Mercer Street Greenhouse Gas Emissions

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Greenhouse Gas Emissions

Introduction

The emissions that have traditionally been considered in the City's SEPA Checklist cover smoke, dust, and industrial and automobile emissions. With a new understanding of the climate change impacts of GHG emissions, the City of Seattle now requires the applicant to estimate GHG emissions: using the *City of Seattle Department of Planning and Development SEPA GHG Emissions Worksheet Version 1.7 12/26/07*. The worksheet is used to estimate the following three types of emissions:

- Embodied Emissions – Emissions created through the extraction, processing, transportation, construction and disposal of materials and landscape disturbance.
- Energy Emissions - Energy demands created by the development after it is completed.
- Transportation Emissions - Transportation demands created by the development after it is completed.

The Energy Emissions section is intended to estimate emissions associated with energy used after a building has been constructed, and the Transportation Emissions section is intended to estimate the emissions associated with the transportation of building occupants. The worksheet does not include emission factors for roadway projects. Therefore, this memo addresses the Embodied Emissions for paving and for construction-related fuel consumption in a quantitative manner, while also including a qualitative discussion of the completed project.

Embodied Emissions

Paving

The project team calculated the GHG emissions created from the manufacture of paving materials, paving equipment, and maintenance of the pavement over its expected life cycle by estimating the area of pavement and applying the GHG Emissions Worksheet embodied emission factor of 50 MTCO2e/thousand square feet of pavement. MTCO2 equivalent; equates to 2204.62 pounds of CO2. It is a standard measure of the amount of CO2 emissions reduced or sequestered.

Based on the calculation, the manufacturing, paving activities and maintenance of asphalt and concrete material will result in 40,542 MTCO2e. It is important to note that the embodied emissions estimate is for roads. Paving that does not need to stand up to the rigors of heavy use (such as parking lots or driveways) would likely use less materials and hence have lower embodied emissions.

Exhibit 1 – Pavement Emissions

Pavement	Description	Square Feet	MTCO2e
Asphalt	For roadway paving	299,539	14,977
Cement Concrete	For roadway paving	324,996	16,250
Cement Concrete	For curb, gutter, and sidewalk	186,300	9,315
	Total	**810,835**	**40,542**

Fuel Estimates for Other Construction Activities (non-paving)

The project team calculated the non-paving construction emissions by estimating the amount of fuel that would be used by construction equipment, worker commutes to the site, and delivery of materials. Values for calculating greenhouse gas emissions were derived from the U.S. Environmental Protection Agency (EPA) Office of Transportation and Air Quality developed Emission Facts: Average Carbon Dioxide Resulting from Gasoline and Diesel Fuel, 2005.

Vehicles and equipment used for the purposes of commuting or construction will use either diesel or gasoline for fuel. The U.S. Environmental Protection Agency (EPA) Office of Transportation and Air Quality developed *Emission Facts: Average Carbon Dioxide Resulting from Gasoline and Diesel Fuel, 2005*, to facilitate consistency of assumptions and practices in the calculation of emissions of greenhouse gases from transportation and mobile sources. It is intended as a reference for anyone estimating emissions benefits of mobile sources air pollution control programs. Based on this fact sheet, a gallon of diesel emits approximately 22.2 lbs CO2. A gallon of gasoline emits approximately 19.4 lbs CO2.

Based on these estimates, the fuel consumption needed to construct the project will result in 14,279,241 lbs of CO2e. CO2 equivalent is a standard measure of the amount of CO2 emissions reduced or sequestered (see Exhibit 2).

Exhibit 2 – Fuel Consumption and Emissions

Activity	Fuel consumption (gallons)	Lbs of CO2 per gallon	Estimated lbs CO2e
Workers Commute	39,600	19.4	768,240
Non-paving Equipment	506,880	22.2	11,252,736
Miscellaneous Equipment	38,016	19.4	737,510
Miscellaneous Subcontractors Commute	8,448	19.4	163,891
Materials Trucking	61,120	22.2	1,356,864
Total	**654,064**		**14,279,241**

The assumptions used to estimate fuel consumption are detailed below.

