

City of Redmond Operations Zero Carbon Strategy

October 2021



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Executive Summary

The City of Redmond Operations Zero Carbon Strategy (Zero Carbon Strategy or Strategy) is the City's approach to reduce emissions and shift City operations to a low carbon future. The foundation of the Strategy is a technical analysis that estimates the greenhouse gas reduction benefits of the actions that guide the City's path towards carbon neutrality.

Achieving carbon neutrality will not be easy and will require significant changes in the way the City does business. We will need to significantly lower building and vehicle energy use, energy sources will need to shift entirely from fossil fuels like gasoline and natural gas to renewables like solar and wind power, and investments will be needed in lower-carbon energy, vehicles, and building infrastructure. Against this backdrop, technology is still rapidly evolving to support the need for a low carbon future.

The Zero Carbon Strategy is driven by the vision of the Climate Emergency Declaration and the Environmental Sustainability Action Plan (ESAP), calling on the City to lead on climate action and reduce greenhouse gas (GHG) emissions to net-zero by 2030. Both the Zero Carbon Strategy and the community-wide ESAP are guided by leading science that shows our climate is rapidly changing, and now is the time for bold climate action.

To limit warming to 1.5°C, global human-caused greenhouse gas emissions must decline by 45 percent by 2030 and reach net-zero (carbon neutrality) around 2050. IPCC, *Global Warming of 1.5°C*

Strategy Development

While the ESAP guides the City's efforts to enhance *community-wide* sustainability and GHG reductions, the Zero Carbon Strategy focuses on GHG reductions from *government operations*. The Zero Carbon Strategy is a technical analysis and strategy to systematically reduce GHG emission from sectors within municipal operations such as government facilities, fleet, and electricity.

The Zero Carbon Strategy includes municipal actions identified in the ESAP and adds new actions that are referenced as *New* in the tables below. The actions were then modeled and visualized in a "wedge analysis" to understand the potential GHG reduction benefits. The Strategy included considerations of resources, facility and fleet strategic planning, and technology maturity. For instance, medium and heavy-duty electric vehicle technology will need to advance to support the City's goals.

Collectively, the actions outlined in this Strategy reduce emissions by an estimated 75% over the next nine years, making a path to carbon neutrality. Remaining emissions in 2030 stem largely from the City's vehicle fleet and employee commuting. Carbon offset/capture programs will be a critical step in achieving carbon neutrality.

Reduction Pathway

The City has a long history and commitment to climate action. This strategy builds on that work and identifies new opportunities to accelerate the transition to zero net emissions. The overarching strategies for achieving cost-effective, long-term emissions reductions for the City of Redmond include:



Transition to clean electricity.

Phasing out fossil fuel-sourced electricity will be important for achieving emissions reductions in both buildings and fleet.



Reduce employee commute and City operational VMT & idling

Reducing the number of single-occupancy vehicle trips for commuting and reducing idling time will be important.



Convert fleet vehicles and new buildings to **all-electric** while also improving **energy efficiency**.

As the electricity fuel mix becomes increasingly renewable, the shift from fossil fuels such as natural gas and gasoline to electricity will be increasingly impactful.



Continue to transition to **zero waste and sustainable consumption**.

While solid waste only makes up a small proportion of the city's overall emissions, the upstream emissions impacts of material consumption are substantial and should not be overlooked.



Increase **tree canopy cover and offsets**.

Carbon sequestration and offset projects will be essential to helping reach 2030 goals as the City transitions its infrastructure and vehicles to run on clean electricity.

Implementation

Many of the actions within the Zero Carbon Strategy are already underway or part of the City's existing business practices. Additional actions will be integrated into the 2023-2024 budget planning efforts to ensure phasing is aligned with staff capacity and budget resources.

An element of implementation will also include ongoing monitoring, evaluation, and reporting to transparently track progress towards goals and targets. Consistent with the ESAP, the City will leverage the following mechanisms to update and monitor progress:

1. Monthly status updates
2. Annual progress and evaluation reports
3. Biennial GHG inventory updates

The evaluation cycle and metric tracking will be used to determine if the actions identified are moving the City quickly enough towards goals, or if additional strategies or phasing need to be considered.

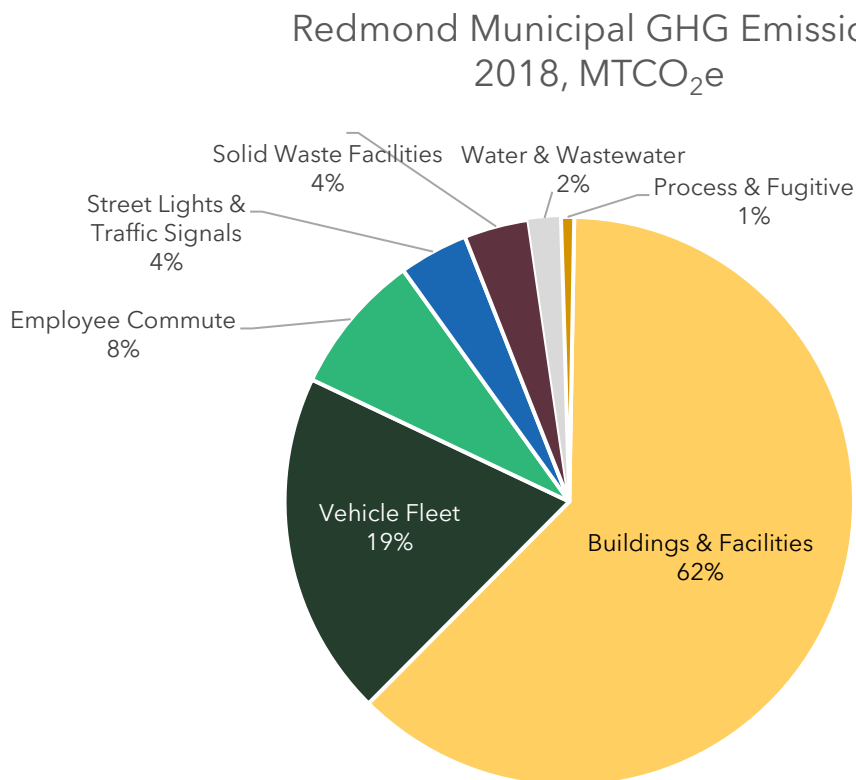
Introduction

This document estimates variables and outcomes associated with identified municipal-level actions in the Environmental Sustainability Action Plan (ESAP) and new actions to support the City's transition to carbon neutrality by 2030. These estimations are often visualized in a "wedge analysis" that depicts a high-level estimate of how much the actions will collectively contribute towards meeting the city's municipal goals and targets.

This document is organized into the following strategies:

1. Cleaner Electricity
2. Reduce Municipal Building Energy Demand
3. Building Fuel Switching
4. Reduce City Fleet Vehicle Miles Traveled
5. Increase City Fleet Vehicle Fuel Efficiency
6. Reduce Employee Commute Emissions
7. Improve Solid Waste & Materials Management
8. Increase Tree Canopy Cover and Offsets

The strategies represent key "levers" for reducing Redmond's municipal GHG emissions. For reference, the following chart provides a breakdown of Redmond's current municipal GHG emissions sources:



1

¹ Process & Fugitive emissions include emissions from energy generation and transmission loss and refrigerant leakage from building heating and cooling equipment.

Methodology

Actions in the Zero Carbon Strategy were broadly classified and modeled into “impact strategies.” The strategies represent variables related to key sustainability indicators. For example, actions that reduce building energy demand were classified under a “Reduced Municipal Building Energy Demand” strategy. These strategies represent key areas for reducing GHGs from municipal operations.

Detailed outcomes from the impact analysis are provided in each of the focus area sections below.

