

# Watertown Area MTP

## Origin-Destination Analysis Memo

Date: Monday, December 28, 2020

Project: Watertown Area Master Transportation Plan

To: Study Advisory Team

From: HDR

Subject: Watertown, O-D Analysis

To analyze the movements of traffic passing through the Watertown region, traffic patterns data were accessed from StreetLight Data. StreetLight uses the movements of smartphones to provide on-demand historic measurements of activity on all streets. The data for the Watertown region covered the year of 2019 excluding the months of June, July and August. Summer months were withheld from the data because traffic in Watertown is impacted seasonally by the local college and K-12 school traffic. The analysis describes traffic patterns during the academic calendar year.

Counts of smart phones crossing the region are adjusted to represent estimated daily vehicle trips by streetlight using a proprietary algorithm. This analysis adjusts these StreetLight volumes with the use of local traffic counts. The data describe external to external traffic and its movements through corridors in the form of a 2019 average daily traffic or ADT.

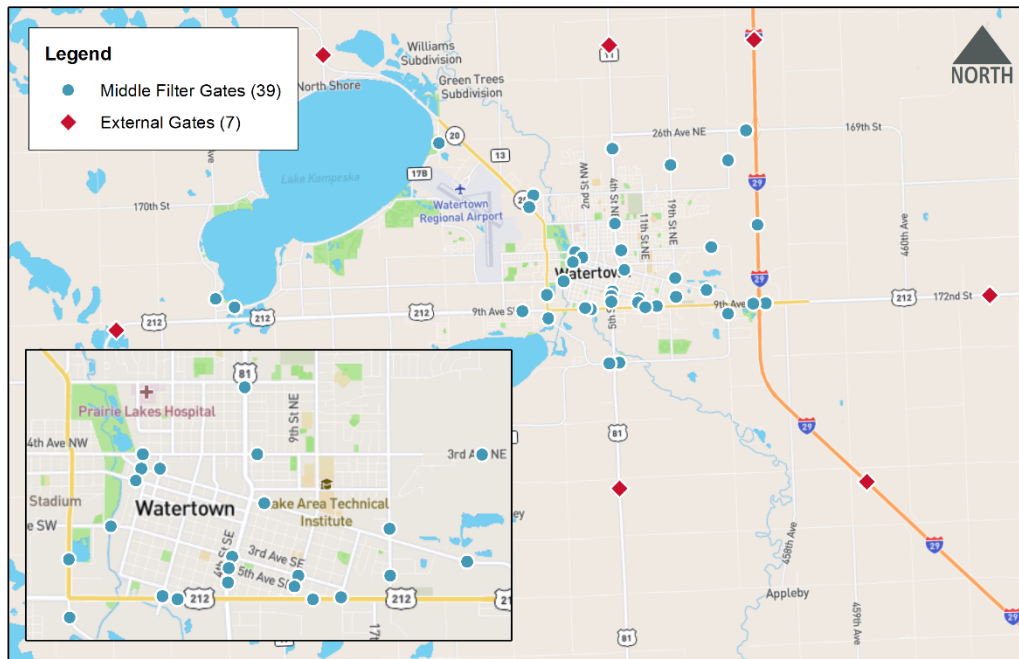
Additional information on StreetLight Data including documentation, methodologies and validation reports are available at [streetlightdata.com](http://streetlightdata.com).

This analysis, called a “select link” analysis, measures amounts of traffic moving to and from external gates through locations called middle filter gates. The external gates are locations on the edges of the regional network where traffic enters and exits. The middle filter gates are located through Watertown on arterial or collector roadways to capture traffics movement through the area.

When configuring the analysis on StreetLightData.com gates are drawn over a combination of satellite imagery and roadway network to define areas for which data are recorded when smart phones cross them on the network.

Illustrated in Figure 1 are the locations of the external gates and middle filters analyzed. External gates are located on the north and south sides of Interstate 29, the east and west sides of the US Highway 212, 455<sup>th</sup> Ave north opposite to US Highway 81 to the south, US Highway 81, and State Highway 20 to the northwest. Middle filters are placed throughout Watertown with a focus on capturing traffic which follows or deviates from direct routes on Highway 212, Highway 20, and Highway 81.

**Figure 1: External gates and middle filters defined for select link analysis**



StreetLight volumes were compared to 2019 observed South Dakota Department of Transportation (SDDOT)<sup>1</sup> average daily traffic (ADT) counts, and the ratio between the two was recorded as an adjustment factor. Factors were calculated from traffic counts and StreetLight’s measurements of average daily actively at external gate locations. As shown in Table 1, the StreetLight volumes and SDDOT counts were relatively consistent, with StreetLight volumes on average 2.4% lower than SDDOT counts. The adjustment factors were applied to the StreetLight data to derive traffic analysis numbers consistent with SDDOT observed traffic.

**Table 1: StreetLight Zone Activity vs. SDDOT Traffic Counts (2019)**

| External  | StreetLight Zone Activity | SDDOT 2019 ADT | Adjustment Factor |
|-----------|---------------------------|----------------|-------------------|
| 455th Ave | 1,163                     | 1,100*         | 0.94583           |
| Hwy 20    | 2,194                     | 2,030          | 0.925251          |
| Hwy 212 E | 2,963                     | 3,045          | 1.027675          |
| Hwy 212 W | 2,955                     | 3,090          | 1.045685          |
| Hwy 81    | 3,275                     | 3,150          | 0.961832          |
| I-29 N    | 6,665                     | 7,900          | 1.185296          |
| I-29 S    | 7,565                     | 8,140          | 1.076008          |

\*Estimated from nearby counts

**External to External Traffic**

Illustrated in Table 2 are the ADTs traveling between external gates (after applying the

<sup>1</sup> <https://dot.sd.gov/transportation/highways/traffic>



adjustment factors). The highest volumes of external to external travel through Watertown occurs on Interstate 29 followed by Highway 212 and Highway 81.

