



**CITY OF KIRKLAND**  
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## MEMORANDUM

**To:** Kurt Triplett, City Manager

**From:** David Barnes, Senior Planner  
Allison Zike, AICP, Deputy Director of Planning and Building  
Adam Weinstein, AICP, Director of Planning and Building

**Date:** February 8, 2024

**Subject:** 2022 Greenhouse Gas Emissions Report

## **RECOMMENDATION:**

It is recommended that the City Council read the attached City of Kirkland Greenhouse Gas (GHG) Emissions Report (see Attachment 1), which evaluates community-wide emissions in 2022. Staff also recommends that, at a future date, Council provide feedback on the report and additional actions the community should take to reduce GHG emissions, potentially as part of the Council's feedback on the Sustainability, Climate, and Environment Element of the K2044 Comprehensive Plan Update (scheduled to be discussed with Council in March 2024).

## **BACKGROUND:**

The Eastside Climate Partnership (ECP), which comprises sustainability staff from the cities of Bellevue, Issaquah, Kirkland, Mercer Island and Redmond, commissioned a report from Cascadia Consulting that would consistently collect and evaluate GHG data across the Eastside cities. The resulting report identifies the most current information and methodology for compiling GHG inventories for both Community and Government Operations. Kirkland and other member cities provided their own information from Puget Sound Energy and internal inventories, such as the Fleet Division's consumption of fuel and refrigerants that were used for government operations, for the GHG inventory.

The accompanying GHG Methodology Report (see Attachment 2), goes into more detail about what was included in the inventory and the sources of the information used. This type of data help readers understand that the most current information and thinking and methods are being used to derive the most accurate inventories.

Completing this GHG emissions inventory is identified in existing Kirkland Comprehensive Plan policy and is an action item in the Sustainability Strategic Plan (formerly known as the Sustainability Master Plan). In addition, reporting for the government operations GHG inventory has been conducted annually since 2009, and we have completed three community GHG inventories in 2017, 2019 and 2022. These inventories provide us with the most current breakdown of the sources of emissions and are utilized to inform citywide actions in functional plans and other initiatives.

**NEXT STEPS:**

Staff will evaluate how to address GHG reductions in the update to the Comprehensive Planning policies in the Sustainability, Climate and Environment Element (formerly known as the Environment Element).

**Attachments:**

1. 2022 City of Kirkland GHG Emissions Report
2. GHG Methodology Report

# City of Kirkland Greenhouse Gas Emissions Analysis

2022 Summary Report

Prepared by Cascadia Consulting Group, Inc.



## Introduction

Kirkland has committed to reducing greenhouse gas (GHG) emissions from community sources and municipal operations as part of its climate action strategy. Kirkland's Sustainability Strategic Plan is a functional plan that helps carry out the goals and policies in Kirkland's Comprehensive Plan. To track its progress in this effort, Kirkland has completed an analysis of 2022 GHG emissions related to communitywide activities and municipal operations.

This summary report presents an overview of findings from this GHG analysis.

## Emissions Overview

### Communitywide Emissions

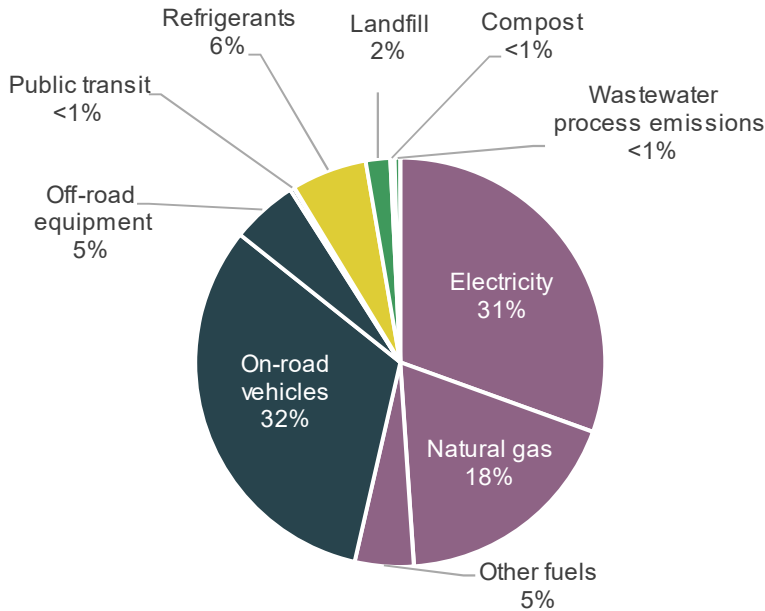
The Kirkland community emitted an estimated **827,221** metric tons of carbon dioxide equivalent (MTCO<sub>2e</sub>) in 2022—equivalent to **8.8** MTCO<sub>2e</sub> per capita. Primary sources of community greenhouse gas emissions include (Figure 1):

On-road vehicles including passenger cars and heavy-duty trucks (**32%**).

