

Appendix E

GHG Reduction Measures Cost Ranges



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Project: **Hayward Climate Action Plan Update**

Re: GHG Measures Cost Ranges Memorandum

Introduction

As part of its Climate Action Plan (CAP) Update, the City of Hayward is developing a comprehensive strategy for reducing communitywide greenhouse gas (GHG) emissions to 55 percent below 2005 levels by 2030 and to carbon neutral by 2045. However, achieving GHG emissions reduction and carbon neutrality requires strategic investments related to many aspects associated with each measure, including new policies, infrastructure, technology, and behavior change. In order to develop transparency around the prioritization of these investments, Rincon, with assistance from Hatch, has prepared this memorandum detailing the estimated cost ranges associated with the implementation of each of the 17 GHG measures proposed as part of the CAP Update. The intent of this memorandum is to convey highly variable community and City cost considerations and to provide respective cost ranges related to the implementation of GHG measures proposed as part of the CAP Update.

Cost Considerations and Variables

For each measure, the cost description focuses on both internal (City) costs and external (community) costs and provides insight into the variability of these costs including the primary variables that may affect cost effectiveness including several primary considerations including upfront costs, lifecycle costs, incremental or marginal costs, and the cost of doing nothing. This analysis is not intended to provide exact and precise cost estimates for each of the measures. The costs described for each measure are variable and provide a general range carried by differed parties associated with the measures.

Upfront versus Lifecycle Costs

When discussing how much a strategy or action costs, it is important to differentiate between the upfront costs, the cost of, for example, an LED light bulb, versus the lifecycle costs of purchasing, operating, maintaining, and ultimately disposing of that lightbulb. While LED lightbulbs may be more expensive up front when compared to an incandescent bulb, the lifecycle costs of owning an LED lightbulb are significantly lower, providing a significant return on investment.

Incremental or Marginal Costs

It is also important to specify the difference between how much a strategy costs overall and what the incremental or marginal cost is. The incremental or marginal cost is the difference in cost between the new action and the old or standard action. For example, purchasing a new electric vehicle (EV) could cost \$30,000 which should be considered a high cost. However, the marginal cost of purchasing an electric vehicle versus purchasing a new internal combustion vehicle may be zero or near zero because of reduced long-term operating and maintenance costs including no fluids to replace, fewer moving parts like transmissions, and less brake wear. It is important to consider what the incremental/marginal costs are for each strategy by keeping in mind what the alternative costs are. In many cases, the difference is negligible.

The Cost of Doing Nothing

Finally, it's also important to keep in mind that doing nothing to prepare for and mitigate climate change will also carry a cost. The alternative to implementing these strategies is not zero. One immediate example is the cost to install conduit and panel capacity for electric vehicle chargers for all new construction. While this action increases upfront construction costs by a few hundred dollars, doing that same work after the building is completed can be an order of magnitude higher (~\$3,000). Given the move towards electric vehicles, the cost of not installing EV infrastructure today could cost the community significantly more in the future. In a similar vein, adaptation strategies will cost the city and the community today. Planting trees, installing microgrids, and setting up cooling centers all have upfront costs. However, it's imperative that we weight these costs against the costs of a future without these adaptive strategies given what we know about the climate. Research published in the journal *Nature* predicts the cost of not decreasing GHG emissions to carbon neutrality by mid-century could range between \$149.78 trillion to \$791.98 trillion globally by the end of the century.¹ That same study found that if we mitigate climate change and achieve carbon neutrality by mid-century the world could see a \$127-to-\$616 trillion-dollar economic benefit after considering the cost of mitigation. The humanitarian impact is also significant. The Red Cross and Red Crescent Societies estimate that the number of people in need of humanitarian aid each year could double to \$200 million annually by 2050

¹ Wei, Yi-Ming et al. *Nature Communications*. 2020. Self-preservation strategy for approaching global warming targets in the post-Paris Agreement era. Accessed at <https://www.nature.com/articles/s41467-020-15453-z>. Accessed August 2022.

due to climate change costing \$20 billion per year.² Furthermore, the World Resources Institute has found that investing in adaptation and resilience provides a benefit-cost ratio ranging from 2:1 to 10:1, meaning that for every dollar invested in resilience and adaptation we stand to see \$2 to \$10 dollars' worth of benefits.

Cost Range Analysis

Climate Action Plans exhibit high variability in implementation costs depending on the measures identified, their level of specificity, and the accompanying funding and financing strategies, which may vary depending on the scope of the project. The cost range estimates are based on cost data derived from past projects, case studies, and available research.

The GHG measures proposed for the CAP Update and listed below have been broken down into 3 cost segments which include:

1. **Low-Cost:** the low-hanging fruit for the City and community to reduce GHG emissions, generally delineated as measures associated with relatively low upfront costs to the City or community, e.g. policy ordinances and outreach
2. **Moderate-Cost:** intermediate level of costs per measure implementation associated with consultant and moderate infrastructure changes, moderate upfront or lifecycle costs associated with e.g. feasibility studies, program development, retrofitting existing infrastructure, program and tax fees, and small capital investments such as purchasing a tree
3. **High-Cost:** longer term projects requiring substantial investments into major infrastructure or technology over time to reduce emissions, e.g., electrification equipment, electric buses, energy storage, bike lanes, infrastructure changes

The tables below categorize each measure into a low, moderate, or high City and community cost categories as described above and also explain the variables and existing data and case studies on which these categorizations were made.