**Table 2: Traffic Count Adjusted External to External Traffic (ADT, 2019)**

|        |           | Destination |        |           |           |        |        |        | Total |
|--------|-----------|-------------|--------|-----------|-----------|--------|--------|--------|-------|
|        |           | 455th Ave   | Hwy 20 | Hwy 212 E | Hwy 212 W | Hwy 81 | I-29 N | I-29 S |       |
| Origin | 455th Ave | 0           | 3      | 5         | 4         | 9      | 6      | 4      | 31    |
|        | Hwy 20    | 7           | 0      | 10        | 5         | 29     | 3      | 53     | 107   |
|        | Hwy 212 E | 7           | 7      | 0         | 41        | 42     | 28     | 33     | 157   |
|        | Hwy 212 W | 3           | 3      | 38        | 0         | 25     | 57     | 91     | 218   |
|        | Hwy 81    | 10          | 22     | 31        | 17        | 0      | 50     | 7      | 137   |
|        | I-29 N    | 6           | 4      | 20        | 45        | 48     | 0      | 1,690  | 1,814 |
|        | I-29 S    | 6           | 36     | 21        | 74        | 6      | 1,648  | 0      | 1,792 |
|        | Total     | 38          | 75     | 125       | 186       | 159    | 1,793  | 1,878  |       |

For each external gate, Table 3 presents observed SDDOT ADTs and the number and percentage of daily external to external traffic. As shown in Table 3, 55% of Interstate 29 traffic has a trip end in Watertown, while 87% to 94% of traffic at the other stations stops in Watertown. According to StreetLight Data’s documentation, a “stop” occurs when a smartphone stops moving in accordance with a vehicle’s cadence for more than 5 minutes; for example a stop for services (gas, food, etc.) while passing through Watertown would not be counted as an external to external movement if the stop is longer than five minutes.

**Table 3: Percentage of External to External Traffic at Gates (2019)**

| External Gate | SDDOT ADT | EE    | % EE   |
|---------------|-----------|-------|--------|
| 455th         | 1,100*    | 69    | 6.29%  |
| Hwy 20        | 2,030     | 181   | 8.93%  |
| Hwy 212 E     | 3,045     | 282   | 9.26%  |
| Hwy 212 W     | 3,090     | 404   | 13.07% |
| Hwy 81        | 3,150     | 296   | 9.39%  |
| I-29 N        | 7,900     | 3,607 | 45.66% |
| I-29 S        | 8,140     | 3,670 | 45.09% |

