□	■□□	■■□	■□□
Enliven Mountain View with native plants and oak trees (**BT1**)	**223***	**$180K**	**$0**	**$808.45**	■□□	■■■	■□□	■■□	■□□	■■■
Adopt a consumption-based emissions inventory for Mountain View's GHG accounting (**W16**)	**0**	**$65K**	**N/A**	**N/A**	■□□	■□□	□□□	■□□	■□□	■□□
Adopt a citywide ban on single-use disposable plastic foodware (**W9**)	**Unknown**	**$213K**	**Unknown**	**Unknown**	■■□	□□□	□□□	■■□	■■■	■□□
Implement a sustainable landscaping program in Mountain View (**W12**)	**92.9-526.8**	**$307K**	**$173K**	**$911-$5,167**	■□□	■□□	■□□	■□□	■■■	■■■
Partner with Palo Alto to install anaerobic digesters to produce clean energy (**W15**)	**1,118**	**$33.8M**	**$0**	**$30,188**	■□□	■■■	■□□	■□□	■■■	■■□
Lead collaboration among Bay Area cities to develop a solution to overseas recycling crisis (**W1**)	**Unknown**	**$0**	**Unknown**	**Unknown**	□□□	□□□	□□□	□□□	■■■	■□□
Pass a resolution to support "Green Monday" (**W2**)	**32,726***	**$82,900**	**$0**	**$2.53**	■■■	■□□	□□□	■■□	■■■	■■■

ESTF-2 Recommendation	MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environ-mental Benefits	Health Benefits
Expand Mountain View's composting program to all residential and commercial properties (**W5**)	**5,756-11,512**	**Unknown**	**Unknown**	**Unknown**	■□□	■■■	□□□	□□□	■■□	□□□
Create a new Sustainability Office for Mountain View	**Unknown**	**$5.3M**	**$0**	**Unknown**	■■□	■□□	■□□	■■□	■■■	■□□
Implement a community and business outreach initiative (**O2A**)	**Unknown**	**$3.6M**	**$0**	**Unknown**	■■□	■□□	■□□	■□□	■■■	■□□
Provide community engagement tools to facilitate household-level GHG reductions (**O2B**)	**29,940***	**$1.6M**	**N/A**	**$54.76**	■■■	■■□	■□□	■■□	■■□	□□□
Conduct annual summit to review and track county, state, and federal sustainability actions (**O3**)	**Unknown**	**$504K**	**$0**	**Unknown**	■■□	■□□	□□□	□□□	□□□	□□□
Manage Mountain View's emissions budget as carefully as its financial budget (**M1**)	**376,220***	**$1.3M**	**$0**	**$3.84**	■■■	■□□	□□□	□□□	□□□	□□□
Set GHG reduction targets according to per capita goals based on service population (**M2**)	**Unknown**	**$15K-$78K**	**Unknown**	**Unknown**	■□□	■□□	□□□	□□□	□□□	□□□
Set annual GHG reduction targets for Mountain View that decline by a constant percentage (**M13**)	**0**	**$15K**	**$0**	**N/A**	■■□	■□□	□□□	□□□	□□□	□□□
Eliminate emissions associated with Direct Access electricity by 2025 (**M4**)	**173,245**	**$135K**	**$0**	**$0.78**	■□□	□□□	■□□	□□□	□□□	□□□
Implement a knowledge resource for electrification and other sustainability actions (**M10**)	**722**	**$30K**	**$0**	**$41.00**	■■□	■□□	■■■	■■□	□□□	□□□

**Indicates some or all of potential GHG emissions reductions are in areas not currently accounted for in Mountain View's GHG inventory*

Explanation of Columns in the Recommendation Summary Tables

MT CO2e reduced thru 2030: This is the sum of the expected annual reductions in GHG emissions through 2030 if the recommendation is implemented (as compared to the business-as-usual forecast). The measurement is in Metric Tons (MT). The "time value of carbon" is not used in this calculation. A ton of CO2e reduction counts the same no matter what year it occurs in.

City's net cost: This is the net cost to the City of Mountain View, expressed in thousands or millions of dollars. If the City realizes net savings or an increase in net revenue, then this is a negative number. To keep the math simple, we did not use net present value or inflation adjustments.

Incremental net cost: This is the net cost to residents and businesses from **new** taxes, fees, and any new building code requirements. Only net costs occurring between 2018 and 2030 are included.

Net cost per MT CO2e: The City's net cost plus incremental net cost, divided by the MT of CO2e reduction.

Easy to implement: This is a subjective assessment scored using 0 to 3 filled circles. 0 = very hard to implement this recommendation, 1 = hard, 2 = somewhat easy, 3 = easy.

Easy to measure: This is a subjective assessment scored using 0 to 3 filled circles. 0 = very hard to measure results from this recommendation, 1 = hard, 2 = somewhat easy, 3 = easy.

Private investment leverage: This is a quantitative assessment scored using 0 to 3 filled circles. 0 = no leverage of private investment, 1 = low leverage (less than $1 of private investment per dollar of public investment, 2 = medium leverage (above 1:1, but below 4:1), 3 = high leverage (better than 4:1).

Local economic benefits: This is a quantitative assessment scored using 0 to 3 filled circles. 0 = no local economic benefit, 1 = low (less than 25% of benefits will be local) 2 = medium (26-50% local), 3 = high leverage (>50% local).

Other environmental benefits: This is a subjective assessment scored using 0 to 3 filled circles. 0 = no significant benefits, 1 = modest or unquantifiable benefits, 2 = significant benefits though possibly hard to measure, 3 = substantial and measurable benefits.

Health benefits: This is a subjective assessment scored using 0 to 3 filled circles. 0 = no significant benefits, 1 = modest or unquantifiable benefits, 2 = significant benefits though possibly hard to measure, 3 = substantial and measurable benefits.

2017-2018 Environmental Sustainability Task Force Analysis

Revolutionize transportation in Mountain View **(T1)**						**Policy**		**Ongoing**	
529,087*	**$0**	**$0**	**N/A**	□□□	■■■	□□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

**Total CO2e reduced by the Transportation recommendations that are enabled by this recommendation*

City Staff Analysis

0	**$0**	**$0**	**N/A**	■□□	■■□	□□□	□□□	■■■	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Removed total for consistency and clarity, as the original number is simply an aggregate of the GHG Emissions reductions from other recommendations. As stated in the original ESTF-2 report, no GHG reductions are directly attributable to this recommendation.

Easy to Implement

Increased to "hard," reflecting that achieving the necessary reductions will be difficult, but that many measures suggested in the Transportation section recommendations are already in the process of being implemented by the City.

Easy to Measure

Reduced to "somewhat easy," as GHG emissions from transportation are estimated rather than directly measured. While some of the measures in the Transportation section are easy to quantitatively assess in terms of GHG emissions reduction potential, overall VMT reductions will still rely on estimation methodologies.

Other Environmental Benefits

Increased to reflect high environmental benefits expected from implementing the Transportation recommendations.

Health Benefits

Increased to reflect high health benefits to the community from reduced vehicle miles and associated air pollution, as well as increased active transportation.

2017-2018 Environmental Sustainability Task Force Analysis

Solve the local solo-trip problem: Pilot discounted pooled ridesharing (**T4B)**						**Incentive**		**1 yr.**	
304	**$100K**	**$0**	**$328**	■■□	■■□	■■■	■■□	■■■	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

-142 to 142	**$103k**	**$0**	**N/A**	■■□	■□□	■□□	■□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Estimated GHG emissions impacts range from a 142 MT CO_2e *increase* to a 142 MT CO_2e decrease. Estimated change in GHG emissions is dependent on several factors, including per-mile cost of autonomous ride-hailing services in 2020, type of vehicle and fuel used by AV ride-hailing fleets, and the percentage of passengers using shared ride-hailing services that would have otherwise completed the trip in a personal vehicle. This analysis made several significant adjustments to the calculations as outlined in this document.

Table 1. Estimated Net GHG Emissions (MT CO_2e) from Shared AV Ride-Hailing Pilot

pricing model:	**$2.50/mile**		**$1.50/mile**		**$0.35/mile**	
Vehicle	Standard	Optimistic	Standard	Optimistic	Standard	Optimistic
Hybrid SUV (Volvo XC90 Hybrid type)	19.9	12.7	33.2	21.2	142.1	91.1
Hybrid Minivan (Chrysler Pacifica Hybrid type)	13.3	7.3	22.1	12.2	94.7	52.2
Fully electric vehicle (Chevy Bolt type)	-19.9	-19.9	-33.2	-33.2	-142.3	-142.3

Vehicle types included in this analysis are the three vehicles comprising existing AV ride-hailing fleets currently planned for deployment by 2020. As noted in the chart above, only fully-electric AVs result in GHG emissions reductions, due to the increase in VMT from ride-hailing.

Calculation Details

Pricing per passenger mile for ride-hailing affects GHG emissions by determining how many total vehicle miles will be subsidized as part of the pilot program. Three different likely pricing scenarios were considered:

- Current ride-hailing prices (approximately $2.50/mile for the Bay Area).
- Estimated per-mile AV ride-hailing prices of $1.50, as cited by GM as the initial cost to passengers in the San Francisco Bay Area in 2019.[1]
- Estimated per-mile AV ride-hailing prices of $0.35, based on industry expert analysis of potential 2020 autonomous taxi costs.[2]

While the recommendation focuses on AV ride-hailing, it is important to note that the CPUC recently voted to prohibit Transportation Network Companies (TNCs) from charging passengers for rides in autonomous vehicles, and a rule change would be required for AV ride-hailing services to begin full operations in California.[3] Therefore, the scenario of current TNC pricing was included to reflect the possibility that AV ride-hailing fleets have not yet been approved for operation by the CPUC by the time the pilot program takes effect.

Change in vehicle miles traveled (VMT) was analyzed under two different scenarios:

- "Standard" scenario:
    - Assumes standard mode shift for TNC trips (60% from non-auto modes)[4]
    - Assumes 90% of users requesting shared rides are matched with another passenger
- "Optimistic" scenario:
    - Assumes higher % of trips shifting from personal vehicles
    - Assumes 80% of riders are matched (due to the more suburban conditions relative to large urban areas considered in the "Standard" scenario)

The mode shift rates are relatively conservative estimates across both scenarios, as they use the average rates measured across all ride-hailing users, while shared ride options have been shown to be more likely to draw passengers away from non-vehicle modes such as transit.[5] The "optimistic" scenario uses mode shift ratios observed in TNC passengers in Denver. [6] Denver has a very similar existing commute mode share to Mountain View, so it may be a good proxy for estimating mode shift in a more suburban environment than San Francisco or other large cities, where a higher percentage of people use transit or other non-auto modes of transportation.

Assumptions:

- Average distance of ride-hailing trips is 5.2 miles[7]

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[1] (LeBeau, 2017)
[2] (Keeney, 2017)
[3] (California Public Utilities Commission, 2018)
[4] (Schaller, 2018)
[5] (Schaller, 2018)
[6] (Henao, 2017)
[7] (Schaller, 2018)

- Average mileage between TNC passenger trips is 1.1 miles[8]
- Some percentage of users requesting shared trips will not be matched with other riders, resulting in a solo trip.
- AV ride-hailing fleets in 2020 will likely consist of the 3 hybrid or fully-electric vehicle models announced by the companies already doing large-scale testing of AV for ride-hailing purposes: Chevy Bolt (GM/Cruise), Volvo XC90 Hybrid (Uber), and Chrysler Pacifica Hybrid (Waymo)
- Pricing will be somewhere in the range of $0.35/mile to $2.50/mile, based on current costs and projected minimum pricing for AV ride-hailing fleets.[9]
- Electricity for charging fully-electric and plug-in hybrid AV fleets will be provided by SVCE.

Table 2. Total trip miles and subsidized miles for Ride-hailing pilot

Pricing scenario:	cost per mile	# subsidized miles	total trip miles
current	$2.50	40000	69333
GM AV pilot	$1.50	66667	115556
2020 AV ride-hailing est.	$0.35	285714	495238

Vehicle Types

While the original recommendation analysis assumes an all-electric AV fleet, most TNCs and other companies with AV ride-hailing fleets planned for deployment within the timeline of this pilot project (Uber, Waymo, and Ford, among others) are planning to use plug-in hybrid vehicles rather than fully electric models. Currently, GM's Cruise is the only company that plans to have a fully-electric AV ride-hailing fleet in operation by 2020. The vehicle types included in this analysis represent the vehicles of existing AV ride-hailing fleets planned for deployment by 2020: the Volvo XC90 Hybrid (Uber), the Chrysler Pacifica Hybrid minivan (Waymo), and the Chevy Bolt (GM/Cruise). While the original recommendation assumes fully-electric fleets would be more cost competitive under the city's RFP model, industry analysis suggests companies are choosing hybrids over fully-electric vehicle for their AV fleets due to the higher range and less lost operational time to charging, which offsets the slightly higher per-mile operating costs.[10] Vehicle type will not likely be the major factor affecting per-mile passenger rates for AV ride-hailing.

Per-mile emissions for AV fleets were calculated based on vehicle information provided by the U.S. Environmental Protection Agency and the U.S. Department of Energy.[11] For the purposes of this analysis, all AV fleet vehicles were assumed to charge locally using GHG-free electricity

[8] (Schaller, 2018)
[9] (Keeney, 2017)
[10] (Abuelsamid, 2017)
[11] www.fueleconomy.gov

from Silicon Valley Clean Energy. Emissions from gasoline used for hybrid vehicles were calculated using The Climate Registry's 2018 default emissions factors.[12] Global warming potential values used for methane and nitrous oxide were from the IPCC's Fourth Assessment. To calculate the change in per-mile GHG emissions from switching from private vehicles to a hybrid or electric AV ride-hailing vehicle, a weighted average value of 0.2874 kg CO2e/mile for the projected 2020 regional passenger vehicle was calculated using data provided by the California Air Resources Board's EMFAC Web Database.[13]

Table 3. Average per-mile emissions from AV fleets by vehicle type

Vehicle	total range (mi)	electric range (mi)	kWh/100 miles (electric mode)	gasoline (gal) per full range	Avg. emissions from AV fleet (kgCO2e/mi)
Volvo XC90 Hybrid	380	19	50	13.2	0.3241
Chrysler Pacifica Hybrid	570	33	40	16.5	0.2701
Chevy Bolt	238	238	28	0	0

Mode Shift

The GHG emissions analysis in the original recommendation was adjusted to reflect that not all TNC trips, including "pooled" trips, replace a personal vehicle trip. Data from multiple surveys of ride-hailing passengers demonstrates that more trips are shifted from non-vehicle modes such as transit, walking, and biking than from personal vehicles. Additionally, a significant percentage of TNC trips are "induced trips" that would otherwise not have occurred via another mode. A survey of the results from these studies suggests that generally, about 50-60% of TNC trips are "new" vehicle trips that were induced or would have otherwise been completed by transit, walking, biking.[14,15]

"Pooled" Rides and Trip Reduction

Shared ride options available through TNCs guarantee a discounted rate regardless of whether a passenger is able to be matched with others along their route, so not every ride using the "pooled" options ends up being a shared ride. Matching of shared ride requests is more frequent in denser urban areas, with much lower rates observed in more suburban areas.[16] For the purposes of this analysis, a high matching rate of 90% is assumed under the standard model, and 80% under the "optimistic" model, which is reflective of more suburban conditions.

Even when passengers are successfully matched, the actual reduction in VMT will depend on the number of passenger parties per "pooled" ride, as well as the percentage of each ride that is shared with other passenger parties. The actual trip reduction for carpooling is dependent on

[12] (The Climate Registry, 2018)
[13] EMFAC2017 web database: https://www.arb.ca.gov/emfac/2017/
[14] (Schaller, 2018)
[15] (Clewlow & Mishra, 2017)
[16] (Schaller, 2018)

the number of people in each shared ride, and is not 1:1. The resulting VMT reduction per mile is (n-1)/n, where n is the number of people in the carpool. For example, a 2-person carpool saves 1 trip, a 3-person carpool saves 2 trips, etc., so the resulting VMT reduction compared to original VMT level is ½ for a 2-person carpool, $^2/_3$ for a 3-person carpool, etc. These reductions apply to the percentage of each ride that is shared with the corresponding number of passenger parties. While shared-trip algorithms minimize extra mileage between passengers, there is still a percentage of every shared trip that is not shared (between first and second passenger pick-ups and between last and second-to-last drop-offs).

A recent study of the impact of ride-hailing on VMT analyzed several different scenarios, and found that while some had substantially lower impacts on VMT than others, even the most highly optimistic scenario still resulted in a 41% increase in VMT.[17] This analysis was adjusted to reflect the conditions of the rideshare pilot (100% shared rides) in Mountain View under the "standard" and "optimistic" scenarios using the inputs in Table 4.

Table 4. Estimated VMT impacts from shared ride-hailing in Mountain View

	Mode shift model	
Mileage	**Standard**	**Optimistic**
Between passenger trips	1.1	1.1
Per passenger	5.2	5.2
Shared trips		
% of all trips	90%	80%
Amount of trip shared	75%	75%
% with 3+ passengers	13%	13%
Amount of trip shared	80%	80%
Previous mode		
Driving	20%	39%
Taxicab	20%	15%
Transit/walk/bike/no trip	60%	46%
Total vehicle miles per passenger		
Using TNCs	4.08	4.32
Using previous mode	2.30	2.97
Change	1.78	1.35
Percent change in vehicle miles	**77%**	**45%**

The analysis in Table 4 takes into account the fact that TNC trips have additional miles per trip compared with personal vehicle use, as TNC drivers must drive to the pick-up location and in between trips. For shared trips, the in-between mileage is minimized, but the additional VMT is always non-zero. The estimate of 1.1 miles on average of additional VMT is from the most

[17] Schaller, 2018.

optimistic scenario (75% shared rides) considered in an analysis of VMT impacts from ride-hailing services, which cites the average additional VMT as 3.0 miles per trip, and 4.0 miles in suburban scenarios.[18] The total vehicle miles per passenger for TNC trips is determined by the percentage of each ride that is shared with 1 or 2+ other passengers. The total vehicle miles using the previous mode is a weighted average accounting for the "previous" transportation mode (likely mode choice without TNCs). The resulting change in VMT is a 77% increase for the standard scenario, and a 45% increase for the optimistic scenario.

Per-mile net emissions were calculated under both the standard and optimistic scenarios, using the emissions factors for each of the 3 potential vehicle types compared to the 2020 passenger fleet average, as seen in Table 5 below.