This analysis assessed the following four primary scenarios:

- 1. Business-As-Usual (BAU):** An estimate of how the metric would change over time without the influence of external or internal policies or programs. Anticipated City employee growth is the key driver of business-as-usual projections for municipal operations.
- 2. External Factors:** The influence of policies external to the City of Redmond—such as state renewable portfolio standards—on the City of Redmond’s projected environmental trends. These are denoted in **gray** in the wedge graphics.
- 3. Current ESAP Actions:** The estimated impact of municipal-relevant actions included in the ESAP and the additional actions that will be needed for the City to meet carbon neutrality in its municipal operations. These are denoted in color in the wedge graphics.

The analysis was conducted to 2030—the target year for municipal operations to attain carbon neutrality.

Findings Summary

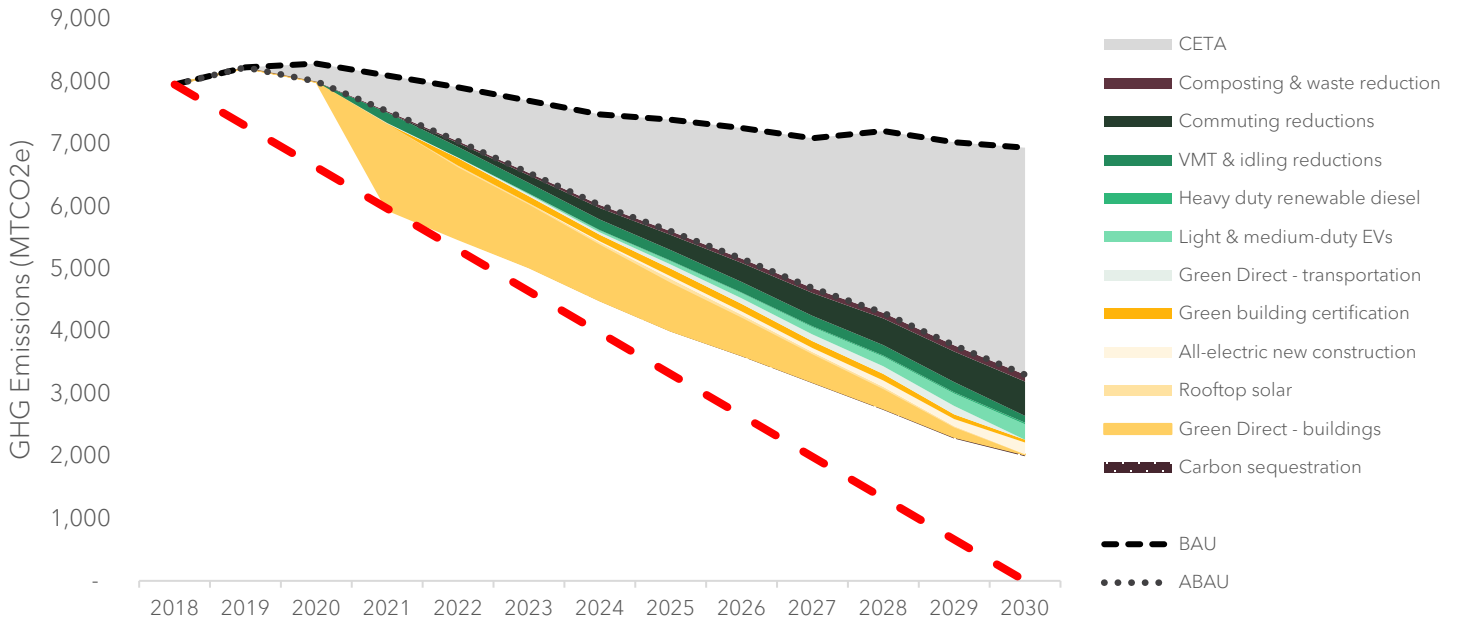
Overall Emissions

Based on outcomes of this analysis, we recommend the following overarching approach for achieving cost-effective, long-term emissions reductions for the City of Redmond:

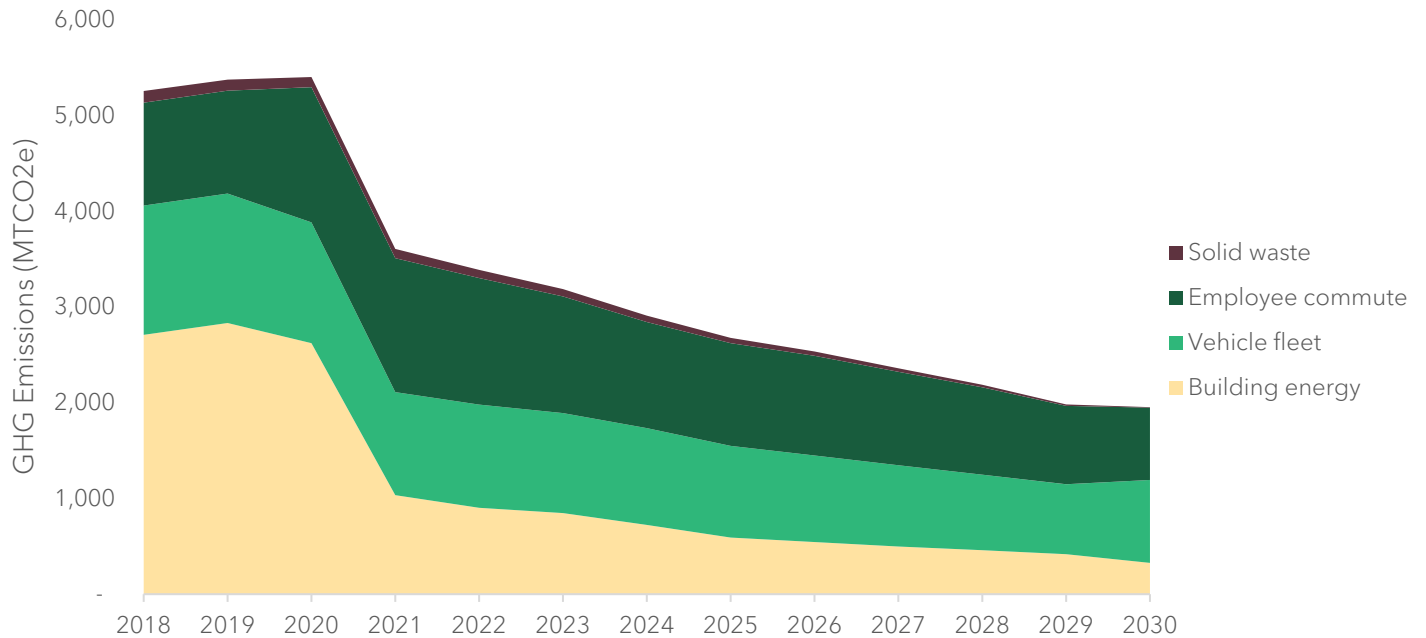
Approach	Description	Strategy Area	Cumulative Estimated Savings by 2030 (MTCO _{2e})
1 Transition to clean electricity as soon as possible.	Phasing out fossil fuel-sourced electricity will be crucial for achieving near-term emissions reductions in both the building and transportation sectors. This is especially true for Redmond, which has a significant proportion of emissions from building electricity. The continuation and increase in the Green Direct program will significant.	1	6,705 (Green Direct used for buildings) + 690 (Green Direct used for vehicles)
2 Reduce employee commute and City operational VMT & idling.	Reducing employee commute through telework options and employee transportation outreach and education will be critical as many of the vehicles driven by employees are gasoline-powered. Reducing the number of single-occupancy vehicles (SOV) used for commuting to work can substantially reduce emissions. Adopting idle reduction strategies can also reduce police and heavy-duty vehicle emissions.	4, 6	2,751 (Commuting reductions) + 1,615 (Fleet VMT and idling reductions)
3 As the electricity fuel mix gets cleaner, convert fleet vehicles and new buildings to all-electric while also improving energy efficiency.	As the electricity fuel mix becomes increasingly renewable, the shift from fossil fuels such as natural gas and gasoline to electricity will be increasingly impactful. Transitioning the municipal fleet and space and water heating in new construction to all-electric will amplify the impact of the Green Direct subscription. Energy efficiency improvements will also be critical for reducing emissions in existing buildings and larger fleet vehicles.	2, 3, 5	589 (All-electric new construction) + 913 (Green building certification) + 1,175 (Light and medium duty EVs) + 113 (Heavy-duty renewable diesel)
4 Increase tree canopy cover and offsets.	While the City is taking actions to reduce emissions, they are not at the scale required to meet carbon neutrality by 2030. Carbon sequestration and offset projects will be essential to helping reach 2030 goals as the City transitions its infrastructure and vehicles to run on clean electricity.	8	146