Electricity (**31%**) and natural gas (**18%**) to heat, cool, and power residential and commercial buildings.

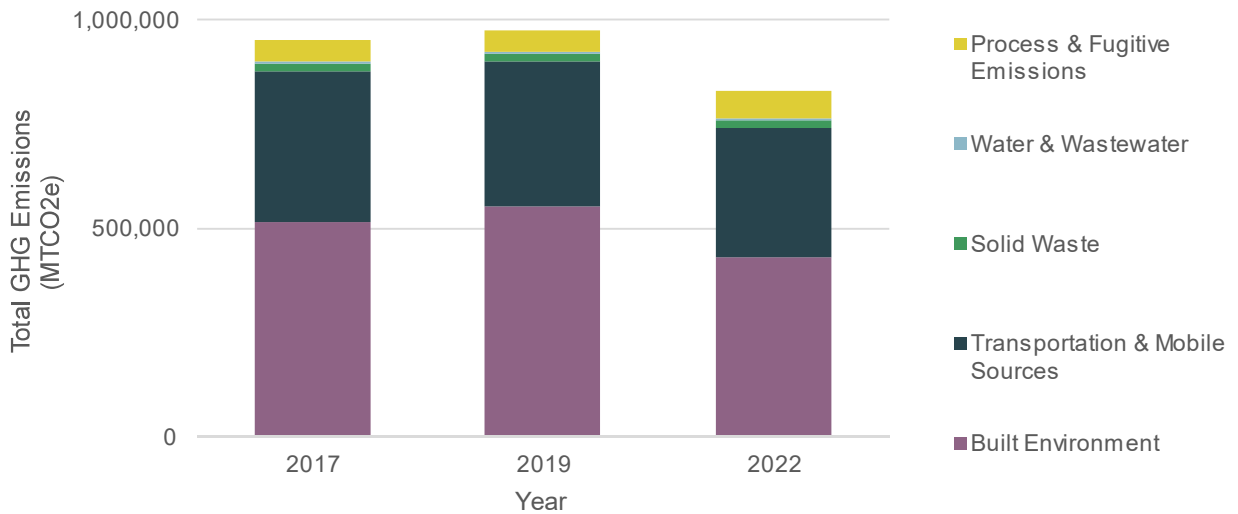
**Figure 1. 2022 Kirkland's community GHG emissions, by sector.**





Kirkland’s 2022 communitywide emissions represent a **15% decrease** compared to the most recent comparable GHG inventory in 2019, primarily driven by a 22% decrease in emissions from energy consumption (likely due to increases in communitywide use of Puget Sound Energy’s Green Power programs), and a 10% decrease in emissions from transportation (Figure 2).