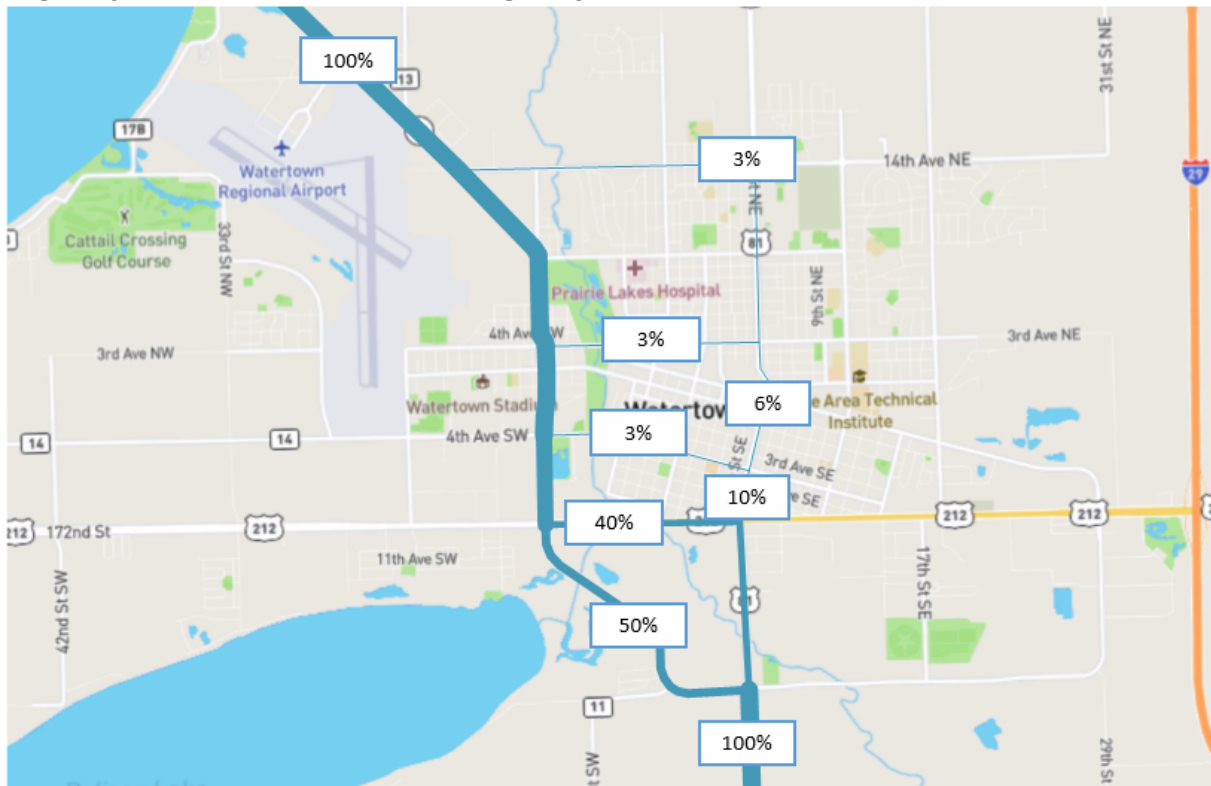
\*Estimated from nearby counts

### Traffic Through Middle Filters

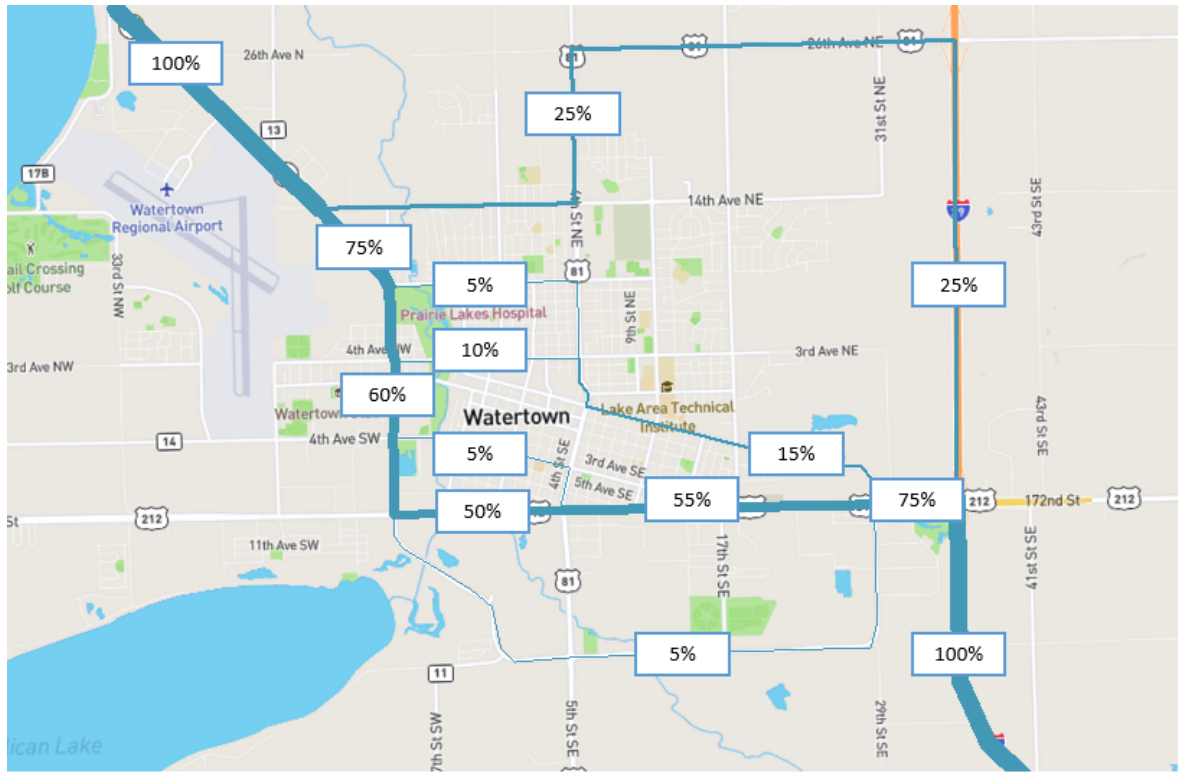
The following figures provide a summary of external travel flow results, using the StreetLight analysis of middle filter gates. ADT at middle filter information has been converted to reflect the total percentage of external to external flows across a roadway network. Flows are documented in a **one-way direction** for the following external to external travel movements:

- Highway 81 to Highway 20
- I-29 south to Highway 20
- I-29 north to Highway 212 west
- I-29 south to Highway 212 west
- Highway 212 east to Highway 8
- Highway 212 west to Highway 81
- Highway 81 to I-29 north
- Highway 212 west to Highway 212 east
- Highway 20 to Highway 81
- Highway 20 to I-29 south
- Highway 212 east to Highway 212 west
- Highway 212 west to I-29 north
- Highway 212 west to I-29 south
- Highway 81 to Highway 212 east
- Highway 81 to Highway 212 west
- I-29 north to Highway 81

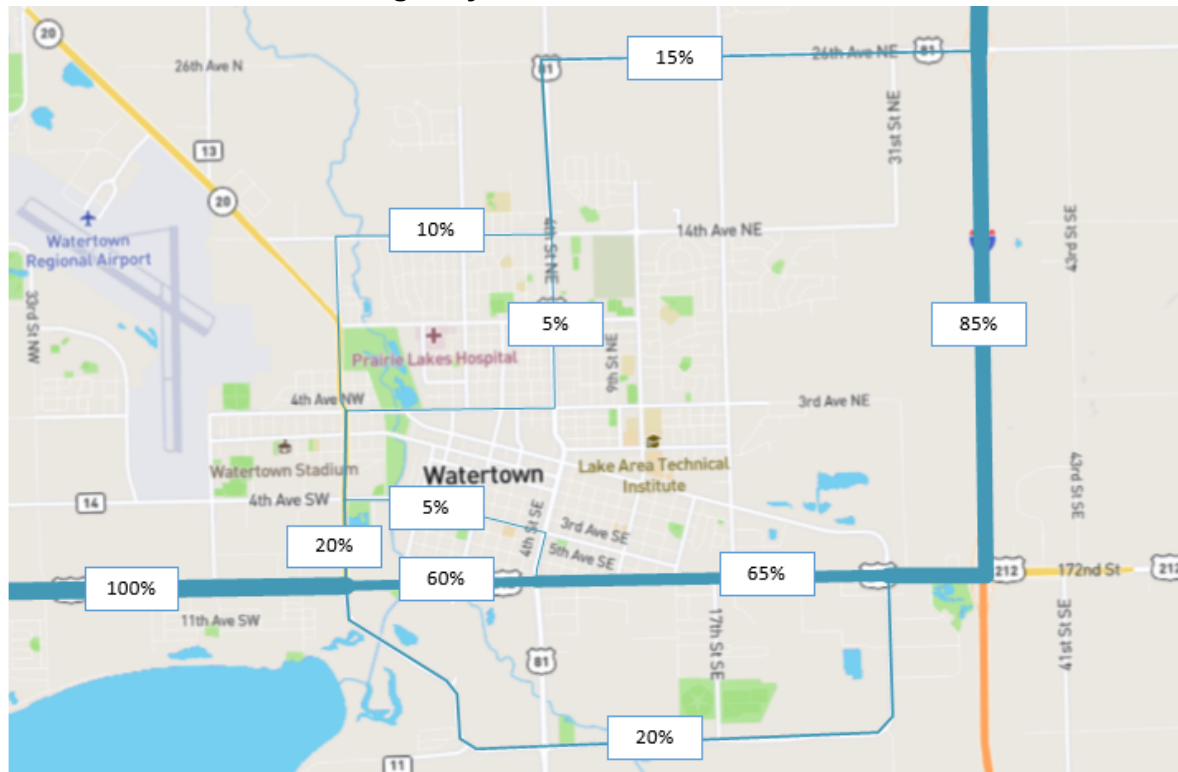
### Highway 81 S External Station to Highway 20 External Station