MUNICIPAL GHG EMISSIONS (MTCO ₂ e)		
	2025	2030
BAU	5,603	3,303
Target	3,313 (42% reduction)	0 (100% reduction)
With Municipal Actions	3,966 (50% reduction)	1,918 (76% reduction)

Current and proposed identified actions are estimated to result in a 75% net GHG emission reduction by 2030:



Remaining emissions in 2030 stem largely from the City's vehicle fleet and employee commuting:



Buildings & Energy

Key Municipal Actions:

- Continue and increase Green Direct subscription.
- Require all new municipal owned buildings to be all-electric and constructed to a minimum certification level.
- Energy efficiency improvements of existing buildings through financing/grants (including an internal revolving fund), energy/water conservation retrofits, implementation of Facilities Strategy Maintenance Plan, and Resource Conservation Management Plan.
- Achieve ENERGY STAR or equivalent recognition for existing buildings.

Key Assumptions:

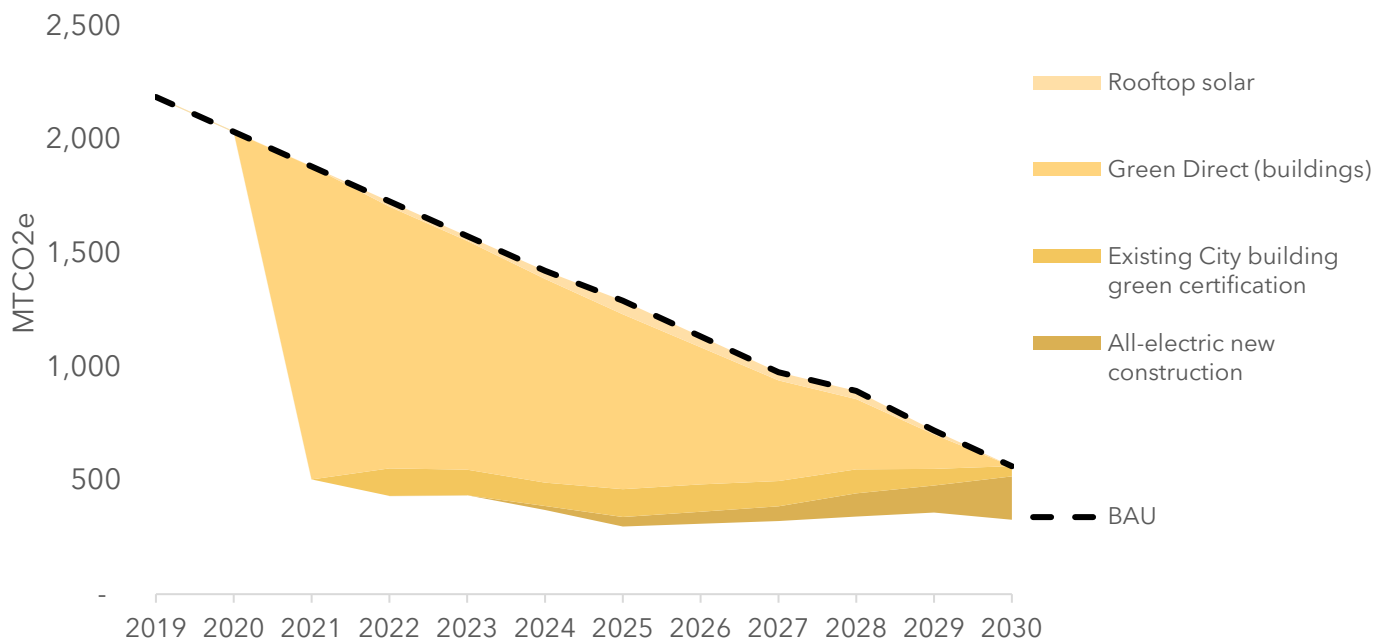
- Puget Sound Energy achieves 100% net carbon neutral electricity by 2030.
- Thirty percent (30%) energy use reduction in existing municipal buildings.

Key Findings:

- Significant and rapid near-term reductions in energy emissions through Green Direct.
- Building electrification and efficiency are essential to further reduce energy emissions.

MUNICIPAL BUILDING EMISSIONS (MTCO ₂ E)		
	2025	2030
BAU	1,291	563
With Municipal Actions	298 (86% reduction)	327 (84% reduction)

Building Energy Wedge Analysis



Transportation

Key Municipal Actions:

- Comprehensive transportation outreach and education.
- Telecommuting and alternative work schedules.
- Police and heavy-duty idling management.
- Convert municipal fleet to electric and require all new passenger vehicle purchases to be fully electric.
- Complete a municipal EV charging infrastructure strategy to fuel new EVs.

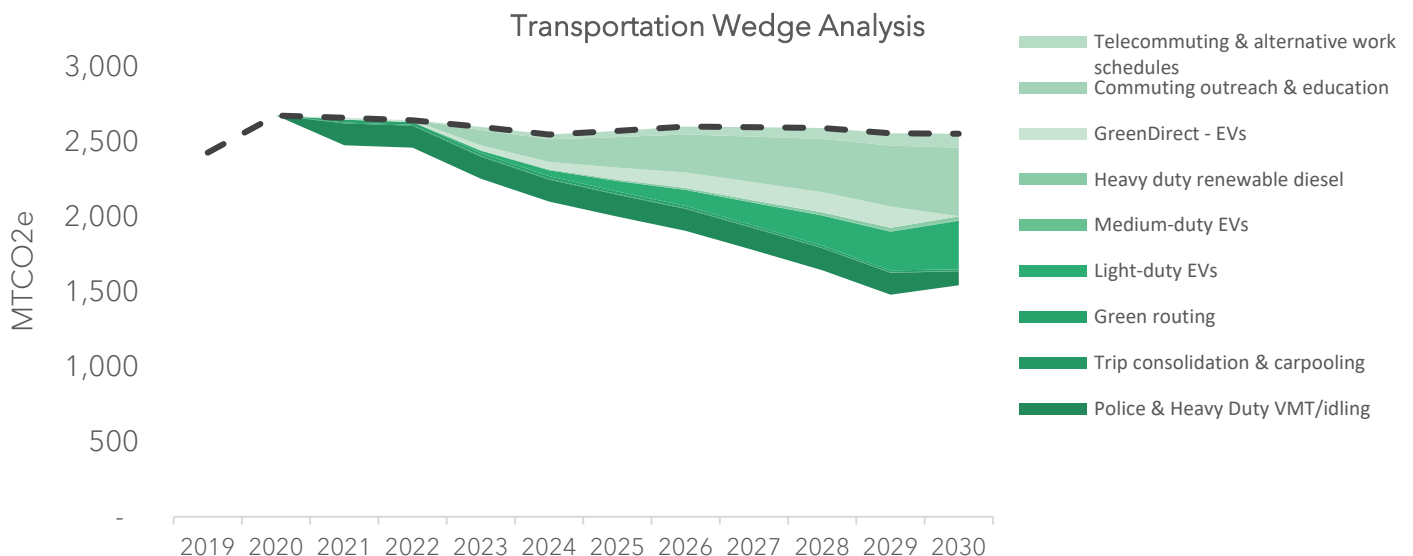
Key Assumptions:

- 35% reduction in VMT among employees due to transportation outreach and education.
- 20% reduction in commute-related GHG emissions for a given week through telecommuting and alternate work schedules.
- Idling management technology installed on police vehicles and heavy-duty vehicles.
- 25% of police vehicles are replaced with EVs by 2030.
- Assume that no new electric vehicles will be purchased until 2023 to allow ramp up in charging infrastructure.
- 43% of fleet passenger vehicles will be replaced with EVs by 2030.