Measure BE-1: Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026	
City Costs	Moderate Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to develop and adopt ordinance and code amendments - Staff time to produce collateral for educational programs and engagements - Collateral materials
City Cost Discussion	Adopting reach codes and building codes generally requires staff time to implement. City staff will need to dedicate time to create educational materials and publish on the website, a low cost, with large potential audience. Workshops, however, will require one-time costs and support from <i>Communications and Media Relations</i> and <i>Environmental Services and Building</i> divisions.
Community Cost	Moderate Cost

² International Federation of Red Cross and Red Crescent Societies. 2019. The Cost of Doing Nothing: The Humanitarian Price of Climate Change and How it Can be Avoided. Accessed at <https://reliefweb.int/report/world/cost-doing-nothing-humanitarian-price-climate-change-and-how-it-can-be-avoided>. Accessed August 2022.

Community Costs Variables - Cost savings of all electric homes compared to mix fuel
 - Long-term costs on energy bills

Community Costs Discussion Cost effectiveness studies completed for Hayward’s climate zones show that new building electrification costs less to build than mixed fuel buildings. Single family homes are \$5,149 dollars less expensive to build all-electric compared to a mixed fuel home. However, annual energy bills are expected to increase by \$423 in an all-electric new home versus a mixed fuel home.¹ Therefore, this measure is considered to be a moderate cost.

Source:
 1. Local Energy Codes - City of Hayward Cost Effectiveness Explorer. https://explorer.localenergycodes.com/jurisdiction/hayward-city/study-results/3-PGE?only_study_type=new-buildings. Accessed August 2022

Measure BE-2: Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.

City Costs High Cost

City Cost Variables - Staff time to develop and adopt ordinance
 - Staff time to develop strategic plans
 - Staff time for partnerships with businesses and private property owners
 - Staff time to produce collateral for education and engagements
 - Staff time for new program management
 - Collateral materials including the update on online permitting process

City Cost Discussion Actions related to this measure will require a larger amount of time from City staff as compared to other Building Electrification measures. The most significant resource will be needed for the expansion of the *Residential Energy Performance Assessment and Disclosure* ordinance with an additional full-time equivalent (FTE) staff to monitor compliance and further facilitate permitting online, as well as developing an electrification strategy with building analysis to be authored by the City. Creating a strategy for electrification of buildings, and devoting staff time for collaborative partnerships, such as with the California Air Resources Board (CARB), to allow neighborhood level electrification/banning of natural gas will also be a significant lift to City and City officials.

Community Cost High Cost

Community Costs Variables - Cost of converting to electric homes from mix fuel
 - Long-term costs on energy bills

Community Costs Discussion Electrifying an existing single-family residential building holds significant upfront costs. Electrifying a home assumes including a heat pump for heating and cooling, heat pump water heater, and an electric resistance clothes dryer and stove. With these appliances considered, electrification upfront costs can range from \$7,930 to \$25,780, without incentives. Additionally, in Hayward’s climate zones, annual energy bill costs are expected to increase by up to 33%. However, if electrification is paired with installation of solar PV, annual energy bill savings can almost double.¹ Existing single-family home electrification is considered high cost, without offset solar.

Source: Berkeley, City of. Existing Building Electrification Strategy. 2021. <https://berkeleyca.gov/sites/default/files/2022-01/Berkeley-Existing-Buildings-Electrification-Strategy.pdf>. Accessed August 2022.

Measure BE-3: Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.

City Costs	High Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to develop strategic plan such as Decarbonization Strategy - Staff time to enforce ordinance - Staff time to produce collateral for education and engagements
City Cost Discussion	<p>Creating a Decarbonization Strategy, while high cost to the city to create, is an important step informing subsequent actions to decarbonize existing commercial and multi-family buildings. The proposal to enforce compliance of a newly adopted electrification ordinance may likely come at high a cost to the City, particular with increased staff time. Enforcement may require additional staff training. Preparation, distribution, and sharing of collateral will also impact key departments such as the <i>City Manager</i> and <i>Development Services</i>.</p>
Community Cost	Moderate Cost
Community Costs Variables	<ul style="list-style-type: none"> - Cost savings of all electric homes compared to mix fuel - Long-term costs on energy bills
Community Costs Discussion	<p>Cost effectiveness studies completed for Hayward’s climate zones show that new building electrification costs less to build than mixed fuel buildings. Multi-family homes are \$3,361 dollars, office buildings are \$75,337 dollars, and retail buildings are \$28,308 dollars less expensive to build all-electric compared to a mixed fuel home. However, annual energy bills are expected to increase by \$176 for multi-family homes, \$4,774 for office buildings and \$481 for retail buildings in an all-electric new home versus a mixed fuel home.¹ Therefore, this measure is considered a moderate cost.</p>
Source:	<p>1. Local Energy Codes. City of Hayward Cost Effectiveness Explorer. https://explorer.localenergycodes.com/jurisdiction/hayward-city/study-results/3-PGE?only_study_type=new-buildings. Accessed August 2022</p>

Measure BE-4: Support Ava Community Energy in providing 100% carbon-free electricity by 2030.

