To: Paul Brewster and Allison Osterberg, Thurston Regional Planning Council

From: Britain Richardson and Andrea Martin, Cascadia Consulting Group

Re: Thurston County Communitywide Greenhouse Gas Inventory Review

Date: June 13, 2019

INTRODUCTION

Thurston County Regional Council and partner organizations solicited Cascadia Consulting Group to conduct a review of the county's 2017 greenhouse gas (GHG) inventory methodology. This review will support county alignment with industry best practices and accurate emissions monitoring and tracking. Our review considered the calculations, data sources, and platforms employed in developing the county's inventory to arrive at a set of recommendations for consideration.

This memorandum presents recommendations for future Thurston County communitywide GHG inventories. Priority recommendations are presented in the **Summary of Highest Priority Recommendations** section below. Most recommendations will facilitate completion and review of future inventories, but will not significantly change inventory outcomes.

SUMMARY OF HIGHEST PRIORITY RECOMMENDATIONS

- Pre-2017 inventories were calculated and housed in the ClearPath platform. However, the 2017 inventory was conducted in Excel only. To ensure year-to-year consistency, stay up-to-date on the latest methodologies and emissions factors, and take advantage of more advanced scenario modeling in the future, **we recommend using ClearPath to calculate and house all inventories**.
- Pre-2017 inventories included robust source documentation for activity data and emissions factors. However, the 2017 Excel-based inventory was missing some detailed information on sources. **We recommend including source information for all activity data and emissions factors within the ClearPath notes section and within the Excel version of the inventories.** This change will streamline the QA/QC process, ensuring that the inventories are accurate, error-free, and constructed in a way that allows for methodology adjustments over time.
- **We also recommend incorporating all calculations—including unit conversions and emissions factor calculations—within the Excel-based inventory** for the same QA/QC reasons as above.
- **We recommend that future inventories confirm which wastewater treatment technologies are in use within the county and incorporate any missing emissions calculations.** This correction will further increase inventory accuracy and facilitate development and monitoring of mitigation strategies.
- **We recommend including land use change** in future inventories. This sector is included in other county inventories, such as King County, and can illuminate opportunities for reducing emissions from this sector.
- **We recommend attributing vehicle miles traveled (VMT) to vehicle-type and fuel-type combinations** to account for the fact that each vehicle type can utilize more than one fuel type. **We also recommend considering the vehicle-age makeup when calculating transportation CH_4 and N_2O emissions factors**.

ALL INVENTORY RECOMMENDATIONS

The table below summarizes the approach used in Thurston County's 2017 greenhouse gas inventory (*Previous Inventory Methodology* column) and our recommendations and considerations for future inventory years (*Methodology Recommendations & Considerations* column).

Emissions Type	Previous Inventory Methodology	Methodology Recommendations & Considerations
All Sectors		
All	Used 100-year time horizon GWP values from the IPCC Fifth Assessment Report.	**We recommend using the 100-year time horizon GWP values from the IPCC Fifth Assessment Report for future inventories**, until the publication of a new IPCC assessment report. TCAT correctly chose to use these values for the 2017 inventory.
All	Not entered into ClearPath.	**We recommend using ClearPath to calculate and house inventories.** This will ensure consistency from year-to-year, stay up-to-date on the latest methodologies and emissions factors, and take advantage of more advanced scenario modeling in the future.
All	Activity data documentation not linked to inventory values.	**We recommend linking the inventory to source activity data materials**, such as PSE electricity consumption amounts. This would benefit the QA/QC process. One approach could be to name a shortened version of the source file path in the notes section of ClearPath and next to the appropriate activity data in the Excel workbook.
All	Some calculations provided in inventory workbook.	**We recommend including all calculations—including conversions of emissions factor units—in the inventory workbook** to facilitate the QA/QC process.
Built Environment		
Electricity use	Utility-specific emissions factors obtained from PSE GHG inventories and multiplied by utility-provided electricity consumption.	**We recommend carefully documenting the year for each emission factor.** Typically, there is a two-year lag in the publication of PSE GHG inventories (e.g., the 2015 emissions factors are the most-recent factors available at the time of 2017 inventory completion). As a result, the inventory year does not necessarily indicate the year of the emissions factors used.
Electricity transmission and distribution losses	Transmission and distribution loss factors taken from EPA Emissions and Generation Resources Integrated Database (eGRID).	**We suggest documenting the year and grid region for each transmission and distribution loss factor** to ensure the values can be easily reviewed for accuracy. **We also suggest noting that this emissions type is an upstream impact**, similar to fuel production emissions.
Upstream emissions from fuel production (electricity)	Default upstream emissions factors from Table B.13 of the US Community Protocol.	**We recommend listing the source for the emissions factors within the workbook.** This can be done by naming the source (preferably with a file path or link) in the notes section of ClearPath and next to the appropriate emissions factors in the excel workbook.
Natural gas combustion	US Community Protocol default emissions factors used for natural gas combustion.	**We recommend listing the source for all emissions factors used.** This can be done by naming the source (preferably with a file path or link) in the notes section of ClearPath and next to the appropriate emissions factors in the excel workbook.