Key Findings:

- Actions that reduce employee commuting such as through commuting outreach and education and telecommuting result in the greatest reduction in transportation emissions.

MUNICIPAL TRANSPORTATION EMISSIONS (MTCO ₂ E)		
	2025	2030
BAU	2,573	2,555
With Municipal Actions	2,002 (18% reduction)	1,544 (36% reduction)



Waste

Key Municipal Actions:

- Reduce City organic waste.
- Increase and enforce City waste diversion.

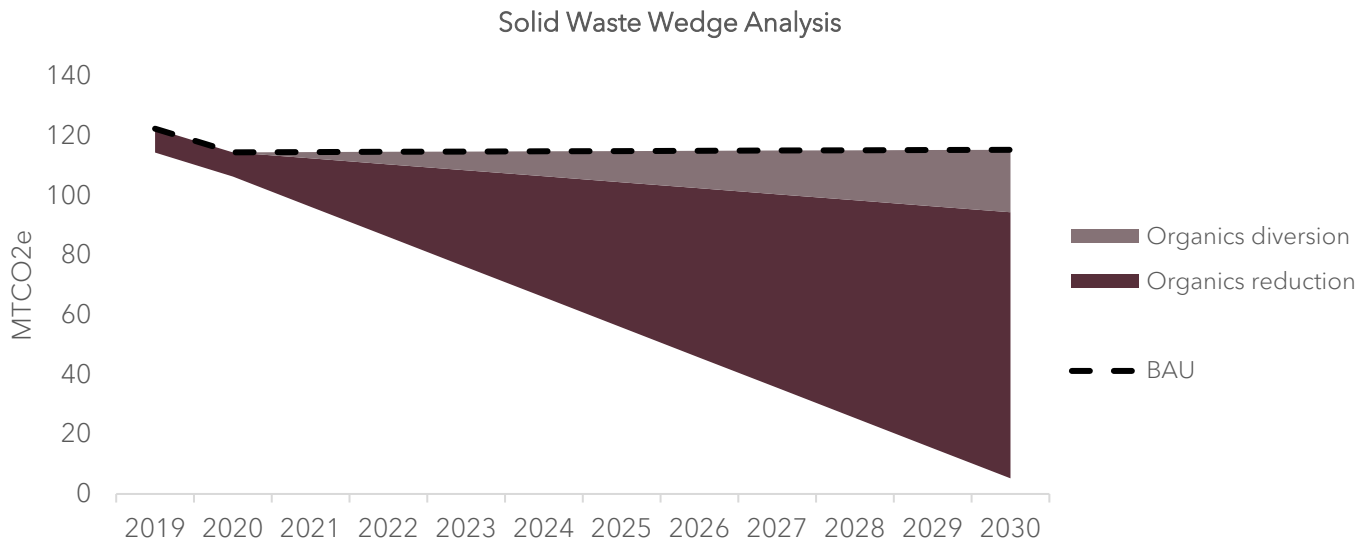
Key Assumptions:

- 80% organics diversion rate by 2030 and reduce organic waste by 50% by 2030.
- Redmond will conduct waste characterization studies to monitor progress towards this goal.

Key Findings:

- Organic waste diversion and reduction will significantly reduce waste emissions.

MUNICIPAL ENERGY EMISSIONS (MTCO ₂ E)		
	2025	2030
BAU	115	115
With Municipal Actions	56 (54% reduction)	5 (96% reduction)



Analysis Assumptions and Details

Strategy #1: Cleaner Electricity

Overview: Reductions in GHG emissions from the built environment and energy sectors will require a transition to clean, renewable energy. Electricity consumption accounts for over 60% of Redmond’s municipal GHG emissions, so making progress toward more renewable electricity sources is an essential component of the clean energy transition. In 2021, Redmond transitioned 100% of its electricity accounts to Puget Sound Energy’s (PSE) Green Direct program which provides dedicated renewable energy resources for program customers. Similarly, new WA State legislation will be very impactful in facilitating this transition: State Bill 5116 calls for 100% carbon-free electricity by 2045 for all electricity utilities in Washington state². Actions in this strategy include efforts to incorporate additional renewable electricity—including from rooftop solar—into City of Redmond’s electricity fuel mix.

Strategy/Phasing:

- While PSE makes the transition to renewable electricity, City of Redmond can increase the use of local renewable energy. Options include:
 - Continue participation in PSE’s [Green Direct](#) program.
 - On-site renewable energy projects on municipal buildings, facilities, and lands.
 - Purchase of renewable energy credits (RECs).

Overarching Assumption(s):

- Redmond’s electricity will be 100% renewable through PSE’s Green Direct program starting in March 2021.
- PSE’s electricity mix will be carbon neutral by 2030 and 100% carbon-free by 2045 to maintain compliance with the Clean Energy Transformation Act.³

² <http://lawfilesexternal.wa.gov/biennium/2019-20/Pdf/Bills/Senate%20Passed%20Legislature/5116-S2.PL.pdf?q=20200226093506>

³ <https://www.pse.com/press-release/details/pse-sets-beyond-net-zero-carbon-goal>

Actions:

#	Action	Description	Status	Impact	Assumption
ESAP B3.1	Increase on-site renewable energy generation	Expand on-site solar generation on new municipal buildings. ⁴	Ongoing	Low	<ul style="list-style-type: none"> Solar installations upon construction of all new PV-suitable buildings. Likely new PV-suitable buildings that are planned to be built by 2030 include: Community Center, MOC complex, and Fire Stations 11, 12, and 18. 65,700 kWh of on-site solar electricity generation annually per rooftop solar installation.⁵ This totals to 394,200 kWh of on-site solar electricity generated annually by 2030. Assumes multi-site aggregation net metering.⁶
ESAP B3.2	Cross-departmental task force	Develop a cross-departmental task force, which works to address challenges related to land use code in siting renewable energy and other sustainability facilities in the city.	Mid-Term		<i>No impact; supporting action for onsite renewable energy</i>

⁴ The community-wide environmental sustainability action plan has an action that introduces requirements for new construction to be all-electric, with solar- and EV-ready infrastructure.

⁵ <https://www.google.com/get/sunroof/building/47.67814600000001/-122.1247356/#?f=buy&b=500>.

⁶ <https://www.pse.com/green-options/Renewable-Energy-Programs/distributed-renewables>.

#	Action	Description	Status	Impact	Assumption
NEW ZCS1	Continue Green Direct Subscription	Continue subscription in PSE's Green Direct Program.	Ongoing	High	<ul style="list-style-type: none"> 100% of the City's electricity is procured through PSE's Green Direct program as of March 1, 2021 (approximately 10 million kWh annually). Prior to March 2021, the City purchased 1.3 million kWh annually through PSE's Green Direct program.

Assumption Summary:

Variable	2020 Value	2030 Value
2017 PSE electricity renewable portfolio (%)*	41% ⁷	100%
City Green Direct purchases (kWh)	1.3 million	10,815,939
City on-site solar generation (kWh)	21,600 ⁸	390,000

*Please note these values fluctuate from year to year.

⁷ [2017 WA Dept. of Commerce Fuel Mix Disclosure Report](#)

⁸ 20.5 kW existing solar system installation on City Hall with an average monthly output of ~1,800 kWh between 2017-2018.