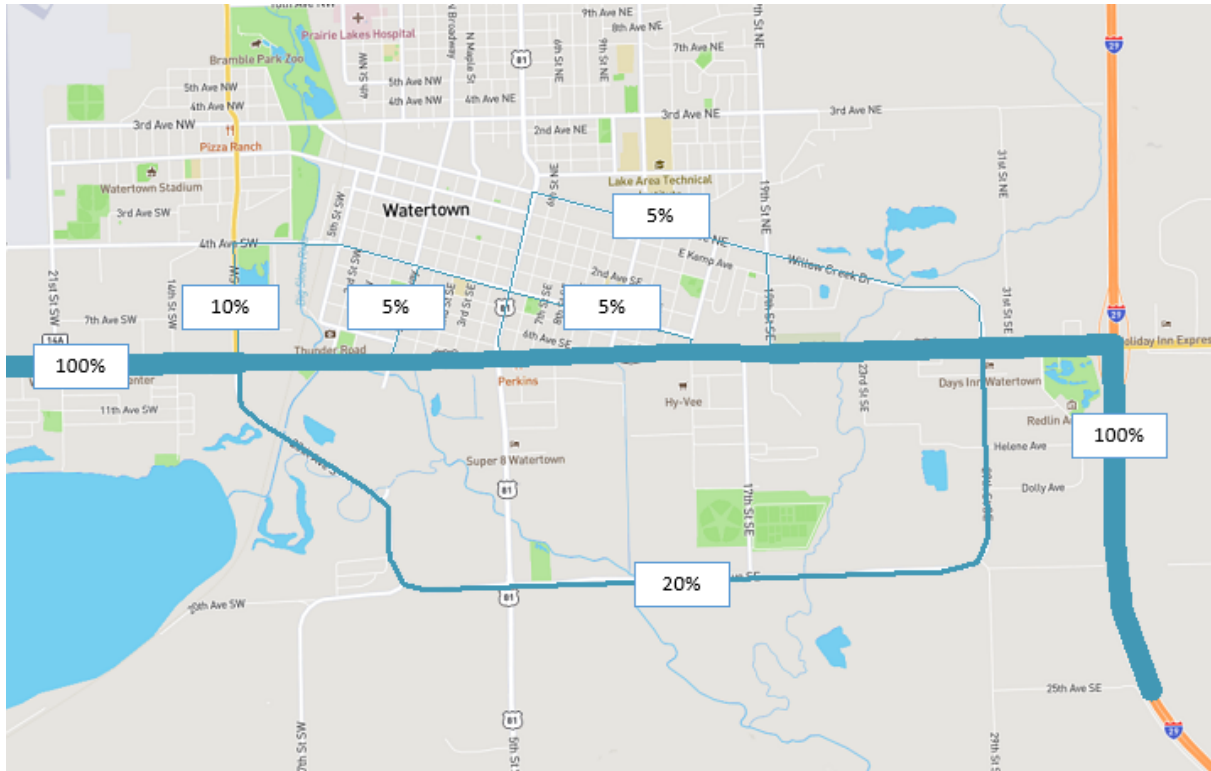
**I-29 S External Station to Highway 20 External Station**



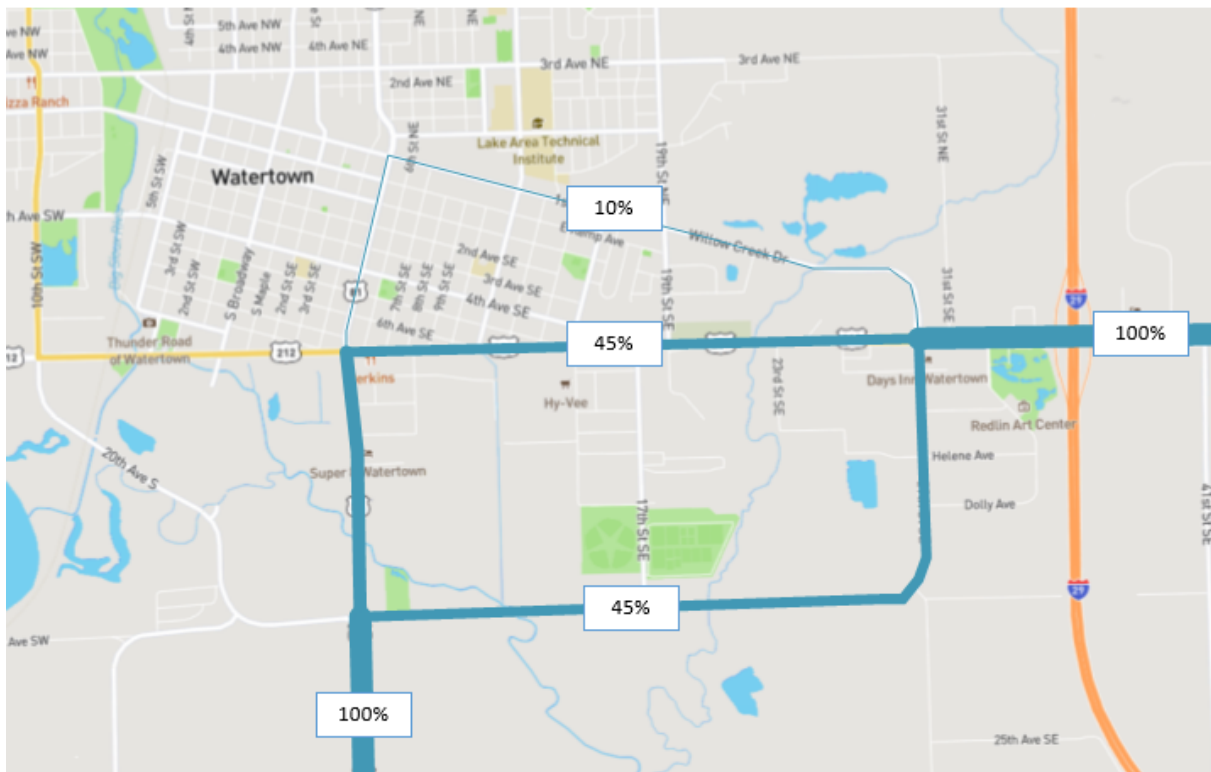
**I-29 N External Station to Highway 212 W External Station**