Table 5. Net change in emissions per subsidized mile of shared ride-hailing

Vehicle	Average emissions from AV fleet ($kgCO_2e/mi$)	Net change in emissions per subsidized mile ($kg\ CO_2e/mile$)	
		Standard scenario	Optimistic Scenario
Volvo XC90 Hybrid	0.3241	0.2870	0.1839
Chrysler Pacifica Hybrid	0.2701	0.1912	0.1053
Chevy Bolt	0	-0.2874	-0.2874

These results were applied to the total trip miles under the three pricing scenarios, resulting in the projected GHG emissions impacts detailed in Table 1.

City's Net Cost

The total net cost to the city was adjusted to reflect the additional cost of staff time to support the pilot program, based on estimates from development of the current city rideshare pilot program. Expected staff time to support this program is approximately 40 hours/year, for a cost of approximately $3,465 based on an Analyst level employee.

Easy to Measure

This has been adjusted to reflect that actual emissions impacts will be difficult to estimate without extensive polling of ride-hailing service users, due to the need to measure mode shift.

Private Investment Leverage

Reduced, as the City is expected to cover the vast majority, if not all, of the reduced fare to passengers through direct subsidies to TNCs.

[18] (Schaller, 2018)

Other Environmental Benefits

Reduced, due to significant projected increase in vehicle congestion due to increased VMT regardless of GHG emissions impacts. Increased VMT from ride-hailing can lead to increased GHG emissions as well as increased air pollution due to the effect on congestion. Congestion has a non-linear relationship with traffic volume and VMT; even small increases in traffic volume or VMT can have a large impact on congestion. MTC measured this effect in the Bay Area and found that a 4% decrease in traffic volume during peak commute hours on Columbus Day resulted in a 50% decrease in congestion.[19] Congestion can increase both GHG and other harmful emissions from vehicles, as it results in longer vehicle running times to travel the same distance. CO_2 emissions per mile increase rapidly when average vehicle speeds drop below 30 mph.[20]

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2017-2018 Environmental Sustainability Task Force Analysis

Solve the local solo-trip problem: MV Shuttle 2.0 and 3.0 (T4A)				**Process**				**Ongoing**	
143,000	**$405K**	**$112M**	**$787**	□□□	■■■	■■■	■■■	■■□	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

34,498	**$912K**	**$122M**	**$3,563**	□□□	■■■	■■□	■■■	■■□	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

- Based on National Transit Database data from nearby transit agencies in much more established bus transit markets and in areas of higher density, an assumption of 50% average occupancy during 16 hours of daily service for new transit routes is not likely feasible, even for smaller services. For reference, in 2009 LA Metro average percent utilization (meaning percent of seats full in this case) was 38%, AC Transit 22%, SF Muni 34%, and Santa Clara Valley Transit Authority (VTA) 22%.[1]
- In 2024, the base analysis assumes that vehicle capacity doubles and implies that ridership, or miles avoided, also doubles. Unless there was significant crowding and capacity issues preventing latent demand from converting to ridership growth prior to this year, it is unlikely that absent a frequency increase, a vehicle capacity increase alone would yield such a significant ridership increase. A review of literature documenting transit ridership response to frequency increases by CARB for the SB 375 legislation found a ridership elasticity of 0.5, or that for every 1% of frequency increase, bus ridership typically grows by 0.5%.[2]

While no changes were made to the following assumptions, staff also noted the following about the underlying analysis:

[1] Public Transportation's Role in Responding to Climate Change. Federal Transit Administration, 2010. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/PublicTransportationsRoleInRespondingToClimateChange2010.pdf

[2] Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions. Handy et al, 2013. https://www.arb.ca.gov/cc/sb375/policies/transitservice/transit_bkgd.pdf

- Staff concurs with the avoided miles estimates, based on literature documenting what is known as the transit land-use multiplier, though it's unclear how this assumption was utilized in the baseline analysis.[3]
- Shuttles are assumed to be electric, and that the power for them is purchased clean energy, so no new emissions from the shuttles are assumed.
- Staff also tested a bottom-up approach relying on scaling ridership estimates for existing Mountain View services, which range in boardings per hour from 12 to 86. The analysis scaled these estimates based on the frequency improvements under the proposed service. This approach yielded far lower emissions reduction estimates.

Calculation Details

- Staff adjusted the capacity utilization factor from 50% to 22%, to align with VTA's current capacity factor, as well as other more established transit services.
- Staff reduced the ridership growth between 2023 and 2024 from 50% to 12.5%, given that vehicle capacity increases are contemplated in this year, but not frequency increases.
- Staff reduced implied ridership growth (i.e. avoided miles) between 2024 and 2028 to 12.5% per year (half of the assumed frequency improvement per year) based on CARB's SB 375 research.
- Staff fixed what appeared to be an error in calculating the avoided miles in 2029 that appeared to not take into account the capacity factor or otherwise doubled the avoided miles.

City's Net Cost

The baseline analysis assumes that the same staffing of ¼ FTE for the City and ½ FTE for the TMA can manage the initial pilot, as well as the final built out network, with over 150 vehicles across 15 routes. Staff has adjusted this assumption to scale City and TMA staff to support and manage the program as the transit network grows.

While no changes were made to the following assumptions, staff also noted the following about the baseline analysis:

- When contracting out bus service as is contemplated in this measure, ownership of the vehicles can be by the contractor or the transit agency. If the contractor owns the vehicles however, costs may be higher if the contract is shorter than the lifespan of the vehicles, which may cause complications for the short-term pilots envisioned that operate with small vehicles for a few years, and then jump to larger vehicles in year 3. Additionally, public agencies can often get more grant support and discounts when

[3] Recommended Practice for Quantifying Greenhouse Gas Emissions from Transit. APTA, 2008. https://www.apta.com/resources/hottopics/sustainability/Documents/Quantifying-Greenhouse-Gas-Emissions-APTA-Recommended-Practices.pdf

purchasing vehicles in bulk. Vehicle capital costs, not included in the original analysis, should be considered when doing more detailed planning, to determine whether it would be more advantageous and/or feasible for the City to procure the vehicles, or to require the contractor to provide them.

- The ESTF-2 report made the assumption that in 2030, other cities, VTA, or other entities might assume 50% of the cost of routes that in part serve Mountain View. Based on discussions with City staff, this may not be realistic, though staff did not adjust this assumption.
- The last two years of the analysis rely upon cost reductions achieved through autonomous shuttles. While labor cost reduction is likely applicable, new technologies often have high cost premiums, and it is still unknown whether an attendant or other supervision may be necessary for public safety in high capacity transit services. Staff would like to note the risk that the cost per operating hour reduction achieved for 2029 and 2030 may not be realistic.
- In addition to the challenges identified with significantly increased levels of bus service, the current measure does not account for the costs or complexity of implementing needed bus priority improvements to help enable quality service that can attract significant ridership, such as bus lanes, signal priority, and off-board fare collection. In an increasingly congested travel network such as Mountain View's, these interventions may be essential to ensuring the quality of service isn't eroded over time, and should be studied in more detail along with the routes developed.

Calculation Details

- The calculation assumes that in 2024, operating costs increase 25% (rather than stay constant) to account for a new contract with larger vehicles.
- The calculations increase staffing costs. It assumes staff costs stay constant 2022-2023 like in the baseline analysis, then assumes staff costs for the TMA increase each year from 2024-2030 as service expands while maintaining a ratio of 3% of operating cost. The analysis also assumes city staff costs increase each year 2024-2028 (ramping up to full time), maintaining ratio of 2% of operating cost. In 2029 and 2030, it's assumed the City would have one full time staff overseeing the program.
- The analysis assumes city staff costs stay constant in 2022 and 2023, then increase each year 2024-2028, maintaining ratio of 2% of operating cost, and then in 2029 and 2030, it's assumed the City would have one full time staff overseeing the program.

Net Cost per MT CO_2e

Updated to reflect the MT CO_2e reduction figure.

Private Investment Leverage

The original analysis may overestimate the willingness of businesses to contribute, and ability to shift cost responsibility to VTA and other cities in later years of the pilot. As a result, staff has adjusted the Private Investment Leverage metric to 2 out of 3.

2017-2018 Environmental Sustainability Task Force Analysis

Support bicycling as a primary mode of transportation **(T5)**						**Infrastructure**		**12 years**	
88,105	**$28M**	**$0**	**$322**	■□□	■■□	■■□	■■■	■■■	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

13,783-50,536	**$28M+**	**$0**	**N/A**	■□□	■■□	■■□	■■■	■■■	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted to reflect an ambitious but more reasonable target mode share of 10% by 2030. While a 20% bicycle mode share is not an unreasonable long-term goal for Mountain View, it is unlikely to result from the suggested projects within the 2030 timeline. However, prioritizing suggested bicycle and pedestrian infrastructure and implementing it as quickly as is feasible is key to achieving mode shift away from vehicles as soon as possible.

Calculation Details

The original recommendation cited Boulder, CO, and Davis, CA, as two cities with greater than 20% bicycle mode share. However, Boulder, CO, is currently only at 10.7% bicycle mode share, according to their latest Bicycle Friendly Community report card.[1] Both Davis and Boulder have significantly more extensive bicycle infrastructure than Mountain View: Davis, CA (population 68,986), currently has over 100 miles of bike lanes and paths, and Boulder, CO (population 107,125), has more than 300 miles. Mountain View currently has 41 miles of Class I, II, or IV lanes, and implementing all of the high- and medium-priority projects in the Bicycle Transportation Plan would increase this to around 75 miles.

It is also important to note the timeframe for Davis to achieve its bicycle mode share of 21.8%, as it takes time for behavior to change after bicycle infrastructure has been built out. Davis was the first city in the country to build dedicated bicycle lanes on city streets, including protected lanes, beginning in 1967. The city has been developing a strong bicycle culture over more than five decades, and it is unlikely Mountain View could achieve similar results in less than half of

[1] https://bikeleague.org/sites/default/files/bfareportcards/BFC_Fall_2017_ReportCard_Boulder_CO.pdf

that time, especially with less supporting infrastructure. Similarly, Boulder's comprehensive bicycling program has been active for approximately 30 years.

Given the time necessary to plan and implement active transportation projects, staff does not believe it is feasible to implement all 104 high- and medium-priority BTP projects in the proposed timeline of this recommendation. Typically, less complicated and uncontroversial bicycle infrastructure projects take 2-4 years to plan, design, and construct. More complicated projects may take 5-10 years or more and may involve more than one phase.

Various factors can increase the duration of a bicycle project and limit the number of projects that can be undertaken simultaneously. Community outreach, engagement, and consensus building are essential to ensure that projects are successfully designed, implemented, and received. Where projects require encroachment permits or interaction with other jurisdictions such as Caltrans, the Water District, Caltrain, the County, or neighboring cities, additional agency and stakeholder engagement is needed and must be undertaken according to the timeframe of the reviewing agency. This community and stakeholder engagement is often time-intensive (for both staff and community members) and, depending on the issues involved, can increase the duration of the projects. In some cases, initial feasibility studies find that the envisioned project is not feasible or is no longer preferable, and needs to be refined or reformulated in order to move forward.

Work has commenced on twenty-two of the high-and medium-priority projects listed in the BTP. Many of the projects, such as those along Shoreline Boulevard, are very complicated and involve cutting edge designs, technical challenges (such as bridges), jurisdictional complexities, right-of-way acquisition, and associated costs. Three of the listed projects that are currently active have been reformulated based on feasibility or Council feedback, and are therefore undergoing a new round of planning. One project has been implemented as a pilot. It is likely other BTP projects would face similar complexities as the ones currently underway.

Two scenarios were explored for potential impacts on GHG emissions reduction: one where the 10% target mode share for bicycles is achieved incrementally by 2030 with 50% of the increase in resulting in a corresponding decrease in VMT (as not all cycling trips replace a vehicle trip), and one using potential decreases in driving behavior based on studies of the effect of bicycle infrastructure on VMT. These were fairly simplistic estimates, using a linear change in mode shift between 2019-2030. For details, see Table 1.

Table 1. GHG Emissions Reduction Scenarios for Bicycle Infrastructure and Programs													
Scenario	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	**TOTALS**
BAU forecasts for GHG emissions from passenger vehicles (MTCO2e)	401,327	395,717	388,596	380,694	372,258	364,036	356,069	349,909	345,297	342,195	340,283	339,486	**-**
Potential GHG emissions reduction (10% target mode share, 50% mode shift from vehicles)	736	1451	2137	2792	3412	4004	4570	5132	5697	6274	6862	7469	**50536**
Minimum expected GHG reduction (5% increase in infrastructure per year, -0.01% change in driving per 1% increase in infrastructure)[2]	201	396	583	761	931	1092	1246	1400	1554	1711	1872	2037	**13783**

City's Net Cost

It is difficult to accurately assess the costs to the city from implementing the BTP projects as described in the recommendation. The cost estimates provided by the BTP reflect 2014 or 2015 construction costs, and do not include many of the major cost components of projects. Costs that are omitted include right-of-way acquisition, environmental assessment, changes to curbs and gutters, utility impacts and relocation, replacement of pavement, and landscaping. Additionally, the cost estimates omit a range of soft costs including design, engineering, community engagement, project contingency, and construction contingency. The cost would also need to be escalated to present values and account for recent increases in construction costs, which are significantly higher than increases in CPI. Staff is not able to develop revised cost estimates for all 104 projects at this time, but are updating the cost estimates for individual projects when they are submitted for the Capital Improvement Program. Total project costs will be higher than those outlined in the BTP.

Cost of bike racks: Staff believes $300 per bicycle rack is a low estimate, and that a typical range would be $300-$1500 once all installation costs have been considered. Variable conditions in manufacturing, purchasing, preparing a site location, conducting outreach, and actual installation costs make for a highly variable price to add new bike racks.

[2] Handy, S., Tal, G., and Boarnet, M. (2014) *Impacts of Bicycling Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions*. Prepared for the California Air Resources Board. Retrieved from: http://www.arb.ca.gov/cc/sb375/policies/bicycling/bicycling_brief.pdf.

Local Economic Benefits

Staff analysis confirms high local economic benefits. In addition to estimated $2.73/mile in economic benefits to the community, research shows that bicycle and pedestrian infrastructure can have a positive economic benefit on local businesses. Studies of local retail businesses on streets in San Francisco and New York City where bicycle lanes have been installed have shown many businesses reported increased sales, and that no businesses in the corridor reported declining sales after the bicycle infrastructure was installed.[3] Studies of consumer behavior and mode choice have demonstrated that consumers utilizing active transportation such as biking or walking as well as public transit spend more overall at retail establishments (except grocery stores) and restaurants due to more frequent trips.[4] Total local economic benefits estimated at $2.1M.

Other Environmental Benefits

It is important to also note the congestion-reducing benefits of even a small amount of mode shift away from vehicles; reducing the number of vehicles on roadways during peak hours by as little as 3% can reduce peak hour congestion by 30%.[5] Similar studies have noted a 50% drop in congestion on Bay Area roadways with only a 4% drop in traffic volume.[6] In addition to the direct air quality and GHG reduction benefits from reducing VMT, reducing congestion yields additional air quality and GHG reduction benefits.[7]

[3] Flusche, D. *Bicycling Means Business: The Economic Benefits of Bicycle Infrastructure.* League of American Bicyclists, 2012.

[4] Clifton, K. Clifton, K. J., Muhs, C., Morrissey, S., Morrissey, T., Currans, K., & Ritter, C. (2012). *Consumer Behavior and Travel Mode Choices*. Portland, OR: Oregon Transportation Research and Education Consortium.

[5] INRIX National Traffic Scorecard: http://scorecard.inrix.com/scorecard/summary.asp

[6] MTC Columbus Day Initiative: https://bayareamonitor.org/wp-content/uploads/2015/11/MTC-Columbus-Day-Initiative.jpg

[7] Barth, Matthew, and Kanok Boriboonsomsin. "Traffic congestion and greenhouse gases." (2009): 2-9.

2017-2018 Environmental Sustainability Task Force Analysis

Expand EV charging infrastructure on public property and right-of-ways (**T3**)						**Policy**		**12 years**	
143K	**$660K**	**$0**	**$4.62**	■■□	■■□	■■■	■■□	■■■	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

137K	**$1.09M**	**$0**	**$7.94**	■■□	■■□	■■□	■■□	■■■	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted based on calculations from Santa Clara County's EV Charging Station GHG Reduction Tool,[1] using the original recommendation's estimates of 100 public EV charging ports per year and an estimated useful life of 10 years for each charger.

City's Net Cost

Adjusted to include cost of installing and operating chargers on city-owned properties. Currently available grant funding programs do not cover the full cost of charger installation or operating expenses. Assumes a net increase of 55 city-owned, dual-port EVSE.

Total Net Cost to City

Total Capital Costs	$260,375
Total Operating Costs 2019-2030	$210,000
Total Staff Costs 2019-2030	$540,600
Total Outreach Costs 2019-2030	$75,000
TOTAL:	**$1,085,975**

Calculation Details

City-owned chargers were assumed to be dual-port, Level 2 chargers. Costs for Level 2 chargers were estimated based on the following table from the 2016 staff report to Council entitled "Public Electric Vehicle Chargers and Fees," accounting for potential grant funding as appropriate based on existing funding programs (PG&E, BAAQMD, etc.) by charger type and application.

[1] https://www.sccgov.org/sites/dnz/Pages/siting-intalling-ev-charging-infrastructure.aspx

Costs to City for Level 2 EV Chargers (from 2016 Staff Report)

	1 Dual-Port L2 Charger
Chargers	$2,000 to $8,000
Permitting, Striping, Signage	$600
Installation	$2,000 to $8,000
Operation (Network Service Fee)	$600 per year
Electricity	$3,000 to $4,000 per year
Maintenance/Repairs	$500 to $2,000 per year

Total number of city-owned chargers is based on serving 5% of parking spaces in city-owned lots, accounting for existing chargers. Assuming the total number of parking spaces remains unchanged through 2030, this would result in a total of 30 new chargers (60 charging ports) in city-owned parking lots downtown. An additional 25 chargers (50 charging ports) were estimated to be installed at other city-owned facilities, including parks, libraries, and community centers, either in existing parking lots or through curbside installations. This is a total of 55 additional city-owned chargers. Operating costs, usage, and revenue are assumed to remain similar to existing chargers in the California Street garage. Assuming the installation of new chargers is phased in over three years, the total additional annual operating costs for the City would be:

Annual City Operation Costs from EV Charging

Year	**Cumulative # of New City-owned Chargers**	**Net annual operating expenses**
2019	15	$5,250
2020	35	$12,250
2021-2030	55	$19,250
TOTAL	**55**	**$210,000**

While ambitious, these estimates are relatively conservative compared to those of other cities, such as Santa Monica, which plans to install 300 public EV chargers by 2020, with a goal of 1000 public chargers citywide by 2025. Note that the 55 dual-port chargers will provide a total of 110 charging ports and serve at least 110 parking spaces, depending on configuration.