Strategy #2: Reduce Building Energy Demand

Overview: Reductions in building GHG emissions will also require a reduction in energy demand. Washington State’s energy code (adopted by the State Building Code Council) is designed to help achieve the goal of net zero GHG **new buildings** by the year 2031.⁹ Further, King County and the King County-Cities Climate Collaborative (K4C) share a target to reduce energy use in all **existing buildings** 25% below 2012 levels by 2030.¹⁰ Actions in this strategy include energy efficiency retrofits at municipal facilities. The City’s energy consumption is expected to increase from more than 10 million kWh annually to approximately 11.4 million kWh by 2030 due to the addition of new infrastructure, further reinforcing the need for and importance of energy conservation.

Strategy/Phasing:

- Reductions in building energy demand will provide **near-term emission reductions** and **facilitate the ability for PSE to meet electricity demand** with cleaner fuel mixes (e.g., reduces the need for dirtier “peaker” plants).
- Installing energy-efficient technologies into new construction will be less expensive than retrofitting later.

Overarching Assumption(s):

- Implementation of WA State building code for new buildings: 70% reduction in new building energy use by 2030.¹¹

Actions:

#	Action	Description	Status	Impact	Assumptions
ESAP B2.1	Financing for energy efficiency	Assess various options for financing and grants to energy efficiency projects for municipal buildings.	Ongoing	Medium	Existing City buildings: <ul style="list-style-type: none"> • Approximately 30% energy use reduction in the existing municipal building portfolio that require investment by 2030 as identified by the Facilities Strategic Management Plan (FSMP).¹²
ESAP B2.2	Energy and water retrofits	Continue to implement energy and water conservation retrofits and operational improvements	Ongoing		

⁹ <https://app.leg.wa.gov/RCW/default.aspx?cite=19.27A.020>

¹⁰ https://your.kingcounty.gov/dnrp/climate/documents/2015_King_County_SCAP-Full_Plan.pdf

¹¹ <https://www.natlawreview.com/article/new-washington-legislation-drives-energy-conservation-commercial-buildings>. Assumed compared to current levels.

¹² Energy use reduction dependent on building type. See building fuel switching assumptions for more detail.

#	Action	Description	Status	Impact	Assumptions
		for municipal facilities, streetlights and traffic signals.			<ul style="list-style-type: none"> Excludes leased facilities where the City does not occupy or pay utilities.
ESAP B2.3	Facilities Strategic Maintenance Plan	Coordinate and implement recommendations from the Facilities Strategic Maintenance Plan that support sustainability. Evaluate option for an internal Revolving Fund as a dedicated source of capital, funded by savings from energy efficiency upgrades or other funding mechanisms.	Ongoing		
ESAP B2.4	Resource Conservation Management Plan	Develop a Resource Conservation Management Plan and general government policy to guide energy efficiency investments, operations, and behaviors in City facilities.	Near-Term		
ESAP B2.5	Information technology improvements	Implement solutions to reduce energy demand from the City's IT infrastructure.	Ongoing		
ESAP B2.6	New City building green certification	Develop a policy that requires all new municipal owned buildings to be constructed to a minimum certification level, such as Living Building Challenge, or Gold level as defined by the U.S. Green	Near-Term		Certification reduces total site energy use intensity (EUI) by 30% when compared to existing buildings of the same type. ¹³

¹³ LEED Gold buildings have 20% lower GHG emissions than average buildings. Source:

<https://www.sciencedirect.com/science/article/pii/S037877881300529X#tbl0005>

LEED buildings on average use 18-39% less energy per floor area than their convention counterparts. Source:

<https://www.sciencedirect.com/science/article/abs/pii/S0378778809000693>

#	Action	Description	Status	Impact	Assumptions
		Building Council's (USGBC) Leadership in Energy & Environmental Design (LEED) for New Construction.			
ESAP B2.7	Existing City building green certification	Implement updates needed for existing City buildings to achieve ENERGY STAR or equivalent recognition. Continue to track progress in a platform such as EPA Portfolio Manager.	Ongoing		Certification reduces energy consumption from existing buildings by approximately 30% when compared to buildings of the same type. ¹⁴
ESAP B2.8	Embodied and operational carbon	Introduce a policy or program to address embodied and operational carbon in municipal operations.	Mid-Term	N/A	N/A (not in municipal inventory)
NEW ZCS2	Net zero energy use at new municipal buildings	Require that new municipal buildings built between 2025-2030 will have net zero energy use, where possible given facility attributes.	Ongoing	Low	<ul style="list-style-type: none"> Solar installation size will be the same regardless of rooftop space on new PV-suitable municipal buildings.¹⁵ Possible new PV-suitable municipal buildings built between 2025-2030 include: Community Center, Fire Station 11, 12, 18, MOC Complex.

¹⁴ LEED Gold buildings have 20% lower GHG emissions than average buildings. Source:

<https://www.sciencedirect.com/science/article/pii/S037877881300529X#tbl0005>

LEED buildings on average use 18-39% less energy per floor area than their convention counterparts. Source:

<https://www.sciencedirect.com/science/article/abs/pii/S0378778809000693>

¹⁵ Assumes each new PV-suitable building will have a 60 kW solar installation that will generate approximately 65,700 kWh annually.

Strategy #3: Building Fuel Switching

Overview: While the energy sector transitions to clean, renewable energy, Redmond can work proactively to shift from fossil fuel energy sources to the clean electricity grid.

Strategy/Phasing:

- According to projected trends in PSE’s electricity fuel mix, switching from natural gas to electricity-based space and water heating will be **most beneficial starting in 2030** when the utility expects to have a carbon neutral electricity mix. Local actions to increase renewable electricity consumption in municipal operations—such as rooftop solar and green power purchasing programs—will expedite this timeframe.
- Due to the relatively long lifetimes of buildings and equipment, actions now **set the stage for a quick and easy transition from natural gas to electricity** will help ensure deep and longer-term emission reductions. Because new construction and major renovations will likely have longer than a 10-year lifespan (i.e., past 2030), it is more economical to eliminate natural gas use in these new municipal construction projects than to retrofit them later.
- For existing buildings, the City can begin **replacing existing natural gas equipment with electric** at the end of the equipment’s life.

Actions:

#	Action	Description	Status	Impact	Assumptions
ESAP B3.4	Green building training	Educate City planning and permitting staff on codes and approaches for incentivizing decarbonization, such as through electric heat pumps. Update permitting process if needed to quickly review and flag decarbonization projects.	Near-Term	Medium	<i>No direct impact - supporting action for municipal building decarbonization</i>
NEW ZCS3	Electric new municipal building construction	Construct all new municipal buildings and major renovations to be all-electric, including for heating. ¹⁶	Ongoing	Medium	<ul style="list-style-type: none"> • All new municipal buildings will be all-electric. New municipal buildings planned for construction before 2030 include: Community Center, FS

¹⁶ The community-wide environmental sustainability action plan includes an action that prohibits hookups of natural gas in new developments and buildings under a phase-in schedule that considers technological feasibility and pair with a list of exemptions.

#	Action	Description	Status	Impact	Assumptions
					Fire Station 11, 12, 13, and 18, MOC). ¹⁷ <ul style="list-style-type: none"> Site EUI for all-electric buildings will be a 30% reduction compared to the baseline Site Energy Use Intensity (EUI).¹⁸
NEW ZCS4	Existing building efficiency and electrification upgrades	Require all newly installed equipment to be energy efficient and all-electric and adopt a policy for large buildings to develop a decarbonization plan to become all-electric and meet established efficiency standards by 2030.	Near-Term	Medium	Existing buildings will have a mixed electric and energy efficiency target based on building type: ¹⁹ <p>Public Order and Safety Buildings²⁰</p> <ul style="list-style-type: none"> Post-Action Site EUI: 66 kBTU/SF <ul style="list-style-type: none"> 35 kBTU/SF non-electric EUI 31 kBTU/SF electric EUI 47% electric <p>Public Assembly Buildings²¹</p> <ul style="list-style-type: none"> Post-Action Site EUI: 34 kBTU/SF <ul style="list-style-type: none"> 21 kBTU/SF non-electric EUI 13 kBTU/SF electric EUI 38% electric <p>Service Buildings</p>

¹⁷ Fire Station 14 and 16 recently underwent seismic upgrades which will push their replacement beyond 2030, so it is assumed that they just undergo energy efficiency upgrades prior to 2030.