### I-29 S External Station to Highway 212 W External Station

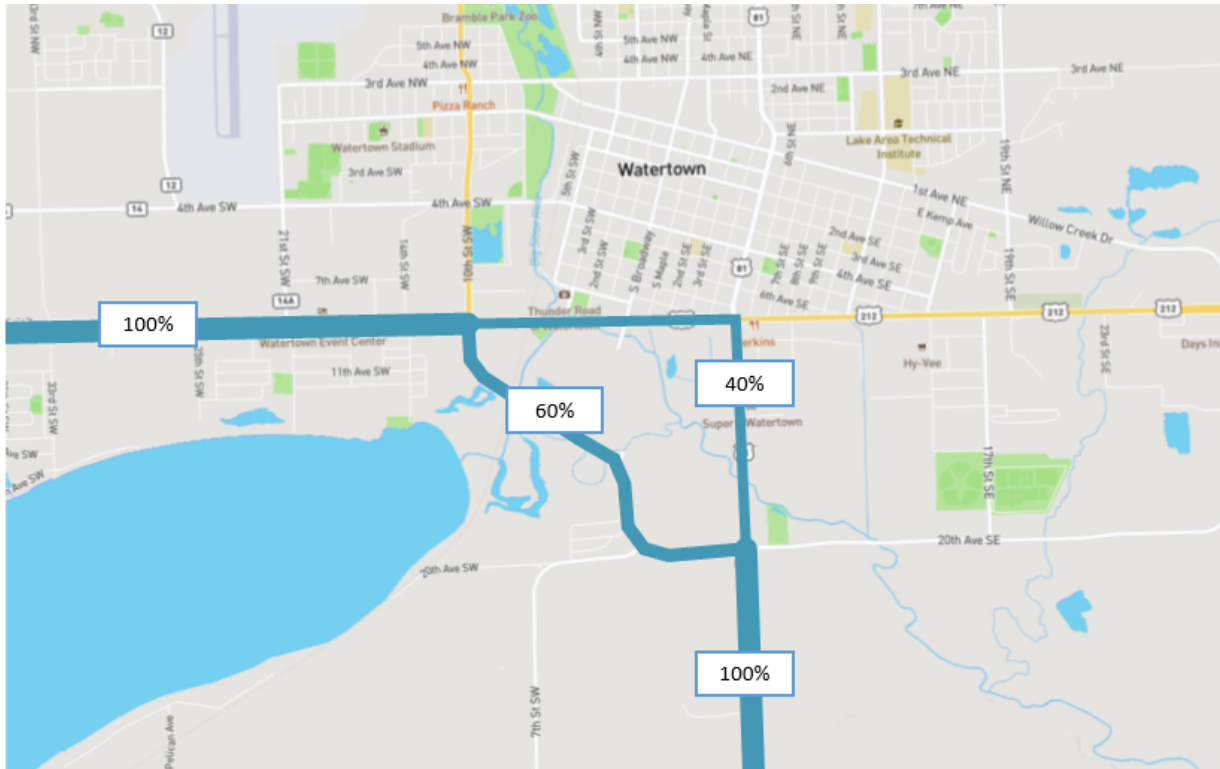


### Highway 212 E External Station to Highway 81 External Station

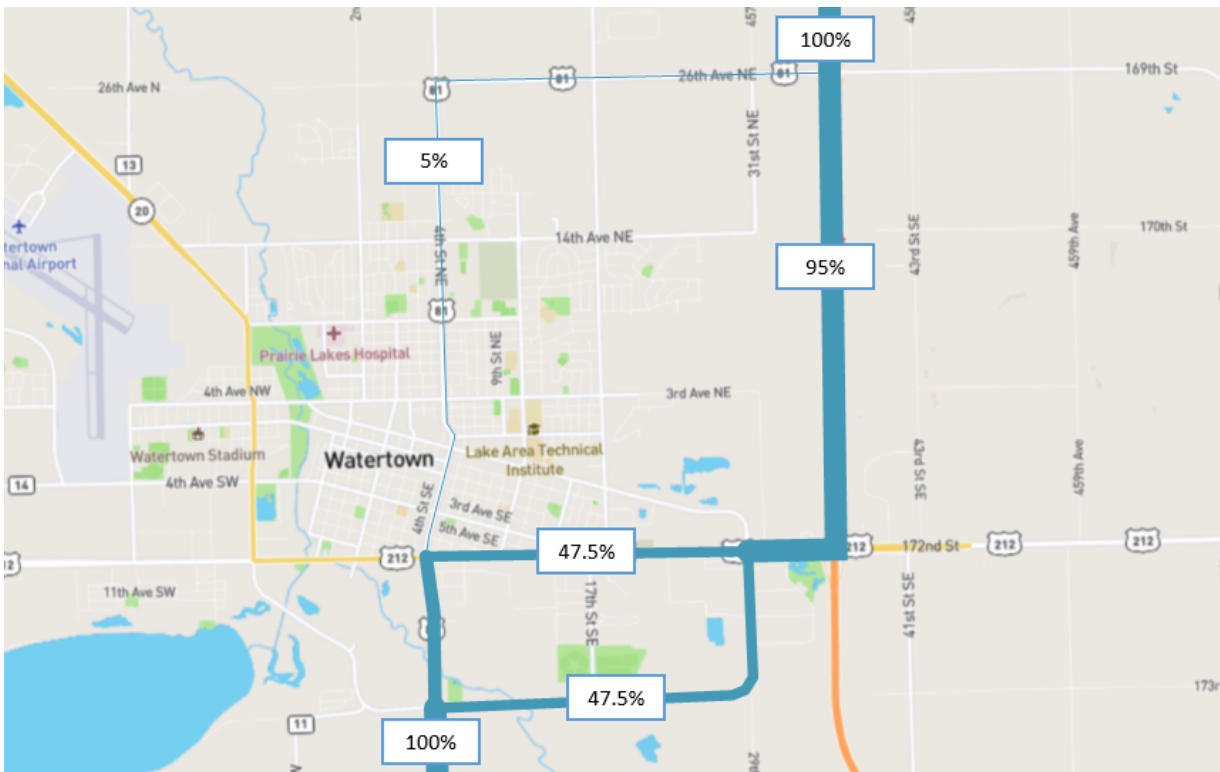