Net Cost per MT CO_2e Reduction

Adjusted to reflect new values for GHG emissions reduction and net cost to the City.

Private Investment Leverage

Adjusted downward to "medium leverage (above 1:1, but below 4:1)" to reflect general grant conditions covering only up to 75% of costs for EV charger installation.

2017-2018 Environmental Sustainability Task Force Analysis

Expand transportation demand management (TDM) to all of Mountain View **(T7)**							**Process**	**Ongoing**	
3,100	**$1.5M**	**Ongoing**	**$440**	□□□	■■■	■■■	■■■	■■□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental net cost	Net cost per MT CO_2e reduction	Easy to implement	Easy to measure	Private investment leverage	Local economic benefits	Other environmental benefits	Health benefits

City Staff Analysis

1,263	**$667K**	**Unknown**	**$528**	□□□	■□□	■□□	■□□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental net cost	Net cost per MT CO_2e reduction	Easy to implement	Easy to measure	Private investment leverage	Local economic benefits	Other environmental benefits	Health benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO2e Reduction 2018-2030

- City staff believe the assumptions of the pilot to reach 33% of existing Mountain View households per year (12k-13k HHs) for three years (or 99% of households total in three years) through means other than direct mail to be impractical. Because direct mail alone is unlikely to produce the high participation rates hoped for in the pilot, staff suggests lowering the expected reach of the pilot in order to better test a variety of higher touch outreach strategies and TDM elements. The King County program that this pilot is based on, In Motion, included a wide range of outreach tactics including direct mail, online messages, local business involvement, lawn signs, many community events, local media outreach, and more.
- While not adjusted in the updated calculations, the ability to maintain continued participation amongst pilot participants beyond one year, and up to 9 years later, is quite uncertain. King County Metro Transit's In Motion programs monitored participant commitments over an average project period of 12 weeks. Sustaining the same behavior over a much longer time horizon may be too optimistic. Focus groups held following the In Motion program reported that participants "needed more ongoing feedback that their trip logs were being received and would like to see their personal and community achievements on a more immediate basis."[1] Based on this, a consistent value for trips avoided from 2015-2030 seems optimistic without incorporating the cost for continued outreach.

[1] Cooper, Carol. "Successfully Changing Individual Travel Behavior Applying Community-Based Social Marketing to Travel Choice." Transportation Research Record: Journal of the Transportation Research Board, No. 2021, Transportation Research Board of the National Academies, Washington, D.C., 2007, pp. 89–99.

Calculation details

- Staff reduced the target percentage of households per year for the pilot program to 20% to reach 60% of existing Mountain View households total in three years.
- The baseline calculations assume a response rate of 10%, though across Seattle neighborhoods for the In Motion program, 10.5% response was the highest, while other neighborhoods saw 6.9%, 9.9%, and 8.4%. Staff reduced response rate to 9%.[2]
- In Seattle, 75% of respondents pledged to reduce trips; this figure does not seem to have been accounted for in the original calculations, so is included in the adjusted figures to estimate participants from respondents.[3]

City's Net Cost

- The baseline assumes one-third time for one city staff person or consultant, for three years total, to develop and oversee outreach pilot at a total salary plus benefits rate of $180,000. However, to achieve a high contact rate as in the In Motion programs, the following program components are recommended: community presence, posters at businesses, and yard signs; mailings with targeted messaging to households within the neighborhood; website with resources, project success tracking, and ability to pledge online; customized information delivery to participants; partnerships with businesses and nonprofits at some level; and evaluation in the form of administration and analysis of pre- and post-surveys.[4]
- The budget does not seem to include costs for offering incentives, though it appears these are typically critical for achieving the participation rates in model programs. For example, the In Motion program gave out Orca cards (transit passes) with a free two weeks of unlimited travel. A VTA monthly pass for regular bus or light rail services is currently $80. However, the calculations assume that incentives are received in-kind, though staff notes this cost may be incurred by city if in-kind donations cannot be secured from businesses, transit operators, or other partners.

Calculations

- Despite the lowered reach and response, staff maintained the budget for a city staff person or consultant ($180,000), though one-third time for one person still may not be sufficient, given the range of components needed for a successful program.
- Staff calculated the estimated cost based on a per participant basis, rather than per target household basis, based on the following data from the In Motion program:[5]

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[2] Cooper, Carol. "Successfully Changing Individual Travel Behavior Applying Community-Based Social Marketing to Travel Choice." Transportation Research Record: Journal of the Transportation Research Board, No. 2021, Transportation Research Board of the National Academies, Washington, D.C., 2007, pp. 89–99.

[3] Ibid

[4] Ibid

[5] Ibid

SEATTLE NEIGHBORHOOD	MADISON-MILLER	LAKE FOREST PARK	COLUMBIA CITY	CROSS-ROADS	WEIGHTED AVERAGE
HOUSEHOLDS	2740	5015	2983	3462	
PARTICIPANTS	212	216	239	289	
COST PER HOUSEHOLD	$57	$18	$20	$13	**$25**
COST PER PARTICIPANT	$542	$426	$196	$153	**$312**
TOTAL COST	$155,553	$92,000	$58,157	$44,380	

- Evaluators of the In Motion program note that the first neighborhood incurred higher costs per participant and per household due to incorporating initial program costs such as background research, coordination to design program and identify initial target neighborhoods, and develop the program branding, messaging, and materials. It's assumed that similar startup costs would apply for a Mountain View program.
- The updated calculations reflect the estimated $312 weighted average (by participant) per participant.

Incremental Net Cost
It is worth noting that it is uncertain whether business contributions to the TMA will cover the annual TMA staff ongoing outreach costs, which ESTF-2 estimated at $500,000, in addition to other TMA initiatives and programming.

Net Cost per MT CO_2e
Updated to reflect the reduced MT CO_2e figure based on updated costs and GHG calculations.

Easy to implement
Staff concurs with the assessment that conducting a high-quality pilot program that could reach more than half the city's existing households in three years and achieve desired response rate would not be easy.

Easy to Measure
Staff reduced the analysis of "easy to measure" from three to one. The analysis may underestimate the difficulty to measure the effectiveness of a TDM outreach program. In recent years, voluntary travel behavior change (VTBC) program evaluation best practice has emphasized the use of behavioral indicators. This is generally done by measuring changes in mobility patterns of residents through extensive pre- and post-intervention travel surveys (which have been cited to receive very low participation rates) spaced sufficiently far apart to detect stable change in household travel behavior. Additionally, people frequently have difficulty recalling or accurately reporting travel behavior. Alternatively, the changes can be measured against a control group to account for background factors, though selection of an adequate control group is associated with additional challenges.[6]

[6] Peter Stopher, Eoin Clifford, Natalie Swann, Yun Zhang, Evaluating voluntary travel behaviour change: Suggested guidelines and case studies, Transport Policy,
Volume 16, Issue 6, 2009, Pages 315-324, ISSN 0967-070X, https://doi.org/10.1016/j.tranpol.2009.10.007.

Private Investment Leverage
For Recommendation 1 only (the TDM pilot), it does not appear that there is necessarily any private investment leverage for an existing residential TDM program. If for new commercial and residential development, it is more typical and likely to be more feasible to require or incentivize participation and contribution to a TMA. It may be feasible to receive in-kind contributions to offer incentives from local businesses for participants, which may help achieve desired participation rates. This metric should take into account the uncertainty of private investment, and as such the rating was reduced from three to one.

Local Economic Benefits
Based on Recommendation 1 alone, the TDM Outreach Pilot, staff does not believe the local economic benefits warrant a rating of three, due to a relatively low reduction in trips. Since the reduction in trips is relatively low, and since the trips reduced are short, it is unlikely there are significant financial savings on gasoline or other operational costs. If assessing some of the other elements to T7, a higher rating for local economic benefits may be warranted.

Other Environmental Benefits
The ESTF-2 rating of two may overestimate the environmental benefits of a relatively small reduction in passenger vehicle trips, at least for the primary measure modeled for this program, Recommendation 1: TDM Outreach Pilot.

Werner Brög, Erhard Erl, Ian Ker, James Ryle, Rob Wall, Evaluation of voluntary travel behaviour change: Experiences from three continents, Transport Policy, Volume 16, Issue 6, 2009, Pages 281-292, ISSN 0967-070X, https://doi.org/10.1016/j.tranpol.2009.10.003.

2017-2018 Environmental Sustainability Task Force Analysis

Implement group-buy programs to expand personal EV adoption (**T2**)						**Incentive**		**8 years**	
16,803	**$160K**	**$0**	**$5.22**	■■■	■■■	■■□	■■□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

3,762	**$160K**	**$0**	**$42.53**	■■■	■■□	■■■	■■□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted based on sales rates from previous group-buy programs, adjusting for population differences in participating jurisdictions. This resulted in lower estimated total vehicle sales than the numbers used in the original ESTF-2 report calculation.

Calculation Details

Expected vehicle sales from a group-buy program were estimated using data from a survey of previous programs included in "Electric Vehicle Group Buy Programs: Handbook & Case Studies."[1] Per-capita sales expectations were developed by looking at the average EV sales per 10,000 residents from multiple previous programs. Programs that had a discrete geographic reach (such as a city or county) were used, rather than university-based programs or similar where the customer reach of the program was harder to estimate. As the populations of the various Colorado jurisdictions differed significantly from Mountain View, a per-capita sales estimate was necessary to adjust for this factor.

As seen in the following table, the group-buy programs resulted in an average of 1.36 EV sales per 10,000 residents per month. Based on a 2-month program offer, which was the most common period in the above programs, this would result in approximately 87 EV sales in Mountain View over 8 program cycles. Given California's relatively high EV adoption rate compared to Colorado, however, a higher estimate of 2 vehicles per month per 10,000 residents was used. This still results in much lower annual EV sales estimates than in the original recommendation. Note that the projected number of EVs is only due to the group-buy program specifically, and do not represent total annual sales of EVs purchased by Mountain View residents.

[1] https://www.colorado.gov/pacific/energyoffice/atom/129811

EV Group Buy Program Sales Analysis

Group buy program	Jurisdiction	Start Date	End Date	Vehicles sold	Vehicles sold per month	Jurisdiction Population (2016 ACS 5-year est.)	Vehicles per month per 10,000 residents
Boulder County: Fall 2015	Boulder County, CO	9/1/15	12/31/15	248	63	313,961	2.01
Boulder County: Spring 2016	Boulder County, CO	4/1/16	7/1/16	108	36	313,961	1.15
Boulder County: Fall 2016	Boulder County, CO	10/1/16	12/31/16	36	12	313,961	0.38
DENC: Winter 2015	Fort Collins, CO	11/1/15	12/31/15	59	30	157,251	1.91
DENC: Spring 2016	Fort Collins, CO	2/1/16	3/31/16	42	22	157,251	1.40
DENC: Summer 2016	Fort Collins, CO	7/1/16	8/31/16	16	8	157,251	0.51
DENC: Winter 2016	Fort Collins, CO	11/1/16	12/31/16	64	33	157,251	2.10
Aurora: Fall 2016	Aurora, CO	9/10/16	11/10/16	71	36	351,131	1.03
Aurora: Spring 2017	Aurora, CO	5/19/17	6/30/17	84	61	351,131	1.74
						Average:	**1.36**

Other assumptions remain the same as in the original recommendation, as seen in the chart below and calculations on the following page. It was assumed that the group-buy program discount would be available for an average of 2 months, as this was the most commonly seen program length in the survey of past programs. It should be noted that there are no programs that have been extended as long as 8 years as proposed in this recommendation. Generally these programs have had multiple cycles per year, with a maximum of 6 program cycles over 2-3 years. Beginning year of program has been adjusted to 2019 from 2018.

Assumptions for GHG Emissions Reduction Calculations

Avg miles per year	**6489**
EV sales per 10,000 res:	2
Avg months of sales event	2

EV Group-Buy Program GHG Emissions Reduction Calculations:

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
MV Population est.	80,626	81,997	83,391	84,809	86,251	87,717	89,208	90,725	92,267	93,836	95,431	97,149	98,995
New EV sales:	0	33	33	34	35	35	36	36	37	38	38	39	40
"Retired" Evs:	0	0	0	0	0	0	0	33	33	34	35	35	36
Total EVs:	0	33	66	100	135	170	206	209	213	217	220	224	228
Sum (Miles)	0	214,137	428,274	648,900	876,015	1,103,130	1,336,734	1,356,201	1,382,157	1,408,113	1,427,580	1,453,536	1,479,492
MT/VMT	0.00036	0.00035	0.00034	0.00033	0.00032	0.00031	0.00030	0.00029	0.00028	0.00027	0.00027	0.00026	0.00026
MT CO2e	0.00	74.39	144.77	212.99	279.03	340.72	400.13	393.18	389.15	385.93	381.81	380.24	379.40
												MT CO_2e	**3,762**

Easy to Measure

Adjusted downward to account for fact that it is difficult to account for sales resulting from these incentive programs versus EV sales that would have occurred anyway. However, increases in total number of EVs registered in Mountain View can be tracked through DMV data. Some participating dealers may also release sales numbers from group-buy incentives.

Private Investment Leverage

Adjusted upwards, since most group-buy programs leverage corporate subsidies or dealer incentives. The standard "Fleetail" discount offered by Nissan and BMW is often up to $10,000 in additional discounts per vehicle. Non-corporate, dealer-sponsored discounts are generally in the $3,000-$4,000 range. [2] A group-buy program operated in partnership with a utility, such as SVCE, would significantly reduce outreach and staff costs to the City and further leverage private investment.

Only Nissan and BMW have consistently participated in group-buy programs, especially larger-scale ones, and remain the only automobile manufacturers to participate at the corporate level in "Fleetail" discount programs.

[2] https://www.colorado.gov/pacific/energyoffice/atom/129811

2017-2018 Environmental Sustainability Task Force Analysis

Adopt a decarbonization policy for buildings **(B1)**						**Policy**		**12 years**	
269,264*	**$380K**	**$0**	**N/A**	■□□	■■■	■■□	■■□	■□□	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

* *Total CO2e saved by the Buildings and Land Use recommendations that are enabled by this recommendation (BE1, BE4, BE9, BE12, BN1, BN3, BN4, BN6)*

City Staff Analysis

0	**$150K**	**$0**	**N/A**	■■□	■■■	■■□	■■□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Removed total for consistency and clarity, as it is simply an aggregate of the GHG Emissions reductions from other recommendations. As stated in the original ESTF-2 report, no GHG reductions are directly attributable to this recommendation.

City's Net Cost

Cost of roadmap and baseline study was reduced to $100,000. Staff verified that $100,000 is a reasonable estimate based on similar studies in other cities. Reduced staff time estimates from City staff from 8 months to 2 months to support the baseline study and roadmap, which would be completed by a consultant. Total costs are: $100,000 for the roadmap and baseline study, 2 FTE months at an Analyst level for a total cost of $30,000, and $20,000 for expenses related to community forums and an advisory council that would not be covered by the consultant fees.

Easy to Implement

Adjusted upwards to "somewhat easy," as this recommendation only covers the policy and decarbonization roadmap, which are relatively easy to develop. Level of difficulty of the implementation measures identified in related recommendations will be assessed as part of the analysis for those individual recommendations.

Health Benefits

Reduced to "modest or unquantifiable benefits," as the majority of health benefits would be due to other measures enabled by the baseline study and roadmap rather than this recommendation itself. It is likely those benefits would be difficult to quantify or attribute directly to this action.

2017-2018 Environmental Sustainability Task Force Analysis

Create financial and non-financial incentives for new above-code buildings **(BN3)**						**Policy**		**3 years**	
18,442	**$216K**	**N/A**	**$11.71**	■■□	■■□	■■□	■■□	■■□	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

1,468	**$0-$65K**	**N/A**	**$0-$51.09**	■■□	■■□	■■□	■■□	■■□	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted calculations to reflect that the highest percentage reduction in total building energy use rewarded under LEED v4 standards is 54%, including the extra credits for exemplary performance. Since building to the mandatory measures of the CALGreen 2016 code automatically earns 1 LEED point (equivalent to a 6% reduction) in this category, the assumption of a roughly 50% additional reduction in energy use from to the Higher-performing Green Building Standards bonus program was used. Also adjusted calculations to reflect that a 50% reduction in energy use due to green building standards does not necessarily represent a 50% reduction in MT CO2e, as the two sources of building energy (natural gas and electricity) have very different contributions to total building GHG emissions. While actual reductions will vary due to the specific efficiency measures utilized by each project and whether they primarily reduce natural gas or electricity use, the calculations here assume a proportional reduction in each based on their existing contributions to total building energy use (e.g. if natural gas accounts for 67% of residential energy use, it will account for 67% of total energy reductions achieved under the higher green building standards). The incremental energy savings from these measures will likely decrease as minimum energy efficiency standards increase in the CALGreen 2019 updates.

Calculation Details

Assumptions:

- Total reduction in energy use would apply to electricity and gas based on current usage ratios in both residential and nonresidential development (e.g. if natural gas accounts for 67% of residential energy use, it will account for 67% of total energy reductions achieved under the higher green building standards).

- Used same estimates for number of new housing units and non-residential square footage added as original ESTF-2 report.
- All LEED Platinum certified buildings would achieve the maximum percentage of energy efficiency reduction rewarded by points (50%), consistent with all known existing certified LEED v4 Platinum buildings.
- Green Point Rating requirements for residential development would achieve similar energy use reduction (50%) as the LEED Platinum requirement for nonresidential.
- Extending the green building FAR bonuses to all new area plans would continue to result in high participation rates in those areas, resulting in roughly 50% of new commercial square footage citywide using FAR bonus structure.

Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
New housing units added each year	580	593	660	730	806	829	848	865	885	969	1064	1163
Avg MT CO_2e/unit from electricity use	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.016
Avg MT CO_2e/unit from natural gas	1.63	1.63	1.64	1.64	1.65	1.64	1.63	1.62	1.61	1.60	1.58	1.57
5% of new units	29	30	33	37	40	41	42	43	44	48	53	58
GHG reductions from electricity (MT CO_2e)	0.080	0.084	0.092	0.104	0.113	0.116	0.118	0.121	0.123	0.133	0.146	0.159
GHG reductions from natural gas (MT CO_2e)	15.7	16.3	18.0	20.2	22.0	22.4	22.8	23.2	23.6	25.5	27.9	30.3
Total GHG Reductions: Residential (MT CO_2e)	**15.8**	**16.4**	**18.1**	**20.4**	**22.1**	**22.5**	**23.0**	**23.3**	**23.7**	**25.7**	**28.1**	**30.4**
Non-residential area added (Million Sq Ft)	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365
Avg MT CO_2e/ Million Sq Ft – Elec.	149.5	152.8	156.2	159.7	163.2	164.5	165.7	167.0	168.4	169.8	171.2	172.7
Avg MT CO_2e/ Million Sq Ft - NG	2393	2434	2476	2518	2561	2567	2574	2581	2589	2597	2606	2615
25% of new C&I (Million Sq Ft)	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182	0.182
GHG reductions from electricity (MT CO_2e)	8.29	8.47	8.66	8.85	9.05	9.12	9.19	9.26	9.34	9.42	9.50	9.58
GHG reductions from natural gas (MT CO_2e)	85.51	86.97	88.45	89.96	91.49	91.71	91.95	92.21	92.49	92.78	93.10	93.43
Total GHG Reductions: Nonres. (MT CO_2e)	**93.8**	**95.4**	**97.1**	**98.8**	**100.5**	**100.8**	**101.1**	**101.5**	**101.8**	**102.2**	**102.6**	**103.0**

Total GHG Reductions 2019-2030: Residential (MT CO_2e)	270
Total GHG Reductions 2019-2030: Nonresidential (MT CO_2e)	1199
Total GHG Reductions (MTCO_2e)	1468

City's Net Cost

This analysis does not include costs from reduced plan check/permit fees for ZNE buildings, as this is already an approved ESAP-3 item and therefore not an incremental additional cost to the

City. The GHG emissions reductions from this part of the recommendation are similarly not calculated; only those expected reductions from the NBS-style green building incentives have been included.

Extending the green building incentives as part of FAR bonus programs to other area plans citywide would not incur any incremental expenses if it is done as part of the regular plan update process. Given the very high participation rate in existing green building incentive programs, it is unlikely that the city would need to support participation in these incentives with additional programs. Therefore, costs have been adjusted to reflect this potential range.

2017-2018 Environmental Sustainability Task Force Analysis

Update green building code to move towards low-carbon buildings **(BN1)**						**Mandatory**		**Permanent**	
54,283	**$367K**	**$5.86M**	**$6.78**	■■□	■■□	■■□	■■□	■■□	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

54,283	**$180K**	**$0**	**$3.32**	■□□	■■□	■■□	■■□	■■□	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

General Feasibility

The following are notes regarding the feasibility and implementation of various parts of this recommendation. This recommendation calls for updating the MVGBC every three years, which is already done by the city as part of the regular code update cycle. The current code update cycle is underway, with final text of the 2019 code expected by July 2019 with an effective date of January 1, 2020. Between July and December of 2019, the City will need to review and adopt the updated code. Considering reach codes and adoption of CALGreen voluntary measures during this time will minimize the cost to the City in terms of both financial and staff resources. Any above-code measures adopted prior to this time would need to be re-adopted as part of the 2019 code update cycle to remain enforceable. Subsequent update cycles will occur every three years, in 2022 and 2025.

Recommendation components:

- **Adopt the existing reach code on low-rise residential new construction: All-electric design for areas with no gas lines.**
  This can be considered as part of the 2019 code update cycle, though as the ESTF-2 report notes it will likely have minimal effect, considering that few, if any, areas of the City are without existing gas lines.

- **Develop a reach code to mandate use of clean energy for all purposes (electrical appliances and installation of EV chargers) in residential and commercial new buildings by 2025, in areas with existing gas lines.**
  Currently, cities are able to mandate installation of EV chargers in new construction, and staff can consider appropriate standards as part of the 2019 code update cycle. However, there are currently barriers to requiring all-electric appliances in new construction due

to federal preemption issues that can arise during the cost-effectiveness studies.[1] These barriers may complicate implementation of such a measure.

- **Develop a reach code for existing homes that supports all-electric-ready design when a building undergoes remodeling or retrofitting.**
  The feasibility of this component will depend on future code updates and the result of cost-effectiveness studies. Any reach code would need to be demonstrated to be cost effective in order to be mandatory, which has been difficult with all-electric codes in areas with natural gas lines.[1] However, voluntary, incentive-based programs could be explored.

Other ordinances to adopt:

- **Adopt a reach code to mandate solar for non-residential new construction**
  This measure, which was included in ESAP-3, has been demonstrated to be cost effective and could be considered as part of the 2019 code updates.

MT CO_2e Reduction 2018-2030

Expected GHG emissions estimates seem reasonable, though it is important to note that adoption would likely occur as part of a future code update cycle, making the measures effective on either January 1, 2023 (for the 2022 code) or January 1, 2026 (for the 2025 code). Therefore, it is unlikely that GHG emissions reductions would begin in 2025 as calculated in the original recommendation, but due to the uncertainty in when these measures may become feasible to implement, it is possible they could be adopted in either the 2022 or 2025 code cycle. As a result, the GHG emissions calculations have not been adjusted.

City's Net Cost

Staff costs for updating the MVGBC have been removed, as this process is already done every three years as part of the regular code update cycle, and would not incur additional costs to the City. It is likely that the City would be able to adopt some reach codes in the future without hiring outside consultants by leveraging existing cost-effectiveness studies and the work of the Statewide Standards & Codes group, but the potential cost of a part-time consultant at a total of $180,000 over multiple years has been left in this estimate as a contingency to represent unforeseen costs that may arise.

Incremental Net Cost

Energy reach codes are required to be cost-effective to implement as mandatory measures, which means that they must provide a net savings. For any mandatory measures implemented, the incremental net cost of the minimum compliance package would be offset by the cost savings from energy use reduction. However, developers would be able to exceed the minimum

[1] *CALGreen All-Electric Cost Effectiveness Study*. Prepared for California Energy Codes & Standards Program. October 11, 2017. Available from: http://localenergycodes.com/

standards or choose efficiency measures or appliances with higher up-front costs if desired. As any mandatory measure would be legally required to demonstrate cost-effectiveness, the incremental net cost has been revised to $0.

Net Cost per MT CO_2e
Revised to reflect new values for City's Net Cost.

Easy to Implement
Revised downward to "hard," as the majority of these measures are currently not allowed as mandatory measures in the building code, and it is uncertain when this may change.

2017-2018 Environmental Sustainability Task Force Analysis

Measure effectiveness of housing near transit **(BN8)**						**Policy**		**Ongoing**	
18,560	**$90K**	**$0**	**$4.85**	■■■	■■■	■■■	■□□	■■□	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

Unknown	**$90K**	**$0**	**N/A**	■■□	■□□	■■■	■□□	■■□	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Potential GHG emissions reductions were difficult to quantify, due to significant overlap between the measures proposed in this recommendation, other proposed recommendations in the ESTF-2 report, and existing mandatory and incentive-based criteria for new development that address many of the VMT-reduction measures outlined in this recommendation. The overlap between these measures makes it difficult to analyze the incremental GHG emissions reduction expected from this measure alone. However, staff expects the GHG emissions reduction potential from well-designed VMT reduction measures in new development to be high.

Implementation of the proposed measures is complicated by current City efforts to comply with recent changes in State law due to SB 743.[1] This legislation requires evaluation of VMT impacts from new development as part of the CEQA process, and the City must develop these criteria in cooperation with regional agencies such as the Santa Clara Valley Transportation Authority (VTA). The results of this effort will determine the appropriate VMT reduction levels required for new development in the City. Therefore, the incremental GHG emissions reduction from a higher, voluntary threshold as part of a FAR/density bonus program will be dependent on the new baseline for VMT reduction. Staff anticipates the SB 743 compliance efforts will be complete in 2019 to prepare for these requirements taking effect in 2020.

Easy to Implement

Reduced due to ongoing staff efforts to develop thresholds of significance of VMT for CEQA as part of compliance with SB 743, which may affect feasibility of the proposed measures in this recommendation.

[1] Guidance on SB 743 compliance is provided by the Office of Planning and Research: http://opr.ca.gov/ceqa/updates/sb-743/

Easy to Measure

Reduced, as there are not currently quantification methodologies for all of the proposed criteria to convert these project characteristics into quantifiable VMT reduction. This makes it difficult to reliably estimate the VMT reduction from any given project using a standard set of factors citywide. The upcoming changes to CEQA analysis will require this analysis to be completed on a project-specific level. However, both of these approaches are still only an estimation of potential VMT impacts before any development occurs, and do not actually measure VMT levels after project implementation.

2017-2018 Environmental Sustainability Task Force Analysis

Incentivize switching residential HVAC and water heaters from natural gas to electricity (**BE1**)				**Voluntary, Educational**				**12 years**	
73,100	**$100K**	**$0**	**$1.37**	□□□	■■■	□□□	■□□	■■■	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

3,332	**$100K**	**$0**	**$30.01**	■□□	■■■	■□□	■□□	■■■	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted based on significantly downscaled estimates of uptake for heat pump water heater (HPWH) and heat pump space heater (HPSH) rebates. SVCE's grant program for 2019 has a target of 150 HPWH installations for their entire service territory. If MV accounts for 10% of these, that will be 15 in 2019. Currently, the program only covers heat pump water heaters and not heat pump space heaters. Projected GHG emissions reduction based on HPWH program more than doubling in size to cover up to 30 HPWH per year in Mountain View and 20 HPSH.

The original recommendation assumed 5,000 homes would convert to both HPWH and HPSH by 2030. This is an extremely optimistic uptake rate, representing 37% of owner-occupied housing units in Mountain View. For context, participation in ARRA-funded appliance rebate programs resulted in purchases of 48,797 heat pumps and 30,116 high-efficiency water heaters nationwide between 2009-2012.[1] Palo Alto has had a generous incentive program for HPWH for over a year that has only resulted in 10 installations.

	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**TOTAL**
new HPWH	15	30	30	30	30	30	30	30	30	30	30	30	**345**
new HPSH	0	20	20	20	20	20	20	20	20	20	20	20	**220**
total HPWH	15	45	75	105	135	165	195	225	255	285	315	345	**345**
total HPSH	0	20	40	60	80	100	120	140	160	180	200	220	**220**
MTCO$_2$e reduced	14.4	62.3	110	158	205.9	253.8	301.6	350	397.4	445.3	493.1	541	**3332**

[1]Wagley, S., Swope, T., Bloch, M. L., & Short, K. (2014). *Lessons Learned from the State Energy Efficient Appliance Rebate Program.* Retrieved from The American Council for an Energy-Efficient Economy: https://aceee.org/files/proceedings/2014/data/papers/2-71.pdf

Average $MTCO_2e$ reduced per HPWH obtained from SVCE at 0.96 $MTCO_2e$/HPWH, and average $MTCO_2e$ reduced per HPSH calculated based on natural gas usage numbers in original recommendation plus Census Bureau data as detailed below:

Total 2015 Residential Natural Gas use in Mountain View (Therms) (Source: MV 2015 Community GHG Inventory)	10,073,557
Percentage of Natural Gas Use for Space Heating (CA Average) (Source: 2009 California Residential Appliance Saturation Study, http://www.energy.ca.gov/2010publications/CEC-200-2010-004/CEC-200-2010-004-ES.PDF)	37%
Number of occupied housing units with utility gas for space heating (Source: Census Bureau 2015 ACS 5-year estimates)	20,795
Avg. Natural Gas use per household for space heating in 2015 (Therms)	179.24
MTCO2e/Therm	0.005321
Average MTCO2e/household for space heating in 2015	0.95

Easy to Implement

Adjusted upwards due to planned SVCE rebate program for 2019.

Private Investment Leverage

Adjusted upwards to "low leverage (less than $1 of private investment per dollar of public investment)"due to the planned pilot program from SVCE that will leverage grant funds with the remainder of program funding covered by SVCE. However, to continue and accelerate HPWH installation after the grant period expires, the City may need to consider partially or fully funding this program.

2017-2018 Environmental Sustainability Task Force Analysis

Encourage installation of EV chargers in existing multi-unit dwellings **(BE7)**						**Educational, Voluntary**		**5 years**	
15,614	**$255K**	**$0**	**$16.30**	■□□	■■□	■■□	■□□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

10,216	**$280K**	**$0**	**$27.41**	■□□	■■□	■■□	■□□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted using Santa Clara County's EV Charging Station GHG Reduction Tool,[1] using the original recommendation's estimates of new chargers installed with an estimated useful life of 10 years for each charger.

City's Net Cost

Adjusted to include costs of $5,000 for outreach and communications materials, resulting in an additional $25,000 over the 5-year program. This was added to the original recommendation's estimate of $255,000 for a new net cost of $280,000.

[1] https://www.sccgov.org/sites/dnz/Pages/siting-intalling-ev-charging-infrastructure.aspx

2017-2018 Environmental Sustainability Task Force Analysis

Adopt a revenue-neutral differential utility tax encouraging low-carbon energy use **(BE9)**				**Mandatory**		**Ongoing**			
18,279	**$175K**	**$0**	**$9.60**	■□□	□□□	■□□	□□□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

0 - 18,279	**$204K-$279K**	**$0**	**$15.26***	□□□	□□□	■□□	□□□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

**Net Cost per MT CO2e Reduction reflects a scenario in which voters approve UUT changes, but if the measure is not approved, there will be no MT CO2e reduction associated with the costs to the City.*

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Expected GHG emissions reductions were adjusted to reflect the fact that a change to the Utility Users Tax (UUT) must be approved by voters, and there is uncertainty over whether such a measure would pass. As the majority of costs to the City would be incurred regardless of whether the ballot measure approving the UUT change is successful, it is possible this expenditure will not result in any GHG emissions reduction.

City's Net Cost

Costs have been adjusted to reflect higher estimated costs for the ballot measure to approve the change in the UUT. The following table details changes to costs. Changes made to estimates are explained in the "Calculation Details" section following the table.

Component	Cost Estimate – Original Recommendation	Cost Estimate – Staff Analysis
Cost sharing of PG&E billing changes	$50,000	$100,000
Incremental cost of ballot measure	$20,000	$74,000
Ballot measure support – survey & marketing	$30,000	$30,000
Implementation costs*	$30,000	$30,000
Outreach for low-income assistance*	$45,000	$45,000
TOTAL:	**$175,000**	**$279,000**

**These costs are dependent on the ballot measure being successful and the measure being implemented.*

Calculation Details

Estimates for cost sharing of PG&E billing changes were increased from $50,000 to $100,000 to better reflect the City's expected share of this change. A contribution of $50,000 would require 10-16 cities to share the expense at this level to cover the $500,000-$800,000 cost estimate, and few cities have expressed interest in making this type of change. It is more likely that Mountain View would be one of only a handful of cities requesting this change from PG&E, and would need to contribute a greater share of the expense.

Estimated costs for adding a ballot measure to approve UUT changes were increased to reflect costs from a single measure in the most recent election. The incremental cost to the City of adding a ballot measure to an election is highly variable and depends on how many other items are on the ballot, the City's overall share of election measures compared to the County and State, and other factors. However, the original estimate of $20,000 was substantially lower than observed City costs of approximately $73,912 per ballot measure in the November 2018 election. There will be additional costs due to printing the full text of the ballot measure in the voter guide, but it was not possible to quantify these at the time of this analysis.

Out of the total estimated $279,000 cost, only the $30,000 for implementation costs and $45,000 for outreach and marketing of low-income assistance programs are dependent on the measure being successful. Therefore, the Net Cost to the City has been adjusted to $204,000-$279,000 to reflect the net costs from the two possible scenarios: 1) the ballot measure to change the UUT is unsuccessful, or 2) the ballot measure to change the UUT is successful and the change is implemented as outlined in the original ESTF-2 recommendation.

Incremental Net Cost

This was not adjusted, but it is important to note that while the net incremental cost to the community is zero as the tax is designed to be revenue-neutral, it will still result in a net increase in costs to many, if not most, households. The original recommendation estimates a net increase in costs to residential customers of approximately $32.72 to $35.79 per year, while commercial customers are most likely to see a decrease in overall bills due to relatively higher electricity use. Since residents will need to approve the UUT change, successful implementation of this measure would require residents approving a tax change that increases utility costs for most households while decreasing them for most businesses.

City's Net Cost

Adjusted to reflect the new City's Net Cost for a successful ballot measure of $279,000. As there would be no GHG emissions reductions resulting from the scenario where the UUT measure is not implemented, the lower potential cost to the City from this scenario was not considered.

Easy to Implement

Adjusted downward to "very hard to implement this recommendation" due to the fact that it is currently impossible to have different utility tax rates with PG&E's billing system and there is no guarantee that PG&E would be willing to make such a change, or that voters in Mountain View would approve a change to the UUT.

2017-2018 Environmental Sustainability Task Force Analysis

Increase efficiency of existing buildings through voluntary programs and city ordinances (**BE4**)						**Outreach, Policy**		**2019-2030**	
70,000	**$1.8M**	**$1.6M**	**$48**	■□□	■■□	■■■	■■■	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

28,540	**$2.04M**	**$11M**	**$458.30**	■□□	■■□	■■■	■■■	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted estimates from participation in voluntary energy upgrades based on participation rates and average savings from Energy Upgrade Mountain View. Adjusted savings estimates from mandatory benchmarking, disclosure, and audit/retrocommissioning of buildings >50,000 square feet based on performance reports from the City of San Francisco's ordinance.

Removed separate estimated savings from rental and time-of-sale audits, as there is too much overlap between these measures and the estimates from voluntary energy upgrade programs (which will almost certainly be used to execute the measures identified in residential energy audits). Added estimated reductions from large multifamily buildings from the combination of mandatory disclosure and benchmarking (AB 802[1] includes large multifamily buildings greater than 50,000 square feet with at least 17 residential accounts) and rental unit audits. Assumed both compliance rates and annual energy use reductions would be similar to commercial buildings at this scale based on City of San Francisco's performance reports (2% annual reduction in energy use, 84% compliance).

As a result of these adjustments the total estimated GHG emissions reductions through 2030 are reduced to 28,540 MT CO_2e from 70,000 MT CO_2e.

City's Net Cost

Adjusted staffing levels to reflect similar program in Berkeley, which has the equivalent of 1.5 FTE to manage programs covering essentially all the energy benchmarking, disclosure, and

[1] AB 802 directed the California Energy Commission to create a statewide building energy use benchmarking and public disclosure program for buildings larger than 50,000 square feet: https://www.energy.ca.gov/benchmarking/

audit measures described in this recommendation. This was scaled to 1 FTE for Mountain View, given that the population of Berkeley (and therefore the scale of their program) is roughly 1.5 times that of Mountain View. Compared to the original recommendation, this meant removing separate staffing projections for each individual component of this recommendation and instead addressing them as part of a single program served by a dedicated staff position, as is the case in Berkeley. The 1 FTE for program implementation does not necessarily include staff time management and oversight.