**Figure 2. Communitywide GHG emissions trends over time, by sector.**



## Government Operations Emissions

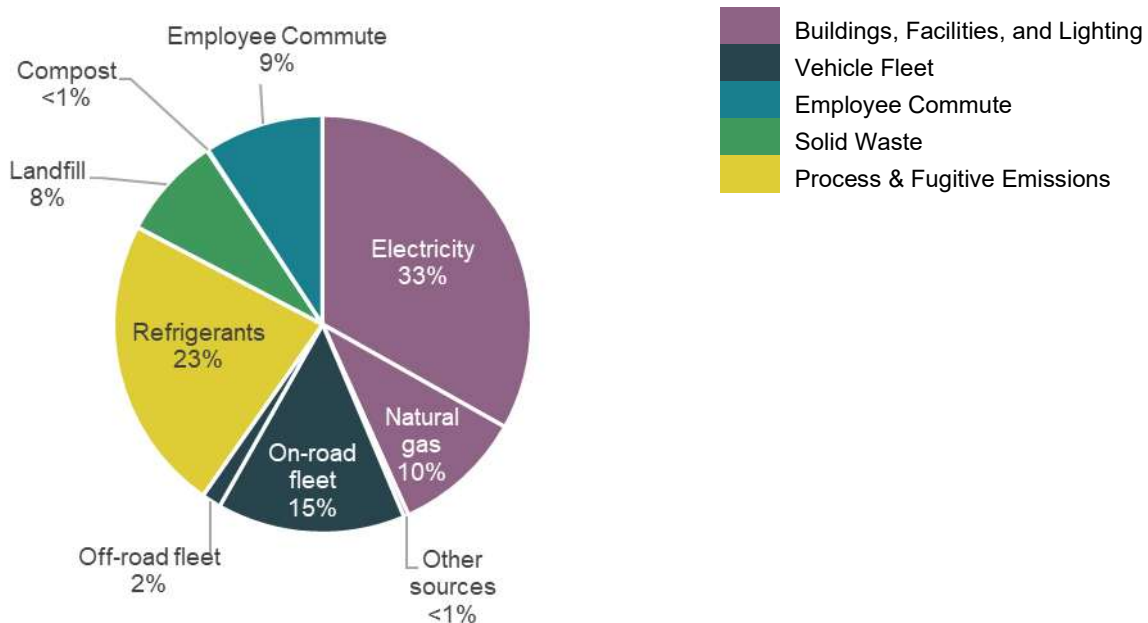
Kirkland’s government operations accounted for approximately **6,899** MTCO<sub>2e</sub> of emissions in 2022, equivalent to **8.7** MTCO<sub>2e</sub> per FTE—representing **0.8%** of total communitywide emissions. Primary sources of government operations emissions include (Figure 3):

Electricity (**33%**) and natural gas (**10%**) to heat, cool, and power government buildings and facilities.

Use of refrigerants to cool facilities, vehicles, and equipment (**23%**).

The City’s vehicle fleet and equipment (**15%**).

**Figure 3. Kirkland’s government operations 2022 GHG emissions, by sector.**

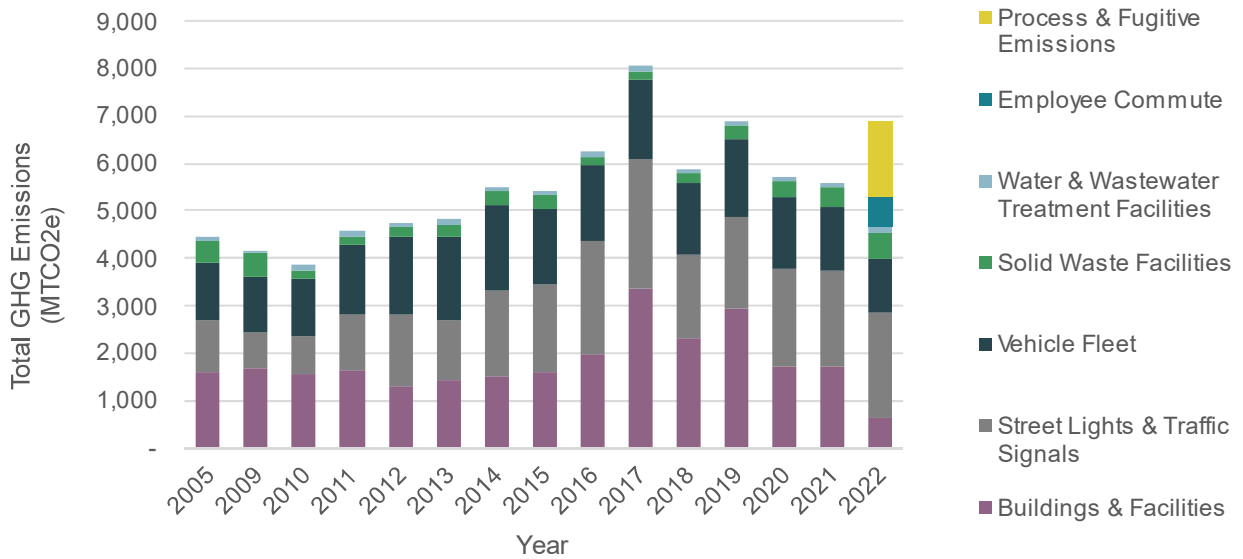


Kirkland’s 2022 government operations emissions represent a **24% increase** compared to the last municipal GHG inventory in 2021. This is likely to be primarily driven by changes to inventory scope, which has not previously quantified emissions from the use of refrigerants or employee commuting which equaled **32%** of the City’s 2022 emissions. In addition, emissions from solid waste generation increased by **32%** from 2021 to 2022, and emissions from water and wastewater treatment facilities increased by 18% (Figure 4).