¹⁸ [BldgEngy Targets 2017-03-30 FINAL.pdf \(seattle.gov\)](#).

¹⁹ Based on Seattle’s performance targets by 2035. Source: Performance Standards for Existing Buildings Performance Targets and Metrics 2019 Memo. Includes the 30% reduction in total site EUI from actions B2.1-B2.4.

²⁰ MOC Building 01 PW Operations has a higher-than-normal site EUI, so we assume this is just reduced by 30%.

²¹ Assume a 30% reduction in electric EUI for City Hall because it only has a maintenance contract, but there is a full renovation planned for 2033.

#	Action	Description	Status	Impact	Assumptions
					<ul style="list-style-type: none"> • Post-Action Site EUI: 43 kBTU/SF <ul style="list-style-type: none"> ○ 25 kBTU/SF non-electric EUI ○ 18 kBTU/SF electric EUI ○ 42% electric

Strategy #4: Reduce Fleet Vehicle Miles Traveled (VMT)

Overview: Reductions in GHG emissions from the City fleet will require a transition to clean, low-/zero-emission vehicles while simultaneously reducing the number vehicle miles traveled (VMT). Vehicle fleet related emissions accounts for nearly 20% of Redmond’s 2018 municipal GHG emissions, so making progress toward reducing fleet vehicle miles while providing essential municipal services is essential to meeting the City’s GHG emissions reduction goal.

Strategy/Phasing:

- Vehicle emissions stem from a combination of fuel efficiency, the carbon content of the fuel, and VMT. Gains in the first two areas may be potentially offset by losses in the third (VMT). Transitioning to all electric vehicles may not be possible for certain vehicle-types, therefore, it’s important that while City of Redmond integrates EVs into its fleet, the City must simultaneously reduce vehicle miles traveled in non-electric vehicles.
- Implementing idling management efforts in fleet vehicles will be an important first step as the City further electrifies its fleet. Idling management technology and strategies already exists and can be applied immediately to high-idling vehicles (e.g., police vehicles), prior to electrification.
- The City of Redmond can utilize a suite of opportunities to reduce VMT (i.e., carpooling, trip consolidation, virtual meetings).

Actions:

#	Action	Description	Status	Impact	Assumption(s)
ESAP T3.1 (amended)	Police and Heavy-Duty VMT/idling.	Identify and implement opportunities for reducing VMT and idling, especially from <i>police vehicles and heavy-duty vehicles</i> .	Mid-Term	High	<ul style="list-style-type: none"> • Idling management technology can save 345 gallons of fuel annually, per vehicle. • By 2025 <ul style="list-style-type: none"> ○ Assumes all 31 police vehicles and 50% of heavy-duty vehicles (total of 15 vehicles) adopt this technology - equivalent to 15,870

#	Action	Description	Status	Impact	Assumption(s)
					gallons of fuel saved annually. ²²
NEW ZCS5	Trip consolidation and carpooling	Provide an incentive to City staff to encourage trip consolidation, virtual meetings, and carpooling for scheduled trips (e.g., from City Hall to MOC).	Ongoing	Medium	<ul style="list-style-type: none"> • Prioritization of virtual meetings during scheduled workday travel will reduce VMT by: <ul style="list-style-type: none"> ◦ 1% per year • These actions do not apply to buses, fire trucks, fuel tankers, plow trucks, off-road vehicles, and equipment.
NEW ZCS6	Green routing	Evaluate all scheduled trips made in fleet vehicles and pre-plan for the “greenest” route (i.e., using real-time GPS programming and selecting the most efficient route). ²³	Near-Term	Medium	<ul style="list-style-type: none"> • Green routing will reduce total fleet fuel consumption 2% per year.²⁴

²² Vermont Clean Cities Coalition (VTCCC) and the City of Burlington recently partnered with the police department to pilot the IdleRight Fuel Management System technology. the city’s data showed the device not only reduced tailpipe emissions but was capable of saving 345 gallons of fuel and decreasing operating costs by about \$811 per vehicle annually. Source: <https://afdc.energy.gov/case/3076>

²³ NREL recently developed a tool to calculate and measure “green routing”. <https://www.nrel.gov/transportation/route-energy-prediction-model.html>

²⁴ A study using a large-scale, high resolution data set from the California Household Travel Survey indicates that 31% of actual routes have fuel savings potential, and among these routes the cumulative fuel savings could reach 12%. Alternately calculating the potential fuel savings relative to the full set of actual routes (including those that already follow the greenest route recommendation), the potential savings relative to the overall estimated fuel consumption would be 4.5%. Given that not all City of Redmond vehicle trips are scheduled, a more conservative (i.e., 2%) will be applied. Source: [Green Routing Fuel-Saving Opportunity Assessment: A Case Study Using Large-Scale, Real-World Travel Data \(nrel.gov\)](https://www.nrel.gov/transportation/green-routing-fuel-saving-opportunity-assessment-a-case-study-using-large-scale-real-world-travel-data.html)

Strategy #5: Increase Fleet Vehicle Fuel Efficiency

Overview:

Reductions in GHG emissions from the transportation sector will require a transition to clean, low-/zero-emission vehicles while simultaneously enhancing community mobility through increased access to alternatives modes of transportation and decreasing community-wide vehicle miles traveled (VMT). Fleet vehicle related emissions accounts for nearly 20% of Redmond’s municipal GHG emissions, so making progress toward more efficient and lower-carbon vehicles will be critical. Currently, Redmond’s vehicle fleet consists of 332 vehicles, with 98% of vehicles powered by fossil fuels and only five fully electric vehicles. A majority (50%) of Redmond’s vehicle fleet is passenger vehicles, with the next two largest vehicle types being medium-duty trucks and equipment (approximately 20% each).

Strategy/Phasing:

- Due to their long lifetimes of vehicles, taking action now to transition to EVs in the **municipal fleet** will be important for achieving 2030 goals.
- Transitioning **small passenger vehicles** will be important in the very short term, with transition of **trucks and other heavy-duty equipment** increasingly important between 2025 and 2030.
- With the limited market for medium-duty electric vehicles, electrification rate will remain lower through 2025 and then experience and accelerated ramp up to 2030.
- To rapidly electrify the fleet, the City must develop and maintain a robust **EV charging infrastructure network**. Ensuring sufficient **EV infrastructure** in the near-term will also help reduce range anxiety and increase buy-in from employees in the short-term.

Actions:

#	Action	Description	Status	Impact	Assumption(s)
ESAP T4.1	Municipal fleet conversion	Implement the Green Fleet Purchasing Policy that commits to replacing municipal vehicles with alternative fuel/low-carbon vehicles in a manner that minimizes greenhouse gas emissions and	Ongoing	High	<p>25 total vehicles are replaced annually (approximately 6% of fleet).</p> <ul style="list-style-type: none"> • The number of vehicles replaced annually will need to be increased through time to address electrification needs (e.g., accelerated medium-duty electrification after 2025). <p>Starting in 2023:</p>

#	Action	Description	Status	Impact	Assumption(s)
		considers life-cycle economics.			
NEW ZCS7	EV Purchasing Policy	Include in the Green Fleet Purchasing Policy that all new light duty vehicles must be full electric.	Near-Term	High	<p>Light Duty (Gasoline):</p> <ul style="list-style-type: none"> Assumes 9 of the 25 total vehicles replaced annually are passenger vehicles. It is assumed that no electric vehicles will be purchased until 2023. This equates to 63 of 167 (37%) passenger vehicles are replaced with EVs by 2030.²⁵ <p>Medium Duty (half gasoline/half diesel):</p> <ul style="list-style-type: none"> Assumes no electric vehicles purchased until 2025. After 2025, the EV adoption rate linearly scales up from 5 to 8 vehicles annually until 2030.²⁶ This equates to approximately 37 medium duty vehicles being replaced by 2030. <p>Heavy-Duty and Equipment (Diesel):</p> <ul style="list-style-type: none"> All heavy-duty vehicles and equipment will utilize renewable diesel [86 diesel vehicles and equipment by 2030]. Each vehicle replaced with renewable diesel will see a 20% reduction in GHG emissions equivalent to that associated

²⁵ Assumes 9 of the 25 total vehicles replaced annually are passenger vehicles. This equates to 63 passenger vehicles replaced over the next seven years. While the calculation assume EV procurement will not begin until 2023/2024, purchasing will begin upon availability of EV charging infrastructure. A project to add 11 new EV chargers was approved in October 2021 and was kicked off November 2021.