This analysis also assumes outreach to increase participation in voluntary energy upgrades would be contracted out instead of done primarily by city staff, as with Energy Upgrade Mountain View. Estimates for cost of contracting this work were based on average annual cost of operating Energy Upgrade Mountain View. This reduces the total staff costs slightly through 2030 from $3,465,000 to $3,350,000.

Additionally, fee revenue to the city was adjusted to account for some calculation errors, using the same assumptions in the original recommendation. This reduced total expected fee revenue through 2030 from $1,619,000 to $1,309,000.

Total adjusted net cost to city (staff costs minus fee revenue) is $2,041,000.

Calculation Details (MT CO2e and City's Net Cost)

Assumptions and Variables for GHG Emissions and Cost Calculations

1. Increase impact of voluntary energy-efficiency programs through additional staff and outreach funding	
Annual cost of contracting out operation of energy efficiency program	$129,000
Number of new participants in energy upgrades per year	430
Average annual savings (Therms) per year	62.11
2-5. Staff Costs for energy disclosure and audit programs	
Number of FTE needed to support program	1
Fully loaded salary+benefits rate of program staff	$180,200
2. Energy audit or RCx for buildings> 50,000 sq ft	
Number of buildings >50,000 sq ft	200
Percentage of buildings exempt or pursuing alternative compliance paths	50%
Percent of eligible buildings reporting annually on 5-year cycle	20%
Compliance fee	$200
Average net cost of RCx to property owner	$ 20,000
3. Time of sale energy audits for buildings> 600 sq ft	
number of home sales per year	600
compliance fee for home energy audits	$60
number of commercial bldg sales per year	150
compliance fee for commercial bldg energy audits	$200
average cost of home energy audit	$200
average cost of commercial energy audit	$2,000
4. Rental Unit Energy Audits	
number of above-market residential units	15000
number of commercial units	1500
percent complying per year over 5 years	20%
compliance fee for residential units	$30
compliance fee for commercial units	$150
average cost of energy audit for residential unit	$30
average cost of energy audit for commercial unit	$1,000
GHG Factors	
Emissions factor for natural gas combustion (MTCO2e/Therm)	0.005321
Annual commercial gas use in MV (Therms)	10537201
Annual energy use reduction due to benchmarking & disclosure (bldgs >50,000 sqft)	2%
Percent of commerical energy use consumed by buildings >50,000 sqft	25%
Compliance rate, buildings >50,000 sq ft	85%
Percentage of MV housing units that are renter-occupied in buildings with 50 or more units	12%
Total annual residential gas use in MV (Therms)	10073557

GHG Emissions reduction												
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**TOTALS**
1) Estimated natural gas savings from increased participation in voluntary energy effiency programs (Therms)	26707	53415	80122	106829	133537	160244	186951	213658	240366	267073	293780	1762682
2) Energy audit and RCx every 5 years for buildings >50,000 sq ft in addition to mandatory annual benchmarking/ disclosure due to AB 802. Assumes buildings >50,000 sq ft account for 25% of total commerical energy use (Therms)		44783	89566	134349	179132	223916	268699	313482	358265	403048	447831	2463071
3) Estimated natural gas savings from benchmark and disclosure/energy audits for multifamily buildings >50,000 sqft (Therms)		20697	41393	62090	82787	103483	124180	144877	165573	186270	206967	1138316
Total Reduction in Natural Gas Use (Therms)												5364068
Total GHG Emissions Reductions (MT CO_2e)												28540

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	TOTALS
Staff costs													
1) staff costs for outreach to improve participation in energy efficiency programs	$129,000	$129,000	$129,000	$129,000	$129,000	$129,000	$129,000	$129,000	$129,000	$129,000	$129,000	$129,000	$1,548,000
2-5) Staff costs to oversee disclosure & audit programs			$180,200	$180,200	$180,200	$180,200	$180,200	$180,200	$180,200	$180,200	$180,200	$180,200	$1,802,000
												Total Costs to City	**$3,350,000**
Revenue from fees													
2) Energy audit or RCx for buildings >50,000 sq ft every 5 years, starting 2020.			$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$40,000
3) Time of sale energy audits for buildings >600 sq ft				$66,000	$66,000	$66,000	$66,000	$66,000	$66,000	$66,000	$66,000	$66,000	$594,000
4) Rental unit energy audit for residential & commercial <50,000 sq ft					$135,000	$135,000	$135,000	$135,000	$135,000				$675,000
												Total Fee Revenue	**$1,309,000**

Net Cost to City	$2,041,000

Costs to property owners (in addition to fees listed above)													
2) Energy audit or RCx for buildings >50,000 sq ft every 5 years, starting 2020			$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$4,000,000
3) Time of sale energy audits for buildings >600 sq ft				$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$420,000	$3,780,000
4) Rental unit energy audit for residential & commercial <50,000 sq ft					$390,000	$390,000	$390,000	$390,000	$390,000				$1,950,000
												Total Fees	$1,309,000
												Total Cost to Property Owners	**$11,039,000**

Incremental Net Cost

Adjusted to account for some calculation errors in the cost and fees for energy audit/RCx for buildings over 50,000 sq ft, using the same assumptions in the original recommendations. Adjusted estimated costs of commercial unit energy audit upwards to better reflect research. Added cost of compliance fees to cost of required audits and retrocommissioning. Total incremental net cost from compliance fees and required audits decreased from $24,380,000 to $11,039,000 largely due to correction of calculation error.

Removed cost savings from reduced natural gas use from "Incremental Net Cost" calculations, as any utility savings are due to participation in voluntary upgrades that property owners may choose to do based on the results of the mandatory audits. Since the upfront costs of these upgrades were not included in the original analysis (and are extremely difficult to estimate), this did not represent a true net cost to property owners. While it is likely that the vast majority of property owners would choose to implement measures with a short payback period and net cost savings by 2030, these costs and/or savings are more appropriately attributed to "Local Economic Benefits" because they are not mandatory.

It should be noted that much of the up-front costs to property owners to in compliance with the energy audit requirements and especially the retrocommissioning requirement for commercial buildings will likely be offset by energy cost savings, with expected paybacks of between 0.2 and 2.1 years.[2]

Net Cost per MT CO_2e

Adjusted to reflect recalculated values for MT CO_2e Reduction, City's Net Cost, and Incremental Net Cost.

[2] http://buildingefficiencyinitiative.org/articles/retro-commissioning-significant-savings-minimal-cost

2017-2018 Environmental Sustainability Task Force Analysis

Use city buildings to demonstrate leadership in electrification and energy efficiency **(BE12)**						**City Operations**		**12 years**	
820	**-$522K**	**$0**	**-$637**	■■■	■■■	■□□	■□□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

1083	**-$538k**	**$0**	**-$497**	■■■	■■■	■□□	■□□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted based on assumption that natural gas use would be eliminated in upgraded facilities, as this was the basis of the cost/benefit estimates in the DNV GL reports cited in original analysis. For 4 fire stations, total annual natural gas use for 2017 in Fire Stations 1-4 was used as an estimate for GHG emissions reductions. All other assumptions remain constant from the original recommendation, as detailed in the charts below:

Assumptions and Variables

Number of Fire Stations upgraded	4
Average Annual Natural Gas Use - Fire Stations (therms)[1]	4416
Average capital cost after rebates: Fire Station[2]	$80,049
Average annual cost savings: Fire Station[2]	$17,537
Number of other facilities upgraded	6
Average Annual Natural Gas Use - Office (Therms)[3]	1185
Average capital cost after rebates: Office[3]	$116,712
Average Annual Energy Cost Savings[3]	$21,645
Cost for fuel switching study	$20,000
MTCO2e/Therm for Natural Gas	0.00532066

[1] Calculated based on total annual natural gas usage in 2017 for Mountain View Fire Stations 1-4

[2] From DNV GL study: http://www.clean-coalition.org/site/wp-content/uploads/2018/01/PAEC-Task-3.14_Final-Economic-BCA-of-Energy-Efficiency-and-Fuel-Switching-Measures_Muni-Building-02_wb-19-Jun-2017.pdf

[3] From DNV GL study: http://www.clean-coalition.org/site/wp-content/uploads/2018/01/PAEC-Task-3.14_Final-Economic-BCA-of-Energy-Efficiency-and-Fuel-Switching_Office-Building-02_wb-19-June-2017.pdf

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	TOTALS
Costs													
Capital project costs	$20,000	$196,761	$196,761	$196,761	$196,761	$116,712							**$923,756**
Annual energy savings			($39,182)	($78,364)	($117,546)	($156,728)	($178,373)	($178,373)	($178,373)	($178,373)	($178,373)	($178,373)	**($1,462,058)**
												Total net cost to City	**($538,302)**

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	TOTALS
Energy Savings													
Annual Therms reduced (Fire)			4416	8833	13249	17665	17665	17665	17665	17665	17665	17665	**150153**
Annual Therms reduced (Office)			1185	2370	3555	4740	5925	7109	7109	7109	7109		**53321**
												Total Therms reduced	**203474**
												Total GHG Emissions	**1083**
												Cost per MTCO2e reduced	**($497.22)**

2017-2018 Environmental Sustainability Task Force Analysis

Require LEED Platinum for city-owned new construction or major renovation (**BN6**)						**Municipal**		**2018-2030**	
5,340	**$634K**	**0**	**$119**	■■□	■□□	■■□	■■□	■■■	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

439	**$480k**	**$0**	**$1,092**	■■□	■□□	□□□	■□□	■■□	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Updated based on higher energy savings estimates, as the energy efficiency thresholds for LEED v4 are much higher than in previous versions of LEED. Also did not include GHG emissions reduction estimates for private sector LEED Platinum buildings inspired by the City's standard, as these are unlikely to be outside the areas of the city covered by precise plans with existing LEED Platinum FAR bonus incentives.

An analysis of the energy efficiency improvements in LEED certified buildings under both LEED v2009 and LEED v4 shows an average incremental improvement of roughly 11-12% between the Gold and Platinum certification levels. All buildings in the USGBC's project directory currently certified at the Platinum level under LEED v4 obtained the maximum points for optimizing energy performance, equivalent to a 50% improvement in energy efficiency over the baseline. For the purposes of this analysis, we will assume that City buildings certified as LEED Platinum under v4 of the rating system will achieve a 50% reduction. Given that the 2019 updates to Title 24 will include a roughly 30% increase in energy efficiency standards for non-residential buildings, the incremental cost of these efficiency measures compared to the base code may be significantly reduced, depending on the project type. However, the expected cost savings from efficiency measures will also decrease as the incremental energy use reductions are smaller.

Calculation Details

	kWh	Therms
Eagle Park Aquatic Center	201213	31905
LEED Silver NC energy savings est.	42757.8	6779.8
LEED Gold NC energy savings est	79143.8	12549.3
LEED Platinum NC energy savings est	100606.5	15952.5

Annual energy savings est. Silver to Platinum	57848.7	9172.6875
Emissions factors: MT CO_2e per kWh or Therm	1.13E-07	0.005321
MT CO_2e	0.00656	48.80

48.81	**Total Annual MT CO_2e**
439.3	**Total MT CO_2e reduced 2022-2030**

City's Net Cost

Updated to account for higher operational savings due to increased energy efficiency levels. Cost premiums for capital costs same as in original recommendation calculations. It is worth noting that this study analyzed a much earlier version of the LEED rating system, as both the LEED standards and the minimum CALGreen code have evolved significantly since 2003. Multiple studies that compared the incremental costs of building to LEED Gold standards in v4 versus LEED 2009 found small differences in total project costs to meet the newer standards.[1] There is no corresponding analysis in the difference between the different LEED versions at the Platinum certification level.

Calculation Details

While the original ESTF-2 report and this analysis attempt to downscale average incremental cost differences to a single building, actual incremental costs for LEED certification at various levels are highly variable at the project level, depending on project-specific criteria. An accurate project-level estimate of LEED certification costs will require review by a LEED specialist.

Total budget for Aquatics Center w/LEED Silver	Estimated base cost w/o LEED certification
$18,000,000	$ 17,628,048

LEED certification level	Estimated cost premium	Total project cost
Silver	$ 371,952	$ 18,000,000
Gold	$ 320,830	$ 17,948,879
Platinum	$ 1,145,823	$ 18,773,871

[1] "The cost of LEED v4," a LEEDuser special report published by BuildingGreen, Inc: https://leeduser.buildinggreen.com/continuing-education/cost-leed-v4

Net Cost to City	
Estimated cost differential- LEED Silver to Platinum	**$ 773,871.32**
Total energy cost savings 2022-2030	**$ (294,208.46)**
Total net cost to City:	**$ 479,662.85**
Cost per MT CO_2e:	**$ 1,091.88**

Private Investment Leverage

Reduced due to removal of private sector buildings from GHG calculations.

Other Environmental Benefits

Reduced due to scale of impact, as the City does not have a significant number of new facilities planned for this timeframe.

2017-2018 Environmental Sustainability Task Force Analysis

Reduce embodied carbon in building construction and maintenance **(BN4)**						**Policy, Outreach**		**2019-2030**	
29,000	**$1.9M**	**$300K**	**$76**	■□□	■■□	■■□	■■■	■■□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

29,000*	**$1.3M**	**$300K**	**$54.21**	■□□	■■□	■■□	■□□	■■□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

**Consumption-based emissions reductions, not accounted for in Mountain View's inventory.*

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Unchanged from original recommendation, but with the note that the cited frameworks (CALGreen voluntary measures for building lifecycle assessment and LEED credits for lifecycle impact of buildings) have a threshold of only 10% reduction in lifecycle GHG emissions reduction, while the recommendation assumes a 20% decrease. It is likely one or both of these standards would need to become more stringent by 2025 for the 20% decrease to be easily applicable as an incentive. All GHG emissions reductions from this measure would be consumption-based and not accounted for in Mountain View's current GHG inventory.

City's Net Cost

Reduced estimated staff time from 1 FTE to 0.5 FTE due to overlap between outreach and other support around this recommendation and other green building initiatives. The original ESTF-2 report underestimated the total cost for 1 FTE from 2019-2030, which would have resulted in $2.16M in staff costs to the City for a total net cost of $2.352M through 2030. With the reduced estimated staffing needs, the total costs to the City are $90,000 per year in salary and benefits and $16,000 per year in training and engagement costs, for a total of $106,000 per year over 12 years. This results in a total net cost to the City of $1.272M through 2030.

Local Economic Benefits

Reduced to "low (less than 25% of benefits will be local)," as the recommendation does not detail any expected local economic benefits, other than some expected cost savings from performing lifecycle analysis and reducing construction waste. As the construction materials covered are not manufactured locally, creating new markets for compliant materials would

likely have limited local economic impact. Initially, construction material costs for compliant materials may be slightly higher as the market adapts to new regulations.

2017-2018 Environmental Sustainability Task Force Analysis

Enliven Mountain View with native plants and oak trees (**BT1**)						**Outreach**		**Ongoing**	
49	**$180K**	**$0**	**$3763**	■□□	■■□	■□□	■■□	■■■	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

223*	**$180K**	**$0**	**$808.45**	■□□	■■■	■□□	■■□	■□□	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

**Mountain View does not currently account for carbon sequestration as part of its GHG inventory*

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Estimated emissions were adjusted upwards from 49 to 223 MT CO_2e based on calculations of additional carbon sequestration and avoidance rates of California native oak species compared to other common street trees in Mountain View.

Annual carbon sequestration and avoidance rates for various tree species were calculated using the National Tree Benefits calculator,[1] which uses i-Tree's street tree assessment tool. The values used assume an average 3" street tree for each species, recognizing that new street trees will be of small size when planted and have lower benefits at this age. The CO_2 sequestration and avoidance potential for California native oak species was compared to the 5 most common non-native street trees in Mountain View according to the Community Tree Master Plan.[2] The average difference in CO_2 sequestration and avoidance between California native oaks and these trees is shown in the table to the right. Note that as tree sizes increase, the sequestration potential difference between native oaks and common street tree species increases as well. Number of native oak trees planted per year remain the same as in the original recommendation.

Carbon Sequestration by Common Mountain View Street Tree Types

Tree species	**Annual CO2/year (lb)**	
	3"	**6"**
California native oak	51	135
London Planetree	37	101
Chinese pistache	23	59
Sweetgum	28	85
Southern magnolia	17	53
Norway maple	24	65
Average difference:	25.2	62.4

[1] The National Tree Benefit Calculator is based on the i-Tree street tree assessment tool used by Mountain View for its Community Tree Master Plan, and can be found at: http://www.treebenefits.com/calculator/

[2] Mountain View Community Tree Master Plan: https://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=17520

Total CO_2 sequestration and avoidance through 2030 in the table below.

Carbon Sequestration and Reduction from California Native Oak Street Trees

Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	TOTALS
New oaks	250	250	250	250	250	250	250	250	250	250	250	250	**3000**
Cumulative total oaks	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	**3000**
Annual CO2e reduced (lb)	6300	12600	18900	25200	31500	37800	44100	50400	56700	63000	69300	75600	**491400**
Annual CO2e reduced (MT CO2e)	2.86	5.72	8.57	11.43	14.29	17.15	20.00	22.86	25.72	28.58	31.43	34.29	**222.90**

Easy to Measure

Adjusted upward to "easy," as Mountain View's comprehensive GIS-based street tree inventory along with resources such as the tree benefits calculators in i-Tree allow for easy comparison of benefits between tree species and assessment of current canopy benefits.

Other Environmental Benefits

Adjusted downward, to reflect that while increased tree canopy cover provides numerous and significant environmental benefits, the *relative* environmental benefits of native oak species to other adapted tree species is more modest. Maintaining diversity of climate-appropriate trees in size, shape, and care provides important community benefits. Setting large target goals for single species within Mountain View's canopy cover could actually reduce environmental benefits by reducing resistance to disease and pests.