City Costs	Moderate Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to manage development of Resolution Plan for 100% Carbon-free Electricity and identify funding and subsidy plan - One-time staff time to develop process to monitor rates
City Cost Discussion	<p>The adoption of a City resolution to be 100% carbon-free electricity must include identification of funding and subsidy plan to ensure cost continuity. The effort to identify funds, manage continued partnerships with Ava Community Energy, and authoring a resolution is typical to the City’s process today, and is not expected to significantly impact staff resources. More significant, however, is the time that will be required to develop a process and enabling the monitoring of annual opt-out rates in the City of Hayward.</p>
Community Cost	Low Cost

Community Costs Variables - Electricity Costs per Rate Plan

Community Costs Discussion Decarbonizing Ava Community Energy’s electricity may cost the community a marginal increase in money spent per kWh. However, this increased electricity cost depends on the rate plans used by the household/business. Based on the rate schedule of Measure BE-1, Measure BE-2, and Measure BE-3 and an average monthly usage of 416 kWh, monthly bills would increase approximately \$4 per month under the Ava Community Energy Renewable 100 rate plan for both standard and CARE rates.¹

Sources:

1. PG&E. EBCE Joint Rate Comparisons. https://www.pge.com/pge_global/common/pdfs/customer-service/other-services/alternative-energy-providers/community-choice-aggregation/ebce_rateclasscomparison.pdf. Accessed August 2022.

Measure BE-5: Continue to promote energy efficiency improvement, in alignment with the existing the 2014 Climate Action Plan

City Costs	Moderate Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to manage multiple programs - Staff time to procure funding
City Cost Discussion	Continuing to promote energy efficiency improvements will lead to moderate costs to the City. Primarily, costs are associated with staff time needed to manage programs (e.g., weatherization program and energy benchmarking trainings) and time needed to obtain funding for the weatherization program.
Community Cost	Moderate Cost
Community Costs Variables	<ul style="list-style-type: none"> - Cost associated with procuring energy efficient equipment and appliances - Cost associated with energy benchmarking programs
Community Costs Discussion	Community costs are associated with the upfront costs related to procurement of energy efficient equipment and appliances. However, over time, energy efficient upgrades lead to electricity and natural gas resource and cost savings to community members. Nonresidential building owners may face costs associated with energy benchmarking programs.

Measure BE-6: Generate carbon-neutral electricity on City facilities meeting 80% of the municipal operational electricity needs by 2030.

City Costs	Moderate Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to streamline permitting for battery storage - Staff time to manage inventory of and implementation at key locations for energy storage and/or generation projects (solar projects; inventory of appliance; others) - Staff time to advocate for smooth integration of identified solar projects into the grid
City Cost Discussion	Creating a streamlined permitting process for battery storage is a new process and requires staff training. The development of energy resiliency strategies, a transition of natural gas appliances to electric in City facilities plan, and the plan and schedule for future solar projects will also require substantial staff time to complete but is an important skeleton to implement actions outlined.

Community Cost	No expected community costs
Community Costs Variables	No expected community costs
Community Costs Discussion	There are no community costs associated with this measure. The City is not expected to raise local taxes to fund this measure. The City would have to receive voter approval to raise local taxes.

Measure T-1: Increase active transportation mode share to 15% by 2030 and to 20% by 2045.

City Costs	High Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to develop and adopt an ordinance and code amendments - Staff time to procure funding (i.e., grant management) - Cost and staff time to manage and implement Street Improvements Priority List
City Cost Discussion	<p>Actions required to develop and implement an <i>Active Transportation Plan</i> will require staff time for oversight. The City will also need time to adopt new policies, such as the <i>micromobility</i> policy and <i>mobility share</i> policy, as well as review and update regulations in the <i>Transportation Demand Plan</i>, <i>Zoning Codes</i>, and <i>Building Code</i>. Further, the implementation of a <i>pilot bike-share</i> program will require oversight from the City staff; however, these are typically one-time costs. The table notes below showcase typical funding received by municipalities in for these policies.¹</p> <p>Amending the <i>Off-Street Parking Regulation of Municipal Code</i> to update ongoing incentives and requirements for transportation will also incur City costs as the program already faces limited staffing and fiscal resources. Staff time will also need to be devoted to identifying, applying, and monitoring compliance for grant opportunities to improve mobility in the community (1 FTE) is anticipated given the typical size of funds received.</p> <p>Additionally, developing a priority list of street improvements will be an added time cost for the City, depending on the City's current method for tracking street conditions. Identifying streets for permanent active transportation traffic may also be politically challenging; and thus, require additional staff time for engagement and stakeholder management.</p>
Community Cost	Low Cost
Community Costs Variables	Costs associated with funding mechanism, e.g. sales tax or parcel tax
Community Costs Discussion	Community costs may include potential funding mechanisms for this infrastructure, such as a parcel tax, sales tax, and more. However, substantial cost savings opportunities exist within diverting drivers from the road to improve health and quality of life. Additionally, the institution of car-free days downtown can enable more active transportation and pedestrian-friendly events (e.g., farmers markets).