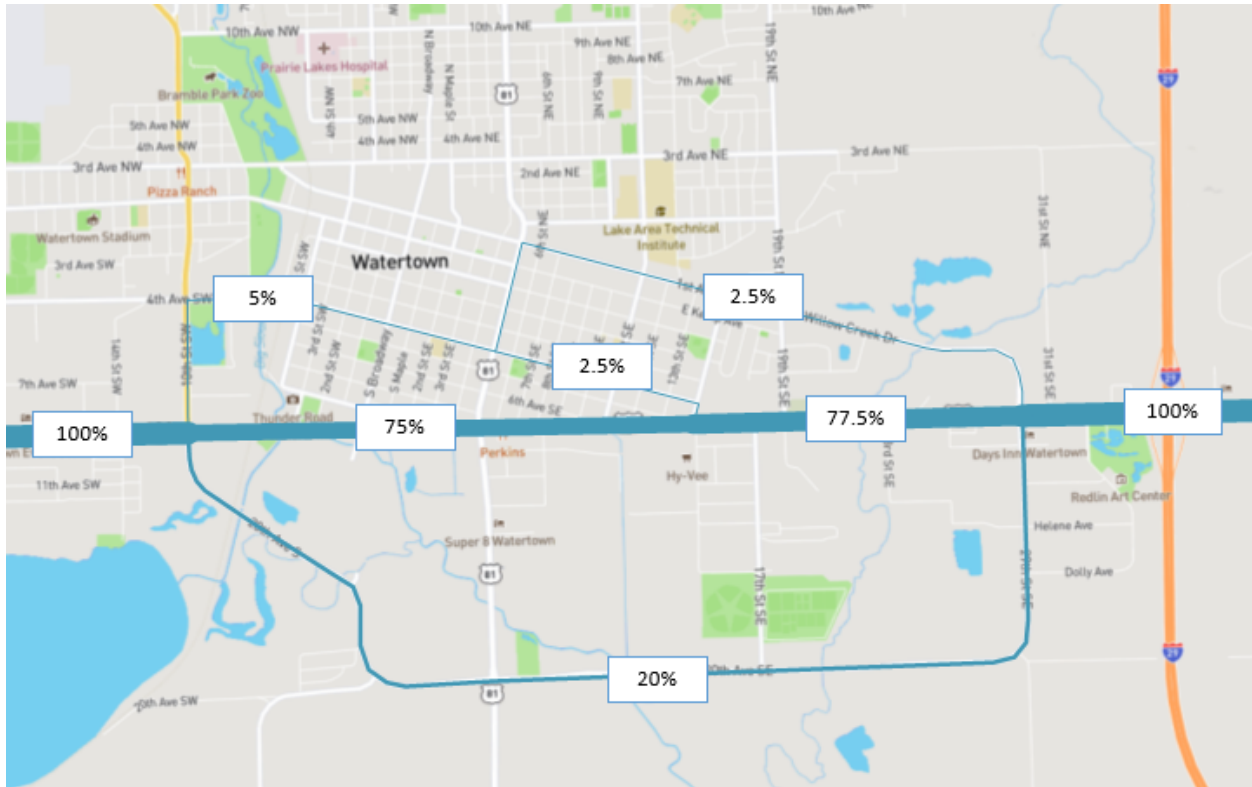
### Highway 212 W External Station to Highway 81 S External Station



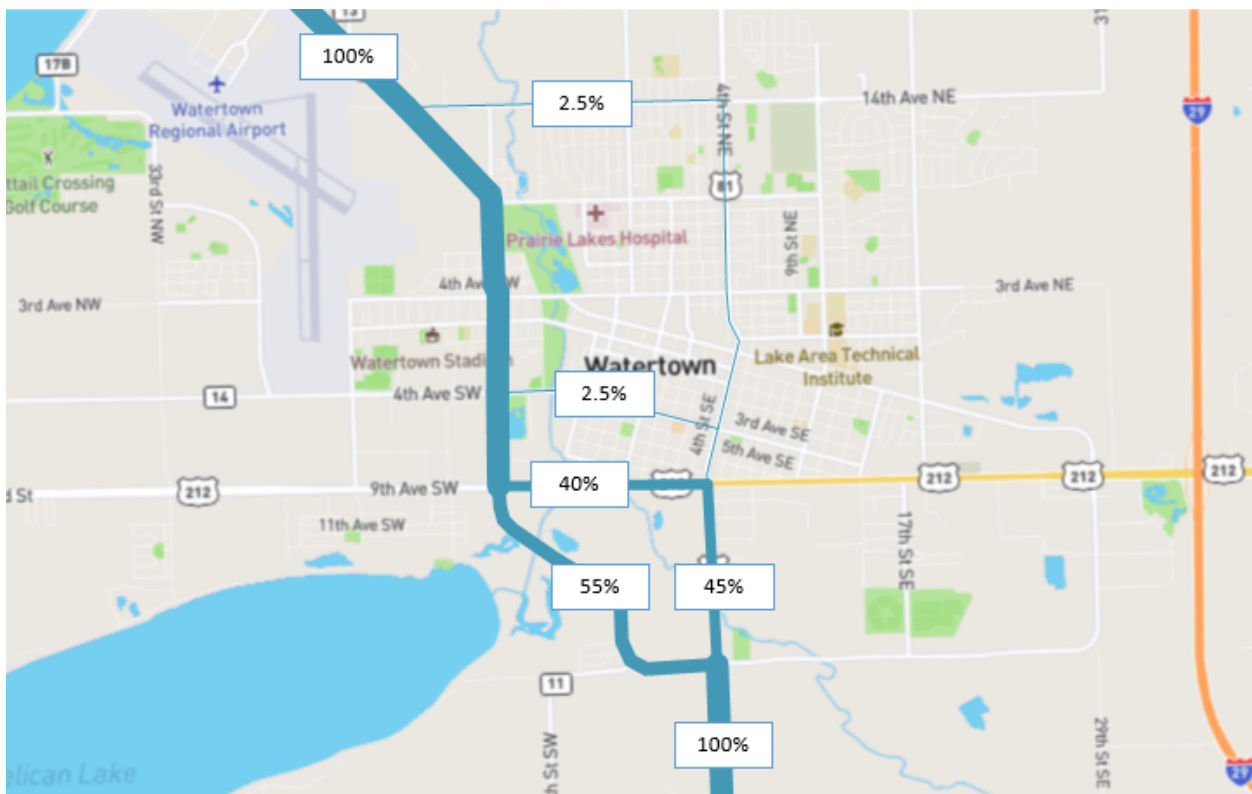
### Highway 81 S External Station to I-29 North External Station