2017-2018 Environmental Sustainability Task Force Analysis

Adopt a consumption-based emissions inventory for Mountain View's GHG accounting **(W16)**				**Process**				**Ongoing**	
369,154	**$167,400**	**N/A**	**$2.36**	■■□	■□□	□□□	□□□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

0	**$65,000**	**N/A**	**N/A**	■□□	■□□	□□□	■□□	■□□	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Instead of a direct GHG benefit, a consumption-based emissions inventory (CBEI) provides value by informing decision-making and prioritizing emissions reduction activities with a holistic view of Mountain View's true impacts on global emissions. The task of developing a CBEI does not have emissions reduction properties since no action is taking place to reduce emissions through this inventory compilation effort. In the current "Final Report of the 2017-2018 Environmental Sustainability Task Force," it is estimated that emissions would be reduced by 396,154 MT CO_2e between 2018 and 2030 as a result of the CBEI; although feasible in the future, these reductions would take place after the CBEI has been developed and this recommended task has been completed. As stated in the report, Mountain View has the potential to reduce emissions *after* the CBEI has been developed because more emissions sources will be accounted for and thus new opportunities can be identified to reduce emissions. However, additional actions would need to be taken to achieve these emissions reductions and aside from the related recommendations in the ESTF-2, these actions have unknown costs and benefits at this point.

It would be the programs developed as a result of a CBEI that would result in GHG emissions reductions rather than the inventory itself. Therefore, no direct GHG emissions reduction has been accounted for in this recommendation.

City's Net Cost

The cost required to complete a CBEI is dependent upon several factors, including the methodology used, the level of data collection, data availability, and whether costs can be shared with other entities. Although the "Final Report of the 2017-2018 Environmental Sustainability Task Force" estimates Mountain View's potential CBEI cost based on the time it

took Oakland to complete its CBEI, it is unlikely that scaling costs down based on population will reflect the effort and resources needed for Mountain View to complete its CBEI. Most CBEIs estimate the GHG footprint of the average household within a certain area but depending on the goals of the entity conducting the CBEI, that data can be very narrow or very broad. For example, the San Francisco Bay Area Neighborhoods, Cities, and Counties CBEI (Bay Area CBEI) collected average household data at Census block-level (of which there are 4,700 in the Bay Area).[1] A simpler method for collecting household consumption data is multiplying the number of households (stratified by income) by the average US/regional consumption baskets for each income strata.[2] More precise data often requires more labor to gather and process, therefore a key driver in the cost of conducting a CBEI.

Ultimately, the cost to develop a CBEI is variable, but the basic criteria for completing a CBEI includes the following[3]:

- Residential GHG emissions
    - Energy, vehicles, and goods/services consumed
- National, regional, and/or local government GHG emissions
    - Services provided to citizens
- Business capital investment
    - Can be omitted based on the argument that consumers (households) are responsible for the emissions output by businesses

Conceptually, a CBEI is equal to the emissions from Mountain View's production, minus the emissions from exported goods and services, plus emissions from imported goods and services:

(Consumption = Production – Exports + Imports)[4]

Table 1 provides additional insight into the data needed to compile a CBEI. Due to an increasingly global economy and availability of disposable income, there are hundreds of possible goods and services consumed within a community. Data collection is often the most time-consuming aspect of developing a CBEI if data collection processes are not already in place. Table 1 outlines common data points where data sources are available as well as potential gaps in data collection.

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[1] Burch, David. "Bay Area Consumption-Based Greenhouse Gas Emissions Inventory." PowerPoint for BAAQMD to Bay Area Regional Collaborative. April 15, 2016.
[2] Allaway, David and Burch, David. "Consumption Based Emissions – Part 1: Inventories." PowerPoint prepared for the West Coast Climate & Materials Management Forum.
[3] According to the *PAS 2070: Specification for the assessment of greenhouse gas emissions of a city* as reported in "CONSUMPTION-BASED GHG EMISSIONS OF C40 CITIES" produced by C40 Cities. Website: https://www.c40.org/researches/consumption-based-emissions
[4] John Barrett, Glen Peters, Thomas Wiedmann, Kate Scott, Manfred Lenzen, Katy Roelich & Corinne Le Quéré. *Consumption-based GHG emission accounting: a UK case study*. Climate Policy. (2013). Pg. 13:4, 451-470, DOI: 10.1080/14693062.2013.788858

Table 1. Required Data Availability

Required Data	Potential Source
Household demographics	US Census & local government sources
Transportation • Vehicle fuel consumption (direct and indirect) • Vehicle manufacturing • Air travel • Public transit	National Household Travel Survey Federal Transit Administration International Organization of Motor Vehicle Manufacturers
Housing • Natural Gas • Electricity • Fuel Oil / Other Fuel • Energy Indirect • Water • Waste • Construction	Utility websites & billing data Waste contractors Estimate tool per individual household: https://coolclimate.berkeley.edu/calculator
Food • Meat • Dairy • Other Food • Fruits/Vegetables • Cereals	USDA (2015) Consumer Expenditures Survey Cost of Living Index
Goods (400-500 product categories) Example goods include: • Small Appliances • Clothing • Furnishings • Cleaning products	Bureau of Labor Statistics Consumer Expenditures Survey Input-Output Life Cycle Assessment Models Global Trade Analysis Project (GTAP)
Services • Vehicle repair • Education • Entertainment and recreation • Health care	Bureau of Labor Statistics Consumer Expenditures Survey Input-Output Life Cycle Assessment Models Global Trade Analysis Project (GTAP)
Business Consumption • Procurement • Construction • Vehicle fuel • Vehicle manufacturing • Air travel • Industrial products	Estimate tool per individual business: http://coolclimate.berkeley.edu/business-calculator
Government Consumption • Construction • Transportation • Capital investment/spending	EPA's State Inventory Tool (SIT)
Compost	Community composting education programs

Table 2 provides a high-level breakdown of the CBEI tasks and their associated time commits.

Table 2 Potential Cost of CBEI Labor

Task Overview	Estimated Hours to Complete	Cost[5]
Collect household demographic data - Identify number of homes and sort by income brackets	40 hours	$3,465
Calculate household consumption - Assign consumption baskets to household at varying income levels using regional/US consumption basket data	48 hours	$4,158
Identify life-cycle emissions factors associated with household consumption - Identify and apply emissions factors to the consumption baskets to determine emissions for each relevant category - Collect market-based emissions factors from relevant utilities	82 hours	$7,104
Collect government consumption data - Build from existing municipal operations GHG inventory - Identify consumption habits - Categories include construction, appliances, and vehicles	240 hours	$20,792
Calculate lifecycle consumption emissions - Identify relevant emissions factors - Complete calculations	250 hours	$21,659
Identify CBEI data gaps and estimate emissions - Identify data gaps - Identify alternative emissions factors/calculation methodologies	70 hours	$6,064
Compile and synthesize data	20 hours	$1,733
TOTAL	**750 hours**	**$64,976**

As a reference, the cost of conducting the Bay Area CBEI conducted in 2015 is estimated at $60,000 when partnered with UC Berkeley's Cool Climate Network. The partnership between the Bay Area Air Quality Management District (BAAQMD), sponsors of the Bay Area CBEI, and UC Berkeley was mutually beneficial; the Bay Area was given a reduced price to complete its

[5] Hourly rate assumes the work would be completed by a City employee at the Analyst level, with a salary plus benefits rate of $180,200.

CBEI with UC Berkeley because the goals and mission of this project were in line with the research being conducted at UC Berkeley's Cool Climate Network at the time. As a result, BAAQMD joined UC Berkeley's network at an advanced membership level. Discussions with BAAQMD staff suggest that UC Berkeley's Cool Climate Network is not looking to complete CBEIs for singular cities if there are no research opportunities on their behalf as a result of the project. Consulting firms, however, quoted a price of roughly $90,000 to complete a regionally scaled CBEI for the Bay Area. Since the Bay Area CBEI was significantly larger than the CBEI Mountain View is considering completing, the cost for Mountain View would likely be less than $90,000 due to the fact that the points of contact for data collection may already be identified. An estimate of roughly $65,000 has been used to reflect potential costs for either a contracted or City staff-produced scenario.

From the labor and timing perspective, the Bay Area CBEI required approximately 200 hours of labor on behalf of BAAQMD, Bay Area officials, and data contacts over the course of one year. However, if Mountain View establishes proper communication plans in place with its partner it would likely take less time to complete the CBEI. The final product, "A Consumption-Based Greenhouse Gas Inventory of San Francisco Bay Area Neighborhoods, Cities and Counties: Prioritizing Climate Action for Different Locations," was published in 2015. This research takes a comprehensive look into one year of the Bay Area's household consumption habits and the associated global emissions. The data collected has been used to inform policy and public educational campaigns. Of the findings, BAAQMD staff remarked that the emissions from food consumption were surprisingly large and this data enabled government-funded efforts to launch educational campaigns regarding the emissions associated with purchased food. Overall, however, the findings of the CBEI were not unlike that of traditional city emissions inventories, indicating that transportation and housing were the largest emissions sources from consumed goods/services.

The report includes the average household carbon footprint for nine counties in the Bay Area, including Santa Clara County where Mountain View resides. Using the Bay Area CBEI resources made publicly available by the CoolClimate Network, Mountain View can use the average household carbon footprint data to determine the emissions from its household entities. Mountain View's average household carbon footprint data can be used to inform its sustainability strategic plan and/or as a data source to inform the Mountain View's own CBEI. If Mountain View is interested in pursuing its own CBEI, there are two pathways it can take to develop this inventory.

> ***Pathway 1:*** *Mountain View could build its CBEI using the data collected and published in the Bay Area CBEI. Since the Bay Area CBEI only addresses household emissions, business sector emissions are treated as intermediary and not final user emissions, and government activities are not accounted for, Mountain View would need to collect the full life-cycle emissions of goods/services consumed by government entities (at a minimum). One potential negative to using this pathway is the relevance of the emissions data. The Bay Area CBEI used data from*

2013, therefore Mountain View would have to use 2013 emissions data for its government entities to create a complete and consistent CBEI inventory.

Pathway 2: *If Mountain View is committed to developing a CBEI inventory with an emissions base year more recent than 2013, it would need to develop the inventory from scratch. To expedite the process, it is likely that Mountain View could consider partnering with research institutions such as UC Berkeley's CoolClimate.*

If Mountain View is not interested in pursuing its own CBEI, the data provided by the Bay Area CBEI can still be used to inform the household consumption habits for the inhabitants of Mountain View. This data can be used to inform Mountain View's sustainability strategic plan which may include additional public education campaigns regarding household emissions reductions. One of the recognized downfalls of CBEI is that the parties who are ultimately responsible for emissions reduction are the consumers, the households and the government entities, rather than the suppliers.[6] The emissions accounted for within the CBEI reflect the consumption habits of Mountain View's population; therefore, to see impactful emissions reductions the consumers would need to change their consumption habits to low-emission sources. It is argued that when the suppliers themselves are expected to change their behavior and provide a lower-emission goods/services, emissions reductions are more significant.

Accounting for consumption-based emissions in climate planning at the city level is important for obtaining the full picture of the environmental and climate impacts of the city, whether or not a full formal CBEI is developed.

Net Cost per MT CO_2e

With zero emissions reductions, the net cost per MT CO_2e calculation is not applicable.

Easy to Implement

Implementation depends on data collection, this may be "very hard" instead of "hard" if data collection and analysis mechanisms are not in place within Mountain View's government. Emissions factors that would come from energy suppliers may also require additional time and effort to gather. Developing an excel workbook will require upfront investment of effort but can be reused and refined to accommodate future year inventories.

Local Economic Benefits

Future economic benefits may arise due to the increased transparency regarding Mountain View's consumption habits and a preference for locally sourced goods with lower transportation emissions. For example, local businesses could use this data as a business opportunity to identify emissions reductions opportunities and pitch their sustainable

[6] Afionis, S. , Sakai, M. , Scott, K. , Barrett, J. and Gouldson, A. (2017), Consumption-based carbon accounting: does it have a future?. WIREs Clim Change, 8: e438. doi:10.1002/wcc.438

goods/services to environmentally-aware consumers in Mountain View, which could also help the city meet its GHG reduction targets.

Another possible benefit of developing CBEI expertise is if it is done by data analytics or consulting firms from Mountain View, this is a skillset that could be used to sell this service to other jurisdictions interested in completing their own CBEIs. Shared CBEI sponsorship may also result in opportunities for additional collaborative government work, such as the collaboration on the Bay Area CBEI.[7]

None of these potential local economic benefits are easily quantifiable or guaranteed, but they represent possible benefits.

[7] Jones, C. M, & Kammen, D. M. (2015). A Consumption-Based Greenhouse Gas Inventory of San Francisco Bay Area Neighborhoods, Cities and Counties: Prioritizing Climate Action for Different Locations. *UC Berkeley*. Retrieved from https://escholarship.org/uc/item/2sn7m83z

2017-2018 Environmental Sustainability Task Force Analysis

Adopt a citywide ban on single-use disposable plastic foodware **(W9)**						**Ordinance**		**Permanent**	
22,500	**$213K**	**Unknown**	**Unknown**	■■□	□□□	□□□	■□□	■■■	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

Unknown	**$213K**	**Unknown**	**Unknown**	■■□	□□□	□□□	■■□	■■■	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted to reflect difficulties in calculating the GHG impacts due to unknowns about the specific scenario proposed. Since GHG emissions calculations in the original ESTF-2 report were based on lifecycle and not just disposal, it is more accurate to calculate the net difference between plastic items and their compostable replacements rather than just the avoided plastic production. Most studies suggest that from a lifecycle analysis (LCA) standpoint, compostable disposable foodware yields few, if any GHG reduction benefits compared to non-compostable disposable foodware, though this can vary based on the method of disposal. As outlined in the original report, reusable foodware is the only scenario under which GHG emissions reductions are both likely and guaranteed. As it was impossible to evaluate the wide range of potential outcomes without specific program details, staff was unable to produce an estimate, though it is likely to be close to zero net GHG emissions reduction unless significant numbers of businesses switch to reusable foodware. However, there are substantial additional environmental benefits to reducing plastic waste, as noted in the original recommendations.

Calculation Details

Actual GHG emissions are very difficult to quantify for this recommendation, as they depend greatly on the specific materials compared and the method of disposal of the final product. For example, the majority of literature suggests there is very little difference in lifecycle GHG emissions between PLA bioplastics and PET plastic clamshell food containers.[1] However, a study commissioned by CalRecycle suggests that disposal or recovery methods can impact Ironically, landfilled PLA has a lower lifecycle carbon footprint than recycled or landfilled PET,

[1] Sheehan, B. (2017). *Literature Review and Inventory: Greenhouse Gas Impacts of Disposable vs Reusable Foodservice Products*. Prepared for Clean Water Action/Clean Water Fund. Retrieved from: https://www.cleanwater.org/sites/default/files/CA_ReTh_LitRvw_GHG_FINAL.pdf

as it is effectively sequestering the carbon used in its production. However, recycled PET has a lower lifecycle carbon footprint than composted PLA, as PLA is more energy-intensive to produce and transport, and the composting process releases the sequestered carbon.[2] A study on the LCA of compostable clamshells made from bagasse suggest that the lifecycle GHG emissions impacts may not be significantly lower than recyclable single-use plastics, though the methodologies vary so it is difficult to directly compare.[3] Most recent studies suggest that reusable foodware will yield the best long-term GHG emissions reductions, and should be prioritized whenever possible.[4]

Actual GHG emissions reductions will depend highly on the specific items banned in any ordinance, acceptable replacement materials, how any materials are disposed of, and how many businesses switch to reusable foodware. This recommendation could have much more significant GHG emissions reduction potential and environmental benefit if food service businesses switch to reusable foodware for all dine-in service, rather than simply substituting compostable or recyclable disposable options. All GHG emission reductions quantified in the original recommendation and described above would be considered part of a consumption-based inventory and not part of those currently quantified in Mountain View's inventory.

City's Net Cost

The cost estimations in the original recommendation seem reasonable, though staff notes that depending on the specifics of implementation, there may be additional costs to the city. Possible costs could be incurred from providing a technical assistance program or making micro-grants available to businesses to support the transition to reusable foodware, which other cities have offered to support both voluntary and mandatory waste reduction programs.

Incremental Net Cost

Incremental costs will depend greatly on whether businesses substitute current disposable plastic foodware with acceptable recyclable or compostable alternatives, or switch to reusable food service products. As noted in the original recommendation, the cost of compostable single-use items is higher than comparative plastic foodservice items. However, businesses that are able to switch to reusable items for dine-in service can see large cost savings, as noted in the *Local Economic Benefits* section.

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[2] Kuczenski, B., Geyer, R., & Trujillo, M. (2012). *Plastic Clamshell Container Case Study* (Report for CalRecycle). Retriefed from https://www2.calrecycle.ca.gov/publications

[3] Harnoto, M (2013). *A Comparative Life Cycle Assessment of Compostable and Reusable Takeout Clamshells at the University of California, Berkeley*. Retrieved from: https://nature.berkeley.edu/classes/es196/projects/2013final/HarnotoM_2013.pdf

[4] Sheehan, B. (2017). *Literature Review and Inventory: Greenhouse Gas Impacts of Disposable vs Reusable Foodservice Products*. Prepared for Clean Water Action/Clean Water Fund. Retrieved from: https://www.cleanwater.org/sites/default/files/CA_ReTh_LitRvw_GHG_FINAL.pdf

Local Economic Benefits

Adjusted upwards to reflect potential cost savings from businesses that choose to switch to reusable food service ware, which can yield significant long-term savings over disposable items. Conversations with staff at Clean Water Action's ReThink Disposable campaign indicate most businesses they work with have a payback period of less than one year for the switch to reusable foodservice items, with most seeing ongoing annual savings of between $1,500-$6,000.

2017-2018 Environmental Sustainability Task Force Analysis

Implement a sustainable landscaping program in Mountain View **(W12)**						**Voluntary & mandatory (2023)**		**12 years**	
5,770	**$307K**	**$173K**	**$160**	■□□	■■□	■□□	■□□	■■■	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

92.9 - 526.8	**$307K**	**$173K**	**$911.16 - $5,166.85**	■□□	■□□	■□□	■□□	■■■	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

GHG emissions reductions were adjusted to reflect lower projected GHG emissions from the leaf blower ban, as well as lower potential reductions from converting City equipment to electric models. GHG emissions reductions from lawn replacement were slightly higher than originally estimated.

Two scenarios were considered for emissions from a Leaf Blower Ordinance, a residential-only ban and a full citywide ban on gas-powered leaf blowers or vacuums. The total resulting GHG emissions reductions from all measures included in this recommendation are noted in the following table:

Measure	**Total GHG Emissions Reduction 2018-2030 (MT CO_2e)**
Lawn replacement	55
Leaf blower incentives and ordinance	27.1 (residential ban only) 461.0 (all leaf blowers)
Mountain View Operations (landscaping equipment electrification)	10.8
TOTAL:	92.9 - 526.8

Calculation Details

The original recommendation estimated that 45% of lawn and garden emissions were from leaf blowers, but according to the OFFROAD model, only about 4.4% of total lawn and garden GHG emissions in Santa Clara County are from leaf blowers and vacuums. Residential leaf blowers

and vacuums account for only 0.25% of total annual lawn and garden GHG emissions in the County.