It is staff’s observation that solid waste increased post pandemic because our parks were being so well utilized and that more frequent pickups of solid waste occurred there to ensure that our parks remained clean for the enjoyment of the community. It is important to point out that landfill emissions are much smaller in comparison to the

overall government operations inventory and that reductions in other sectors of emissions can be appropriately prioritized to maximize resources.

**Figure 4. Government operations GHG emissions trends over time, by sector.**



# Eastside Cities Greenhouse Gas Emissions Inventory

2022 Methodology Report

Prepared by Cascadia Consulting Group, Inc.

November 2023





# Inventory Approach

## Scope

The cities of Bellevue, Redmond, Kirkland, Issaquah, and Mercer Island (Eastside Cities) partnered to complete updated greenhouse gas (GHG) inventories for each city's communitywide and municipal operations. These inventories were completed for calendar year **2022** and included emission sources and sectors intended to align closely with the 2019 Puget Sound Regional Emissions Analysis scope and methodology.

The community-level inventories were completed in compliance with ICLEI's *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* and the government operations inventories were completed in compliance with ICLEI's *Local Government Operations Protocol*.

## Inventory Platform

Emissions were calculated using a combination of [ICLEI's ClearPath platform](#) and Microsoft Excel.<sup>1</sup> ClearPath is the leading software platform used by local governments to complete communitywide and government operations GHG inventories in the United States.

# Inventory Processes & Data Sources

Conducting these inventories involved identifying and applying activity data and emission factors, summarized in Table 1 and Table 2 and detailed in the following sections:

- **Activity data** quantify levels of activity that generate GHG emissions, such as vehicle miles traveled and kWh of electricity consumed.
- **Emission factors** translate activity levels into emissions (e.g., MTCO<sub>2e</sub> per kWh).

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<sup>1</sup> Microsoft Excel was utilized to perform more detailed calculations than what is currently possible in ClearPath.

# Community

Table 1. Key approaches and data sources for 2022 communitywide inventories.

Sector	Activity Data	Emission Factors
<b>Transportation</b>		
On-road vehicles	<ul style="list-style-type: none"> <li>Modeled vehicle miles traveled by vehicle type. The BKR model was used for Bellevue, Kirkland, and Redmond and the PSRC model was used for Mercer Island and Issaquah.</li> </ul>	<ul style="list-style-type: none"> <li>Vehicle carbon intensities (MTCO<sub>2</sub>e/mile) based on PSRC modeling</li> </ul>
Non-road vehicles and equipment	<ul style="list-style-type: none"> <li>County-level emissions from non-road vehicles (EPA MOVES) by sector (e.g., construction, lawn/garden) and fuel type, downscaled to cities by population</li> </ul>	
Aviation.  <i>Note: Aviation was included as “Information Only” in these inventories, so these emissions are not counted as part of communities’ total emissions.</i>	<ul style="list-style-type: none"> <li>Fuel consumption data (SeaTac, Boeing Field), downscaled to cities by average household income (US Census)</li> </ul>	<ul style="list-style-type: none"> <li>EPA emission factors, by fuel type (US EPA)</li> </ul>
Public transit	<ul style="list-style-type: none"> <li>Modeled transit vehicle miles traveled (PSRC; BKR model)</li> </ul>	<ul style="list-style-type: none"> <li>Average vehicle fuel economies for KC Metro and Sound Transit (NTD Database)</li> <li>EPA emission factors for fuels (US EPA)</li> </ul>
<b>Building Energy</b>		
Electricity	<ul style="list-style-type: none"> <li>Electricity consumption from PSE’s standard service and through green power programs, by sector (Puget Sound Energy)</li> <li>Grid loss rates (Puget Sound Energy)</li> </ul>	<ul style="list-style-type: none"> <li>Utility-specific emission factors (Puget Sound Energy)</li> </ul>
Natural gas	<ul style="list-style-type: none"> <li>Natural gas consumption, by sector (Puget Sound Energy)</li> <li>Natural gas leakage rates (Puget Sound Energy)</li> </ul>	<ul style="list-style-type: none"> <li>Utility-specific emissions factor (Puget Sound Energy)</li> </ul>
Fuel oil	<ul style="list-style-type: none"> <li>Washington state energy consumption estimates (EIA), downscaled by:                             <ul style="list-style-type: none"> <li>Local households heated using fuel oil (US Census)</li> <li>Local employment, by sector (PSRC)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>ClearPath default emission factor (US EPA)</li> </ul>
Propane	<ul style="list-style-type: none"> <li>Washington state energy consumption estimates (EIA), downscaled by:                             <ul style="list-style-type: none"> <li>Local households heated using fuel oil (US Census)</li> </ul> </li> <li>Local employment, by sector (PSRC)</li> </ul>	<ul style="list-style-type: none"> <li>ClearPath default emission factor (US EPA)</li> </ul>