Notes:

1. Orange County, California, employs several transit incentives programs for individuals, including monetary incentives for starting a carpool, online platforms for connecting carpool and vanpool partners, reimbursements for bus and train passes, monetary incentives for electric vehicles, Club Rideshare which offers monthly prize drawings and merchant discounts, and reimbursements for emergency rides home. Participation levels in these programs is not reported. The City of Palo Alto, CA, has received \$1.1 million in federal USDOT Mobility on Demand funding for developing a pilot program involving commuter trip reduction software, a mobility aggregation multimodal trip planning app, workplace parking rebates and analytics to compare commutes in order to reduce vehicle commuting.

Measure T-2: Implement public and shared transit programs to increase mode shift to public and shared transit mode to 15% by 2030 and 30% by 2045.

City Costs	High Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to develop and adopt an ordinance and code amendments - Staff time to manage multiple programs - Staff time to procure funding (i.e., grant management) - Student Transit Pass Program cost
City Cost Discussion	<p>Staffing time and expanding city staff capacity are two key drivers of City costs for this measure. Of lower magnitude costs is the required policy work such as: adopting a policy or code for transit accessible public spaces, adopting parking requirements for mixed-use consistent with the <i>Parking Management Plan</i>, adopting an ordinance to require carshare in new developments, and implementing a requirement for employer developed Transportation Demand Management (TDM) Plan. Additional time will be required to identify and pursue funding for City transit and TDM projects (anticipated as 1 FTE), as well as for obtaining grant funds for AC Transit expansion (1 FTE).</p> <p>The City will also need to expand oversight of transit programs. This includes additional responsibilities for transit stops, evaluating needed renovations to meet <i>Pedestrian Design Standards</i> for transit stops. Further, expansion of the <i>Student Transit Pass Program</i> will be completed by the City.</p> <p>Lastly, actions required to implement transit programs include at least three feasibility studies that City staff will need to oversee in some capacity.</p>
Community Cost	Low Cost
Community Costs Variables	<ul style="list-style-type: none"> - Transit Passes
Community Costs Discussion	<p>Community members will incur costs from transit passes. A monthly local transit pass and a monthly Transbay pass from AC Transit are \$84.60 and \$216 respectively.¹ Savings opportunities exist through less driving and better health outcomes resulting from better air quality and more active transportation methods, like share bike lanes. Variable costs stem from new requirements resulting from future ordinances that consider a shift away from single occupancy vehicles, such as parking reductions or minimums, bike parking requirements, parking prices, and more.</p>
Source:	<p>1. AC Transit. Fares. https://www.actransit.org/fares. Accessed August 2022</p>

Measure T-3: Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-2 and T-3

City Costs	Low Cost
City Cost Variables	<ul style="list-style-type: none"> - Cost of updating Transportation Demand Management Plan - Cost of setting up and disseminating disincentive programs
City Cost Discussion	<p>Updating the City's TDM Plan that includes strategies to reduce peak-hour traffic will require significant City time to author and subject matter expertise. Political challenges involved in reducing parking minimums and maximums may also be a cost to the City staff in meeting this measure, requiring coordination across key departments such as <i>Public Works</i> and <i>Development Services</i>.</p>

Community Cost	Moderate Cost
Community Costs Variables	<ul style="list-style-type: none"> - Costs associated with disincentive programs or mechanisms - TDM Compliance
Community Costs Discussion	<p>The cost to the local business community due to the implementation of a TDM Plan requirement may vary depending on the transportation management measures, including cost of transit passes and cost of compliance. For example, allowing employees to continue telecommuting 1-2 days a week could cost employers nothing, while providing transit subsidies could be \$100 per employee per month, and charging for parking could generate revenue for a monthly bike commute competition. Implementation costs will be developed as part of the TDM plan. The community may also face costs from specific disincentive programs. For example, as stated in action T-3.5, a congestion charge program would charge drivers a fee to drive in congested areas of the City during rush areas. Program revenue would be used to expand active and transit services. San Francisco’s current proposed pricing chargers based on income levels with middle and high-income drivers being charge the most at \$6.50 to low-income drivers being charged \$2.17 and very low-income driver not being charged.¹ Additionally, as stated in T-3.9, a Transportation Network Company (TNC) user tax would impose a fee for ride-hail vehicle trips. San Francisco County imposes a 3.25% surcharge on all individual rides and a 1.5% surcharge on shared rides that originate in San Francisco.² Program revenue would also be utilized to expand active and transit services. Savings opportunities exist through less driving and better health outcomes resulting from better air quality and more active transportation methods, like shared bike lanes.</p>

Sources:

1. San Francisco County Transportation Authority- Downtown Congestion Pricing. <https://www.sfcta.org/downtown#:~:text=Congestion%20pricing%20involves%20charging%20drivers,used%20to%20improve%20transit%20service>. Accessed August 2022
2. San Francisco County Transportation Authority – TNC Tax. <https://www.sfcta.org/funding/tnc-tax#:~:text=The%20tax%20imposes%20a%203.25,that%20originate%20in%20San%20Francisco>. Accessed August 2022.