Assumptions:

- An ordinance banning leaf blowers may only apply to residential use, not commercial properties, as is the case with similar ordinances in the area. Scenarios for a ban on only residential leaf blowers or all gas-powered leaf blowers are considered.
- Emissions estimates for lawn and garden equipment from the OFFROAD model created by the California Air Resources Board were used for these projections, which is the same source and methodology used for Mountain View's GHG emissions inventory.
- Business-as-Usual Emissions from residential landscaping and garden equipment would scale with projected increase in number of households (projections from ESTF-2 BAU estimates used for the purposes of this analysis). Generally, the ratio of households at the County and City level is used to downscale the OFFROAD data for the purposes of creating Mountain View's Community GHG inventory.
- Estimated percent reduction in GHG emissions from implementation of the leaf blower ordinance are the same as in the original recommendation analysis.

According to the OFFROAD model, total GHG emissions from leaf blowers/vacuums in 2017 was 4.35 MT CO2e for residential equipment, and 76.78 MT CO2e for all leaf blowers/vacuums in the City. These totals were used to project total emissions reductions through 2030 as detailed in the following table. Emissions from the voluntary program are estimated by using the per-unit annual $MTCO_2e$ calculated from the OFFROAD model.

GHG Emissions Reductions from Leaf Blower Replacement Incentives and Ordinance

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
leaf blowers replaced (incentives)		0	42	42	85	202	424							
Percent GHG reduction from ordinance							20%	30%	40%	60%	75%	85%	90%	90%
GHG from leaf blowers: residential (MT CO_2e)		4.35	4.42	4.49	4.57	4.65	4.75	4.85	4.95	5.05	5.16	5.28	5.40	5.54
GHG from leaf blowers: all (MT CO_2e)	76.78	78.00	79.25	80.52	81.94	83.51	85.24	87.03	88.85	90.71	92.61	94.69	96.98	99.48
GHG reduced: residential (MT CO_2e)	0	0	0.07	0.07	0.14	0.33	0.68	4.85	4.95	5.05	5.16	5.28	5.40	5.54
GHG reduced: residential (MT CO_2e)	0	0	0.068	0.136	0.273	0.599	17.05	26.11	35.54	54.42	69.46	80.49	87.53	89.53

Emissions from the City switching to electric landscaping equipment have been reduced due to limited availability of electric models that meet the use conditions for the City. The City currently utilizes electric landscaping equipment for some applications, especially in downtown, near parks, or in areas where noise complaints are an issue. Staff can evaluate the potential to replace more gasoline-powered equipment with electric models; however, currently utilized electric equipment has presented problems with battery life and run time. Landscaping equipment at City facilities generally has significantly longer run time requirements and is used in more remote areas than standard residential uses, making it a challenge to shift to electric models with limited battery life and inability to immediately refuel/recharge. Shifting all gasoline-powered landscaping equipment to electric models will be contingent on comparable-performing electric options being available that are appropriate for the specific conditions and uses at City facilities, and sufficient funds to cover the cost premium for electric models.

Given these factors, estimates have been reduced to 3 pieces of equipment per year, or roughly half of the originally projected 78 pieces of lawn and garden equipment through 2030. Emissions reductions are estimated by using an average per-unit annual emissions for lawn and garden equipment as calculated by the OFFROAD model, as there are many different types of gas-powered City landscaping equipment that could be replaced as part of this program.

Estimated GHG Emissions Reductions from City Equipment Replacement

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Number of pieces of landscaping equipment replaced	3	3	3	3	3	3	3	3	3	3	3	3
Cumulative number of replacements	3	6	9	12	15	18	21	24	27	30	33	36
Total Annual GHG emissions reductions (MT CO2e)	0.14	0.28	0.42	0.55	0.69	0.83	0.97	1.11	1.25	1.38	1.52	1.66

Estimated GHG emissions reductions from lawn replacement were calculated only based on water savings, using the average lawn size for the San Francisco/San José area of 6,308 square feet[1] and an average expected water savings from lawn replacement of 31 gallons per square foot per year.[2] GHG emissions were estimated using the energy intensity of water based on calculations from Mountain View's GHG inventory. Number of expected lawn replacements (10 per year for a total of 120) were not changed from the original ESTF-2 report.

[1] http://www.ppic.org/content/pubs/cep/EP_706EHEP.pdf

[2] http://toolbox.calwep.org/w/images/9/98/Turf_Removal_%26_Replacement_-_Lessons_Learned.pdf

Estimated GHG Emissions Reductions from Lawn Replacement

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Lawns replaced per year	10	10	10	10	10	10	10	10	10	10	10	10
Cumulative lawns replaced	10	20	30	40	50	60	70	80	90	100	110	120
Total annual water savings (MG)	1.96	3.91	5.87	7.82	9.78	11.73	13.69	15.64	17.60	19.55	21.51	23.47
Electricity used (kWh)	4389	8778	13167	17556	21952	26341	30730	35118	39507	43896	48285	52674
GHG emissions reduced (MT CO2e)	0.783	1.544	2.285	3.003	3.702	4.378	5.033	5.666	6.278	6.869	7.438	7.986

Total estimated GHG emissions reductions through 2030 are estimated at 55 MT CO_2e.

Net Cost per MT CO_2e

Net Cost per MT CO2e was adjusted to reflect new GHG emissions reduction estimates.

Easy to Measure

Adjusted downward to "hard to measure results from this recommendation," as emissions from lawn and garden equipment are not actually measured for inventory purposes. GHG emissions for all off-road equipment are estimated using CARB's OFFROAD model, which produces County-level emissions estimates that are downscaled to the city level based on jobs ratios (for construction equipment) or relative number of households (for lawn and garden equipment). In order to account for GHG emissions reductions from this measure, staff would need to estimate the reduction in number or percentage of leaf blowers and manually adjust the calculations in the model. However, it would still be a modeled estimate rather than an actual measurement of changes in GHG emissions.

2017-2018 Environmental Sustainability Task Force Analysis

Partner with Palo Alto to install anaerobic digesters to produce clean energy (**W15)**						**Educational, Incentive, Voluntary**		**Permanent**	
8,304	**$11.4M**	**$0**	**$275**	■□□	■□□	■□□	■■□	■■■	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

1,118	**$33.75M**	**Unknown**	**$30,188**	■□□	■■■	■□□	■□□	■■■	■■□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted based on actual reported emissions from the Palo Alto Regional Water Quality Control Plant's annual Internal Greenhouse Gas Report, as detailed in Table 1 below. For 2017, total reportable GHG emissions from combustion of biosolids at the RWQCP were 218 MT CO_2e, including landfill gas and green natural gas used in the incinerators.[1]

Table 1. 2017 Emissions from Incineration of Biosolids at RWQCP

Emission Source	MT CO_2e
Incinerator – Biosolids Combustion	201
Incinerator – Landfill Gas Combustion	5
Incinerator – Green Natural Gas Combustion	12
TOTAL:	**218**
Emissions Attributable to Mountain View (38.71%)	**84.4**

Since the direct CO_2 emissions from biosolids combustion are considered biogenic rather than anthropogenic, only the N_2O and CH_4 emissions are accounted for in GHG inventories. Mountain View's share of the wastewater volume for 2017 was 38.71%, so the approximate amount of these emissions attributable to Mountain View is 84.4 MT CO_2e.

To calculate projected emissions through 2030 (timeline for ESTF-2 recommendations) and 2035 (end of wastewater partner agreement between Mountain View and RWQCP), projected wastewater flows were used to scale the 2017 emissions based on expected growth. These projections from the RWQCP Long Range Facilities Plan were provided by the City of

[1] (Engelage, 2018)

Mountain View in the 2010 Urban Water Management Plan and 2010 Sewer System Master Plan.[2] Projected GHG emissions for biosolids treatment through 2035 are estimated in Table 3.

The timeline for operation is assumed to proceed along with the timeline outlined in the 2014 City of Palo Alto Staff Report.[3] This assumes that the incinerators will be offline and demolished by the end of 2018, with an interim plan for dewatering and transporting biosolids to off-site anaerobic digestion facilities in San José. The anaerobic digestion facilities planned for the RWQCP are expected to be operational by mid-2022 according to this timeline. Total GHG emissions reductions through 2030 are calculated using the assumption that emissions from the biosolids incinerators will be eliminated starting in 2019.

Table 2. Projected Wastewater Flows and GHG Emissions from Biosolids Incineration for the City of Mountain View

Year	MGD	% of 2017 value	GHG Emissions (MT CO2e)
2015	8.8	94%	-
2016	9.08	97%	-
2017	9.36	100%	84.4
2018	9.64	103%	86.92
2019	9.92	106%	89.45
2020	10.2	109%	91.97
2021	10.24	109%	92.34
2022	10.28	110%	92.70
2023	10.32	110%	93.06
2024	10.36	111%	93.42
2025	10.4	111%	93.78
2026	10.42	111%	93.96
2027	10.44	112%	94.14
2028	10.46	112%	94.32
2029	10.48	112%	94.50
2030	10.5	112%	94.68
2031	10.54	113%	95.04
2032	10.58	113%	95.40
2033	10.62	113%	95.76
2034	10.66	114%	96.12
2035	10.7	114%	96.48
Total 2019-2030			**1118.30**
Total 2019-2035			**1597.11**

The estimated annual GHG reduction for an anaerobic digestion facility at the RWQCP in a 2014 Palo Alto City Council Staff Report was much higher, but was based on avoided natural gas use.[4] Since the RWQCP now uses 100% green natural gas, there is no longer any GHG emission reduction associated with reducing natural gas use.

The excess power produced would be either sold to the City of Palo Alto's utility or used on-site to offset RWQCP electric needs, depending on the more financially beneficial arrangement. Since the RWQCP currently uses 100% GHG-free power and purchased green natural gas, there are no direct GHG reduction benefits from reducing energy usage on-site. Emissions reduction from sale of this energy for use off-site (by replacing another power source with cleaner, biogas-derived energy) would not be attributable to the City of Mountain View but could count towards "Other Environmental Benefits."

The total estimated GHG emissions reduction through 2030 is 1118.3 MT CO_2e. The net cost per

[2] (Carollo, 2012)
[3] (City Manager, City of Palo Alto, 2014)
[4] (City Manager, City of Palo Alto, 2014)

MT CO_2e is $30,179.74 for expected reductions through 2030, and $21,131.95 through 2035, which is when Mountain View's partner agreement with the RWQCP expires.

City's Net Cost

Adjusted capital cost estimates from $11.1M in original recommendation to reflect cited value of $33.75M in the Palo Alto RWQCP Long Range Facilities Plan. This is the preliminary partner cost allocation for Mountain View for the Anaerobic Digestion facility out of a total estimated project cost of $89M.[5] The cost of staff time was removed from this estimates, as RWQCP accounted for planning costs in their project cost estimates. The anaerobic digestion option will not likely require incrementally more City staff time than the other alternatives in the RWQCP Long Range Facilities Plan, and these would be part of regular duties of existing staff.

Incremental Net Cost

Significant capital costs for new infrastructure at the RWQCP such as the digesters would likely need to be at least partially recovered through rate increases to customers, though these are difficult to estimate. However, the incremental net cost would certainly be non-zero.

Net Cost per MT CO_2e Reduction

Adjusted to reflect new estimates for GHG emissions reduction and net cost to City. This value does not include any potential incremental net costs from rate increases to customers, as these were too difficult to estimate.

Easy to Measure

Adjusted upwards to "easy" based on fact that the RWQCP quantifies GHG emissions as part of annual report, so emissions both before and after implementation would be well-documented.

Works Cited

Carollo. (2012, October). *Long Range Facilities Plan for the Regional Water Quality Control Plant Final Report.* Retrieved August 8, 2018, from City of Palo Alto: https://www.cityofpaloalto.org/civicax/filebank/documents/32042

City Manager, City of Palo Alto. (2014, April 29). *City Council Staff Report ID#4550: Direct Staff to Pursue the Four-Component Organics Facilities Plan.* Retrieved August 8, 2018, from City of Palo Alto: https://www.cityofpaloalto.org/civicax/filebank/documents/40031

Engelage, S. (2018). *Palo Alto Regional Water Quality Control Plant Internal Greenhouse Gas Report - Emission Year 2017.* City of Palo Alto.

[5] (Carollo, 2012)

2017-2018 Environmental Sustainability Task Force Analysis

Lead collaboration among Bay Area cities to develop a solution to overseas recycling crisis **(W1)**						**Collaboration, leadership**		**Ongoing**	
Unknown	**$309K**	**Unknown**	**Unknown**	□□□	□□□	□□□	■□□	■■■	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

Unknown	**$0**	**Unknown**	**Unknown**	□□□	□□□	□□□	□□□	■■■	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

City's Net Cost

Revised to reflect minimal to zero additional staff time required from the City, as this effort is already underway at the State level, and any staff support from the City would likely be covered as part of existing responsibilities. Additionally, the State is a more appropriate lead agency for studies in this area. The development of domestic markets for recyclables is an active focus of CalRecycle, the State agency charged with overseeing waste management and diversion efforts in California. Because many factors can influence the demand for recycled materials, the State has an appropriate high level view of the issue. Minimum recycled-content requirements for manufacturers (through legislation), grants to help fund processing facilities and the development of products that use recycled materials, and business incentives are most effective at a State level rather than a regional or local one. Currently, CalRecycle has funding programs specifically addressing this issue, including the Recycling Market Development Zone Loan Program[1] to encourage California-based recycling businesses to site new manufacturing facilities and expand existing operations. The intent of this program is to help California manufacturers increase their processing capabilities and create additional markets for recycled-content products.

Local Economic Benefits

Reduced, as new facilities developed as part of this initiative are likely not in the immediate region. Plastics collected in Mountain View's recycling programs already go to the HDPE Processing Center in Lodi, CA, which is mentioned in the original recommendation. City staff will continue to support State efforts in this area and work with partners in the SMaRT center to examine possible domestic markets for recyclable materials.

[1] https://www.calrecycle.ca.gov/RMDZ/Loans/

2017-2018 Environmental Sustainability Task Force Analysis

Pass a resolution to support "Green Monday" **(W2)**						**Resolution, Outreach**		**Ongoing**	
115,803	**$78,580**	**$0**	**$0.68**	■■■	■■□	□□□	■■□	■■■	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

32,726	**$82,900**	**$0**	**$2.53**	■■■	■□□	□□□	■■□	■■■	■■■
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Estimated GHG emissions reductions were reduced based on reasonably expected participation rates. The original recommendation calculated the full potential emissions reduction from every resident and 50 percent of employees switching from a meal containing meat to a vegetarian meal once a week, but achieving this level of participation is highly unlikely. This also assumes that all Mountain View residents and employees currently eat meat at most or all meals, while data shows higher than average consumption of vegetarian meals in the region.[1] All emissions reductions estimated from this measure would be considered part of a consumption-based inventory, rather than those captured in Mountain View's current GHG inventory.

Calculation Details

Assumptions changed from original calculations:

- Participation rate in a Green Mondays campaign will be less than 100%. Participation in a Meatless Mondays campaign in the town of Bedford, New York reached about 50% of the households in the town (320 out of 649).[2] Participation rates are assumed to be lower for a larger city such as Mountain View, where individual outreach will reach a smaller percentage of the population.
- Not all residents who pledge to participate in a Green Mondays campaign will consistently opt out of consuming meat, and participation rates will likely decline over time. However, this may be offset by overall declines in meat consumption.
- Not all Mountain View residents and employees currently eat meat at every meal. Recent polling suggests that 3.3% of the U.S. population is strictly vegetarian, and that

[1] https://www.huffpost.com/entry/vegetarian-cities-in-america_n_56200629e4b050c6c4a4f155
[2] http://bedford2020.org/meatless-mondays/

39% of people in the western part of the U.S. always or sometimes eat meals without meat, fish, or poultry when eating at a restaurant.[3] Accounting for existing vegetarians and others who choose not to eat meat is important for accurately calculating the incremental effect of this measure.

- The vast majority of working Mountain View residents work outside the City, and are likely consuming at least one meal outside the City during work days. Employees who do not live in the City likely only consume one daily meal at most in the City. This will reduce effective participation rates from Mountain View's perspective, as both employees and residents may choose to opt out of meat consumption for a meal that is not consumed in Mountain View.

Taking the above into consideration, the incremental participation rate were reduced to 30% of residents and 15% of employees. This is intended to account for the percentage of residents and employees already opting out of meat consumption. This is still a generous estimate of participation in this type of initiative; it is quite likely actual participation rates would be lower.

Given these assumptions, the resulting GHG emissions reductions through 2030 would be 32,726 MT CO_2e:

Annual GHG Emissions Reductions from a "Green Mondays" Campaign in Mountain View

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Residents	83,618	85,290	86,996	88,736	90,511	92,321	94,167	96,050	97,971	99,930	101,929	103,968
Employees	107,810	111,044	113,265	115,530	117,841	120,198	122,602	125,054	127,555	130,106	132,708	135,362
GHG emissions reductions (MT CO2e)	2431.4	2489.6	2539.4	2590.1	2641.9	2694.8	2748.7	2803.6	2859.7	2916.9	2975.2	3034.8

City's Net Cost

Adjusted slightly upward to reflect higher staff time estimates for Green Monday sister city partnership (12 hours/month instead of 8 hours/month in year three). This adds $4,320 to the City's cost for a total of $82,900.

Cost per MT CO_2e Reduction

Adjusted to reflect new values for GHG emissions reduction and City's net cost.

Easy to Measure

Reduced to reflect that residents would sign a pledge to participate in Meatless/Green Mondays, but it is impossible to measure actual participation rate.

[3] https://www.vrg.org/nutshell/Polls/2016_adults_veg.htm

2017-2018 Environmental Sustainability Task Force Analysis

Expand Mountain View's composting program to all residential and commercial properties **(W5)**						**Mandatory**		**Permanent**	
91,837	**$225K**	**Unknown**	**$2.45**	■□□	■■■	□□□	■□□	■■□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

5,756-11,512	**Unknown**	**Unknown**	**Unknown**	■□□	■■■	□□□	□□□	■■□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Estimated GHG emissions reductions were adjusted to better reflect City waste generation data and account for lower than estimated diversion based on the existing food scraps pilot. The original recommendation assumed all potentially compostable waste could be diverted from landfill, but this is highly unlikely based on preliminary data from the single-family food scraps program.

