

Multimodal Data Set Clean-up for  
Portland Oregon Metropolitan Region

# Aggregation Documentation

## Freeway Data

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## Table of Contents

1. Introduction .....	3
2. 20-Second Data Readings .....	3
3. Aggregations over Time .....	3
4. 5-Minute Raw Aggregations .....	3
5. 15-Minute Raw Aggregations .....	5

## 1. Introduction

This document describes the calculations for the aggregation tables in the PORTAL Freeway Data Set for the FHWA Test Data Set project submission. Aggregations for 5-minute, 15-minute and 1-hour granularities are described as well as procedures for aggregating across lanes.

## 2. 20-Second Data Readings

### **Volume:**

*Description:* The number of vehicles that passed over the detector during the 20-second collection period. Volume is reported as an integer.

*Units:* none (this is a count)

### **Speed:**

*Description:* The average speed of vehicles passing over the detector during the 20-second collection period. It is unknown how the controllers measure and/or calculate this speed reading.

*Units:* miles per hour

### **Occupancy:**

*Description:* The average occupancy of the detector during the 20-second collection period, where occupancy means the percent of time the detector is 'occupied', that is the percent of time a vehicle is physically positioned over the detector.

*Units:* Percent expressed as a value between 0 and 100.

## 3. Aggregations over Time

The calculations for PORTAL Aggregations are shown below. These aggregations are intended to be raw, unfiltered aggregations that display the data collected as is. Filtered and imputed aggregations will be considered in the future. This proposal first addresses the Raw Aggregations for the 5-minute, 15-minute and 1-hour aggregation tables for PORTAL. Aggregating over lanes is addressed in a separate section.

## 4. 5-Minute Raw Aggregations

We list the calculations first, followed by notes and assumptions.

### **Volume:**

*Calculation:* Sum of 20-second volumes

*Description:* This calculation provides the total volume of vehicles travelling through the segment during the 5-minute period.

*Units:* none (this is a count)

**Speed:**

*Calculation:* Volume-weighted average of 20-second speeds

*Description:* This calculation provides the average speed of vehicles travelling over the detector during the 5-minute period. A volume-weighted average is used.

*Units:* miles per hour

**Occupancy:**

*Calculation:* Average of 20-second occupancies (not weighted)

*Description:* This calculation provides the average occupancy of the detector of vehicles travelling over the detector during the 5-minute period.

*Units:* Percent expressed as a value between 0 and 100.

**CountReadings:**

*Calculation:* Count of 20-second readings received from ODOT.

*Description:* Total valid readings observed for this detector during the 5-minute period. Readings indicating communication errors and disabled detectors are not included in aggregations and so are not included in this count.

*Units:* none – this is a count.

**Vehicle Miles Travelled (VMT):**

*Calculation:* 5-minute volume \* length of influence area

*Description:* The estimated total miles travelled by vehicles in this segment during the 5-minute period.

*Units:* miles

**Vehicle Hours Travelled (VHT):**

*Calculation:* 5-min volume \* (length of influence area/5-minute speed)

*Description:* The estimated total hours vehicles spent travelling in this segment during the 5-minute period.

*Units:* hours

**Travel Time:**

*Calculation:* (length of influence area/5-min speed)\*60

*Description:* The estimated average time it took a vehicle to cross through this segment during the 5-minute period.

*Units:* hours minutes

**Delay:**

*Calculation:* (5-min travel time – (length of influence area/free-flow speed))\* 60; if delay is < 0; if calculated delay is < 0, a 0 delay is reported.

*Description:* The average minutes of delay experienced by a vehicle in this segment during the 5-minute period. This calculation provides average delay; total delay can be calculated by multiplying by volume. Current PORTAL calculation provides total delay in hours. Free-flow speed is assumed to be 60 mph. Negative delays are reported, the user can remove if they feel appropriate.

*Units:* minutes

**Free Flow Speed:** Free flow speed is assumed to be 60 mph.

**Speed = 0:** VHT, Delay and Traveltime all require dividing by speed. When speed=0; VHT, Delay and Traveltime are set to NULL.

**Filtering:** Records indicating no communications from the detector or a disabled detector are removed from the aggregations. In technical terms, a record is not included in the aggregation if speed, volume and occupancy are all NULL. In addition, 5-minute periods with zero volume will have speed set to NULL as a volume-weighted average cannot be computed when volume is zero.

**Missing Readings:** Readings not received from ODOT appear as missing rows. The countreadings field in the aggregations indicates how many readings were received for a particular time period.

## 5. 15-Minute Raw Aggregations

Descriptions and units are the same as for 5-minute aggregations; calculations are provided here. Calculations are provided followed by a discussion and analysis supporting why these particular calculations were supported.

**Volume:** *Calculation:* Sum of 5-min volumes

**Speed:** *Calculation:* Volume-weighted average of 5-minute speeds

**Occupancy:** *Calculation:* Average of 5-minute occupancies (not weighted)

**CountReadings:** *Calculation:* Sum of 5-minute CountReadings.

**Vehicle Miles Travelled (VMT):** *Calculation:* 15-min volume \* length of influence area

**Vehicle Hours Travelled (VHT):** *Calculation:* 15-min volume \* (length of influence area/ 15-min speed)

**Travel Time:** *Calculation:* (length of influence area/15-minute speed)\*60

**Delay:** *Calculation:* ((length of influence area/15min speed)-(length of influence area/free flow speed))\*60

Delay is average minutes of delay; total minutes of delay can be obtained by multiplying by volume.

**Free Flow Speed:** Free flow speed is assumed to be 60 mph.

**Speed = 0:** VHT, Delay and Traveltime all require dividing by speed. When speed=0; VHT, Delay and Traveltime are set to NULL.