Measure T-4: Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045

City Costs	Moderate Cost
City Cost Variables	<ul style="list-style-type: none"> - Cost of EV chargers - Staff time to establish partnerships and produce collateral for education programs and engagements
City Cost Discussion	<p>Costs incurred by the City in increasing passenger zero-emissions vehicle adoption will depend on various factors. The total cost of purchasing and installing EV chargers will depend on the number of chargers in City-owned properties determines is feasible and the capacity for Ava Community Energy to support the City. An example of municipal EV infrastructure funding is showcased below.¹</p> <p>Also related to this measure, the City will likely need to dedicate significant time to forming partnerships with ZEV car share companies, but may leverage collaboration with neighboring jurisdictions.</p>
Community Cost	Moderate Cost
Community Costs Variables	<ul style="list-style-type: none"> - Cost of charging infrastructure - Marginal cost of EV selected (Cost of combustion vehicle compared to EV alternative) - Lifecycle costs of EV ownership - Lifecycle costs of combustion vehicle ownership

Community Costs Discussion	<p>The community may see increased upfront costs associated with the purchase of an EV. The cost of an electric vehicle varies significantly depending on the EV chosen. Since the purchase of an EV will likely offset the purchase of an internal combustion vehicle, the marginal cost should be considered here. EVs also offer considerable opportunities for lifecycle cost savings compared to their internal combustion (ICE) or hybrid vehicle counterparts since they do not need oil changes, transmission fluid changes, spark plugs etc. For example, the electric MINI cooper emits approximately half of the greenhouse gas emissions than that of its ICE and hybrid models while costing considerably less per month in fuel, maintenance, and total vehicle costs per month.¹ In general, new electric vehicles may or may not cost more upfront, but generally cost less over their lifetime compared to combustion vehicles.</p> <p>There will also be community costs associated with EV charging stations. While community members may utilize public charging stations, many need to utilize charging at home overnight. Installing a Level 2 charger at home is about \$2,000 for parts and installation.²</p>
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Notes:

1. The County of San Diego procured \$21.7 million in funds to support EV infrastructure needs. The California Electric Vehicle Infrastructure Project (CALeVIP), a program funded by CEC that provides incentives for EV charger installations, provided the county with \$15.8 million in funds. The San Diego Association of Governments and San Diego County Air Pollution Control District provided the remaining \$5.9 million through sales tax revenue and motor vehicle fees. These funds were used to provide individual rebates up to \$6,000 for Level 2 charger.

Sources:

1. MIT Trancik Lab. Carbon Counter. Accessed at <https://www.carboncounter.com/#!/explore?cars=35870;35756;36427>. Accessed August 2022.
- Property Manager Insider. 2019. How Much do EV Charging Stations Cost? <https://www.propertymanagerinsider.com/how-much-do-ev-charging-stations-cost/>. Accessed August 2022.
2. How much does it cost to charge an electric car? <https://www.kbb.com/car-advice/how-much-does-it-cost-to-charge-an-ev/>. Accessed August 2022

Measure T-5: Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045.

City Costs	Low Cost
City Cost Variables	- Staff time to produce collateral for education programs and engagements
City Cost Discussion	Actions required to increase business zero-emission vehicle adoption require significant engagement efforts for city personnel with local stakeholders. Depending on current staff capacity to conduct additional engagement and outreach, as well as current relationships with key community employers, the magnitude of this cost may vary.
Community Cost	Moderate Cost
Community Costs Variables	<ul style="list-style-type: none"> - Cost of charging infrastructure - Marginal cost of EV selected (Cost of combustion vehicle compared to EV alternative) - Lifecycle costs of EV ownership - Lifecycle costs of combustion vehicle ownership
Community Costs Discussion	The community costs to businesses for increased ZEV adoption is expected to be the same as the cost to passengers.

Measure T-6: Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045.

City Costs	Moderate Cost (Near-term)
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City Cost Variables	<ul style="list-style-type: none"> - Staff time to develop and adopt an ordinance - Staff time to manage programs and feasibility studies - Cost to develop City-owned End-of-Life Off-Road Equipment Plan - Staff time to produce collateral for educational programs and engagements
City Cost Discussion	The development and implementation of a City-owned <i>End-of-Life Off-Road Equipment</i> Plan and the <i>Small Off-Road Equipment</i> Ordinance that includes evaluation of current equipment, alternative options, and replacement timeline will require significant time for City personnel to create, including staff in-reach and training campaign. Oversight of the replacement program will also be a significant for the <i>Maintenance Services</i> department.
Community Cost	Moderate Cost
Community Costs Variables	<ul style="list-style-type: none"> - Cost of charging infrastructure - Marginal cost of electric off-road equipment selected (Cost of combustion equipment compared to electric alternative) - Lifecycle costs of electric off-road equipment ownership - Lifecycle costs of combustion equipment ownership
Community Costs Discussion	The community may incur upfront costs associated with electric off-road equipment. The cost of electric off-road equipment varies depending on the type of off-road equipment and version chosen. Off-road equipment includes landscape equipment, such as leaf blowers and lawn mowers, tractors, forklifts, construction equipment, and agricultural equipment. Some electric off-road equipment has lower upfront costs than combustion off-road equipment, whilst other electric off-road equipment has significantly higher upfront costs. For example, a battery-powered leaf blower has an average cost of \$137 and a gas leaf blower has an average cost of \$206. An electric forklift cost varies between \$20,000 and \$45,000, with the additional cost of a battery and charger, while an internal combustion forklift cost varies between \$20,000 and \$50,000. In many cases the upfront cost of electric large construction and agricultural equipment is higher than combustion options. However, generally, the operational and maintenance costs of combustion off-road equipment are higher than electric alternatives. Electric off-road equipment such as tractors and forklifts often require additional charging equipment which poses an additional upfront cost to the owner.
Sources:	<ol style="list-style-type: none"> 1. Lawn Starter. Pricing Guide. https://www.lawnstarter.com/blog/cost/leaf-blower-price/. Accessed August 2022. 2. Toyota Forklifts. Forklift Pricing 101. https://www.toyotaforklift.com/resource-library/material-handling-solutions/finance/forklift-pricing-101-what-you-should-know. Accessed August 2022.