## Eastside Cities Greenhouse Gas Emissions Inventory

Sector	Activity Data	Emission Factors
<b>Solid Waste &amp; Wastewater</b>		
Solid waste and compost generation & disposal	<ul style="list-style-type: none"> <li>Annual tons disposed and composted, as reported by City staff from haulers</li> <li>Landfill and composted waste characterization (King County Solid Waste Division)</li> </ul>	<ul style="list-style-type: none"> <li>EPA WARM v15 model</li> </ul>
Wastewater process emissions	<ul style="list-style-type: none"> <li>Process emissions for South Plant and Brightwater Plant, scaled by population served (King County Wastewater Treatment Division)</li> </ul>	
<b>Refrigerants</b>		
Refrigerants	<ul style="list-style-type: none"> <li>Nationally reported fugitive gas emissions, scaled by local population (US EPA)</li> </ul>	

## Government Operations

Table 2. Key approaches and data sources for 2022 government operations inventories.

Sector	Activity Data	Emission Factors
<b>Transportation</b>		
Vehicle fleet	<ul style="list-style-type: none"> <li>Gallons of fuel, vehicle type, and miles travelled, as reported by City staff</li> </ul>	<ul style="list-style-type: none"> <li>ClearPath default emission factors (US EPA)</li> </ul>
Employee commute	<ul style="list-style-type: none"> <li>Average one-way commute, number of employees, and working days as reported by WSDOT CTR Employer Survey (Bellevue, Redmond, and Issaquah)</li> <li>Employee Survey (Mercer Island)</li> <li>City staff estimates (Kirkland)</li> </ul>	<ul style="list-style-type: none"> <li>WSDOT CTR Employer Survey (Redmond &amp; Issaquah)</li> <li>ClearPath default emission factors (US EPA)</li> </ul>
Business travel	<ul style="list-style-type: none"> <li>Air miles traveled, as reported by City staff</li> </ul>	<ul style="list-style-type: none"> <li>ClearPath default emission factors (US EPA)</li> </ul>
<b>Building Energy, Streetlights/Traffic Signals, and Water Conveyance</b>		
Electricity	<ul style="list-style-type: none"> <li>Electricity consumption from PSE’s standard service and through green power programs (Puget Sound Energy)</li> <li>Grid loss rates (Puget Sound Energy)</li> </ul>	<ul style="list-style-type: none"> <li>Utility-specific emission factors (Puget Sound Energy)</li> </ul>
Natural gas	<ul style="list-style-type: none"> <li>Natural gas consumption (Puget Sound Energy)</li> <li>Natural gas leakage rates (Puget Sound Energy)</li> </ul>	<ul style="list-style-type: none"> <li>Utility-specific emission factor (Puget Sound Energy)</li> </ul>
Fuel oil/diesel	<ul style="list-style-type: none"> <li>Consumption for generators (City staff)</li> </ul>	<ul style="list-style-type: none"> <li>ClearPath default emission factors (US EPA)</li> </ul>
<b>Solid Waste</b>		
Solid waste generation & disposal	<ul style="list-style-type: none"> <li>Annual tons disposed and composted (City staff)</li> <li>Landfill waste characterization studies (King County Solid Waste Division)</li> </ul>	<ul style="list-style-type: none"> <li>ClearPath default emission factors</li> </ul>
<b>Refrigerants</b>		
Refrigerants	<ul style="list-style-type: none"> <li>Annual tons of refrigerants used in City facilities and vehicles (City staff)</li> </ul>	

# Data Limitations and Assumptions

Notable limitations of the approach and data sources are summarized below.

## Community

### Transportation

- **Non-Road Vehicles and Equipment:** The EPA MOVES model estimates emissions at the County level, so emissions were scaled from County to City level by population for this analysis.
- **Aviation:** Aviation emissions were estimated by equitably attributing emissions from fuel consumption at Seattle-Tacoma International Airport and Boeing Field, using population and average household income data. The 2022 household income data from the US Census was unavailable for all cities at the time of this analysis, so 2021 data was used as a proxy. Some jurisdictions opted to include aviation as “Information Only” in these inventories, so these emissions are not counted as part of communities’ total emissions, while other jurisdictions opted to count these as part of the communities’ total emissions.