Emissions Type	Previous Inventory Methodology	Methodology Recommendations & Considerations
Upstream emissions from fuel production (natural gas)	Unknown conversion factors for CCF/Therm and M^3/CCF	**We recommend listing the source—within ClearPath and the Excel workbook—for all conversion factors. These factors should also be checked for accuracy.** There appears to be an error in these conversion factors (there is approximately 0.98 CCF/Therm of natural gas and 2.83 M^3/CCF of natural gas). **If available, we also recommend using higher heating values from PSE** to improve the accuracy of conversions between energy content and volume of fuel.
Fugitive gases from refrigeration and fire suppression	Not included.	**We recommend including emissions from refrigeration and fire suppression in future inventories.** Although this emissions type accounts for a small portion of the total inventory, it is commonly included in local government inventories. Incorporating these emissions would aid comparability with other jurisdictions.
Transportation		
On-road passenger, freight, and transit vehicles	Thurston Regional Planning Council VMT and vehicle mix information, along with US Bureau of Transportation Statistics and EIA - Stone & Lymes, 2017 average fuel economies and the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2017 emissions factors, used to calculate emissions by vehicle category.	**We recommend attributing VMT to vehicle-type and fuel-type combinations.** This would account for the fact that each vehicle type can utilize more than one fuel type. This will become more critical in future inventories as alternative fuels become more prevalent. **We also recommend considering the vehicle-age makeup when calculating transportation CH4 and N2O emissions factors.** Emissions factors for CH_4 and N_2O are highly dependent on vehicle model year because of improvements in emissions control technology over time. Therefore, these emissions factors should be calculated based on the estimated model year composition in Thurston County. We recommend that these emissions factors calculations be performed in the inventory workbook for QA/QC purposes.
Off-road surface vehicles and other mobile equipment	Not included.	**We recommend using EPA's NONROAD model to include off-road emissions in future inventories.** Although this emissions type accounts for a small portion of the total inventory, it is commonly included in local jurisdiction inventories. Incorporating these emissions would aid comparability with other jurisdictions.
Solid Waste		
Generation and disposal of solid waste	Combined solid waste emission factor calculated based on Thurston County waste composition study and US Community Protocol default emission factors by waste type.	**We recommend performing the combined emission factor calculation within the inventory workbook.** This would facilitate QA/QC review. **We also recommend conducting these calculations within ClearPath.** This would eliminate the need to manually calculate a combined emission factor, and the program has been updated with more current waste emission factors than those in the U.S. Community Protocol.
Composting of organic waste	Not included.	**We recommend including emissions from composting.** This would provide a more comprehensive accounting of the various waste streams.

Emissions Type	Previous Inventory Methodology	Methodology Recommendations & Considerations
Water and Wastewater		
Treatment of wastewater generated by the community	Includes emissions associated with methanol use and digester gas.	**We recommend that future inventory preparers confirm which wastewater treatment technologies are in use within the County and incorporate any missing emissions calculations, such as process and fugitive N_2O emissions.** According to an initial review of the wastewater treatment processes at Bud Inlet Treatment Plant, it appears that methods WW.7 (process N_2O emissions), WW.9 (CO_2 emissions from methanol) and WW.12.a (fugitive N_2O emissions from effluent discharge) from the US Community Protocol should be used to calculate wastewater treatment emissions.
Agriculture, Forestry, and Land Use		
Land use change	Not included.	**We recommend including land use change in future inventories.** This sector is included in other county inventories, such as King County, and can illuminate opportunities for reducing emissions from this sector.
Agriculture	Enteric fermentation emissions calculated for beef cattle, dairy cows, sheep, and swine.	**We recommend including emissions from manure management and agricultural soils in future inventories.** This would provide a more comprehensive accounting of agricultural emissions. **We also suggest listing the sources for emissions factors used.** This can be done by naming the source (preferably with a file path or link) in the notes section of ClearPath and next to the appropriate emissions factors in the excel workbook.

**GWP = Global Warming Potential; IPCC = Intergovernmental Panel on Climate Change; PSE = Puget Sound Energy; EPA = Environmental Protection Agency; VMT = Vehicle Miles Traveled; QA/QC = Quality Assurance/Quality Control; EIA = Energy Information Administration; CO_2 = Carbon Dioxide; CH_4 = Methane; N_2O = Nitrous Oxide; GHG = Greenhouse Gas*