Measure T-7: Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.

City Costs	High Cost
City Cost Variables	<ul style="list-style-type: none"> - Cost of Zero-Emission Fleet Conversion and Purchase Policy Development - Staff time to manage feasibility studies - Staff time to procure funding (i.e., grant management from CARB)
City Cost Discussion	Establishing a <i>Zero-Emission Fleet Conversion and Purchase Policy</i> that includes replacement schedule will require staff time, however the additional costs are not significant as this policy supports existing Policy N.R-2.9 for City purchase of zero-emission vehicles.

The most significant cost to the City in meeting this measure will be determined by the number of EV/ZEV chargers needed to meet the City’s transition goals and any additional ZEV infrastructure determined through the conversion plan. Upfront costs of implementing the transition will be high. As an example, the cost of Level 2 charging station is \$5,000 to \$10,000 and cost of electricity over an eight-year period is \$4,000.¹ Disregarding the future costs to purchase charging infrastructure, the costs are low for this measure.

Community Cost	Low Cost
Community Costs Variables	- Cost associated with funding mechanism, e.g. sales tax or parcel tax
Community Costs Discussion	Community costs may include potential funding mechanisms for this investment, such as a parcel tax, sales tax, and more. The City, however, may opt to utilize grant funding or other funding mechanisms to pay for costs associated with decarbonizing the municipal fleet.
Notes	
1. Cost of Level 2 charging station are average. Assumes 100,000 miles traveled over 8-year period. Maintenance costs include insurance, routine service and engine wear. Electric prices based on July 2019 average for LA-Long Beach-Anaheim. Electricity and maintenance may vary. San Francisco Department of Environment Services; Bureau of Labor Statistics	

Measure SW-1: Implement and enforce SB 1383 requirements to reduce communitywide landfilled organics by 75% by 2030 and 90% by 2045.

City Costs	Moderate Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to produce collateral for educational programs and engagements - Staff time to adopt an ordinance - Staff time to manage programs and policies - Cost of compost bins and food waste containers
City Cost Discussion	<p>The primary cost variable for this measure is time. Enforcing a fee for incorrectly sorted materials as well as implementing a monitoring and quality control program will be ongoing costs to the City, including the time to vet existing vendors’ practices.</p> <p>City staff will also need to dedicate additional time to manage and oversee the various partnerships outlined to reduce landfill organics to create diversion and prevention programs, investigate funding opportunity for food recovery, and conduct feasibility studies. Additional policy work required includes adopting procurement policies in compliance with SB 1383. The City will also incur costs in providing free outdoor compost bins and kitchen-top food waste containers to low-income communities of colors and elderly households.</p> <p>Example estimate costs of outdoor waste, compost, and recycling receptables are as follows:²</p> <ul style="list-style-type: none"> ▪ Outdoor waste receptacles – landfill, recycling & compost: \$1,750 - \$4,000 ▪ Outdoor waste receptables – regular/single stream: \$660 - \$970
Community Cost	Moderate Cost
Community Costs Variables	<ul style="list-style-type: none"> - Cost to implement composting at home - Cost to businesses to implement composting - Cost of businesses to implement waste diversion techniques

Community Costs Discussion To satisfy the requirement of SB 1383, Cal Recycle estimates the cost to the community to be \$17 per household per year after full implementation, and \$662 annually for small businesses.¹ However, the costs for individuals will vary significantly, as the cost is dependent on the amount of waste that is currently disposed and the ability of the business to reduce the amount of organic disposal.

1. CalRecycle. 2020. Proposed Regulation for Short-Lived Climate Pollutants: Organic Waste Methane Emissions. https://www.dof.ca.gov/Forecasting/Economics/Major_Regulations/Major_Regulations_Table/documents/Final_Sria_11-16%20.pdf#search=%22SB%201383%20Economic%20Analysis%22. Accessed August 2022
2. Based on current market sales from select vendors: Trashcan Warehouse and Waste360. Accessed August 2022

Measure SW-2: Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045.

City Costs Moderate Cost

- City Cost Variables**
- Staff time to update and adopt an ordinance
 - Staff time to produce collateral for educational programs and engagements
 - Staff time to develop Zero Waste Strategic Plan
 - Cost of re-routing collected landfill waste hauling to Material Recovery Facility

City Cost Discussion City time will be required to complete policy actions that increase communitywide landfill diversion that include adopting a *Waste Diversion Ordinance*, updating municipal codes and hauling agreements to reflect recent legislation, creating waste management requirements for large events, establishing a post-consumer recycled content requirement, and increasing bans on “problem materials”.

The development of a *Zero-Waste Strategic Plan* will also require significant initial staff time, though it will inform subsequent actions in meeting the target. These actions require numerous partnerships and exploration of funding opportunities, which may require additional time to oversee.