Calculation Details

Assumptions/changes:

- Business-as-usual projections for multifamily housing units from the ESTF-2 BAU projections were used for these estimates and were not adjusted.
- Waste generated per muti-family dwelling (MFD) unit remains constant through 2030. Based on the City's data for waste generation in 2015, MFDs produced 11,391 tons of waste, with 18,939 MFDs citywide. This value of 0.6 tons per MFD was used to extrapolate total waste generation through 2030 based on number of units.
- Participation rate was left at 50% as calculated in the original recommendation, though staff notes this is extremely optimistic based on results from the single-family food scraps pilot.
- The percentage of compostable trash sent to landfill for MFD is 31.4% based on the 2010 Waste Characterization study, rather than the 35% used in the original recommendation.
- Half of potentially compostable waste will be diverted from landfill under the MFD for participating households.

- Emissions reductions from fertilizer production displacement credits are not accounted for in Mountain View's inventory and were not included as part of these calculations.
- Breakdown of compostable waste based on Mountain View's 2010 Waste Characterization study.
- Emissions factors for categories of compostable waste from ICLEI's Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions.[1]

Estimated Organics Waste Diverted from Landfill

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Multifamily Housing Units	20,702	21,220	21,804	22,458	23,188	23,942	24,720	25,523	26,352	27,274	28,297	29,429
Participating households	10,351	10,610	10,902	11,229	11,594	11,971	12,360	12,762	13,176	13,637	14,149	14,715
Waste Generated (tons)	6225.7	6381.5	6557.1	6753.8	6973.3	7200.0	7434.0	7675.5	7924.8	8202.1	8509.7	8850.1
Compostable trash sent to landfill (tons)	1954.9	2003.8	2058.9	2120.7	2189.6	2260.8	2334.3	2410.1	2488.4	2575.5	2672.1	2778.9
Estimated diverted compostable waste (tons)	977.4	1001.9	1029.5	1060.3	1094.8	1130.4	1167.1	1205.1	1244.2	1287.7	1336.0	1389.5

Estimated GHG Emissions Reductions 2019-2030 from MFD Composting

Maximum possible diverted compostable waste (tons)	35228.3
Likely diverted compostable waste (tons)	17614.1
Maximum GHG emissions reduction (MT CO2e):	11512
Likely GHG emissions reduction (MT CO2e):	5755.9

City's Net Cost

The original recommendation estimates $225,000 in additional staff costs over four years to implement this measure. These projected costs have been eliminated from the estimate, as City staff anticipate that a multifamily composting program will be implemented within existing staffing levels. However, there are likely to be some additional costs from program implementation, though program details and associated costs will be largely contingent on the success of various measures tested as part of the pilot program. As this is a program that is currently in progress, cost estimates will not be developed as part of this report, as they may not accurately reflect program conditions.

Local Economic Benefits

It is unlikely that there will be measurable economic benefits from implementation of this measure.

[1] ICLEI's Community Protocol: http://icleiusa.org/publications/us-community-protocol/

2017-2018 Environmental Sustainability Task Force Analysis

Create a new Sustainability Office for Mountain View (**O1)**				**Staffing**				**12 yrs.**	
Unknown	**$6.5M**	**$0**	**Unknown**	■■□	■■□	■□□	■■□	■■■	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

Unknown	**$5.3M**	**$0**	**Unknown**	■■□	■□□	■□□	■■□	■■■	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

City's Net Cost

Adjusted to reflect change from recently increased staffing levels for the Environmental Sustainability program. The net change reflects current staffing levels as budgeted for FY18-19, reducing total cost over 12 years from $6.5M to $5.3M. This would result in a net increase of 1.5 FTE for sustainability staff based on current budgeted levels, and a net increase of 2.5 FTE from actual staffing levels. Breakdown of change in annual staffing costs is detailed in the table below:

Proposed		**Existing**	
Position	**Total Budgeted Cost (Salary+Benefits)**	**Position**	**Total Budgeted Cost (Salary+Benefits)**
Chief Sustainability Officer	$250,000	-	-
Sustainability Coordinator	$195,100	Sustainability Coordinator	$195,100
Sustainability Analyst I/II	$180,200	Sustainability Analyst I/II	$180,200
Sustainability Analyst I/II	$180,200	Sustainability Analyst I/II 0.5	$94,000
Sustainability Specialist	$154,500	Sustainability Fellow	$50,000
TOTAL:	**$960,000**	**TOTAL:**	**$519,300**

Easy to Measure

Adjusted downwards to "hard" to reflect that emissions reductions attributable to increased staffing are difficult to quantify.

2017-2018 Environmental Sustainability Task Force Analysis

Implement a community and business outreach initiative **(O2A)**						**Outreach**		**2019-2030**	
Unknown	**$3.6M**	**$0**	**Unknown**	■■□	■□□	■□□	■□□	■■■	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

Unknown	**$3.6M**	**$0**	**Unknown**	■■□	■□□	■□□	■□□	■■■	■□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

City's Net Cost

Unchanged from original ESTF-2 report, but staff notes that the costs included in this estimate are for $300,000 to cover outreach efforts each year and do not explicitly cover staffing needs to implement this outreach initiative, which are covered in recommendation O1. Ultimately, the City's net cost to implement this program will be dependent on whether staffing needs are met through adoption of other recommendations.

2017-2018 Environmental Sustainability Task Force Analysis

Provide community engagement tools to facilitate household-level GHG reductions **(O2B)**						**Outreach**		**12 years**	
29,940	**$1.6M**	**N/A**	**$54.76**	■■■	■■□	■■□	■■□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

29,940*	**$1.6M**	**N/A**	**$54.76**	■■■	■■□	■□□	■■□	■■□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

**MT CO_2e reduction represents consumption-based emissions, not GHG emissions accounted for in Mountain View's current inventories.*

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

No adjustments made to total, but noting that reductions are likely to be consumption-based rather than the type of emissions accounted for in Mountain View's Community GHG Inventory. The GHG emissions reductions from any measures that would count towards the Community Inventory (replacing a natural gas water heater with a heat pump, replacing a gasoline vehicle with an EV, etc.) would be accounted for in other recommendations.

Private Investment Leverage

Adjusted downward to "less than $1 of private investment per dollar of public investment," as the total cost to the city per household will likely be higher than the average net cost to participating households.

Other Environmental Benefits

Adjusted upwards to "significant benefits though possibly hard to measure" to account for the fact that the Cool Block platform is broader than just GHG emissions reduction, and includes other sustainability actions like water conservation.

2017-2018 Environmental Sustainability Task Force Analysis

Conduct annual summit to review and track county, state, and federal sustainability actions **(O3)**						**Outreach**		**12 years**	
Unknown	**$504K**	**$0**	**Unknown**	■■■	■□□	□□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

Unknown	**$504K**	**$0**	**Unknown**	■■□	■□□	□□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

City's Net Cost

Cost estimates were not adjusted, but it should be noted that $24,000 seems to be a conservative estimate for an event which would have a large public audience. In order to accurately estimate costs, more specifics about the summit event would be needed, such as the expected attendance, need for breakout sessions/additional rooms, whether food would be provided, and whether or not the event would have registration fees to completely or partially recover event costs.

It should also be noted that feasibility of this measure at estimated costs noted above are dependent on staffing levels from recommendation O1 being approved and implemented.

There may be alternative formats for this type of regional dialogue worth investigating, including workshops, quarterly meetings, or regular regional conference calls. Additionally, it may be more appropriate for an external group focused on regional collaboration such as Joint Venture Silicon Valley or the County to take the lead on such an effort. These changes could significantly reduce costs to the City.

Easy to Implement

Adjusted downwards to "somewhat easy" to reflect the logistical difficulties of convening an event that could include appropriate representatives from all the listed cities, state and county officials, and members of the public.

2017-2018 Environmental Sustainability Task Force Analysis

Manage Mountain View's emissions budget as carefully as its financial budget (**M1**)						**Mandatory, Permanent**		**2019-2030**	
256,220	**$1.4M**	**$0**	**$5.66**	■■□	■□□	□□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

376,220*	**$1.3M**	**$0**	**$3.48**	■■■	■□□	□□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

**This total estimate includes 16,220 MT CO_2e in direct emissions reductions for Mountain View, plus 360,000 MT CO2e in offsets, which reduce emissions elsewhere to offset Mountain View's emissions but do not represent direct reductions in the City.*

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted upward to reflect higher estimated overshoots of GHG emissions reduction targets in earlier years based on recent inventories, resulting in larger than estimated purchases of offsets. The purchase of carbon offsets does not reduce Mountain View's GHG emissions, but "offsets" them by funding GHG emissions reduction projects elsewhere. Without direct investment in GHG emissions reduction in the City, Mountain View's GHG emissions will continue to increase.

City's Net Cost

Adjusted cost estimates as follows:

- Due to GHG inventory streamlining as part of Google Civic Leadership project, there should not be additional cost to complete preliminary GHG inventories (however, see *Timeline* note below regarding how quickly inventories can be completed). This removes $60,000 from the City's Net Cost for 2019-2030.
- Minimal additional staff time expected to track emissions budget and incorporate this information into City's budgeting process. Estimate at approximately 20 hours per year.
- Consultant costs: if the City continues to use Fehr & Peers for annual VMT analysis, this would result in an estimated cost of $120,000 over 12 years (likely costs were quoted at $5,000-$10,000 per year once a travel model has been developed). If this cost can be eliminated, the net Cost per MT CO2e could be reduced to $3.16. The City is exploring possible alternatives for VMT estimates for GHG inventory purposes.
- Emissions overshoots: estimates were adjusted upwards in first few years of implementation to reflect current conditions. In 2015, Mountain View exceeded its GHG

emissions reduction targets by over 130,000 MT CO_2e. This difference is much greater than the emissions reductions that can be achieved by switching to carbon-free electricity from SVCE. Therefore, emissions overshoots have been revised upwards to reflect recent overshoots and the extra work it will take to "catch up" to emissions targets as well as an expected 2 year delay to see mode shift results from transportation investments. Estimated average overshoot for 2019-2025 was revised upwards to 40,000 MT CO_2e and left at 20,000 MT CO_2e for 2025-2030. At a cost of $3.30/MT, this would be a total cost of $1.188M from 2019-2030.

Timeline

The primary constraints on the timeframe for developing Mountain View's Community GHG inventory are the availability of data and emissions factors. While it is possible to develop a preliminary emissions inventory before receiving the final emissions factors, it is not possible to develop even preliminary estimates before receiving data on community energy consumption and waste generation. Unfortunately, Mountain View is dependent on external agencies to report this data. As this data is not available until June or July of the following year, the earliest a preliminary inventory could be completed would likely be by August/September. Developing a preliminary estimate before this date would mean effectively using the previous year's inventory. Therefore, there would likely be a minimum 1-year delay in having a preliminary inventory as an input to the City's budget process. Inventories cannot be finalized without PG&E's emissions factors, which generally become available approximately 12-15 months after the end of the calendar year for the inventory.

Net Cost per MT CO_2e Reduction

Adjusted to reflect new values for GHG emissions reduction and net cost to the City.

Easy to Implement

Revised upwards due to efficiencies from GHG Inventory streamlining project with Google Civic Leadership program, but with caveat noted above in "*Timeline*"section.

2017-2018 Environmental Sustainability Task Force Analysis

Set GHG reduction targets according to per capita goals based on service population **(M2)**						**Policy**		**Permanent**	
Unknown	**$15K**	**$0**	**Unknown**	■■■	■□□	□□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

Unknown	**$15K-$78K**	**Unknown**	**Unknown**	■□□	■□□	□□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

City's Net Cost

The overall feasibility and net cost to the City are largely dependent on whether the City chooses to simply express the existing total GHG emissions reduction targets in per-capita form, which will still differ from those in the Greenhouse Gas Reduction Plan (GGRP), or revise the GGRP goals to so they are consistent with the reduction targets from the Climate Protection Roadmap (CPR). Expressing the total GHG emissions reduction goals from the CPR in terms of per-capital emissions is fairly easy to do using current estimates of service population, as is regularly updating these targets when population estimates change. However, the City will still have two conflicting sets of GHG emissions reduction goals (now both in per-capita form) unless the targets in the GGRP are updated.

Updating the GHG emissions targets in the GGRP would be a complex, time-intensive, and expensive process. It is unclear if the City would be legally able to revise the GGRP targets to match the significantly lower per-capita thresholds from the CPR goals. An analysis by a consultant, supported by City staff, would be required to understand the significance of making these revisions to the GGRP. Estimates of $50,000 for a consultant and 0.15 FTE staff time have been used for this analysis, for a total of $77,570 in estimated costs to the City. BAAQMD has not offered any concrete regulatory guidance on this topic, however. The key purpose of the GGRP is to provide CEQA guidance to projects, which may differ from other City goals or metrics. The GGRP is a qualified Climate Action Plan, and therefore its thresholds of significance for GHG emissions have legal implications under CEQA.

Incremental Net Cost

Updating the thresholds of significance for GHG emissions to align with the lower values in Mountain View's Council-adopted GHG targets from the CPR would likely have significant financial implications for new development. It is impossible to estimate the financial

implications for new development from this change, but it is definitely nonzero. Understanding the full incremental net cost and other impacts to the community would require a full analysis by a consultant.

2017-2018 Environmental Sustainability Task Force Analysis

Set annual GHG reduction targets for Mountain View that decline by a constant percentage **(M13)**						**Policy**		**Permanent**	
0	**$30K**	**$0**	**N/A**	■■■	■□□	□□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

0	**$15K**	**$0**	**N/A**	■■□	■□□	□□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

City's Net Cost

Adjusted to reflect lower estimated staff time (1 FTE-month). It is likely that the measures proposed in this recommendation will be evaluated in tandem with those in related recommendations (M1: Manage Mountain View's emissions budget as carefully as its financial budget and M2: Set annual GHG emissions reduction targets for Mountain View that decline by a constant percentage) in order to make a single recommendation to Council regarding measuring and updating the City's GHG emissions targets.

Easy to Implement

Revised downward to "somewhat easy" to reflect complications from having GHG emissions reduction goals that are out of sync with the State's.

2017-2018 Environmental Sustainability Task Force Analysis

Eliminate emissions associated with Direct Access electricity by 2025 **(M4)**						**Educational, ordinance**		**Permanent**	
250,672	**$135K**	**$0**	**$0.54**	■■□	■■□	■□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

173,245*	**$135K**	**$0**	**$0.78**	■□□	□□□	■□□	□□□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

**Actual GHG emissions from Direct Access are unknown, as exact energy mix is not disclosed. This estimate represents maximum possible GHG emissions reduction.*

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

MT CO_2e Reduction 2018-2030

Adjusted to reflect BAU case that accounts for the state's Renewable Portfolio Standard (RPS) requirements, which apply to Direct Access (DA) purchases, that would result in declining GHG emissions through 2030 with no further action.

Calculation Details

GHG Emisisons Reduction from Direct Access 2019-2030

Year	SB 100 RPS	BAU GHGs (MT CO_2e)	M4 GHGs (MT CO_2e)	GHG Reduction (MT CO_2e)
2019	31%	31334	31334	0
2020	**33%**	30426	30426	0
2021	35.75%	29177	25067	4110
2022	38.50%	27928	18800	9128
2023	41.25%	26679	12534	14146
2024	**44%**	25430	6267	19164
2025	47%	24068	0	24068
2026	**50%**	22706	0	22706
2027	**52%**	21798	0	21798
2028	54.67%	20587	0	20587
2029	57.33%	19376	0	19376
2030	**60%**	18165	0	18165
			TOTAL:	**173245**

Assumptions:

- DA electricity purchases meet but do not exceed the mandatory RPS targets in SB 100.
- In between target years, renewable energy purchases increase linearly.
- GHGs per kWh remain the same for non-renewable energy DA purchases
- Carbon-free energy can be purchased at no price premium. Discussions with DA customers indicate a current premium for renewable energy of around $0.17/MWh for each % of renewable power, but no cost comparison was available for non-renewable, carbon-free sources of energy such as small hydropower.

Actual GHG emissions reductions will likely be lower than estimated, as this represents a maximum possible reduction. The actual energy content of DA purchases is unknown, but several known DA customers have publicly committed to being carbon-neutral and powering their operations with renewable energy. For GHG inventory purposes, the City of Mountain View uses the average regional power mix to estimate GHG emissions from DA purchases, which results in higher estimates than would occur if any DA customers are choosing to purchase more than the minimum required renewable power. It is very likely that actual emissions from DA energy are lower than estimated as part of Mountain View's inventory. SVCE's estimates of 2015 GHG emissions from DA customers, which take into account public commitments to renewable energy, are lower than the estimates used in the City's inventory which do not account for these commitments. SVCE's estimate for DA GHG emissions in Mountain View is 28,617 MT CO_2e, while the official City inventory estimates 31,334 MT CO_2e.

City's Net Cost

Assumes 2 full-time equivalent months of work from Economic Development and Sustainability staff at an Analyst level annually for 2 years, then 1 FTE month per year through 2025. There would be additional costs for the "celebration event hosted by the mayor and involving plaques and proclamation" if the City chooses to have such an event, though these are not included in this analysis.

Easy to Implement

Adjusted downward to "hard" due to lack of transparency/disclosure of Direct Access customers, which will significantly complicate outreach.

Easy to Measure

Adjusted downward to "very hard to measure results from this recommendation," as accurately assessing GHG reductions relies on obtaining both baseline and annual voluntary energy purchase disclosures from all Direct Access customers in Mountain View. Currently, the City has no way to measure actual DA electricity emissions and must use an estimate based on the regional average power mix.

2017-2018 Environmental Sustainability Task Force Analysis

Implement a knowledge resource for electrification & other sustainability actions **(M10)**						**Outreach**		**2 years**	
722	**$30K**	**$0**	**$38.86**	■■□	■□□	■■■	■■■	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

City Staff Analysis

722	**$30K**	**$0**	**$41.00**	■■□	■□□	■■■	■■□	□□□	□□□
MT CO_2e Reduction 2018-2030	City's Net Cost	Incremental Net Cost	Net Cost per MT CO_2e Reduction	Easy to Implement	Easy to Measure	Private Investment Leverage	Local Economic Benefits	Other Environmental Benefits	Health Benefits

Based on analysis of the data/assumptions in the "Final Report of the 2017-2018 Environmental Sustainability Task Force," staff made changes in the following areas:

City's Net Cost

Did not adjust, but depending on SVCE's work in this area, implementation of this recommendation may require less than the estimated 14 hours/month of City staff time.

Local Economic Benefits

Reduced slightly to "medium (26-50% local)," as the limited availability of heat pump water heaters and related expertise means it is more difficult to source the equipment locally and find locally-based qualified installers in the near term.