²⁶ Assuming the City begins purchasing electric medium-duty vehicles starting in 2025, this equates to 37 medium-duty vehicles are replaced with zero emissions vehicles over the next five years.

#	Action	Description	Status	Impact	Assumption(s)
					with switching to biodiesel in ClearPath. ²⁷
NEW ZCS8	Fleet Use Prioritization	Prioritize EV fleet vehicles for highest uses.	Long-Term	High	In addition to the above assumption, 25% of police vehicles are replaced with EVs by 2030. ²⁸
ESAP T4.3	Emission standards for contractors	Develop and incorporate contractor fuel emission reduction standards into bids and contracts to ensure construction contractors doing work on the city's behalf are using fuel efficient and low polluting vehicles and equipment when feasible and practicable.	Mid-Term	N/A	N/A (not a part of the municipal GHG inventory)
NEW ZCS9	EV Charging	Develop a policy that requires all major City planning efforts, major renovations, remodels or new construction to evaluate the need for electric vehicle charging and incorporate into the project and/or	Near-Term	High	Based on the assumptions above, Redmond is projected to have approximately 100 new EVs in its fleet; requiring approximately 75 EV chargers by 2030. ²⁹ The specific number of chargers will be dependent on vehicle battery capacity, use, and location of chargers in proximity to parking spaces.

²⁷ Based on EIA article stating that renewable diesel emissions reductions are comparable to that of biodiesel (<https://www.eia.gov/todayinenergy/detail.php?id=37472>).

²⁸ Police vehicles are one of the most frequently used and replaced vehicles in the fleet; electrifying police vehicles addresses the need to prioritize high-use vehicles. Includes cruisers, which are predominantly SUVs.

²⁹ The City of Seattle currently operates 165 battery electric and plug-in hybrid vehicles and has 250 EV chargers to support their fleet. This is equivalent to a 1:1.5 ratio of EV's to EV chargers. Given the size of Redmond's operations, we are estimating a more conservative approach, using a 1:1 ratio of EVs to EV chargers. Final estimates were rounded from 190 to 200 to support future growth. Source: <https://www.seattle.gov/Documents/Departments/FAS/FleetManagement/Fleet-Electrification.pdf>. Assumes one port per charger.

#	Action	Description	Status	Impact	Assumption(s)
		construction. Complete a municipal EV charging infrastructure strategy to understand EV infrastructure needs, employee workplace charging opportunities, placement of chargers, and budget to guide the City's efforts.			
NEW ZCS10	Zero Emissions Leaf Blowers	Evaluate the impact of gas-powered leaf blowers and explore zero emissions alternatives.	Near-Term	Low	Not evaluated as part of qualitative analysis.

Strategy #6: Reduce Employee Commute Emissions

Overview:

Emissions reductions associated with the travel of employees to and from work in personal vehicles will require a transition to clean, low-/zero-emission vehicles while simultaneously enhancing community mobility and decreasing vehicle miles traveled (VMT). Employee commute related emissions accounts for approximately 8% of Redmond's municipal GHG emissions, so making progress toward reducing commuting miles and increasing equitable access to goods and services are essential to effective climate action. Local governments can often influence these emissions through various programs (e.g., carpools, telecommute options, flex schedule options) despite not having direct control over how employees commute to and from work.

Strategy/Phasing:

- Vehicle emissions are driven by combination of fuel efficiency, the carbon content of the fuel, and VMT. Gains in the first two areas may be potentially offset by losses in the third (VMT). It's important that while City of Redmond supports EV's, they simultaneously reduce vehicle miles traveled by promoting non-SOV modes like transit, walking, biking, and ridesharing amongst employees.

- Maintaining strong telecommuting practices as the City transitions to a post-COVID economy will be an effective strategy to quickly realize emission reductions. The behavioral and technological changes associated with a hybrid telecommuting workplace have been established and the associated GHG reductions will be easier to maintain with this approach.
- Redmond is preparing for the opening of the Link Light Rail and therefore should partner with transit agencies to maintain and enhance multimodal transit services and related facilities, including better first/last mile access to transit.

Overarching Assumptions:

- Drive alone rate and work schedules obtained from Redmond City Hall CTR Survey.

Actions:

#	Action	Description	Status	Impact	Assumption(s)
ESAP T1.11	Comprehensive transportation outreach and education	Continue employee education and outreach programs and materials for transportation initiatives related to reducing emissions and community mobility. Promote alternative non-SOV incentive programs.	Ongoing	High	<p>By 2030:</p> <ul style="list-style-type: none"> • 20% increase in non-drive alone rate. • 35% reduction in VMT among employees—equivalent to 35% reduction in vehicle fleet fuel use.³⁰
ESAP T4.2	Telecommuting and alternative work schedules	Expand telecommute and flexible schedules for City employees and encourage Redmond businesses to adopt.	Ongoing	High	<p>Alternate Work Schedules as of Q3 2021:</p> <ul style="list-style-type: none"> • 86 employees work 4/10 schedule • 44 employees work 9/80 schedule <p>Prior to the COVID-19 pandemic, 1% of Redmond employees telecommuted (i.e., 99% of employee VMT is used for commuting).</p> <ul style="list-style-type: none"> • Of the 711 employees, we assume 390 have the ability to telecommute consistently (55%). If each of the 390

³⁰ According to a literature review commissioned by the University of California Berkley and the State of California Public Transportation Account, carsharing appears to have reduced annual VMT overall between 26-42% among those who have participated. The associate GHG impacts varied, depending on whether or not carsharing was one-way or roundtrip. On average, carsharing trips reduces 10% of GHG emissions per household in the Seattle area. Source: http://innovativemobility.org/wp-content/uploads/2016/07/Impactsofcar2go_FiveCities_2016.pdf

#	Action	Description	Status	Impact	Assumption(s)
					<p>employees telecommute once per week, this would reduce their commute-related GHG emissions by 20% for that week. ³¹</p> <ul style="list-style-type: none"> In total, this would reduce annual employee commuting emissions by 11%.
ESAP T1.10	Active mobility infrastructure investments	Identify and implement pedestrian and bicycle infrastructure investments that promote connectivity, safety, and mobility for all.	Ongoing	Low	<i>Supporting Action</i>
ESAP T1.8	Increase new mobility options	Encourage and foster the use of new mobility options, such as bike share, electric bike and scooters, and ride hailing.	Ongoing	Low	<i>Supporting Action</i>
NEW ZCS11	Employee EV Purchasing	Explore opportunities to allow employees to purchase electric vehicles through the City's fleet purchasing contract.	Near-Term	Medium	<i>Supporting Action</i>

Assumption Summary:

Variable	2015-2016	2017-2019	2020
Employee Counts	663 FTE	711 FTE	652 FTE

³¹ Greenhouse Gas Emission Reductions from Teleworking. San Diego County. 2020. <https://www.sandiegocounty.gov/content/sdc/sustainability/cap.html>

Strategy #7: Improve Waste and Materials Management

Overview: While solid waste related emissions account for only 4% of Redmond’s municipal GHG emissions, many of the actions in this strategy offer environmental, economic, and social co-benefits. Upstream lifecycle impacts of goods and services we buy can be significant—especially for carbon-intensive products such as red meat. Furthermore, actions such as rescuing edible food from the landfill and redistributing to food donation programs not only reduces methane emissions but helps to address hunger in local communities.