Staff will also need to oversee the implementation of a single-use food ware fee. The City may also incur a cost in re-routing collected landfill waste to a Materials Recovery Facility (MRF).

Community Cost Moderate Cost

- Community Costs Variables**
- Cost to implement composting at home
 - Cost to businesses to implement composting
 - Increased cost of food items served in reusable/compostable food ware
 - Cost to businesses to implement waste diversion techniques

Community Costs Discussion Community costs associated with organic waste diversion are explained in the community costs discussion for Measure SW-1. Community costs are moderate while providing beneficial emission reductions to the City. Ordinances are known to be an effective means to influence consumer behavior. For example, after the passing of the 2013 Alameda County Reusable Bag Ordinance, which charged \$0.10/bag, bag purchases by affected retail stores declined 85%.¹ For businesses, costs include the marginal cost of providing compostable foodware compared to the cost of foodware already in practice. In Alameda County, the *Rethink Disposable* program, in partnership with StopWaste, demonstrated that several businesses that voluntarily minimized single-use foodware saw net cost savings of \$1,000 to -\$22,000 per year.² Developers may see additional operating costs associated with the separation of waste for proper reuse and recycling for better rates of waste diversion and consumers may see variable cost increases to food items as a result of these food items being provided in new compostable foodware.

Sources:

1. City of Berkeley Zero Waste Department. 2020. Passing a Single-Use Foodware and Litter Reduction Ordinance in Berkeley, CA. Accessed at https://zwconference.org/wp-content/uploads/presentations/nrc-nzwc_detournay_c.pdf. Accessed August 2022
2. City of Berkeley. 2018. Single Use Disposable Foodware and Litter Reduction Ordinance. Accessed at <https://ecologycenter.org/wp-content/uploads/2018/11/Disposable-Free-Dining-Ordinance.pdf>. Accessed August 2022

Measure WW-1: Reduce water consumption by 15% by 2030 and maintain it through 2045.

City Costs	Moderate Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to produce collateral for educational programs and engagements - Recycled Water Plan Development
City Cost Discussion	To implement this measure, the City will need to dedicate staff to overseeing numerous engagement and partnership efforts to continue and implement water conservation and water recycling programs. Managing numerous engagements to oversee feasibility studies and work with community stakeholders may be an added cost. A city authored <i>Recycled Water Master Plan</i> , while requiring significant staff time to create, will serve as a useful roadmap in overseeing these engagement and partnership efforts.
Community Cost	Low Cost
Community Costs Variables	<ul style="list-style-type: none"> - Cost of water conservation efforts - On-bill water savings
Community Costs Discussion	Decreasing water consumption directly leads to lower water bills for the community. Community costs may include investment into water conservation practices such as a City high water efficient washer rebate or lawn conservation rebate. Incentives provided to the community by the City lead to relatively fast returns in water savings and water bill savings long-term. Some outdoor watering conservation practices may reduce bills by 50%. ¹

Notes:

1. The City of Mountain View estimated that the costs associated with a water conservation program that included outreach and technical assistance would be equivalent to 80% to 100% FTE.

Source: EPA. 2022. WaterSense. <https://www.epa.gov/watersense/start-saving>. Accessed August 2022.

Measure CS-1: Increase carbon sequestration by planting and maintaining 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.

City Costs	Moderate Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to update an ordinance - Staff time to manage programs and policies - Staff time to procure funding - Cost of tree maintenance - Staff cost to develop Hayward Urban Forest Management Plant
City Cost Discussion	Policy actions for this measure include expanding <i>Hayward Street Tree Ordinance</i> , updating <i>Hayward Tree Preservation Ordinance</i> , adopting policy and practices for expanding tree canopy, creating cool roof requirements, and creating a code to preserve trees on homeowners' land, which will need to be adopted by the City.

The City will incur capital costs in increasing the tree canopy through planting and maintenance. Tree care activities include pest management, watering, pruning, and removal when necessary.

Annual maintenance costs for urban street trees are estimated below. Cost estimates are based on a nationwide survey of municipal in-house budgets for street tree maintenance and the associated number of street trees with each tree care activity.¹

- Tree Pest Management (Per tree per year): \$36
- Tree Watering (Per tree per year): \$62
- Tree Pruning (Per tree per year): \$139
- Tree Removal (Per tree per year): \$368

There are examples of municipal tree pruning and maintenance costs/tree planting partnerships.¹

City staff will also need to dedicate time to implement and enforce the tree removal in-lieu fee and oversee both the tree planting and adopt-a-tree program, and manage the Tree Trust or Fund established for this measure. Lastly, City staff will need time to explore grant funding for tree planting (anticipated as 1 FTE).