Assumptions used in Fuel Estimates:

Workers Commute

Construction workers commuting to and from work are estimated to use 39,600 gallons of gasoline. The calculation is based on the following assumptions:

- 25 workers per day (5 construction crews per day with 5 people in each crew)
- 40 mile round trip commute
- 792 days of work (22 working days per month for 36 months)
- 20 mpg average

Construction Equipment

Construction equipment that will be used for earthwork and utility installation is estimated to use 506,880 gallons of diesel fuel. The calculation is based on the following assumptions:

- 20 construction vehicles (5 construction crews per day each with 4 pieces of equipment per crew)
- 6,336 hours per vehicle (8 hours per day, 22 working days per month for 36 months)
- 25,344 gallons of diesel fuel per vehicle (4 gallons of diesel per hour of vehicle operation)

Miscellaneous Construction and Subcontractor Commute:

Miscellaneous construction equipment is estimated to use 38,016 gallons of gasoline. The calculation is based on the following assumptions:

- 3 construction vehicles = (1 construction crews per day x 3 pieces of equipment per crew)
- 6,336 hours per vehicle = (8 hours per day, 22 working days per month for 36 months)
- 12,672 gallons of diesel fuel = (2 gallons of diesel per hour of vehicle operation)

Miscellaneous subcontractors commuting to and from work are estimated to use 8,448 gallons of gasoline. The calculation is based on the following assumptions:

- 4 workers per day (1 construction crew per day with 4 people in each crew)
- 40 mile round trip commute
- 792 days of work (22 working days per month for 36 months)
- 15 mpg average

Trucking activities for importing and exporting material:

Trucking unsuitable material off site and trucking suitable material on site is estimated to use 61,120 gallons of diesel fuel. The calculation is based on the following assumptions:

- 3,884 truck trips (97,100 tons of imported material @ 25 tons per trip)
- 2,228 truck trips (40,100 cubic yards of exported material @ 18 cubic yards per trip)
- 40 miles round trip
- 4 mpg average

Transportation Emissions Related to the Completed Project

Vehicles are a significant source of greenhouse gas emissions and contribute to global warming primarily through the burning of gasoline and diesel fuels. National estimates show that the transportation sector (including on-road, construction, airplanes, and boats) accounts for almost 30 percent or more of total domestic CO2 emissions. However, in Washington State, transportation accounts for nearly half of GHG emissions because the state relies heavily on hydropower for electricity generation unlike other states that rely on fossil fuels such as coal, petroleum, and natural gas to generate electricity.

At this time, the main way to reduce greenhouse gas emissions by transportation is to reduce the amount of fossil fuel consumed by drivers. This can be achieved by:

(1) Creating more efficient driving conditions (for example, reduce traffic congestion);

(2) Reducing the amount of driving (for example, provide improvements for using transit, walking, and bicycling); and

(3) Introducing more fuel-efficient vehicles.

As a project, the Mercer Corridor Improvements will make progress toward the first two efforts above. Once completed, it will increase the efficiency of the street network in the

area and encourage a higher share of non-automotive trips, such as transit, pedestrian, and bicycle trips. More efficient driving conditions will be created by improving local circulation in the area and providing more direct traffic movement through the corridor. The project would provide more direct access from I-5 to South Lake Union and neighborhoods to the north and west for regional traffic, and would reduce the potential for backups onto I-5 from the I-5 off-ramps at Mercer.

Non-automotive trips will be encouraged by adding and widening sidewalks on Mercer and Valley streets, adding bike lanes on Valley Street, improving crossings at the intersections of Fairview, Boren, Terry and Westlake avenues with Valley Street, and redirecting through traffic from Valley Street to Mercer Street, allowing speeds and overall traffic to be reduced on Valley Street, and reducing conflicts with high volumes of turning traffic.

Beyond the scope of this project, new vehicle standards will make progress toward the third effort of introducing more fuel efficient vehicles to reduce greenhouse gas emissions and help reduce carbon monoxide and ozone pollutants. In 2009, new cars sold in Washington will be required to meet new standards that restrict CO2 emissions. Additionally, oil prices are increasing the demand for more fuel efficient vehicles and prompting more people to consider how — and whether — they drive (City of Seattle 2006).

Together, these changes would create more efficient driving conditions and encourage non-automotive trips to help reduce the amount of fuel consumed by drivers. Region-wide, lower emissions are a positive effect of the project.

References

http://www.epa.gov/otaq/climate/420f05001.htm

U.S. Environmental Protection Agency (EPA) Office of Transportation and Air Quality developed Emission Facts: Average Carbon Dioxide Resulting from Gasoline and Diesel Fuel, 2005

City of Seattle Department of Planning and Community Development SEPA GHG Emissions Worksheet Version 1.7 12/26/07

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