### Building Energy

- **Electricity:** Electricity provided through Puget Sound Energy’s green power programs, such as Green Direct and Community Solar, was assumed to be carbon neutral. This assumption is based on information provided by Puget Sound Energy and guidance provided by ICLEI and standard protocols.
- **Propane and fuel oil:** In the PSREA project, propane and fuel oil emissions were estimated using EIA sales data. With this update, these emissions were estimated using EIA consumption data for WA state to improve the accuracy of estimations.

### Solid Waste & Wastewater

- **Compost:** Emissions from composted waste were estimated using King County’s most recent residential and commercial organics studies, completed in 2018 and 2019.

- **Wastewater:** In previous years, emissions were estimated using wastewater treatment process data provided by King County's Wastewater Treatment District (KC WTD). In 2022, KC WTD provided each plant's calculated emissions. To estimate emissions by jurisdiction, a per-capita emission factor was determined based on the approximate population served by each plant, and this factor was applied to each jurisdiction's population.

### Refrigerants

- Emissions from refrigerants were scaled from national data based on population.
- The EPA has not released the 2022 *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, so 2021 refrigerant emissions were scaled to 2022 for this analysis.

## Government Operations

Each of the Eastside Cities collects and maintains records differently. Due to the variation in data available, each City's municipal operations inventory was completed using slightly different activity data and methodologies for certain emission sources (e.g., employee commute, refrigerants), as noted in Table 2.

# Appendix A. Changes from Past Inventories

Several methodological differences between the current inventory and previous inventories led to changes in GHG emissions reported (see table below). The values reflected in this inventory report for current and previous inventory years have been calculated using the current methodology.

**Brief methodological outline of previous inventories and the 2022 inventory.**

Sector	Methodology for Previous Inventories <sup>2</sup>	Methodology for 2022 Inventory Update	Rationale
<b>Transportation</b>			
On-road vehicles	Model-derived VMT and vehicle carbon intensities	No change	Reflects best available information
Non-road vehicles and equipment	MOVES model, downscaled by population/jobs	No change	Reflects best available information
Aviation	Not included	SeaTac & Boeing field fuel usage downscaled to jurisdiction through passenger survey data	Important to acknowledge this important emissions source, but also highly modeled and with limited local control
Public transit	Same as on-road vehicles	Model-derived VMT with agency-specific vehicle carbon intensities	More reflective of local transit agency emission reduction initiatives; consistent with PSREA

<sup>2</sup> Methodologies may have varied by jurisdiction. This column presents a general methodology that was used by most cities in previous inventories.

## Eastside Cities Greenhouse Gas Emissions Inventory

Sector	Methodology for Previous Inventories <sup>2</sup>	Methodology for 2022 Inventory Update	Rationale
<b>Building Energy</b>			
Electricity - General	kWh consumed and either 1) utility-specific or 2) grid average emissions factors	kWh consumed and utility-specific emissions factors	Consistent with PSREA and protocols
Electricity – Green Programs	No separate accounting for green program participation	Consider green program kWh consumption to be zero emissions	New, more detailed information from Puget Sound Energy related to utility-specific emissions factors for general and green program consumption
Electricity – Transmission & Distribution Losses	Not included	Included using utility-specific grid loss factor	Consistent with protocols and PSREA
Natural Gas	Therms consumed and EPA natural gas emissions factor	No change	Consistent with protocols
Natural Gas – Distribution	Not included	Included using utility-specific leakage rate	Consistent with protocols and PSREA
Fuel oil	Not included	Downscaled state-level consumption data based on local households/jobs	Consistent with protocols and PSREA
Propane	Not included	Downscaled state-level consumption data based on local households/jobs	Consistent with protocols and PSREA



Sector	Methodology for Previous Inventories <sup>2</sup>	Methodology for 2022 Inventory Update	Rationale
<b>Solid Waste &amp; Wastewater</b>			
Solid waste generation & disposal	Applied ClearPath-provided EPA WARM emissions factors to tonnage estimates	Applied detailed EPA WARM emission factors to tonnage estimates	More accurate results
Wastewater process emissions	Assumed an average facility-specific per-capita emissions rate, scaled to local population	Downscaled facility-level emissions to local population	Based on information available from facility
<b>Refrigerants</b>			
Substitution of ozone-depleting substances (ODS)		National EPA value downscaled by population	Consistent with protocols and PSREA