Community Cost	Moderate Cost
Community Costs Variables	<ul style="list-style-type: none"> - Cost of trees - Cost of water/maintenance of trees
Community Costs Discussion	<p>Community members may incur costs associated with planting trees, conducting maintenance and watering over time. The cost of planting a new tree varies between \$150 to \$3,000 depending on variety factors including size, species, location, labor costs, equipment costs, and permit or inspection fees.² City programs may provide incentives or subsidies for residents to plant and/or maintain trees. Watering and other maintenance is likely to be minimal (a few dollars a summer) while trimming costs may increase in the future once the tree is larger. Co-benefits of carbon sequestration projects to the community include more open spaces, savings on electricity bills if trees help shade your home, more greenery in the surrounding environment, and enhanced climate resiliency against natural disasters, like flooding, urban wildfires, and drought, improving the overall health and well-being of the community.</p>

Notes:

1. The City of Claremont contracts with West Coast Arborist for pruning and other maintenance and pays \$67 (2016) per tree for pruning services. The San Francisco Department of Public Works has partnered with a nonprofit, Friends of Urban Forest (FUF), to manage tree planting and establishment. The municipal government provides FUF with 60% of their annual revenue. The Department of Public Works manages a municipal program that aims to take the burden of maintenance off of property owners.

Sources:

1. Based on the Urban Forest Management information from San Mateo County. Accessed August 2022
2. Bob Villa. How Much Does it cost to Plant a Tree? 2022. <https://www.bobvila.com/articles/cost-to-plant-a-tree/>. Accessed August 2022.

Measure CS-2: Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030 and 2045.

City Costs	Low Cost
City Cost Variables	<ul style="list-style-type: none"> - Staff time to produce collateral for educational programs - Cost of collateral materials - Staff time to enforce policy compliance
City Cost Discussion	<p>City staff will need time to complete actions towards this measure. A lower cost to the City includes time needed to adopt procurement requirements of SB 1383 and distribute educational materials regarding compost. Greater costs to the City include time to develop and adopt urban park guidelines, implementation of shoreline master plan. Enforcing compliance with SB 1383 by establishing a minimum level of annual compost application would be the greatest requirement and may require applying outside City.</p>

Community Cost	No expected community costs
Community Costs Variables	No expected community costs
Community Costs Discussion	There are no expected community costs associated with the City applying compost in the community to sequester carbon.

Conclusion Summary

A summary of estimated City and community cost range for each measure is shown in the table below. For building energy and transportation measures, there’s a low to high community cost range. For waste measures there’s a moderate community cost range. For water/wastewater and carbon sequestration measures, there’s a low community cost range.

ID #	Measure	City Cost Range	Community Cost Range
Building Energy			
BE-1	Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026.	Moderate	Moderate
BE-2	Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.	High	High
BE-3	Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.	High	Moderate
BE 4	Support Ava Community Energy in providing 100% carbon-free electricity by 2030.	Moderate	Low
BE 5	Continue to promote energy efficiency improvement, in alignment with the existing the 2014 Climate Action Plan.	Moderate	Low
BE-6	Generate carbon-neutral electricity on City facilities meeting 80% of the municipal operational electricity needs by 2030.	Moderate	Low
Transportation			
T-1	Increase active transportation mode share to 15% by 2030 and to 20% by 2045.	High	Low
T-2	Implement public and shared transit programs to increase mode shift to public and shared transit mode to 15% by 2030 and 30% by 2045.	High	Low
T-3	Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-1 and T-2.	Low	Moderate
T-4	Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045	Moderate	Moderate
T-5	Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045.	Low	Moderate
T-6	Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045.	Moderate	Moderate
T-7	Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.	High	Low
Waste			

SW-1	Implement and enforce SB 1383 requirements to reduce communitywide landfilled organics by 75% by 2030 and 90% by 2045.	Moderate	Moderate
SW-2	Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045. Reduce water consumption by 15% by 2030 and maintain it through 2045.	Moderate	Moderate
Water and Wastewater			
WW-1	Reduce water consumption by 15% by 2030 and maintain it through 2045.	Moderate	Low
Carbon Sequestration			
CS-1	Increase carbon sequestration by planting and maintaining 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.	Moderate	Low
CS-2	Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030 and 2045.	Low	Low

Given the number of the GHG measures contemplated by the City of Hayward for the CAP Update that involve creation and enforcement of new building codes, the City is anticipated to need additional staff, particularly in the Development Services department. The City is also likely to need resources to design educational and outreach programs, adding to the need for staff with skills in community and stakeholder engagement. Key departments responsible for interface with stakeholders such as the public and partner organizations such as the City Manager’s Office, Communications and Media Relation division, Information Technology, among others will likely see an increase in staff costs. Select subject matter experts, such as the Environmental Services and Code Enforcement divisions, will be required to provide insights in collateral material associated with these programs. Additional outreach and engagement efforts may cost up to \$0.84 per communication depending on the type of outreach.³

While GHG measures proposed as part of the CAP Update (such as those related to off-road City-owned equipment) will require some capital investment, the City’s budget and capital improvement plans are not expected to be significantly affected within the near-term (next 5 years) timeframe of the CAP Update. Community costs are expected to be the highest for building electrification and decarbonization measures, which, depending on the measure, require notable capital investments and pose lifecycle costs associated with energy bills (BE-1, BE-2, and BE-3). Additionally, the community may face significant upfront costs associated with procurement of new decarbonized vehicles and equipment (T-4, T-6, and T-7). They may also face ongoing costs from future single passenger driving disincentive programs and mechanisms (T-3). Measures that aim to reduce City operational GHG emissions pose low costs to the community as the community is not likely to bear a cost burden associated with implementing these measures.

³ Email (per household) cost: \$0.00 - \$0.01; Direct Mail (per household) cost: \$0.60 - \$0.66; Phone Call (per household) cost: \$0.74 - \$0.83