### Highway 212 W External Station to Highway 212 E External Station

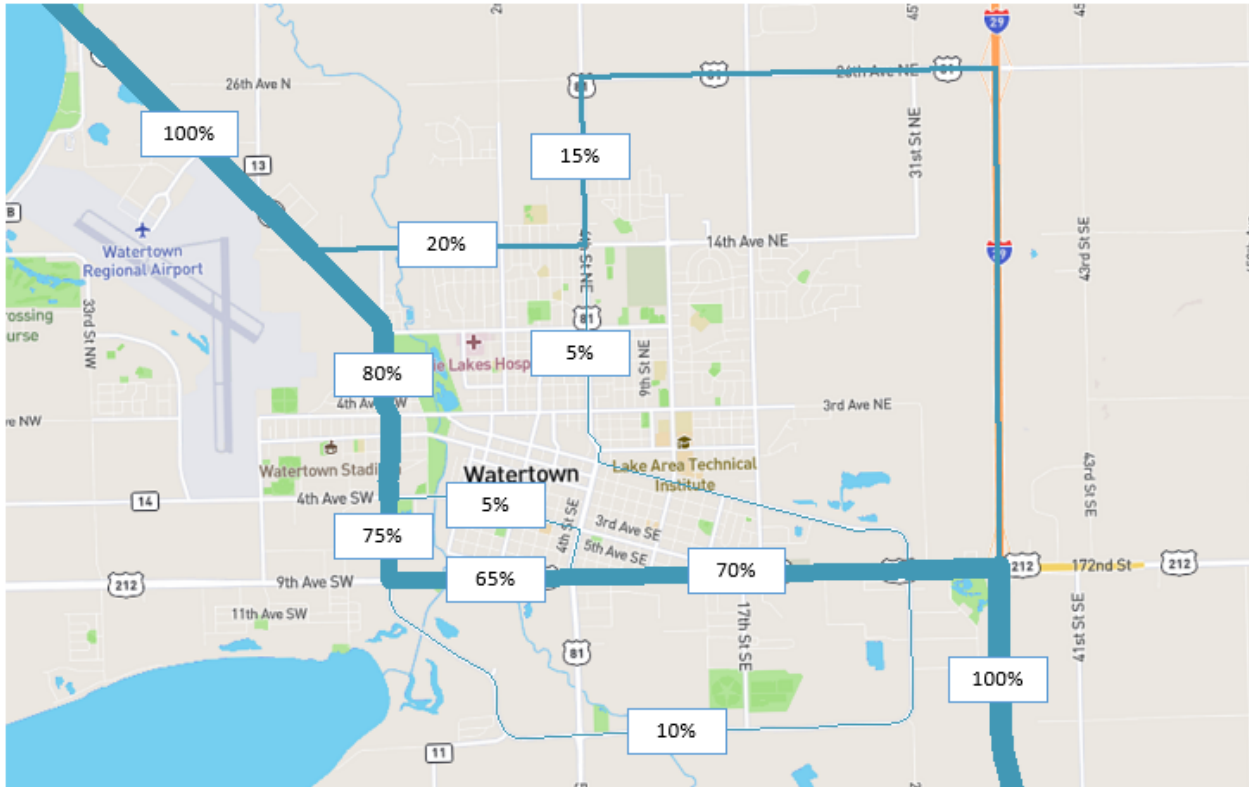


### Highway 20 External Station to Highway 81 External Station

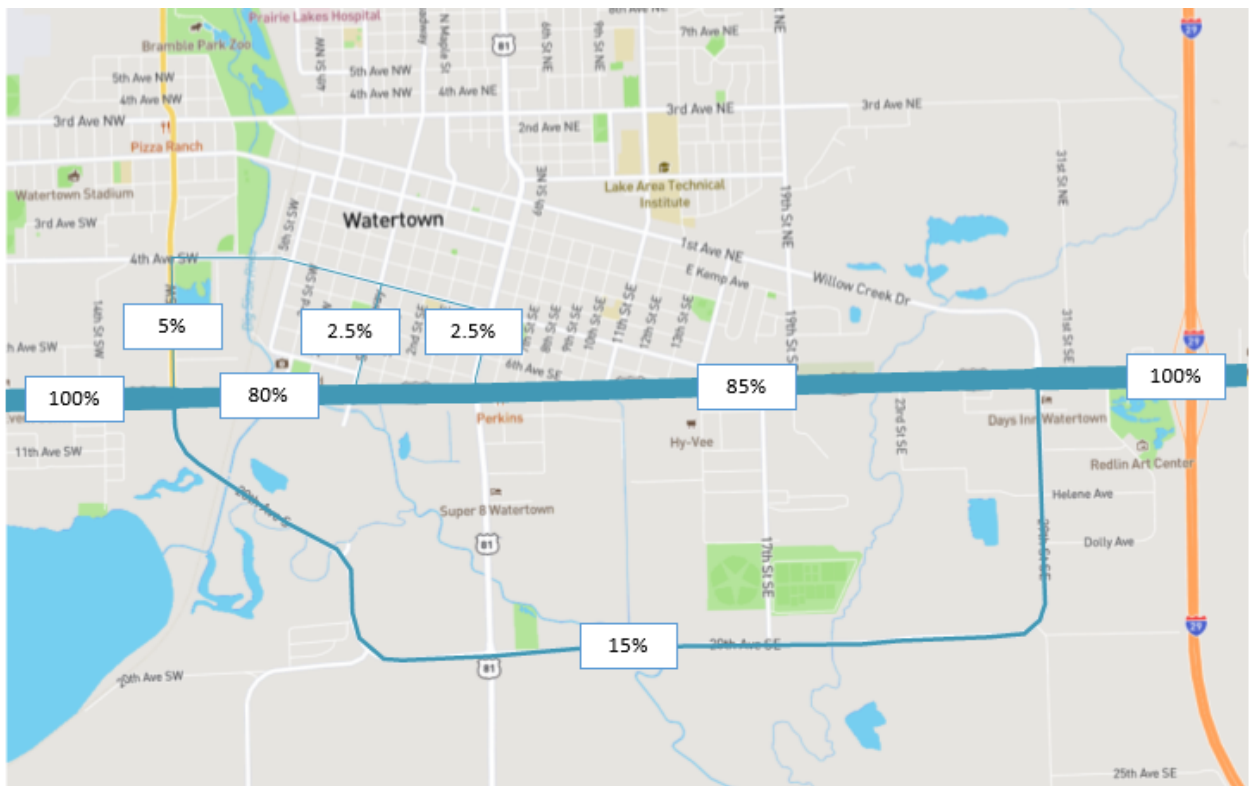