Strategy/Phasing:

- **Expand incentives, education, and outreach** initially to ensure all employees understand what can be recycled and methods for doing so.
- Phase in mandatory separation and recycling requirements to ensure achievement of target diversion rates.

Overarching Assumptions:

- Cedar Hills Landfill will reach current permitted capacity in 2028.³²
- Redmond’s Climate Emergency Declaration establishes a target of zero waste of resources by 2030.

Actions:

#	Action	Description	Status	Impact	Assumption(s)
ESAP M3.1	Increase City waste diversion	Provide composting and recycling at all City buildings and for all municipal operations, including specialized items.	Ongoing	Low	GHG emissions will only come from organic materials. No GHG emissions reductions from plastics recycling. Assume 80% organics diversion rate to help
NEW ZCS12	Enforce City waste diversion	Introduce and enforce a policy requiring composting of all organics waste.	Mid-Term		

³² <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan.pdf>

#	Action	Description	Status	Impact	Assumption(s)
					reach zero-waste goal by 2030 ³³³⁴
ESAP M3.3	Reduce City waste	Reduce the total tonnage of waste that is produced by the City and identify opportunities for otherwise wasted edible food by cafeteria vendors to be recovered by food banks.	Mid-Term	Medium	Reduce organic waste generation by 50% of 2015 levels by 2030 according to HB1114. ³⁵
ESAP M3.2	Increase use of electronic documents	Enhance systems for electronic documentation and file sharing.	Ongoing	Low	<i>Negligible impact on emissions.</i>
ESAP M3.4	Green purchasing/procurement	Develop and enforce green City purchasing procedures and policies, including for green cleaning materials and support of end-use markets for recycled materials.	Near-Term	Low	<i>No Impact.</i>
ESAP M3.5	Fleet hazardous waste	Set a policy/goal for hazardous waste generated by the city's Purchasing and Fleet divisions (separate) to be zero or near zero.	Long-Term	Low	<i>No impact; hazardous waste does not reduce GHG emissions.</i>

³³ See commercial sector section of [Organic materials management in King County - LinkUp program - King County Solid Waste Division](#). Redmond would need to increase average commercial capture rate from 17% to 80%. Redmond would also need to conduct waste characterization studies to monitor progress towards this goal. Organics make up approximately 39.5% of nonresidential waste in King County. <https://www.kingcounty.gov/~media/depts/dnrp/solid-waste/about/documents/waste-characterization-study-2019.ashx?la=en>

³⁴ <https://www.redmond.gov/DocumentCenter/View/15318/Climate-Emergency-Declaration-October-2020>

³⁵ [https://app.leg.wa.gov/bills/summary?BillNumber=1114&Year=2019](https://app.leg.wa.gov/bills/summary/BillNumber=1114&Year=2019). House Bill 1114 sets a goal of reducing food waste by 50 percent below 2015 levels by 2030.

Strategy #8: Increase Tree Canopy Cover and Offsets

Overview: Tree canopy coverage refers to the amount of area that is covered by tree foliage and the City of Redmond is currently at 38.1% tree canopy (as of 2017). Increasing the tree canopy will provide multiple environmental benefits including water, air, and habitat improvements. In 2019, the City adopted a community-wide goal of 40% tree canopy by 2050. This goal represents a 200-acre increase in canopy from 2019.

Strategy/Phasing:

- Maintenance and prevented loss of existing tree canopy is the essential first step needed to hit Redmond’s community-wide 40% tree canopy target.

Assumptions:

- Emissions will continue to be produced through 2030, carbon offset/capture programs will be a critical step in achieving carbon neutrality.
 - The number of offsets required will ultimately depend on the remaining emissions produced each year.

Actions:

#	Action	Description	Status	Impact	Assumption(s)
ESAP N1.6	Urban forestry department/dedicated staff/ arborist	Hire a person/team at the City to implement the goals and strategies associated with increasing canopy cover across the city and to update the 20 yr plan. This team/person can be the lead on finding community partners and funding to increase community outreach, adoption of policies/goals and education.	Mid-Term	Low	<ul style="list-style-type: none"> • The City planted four acres of trees during the 2019 - 2020 budget. Assumes consistent rate of planting to 2030 (2 acres/year which was 700-800 trees). • Assume 150 western white pine, 150 sitka spruce, 150 douglas fir, 30 Oregon white oak, 30 pacific dogwood, 30 cascara, 30 serviceberry, 30 shore pine, 70 western hemlock,
ESAP N3.13	Assess health of city owned ROW trees	Assess the health of natural systems for parks and ROW trees (urban forests will be part of 20 yr plan). Develop goals, risk tolerances, and restoration strategies to manage tree species and canopy cover.	Mid-Term		

#	Action	Description	Status	Impact	Assumption(s)
ESAP N4.1	Increase City-Led Planting	City led planting involves canopy enhancement projects on City-owned land, such as parks, rights-of-way, and stream restoration corridors within contiguous boundaries.	Ongoing		70 western redcedar trees are planted annually. ³⁶
ESAP N4.6	City Acquisition of Lands	Evaluate acquisition of forest parcels, especially in neighborhoods or zones with less canopy, to preserve urban forest cover. As more infrastructure ages and land use changes, consider acquisition of non-forest parcels for a "tree bank."	Mid-Term		
TCSP B.1	Strategy B.1 from Redmond Tree Canopy Strategic Plan.	Continue program to allow residents to plant trees on park property (via donation) for memorials.	Ongoing		
TCSP B.2	Strategy B.2 from Redmond Tree Canopy Strategic Plan	Increase Canopy on city property by planting open space areas in parks consistent with park master plans, street trees, riparian and restoration plantings	Ongoing		
TCSP B.3	Strategy B.3 from Redmond Tree Canopy Strategic Plan	Maintain and develop partnerships (Strategy F) to assist in city planting.	Ongoing		
NEW ZCS13	Local Carbon Offset/Capture Opportunities	Develop a portfolio of local and regional carbon offset/capture initiatives to meet the City's commitment to carbon neutrality. If local projects are insufficient, obtain high-quality carbon	Mid-Term		

³⁶ The annual carbon sequestration is estimated using the i-Tree tool (<https://planting.itreetools.org/>). Assume that 1 gallon is equivalent to 1/5 inch diameter at breast height (<https://hort.ifas.ufl.edu/woody/root-ball-dimension-chart.shtml>).

#	Action	Description	Status	Impact	Assumption(s)
		offsets and CO2 Removal Certificates (CORCs). ^{37,38}			

³⁷ Emissions will continue to be produced through 2030, carbon offset/capture programs will be a critical step in achieving carbon neutrality. The number of offsets required will ultimately depend on the remaining emissions produced each year. Potential carbon offset/capture projects may include nature-based initiatives on City lands and open spaces that remove carbon dioxide from the atmosphere and store it in biomass and soils. These could include urban forestry projects in areas of the City that lack canopy and are vulnerable to the impacts of heat, or regenerative practices on riparian or degraded lands.

³⁸ Offsets and RECs can be purchased through brokers in a voluntary, open market. Several brokerage firms and online auction platforms facilitate these purchases: [Forterra's Evergreen Carbon Capture](#), 3Degrees, Bonneville Environmental Foundation (BEF), [PSE's Carbon Balance Program](#). For a full list of certified RECs and carbon offset brokers, visit www.green-e.org/certified-resources and www.green-e.org/certified-resources/carbon-offsets.

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