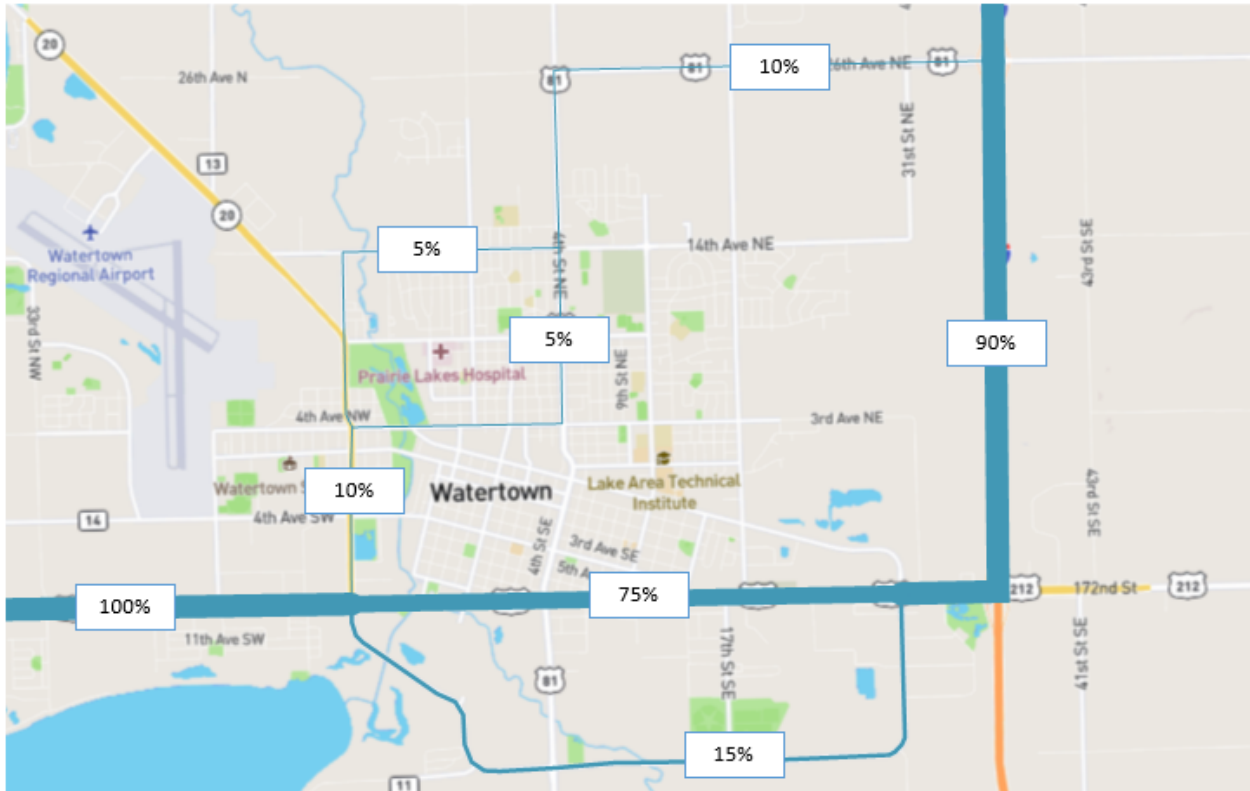
### Highway 20 External Station to I-29 South External Station



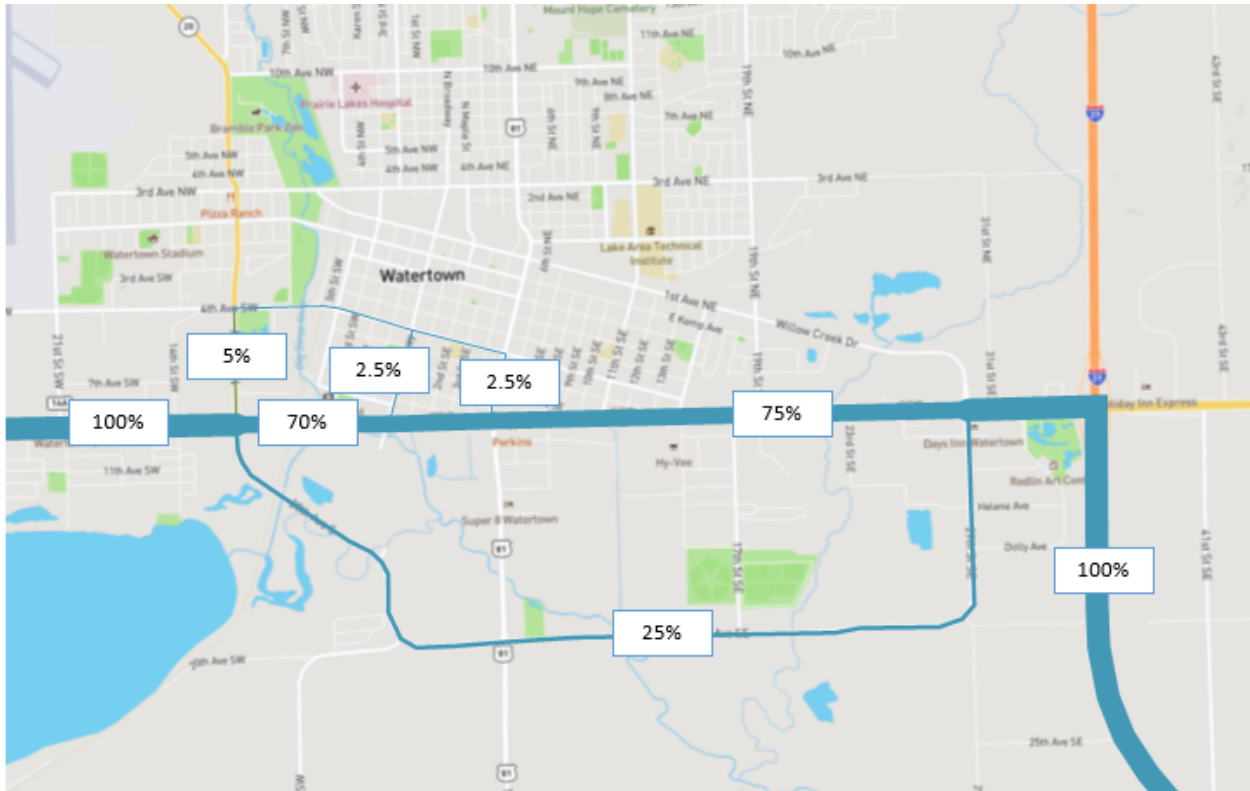
### Highway 212 E External Station to Highway 212 W External Station



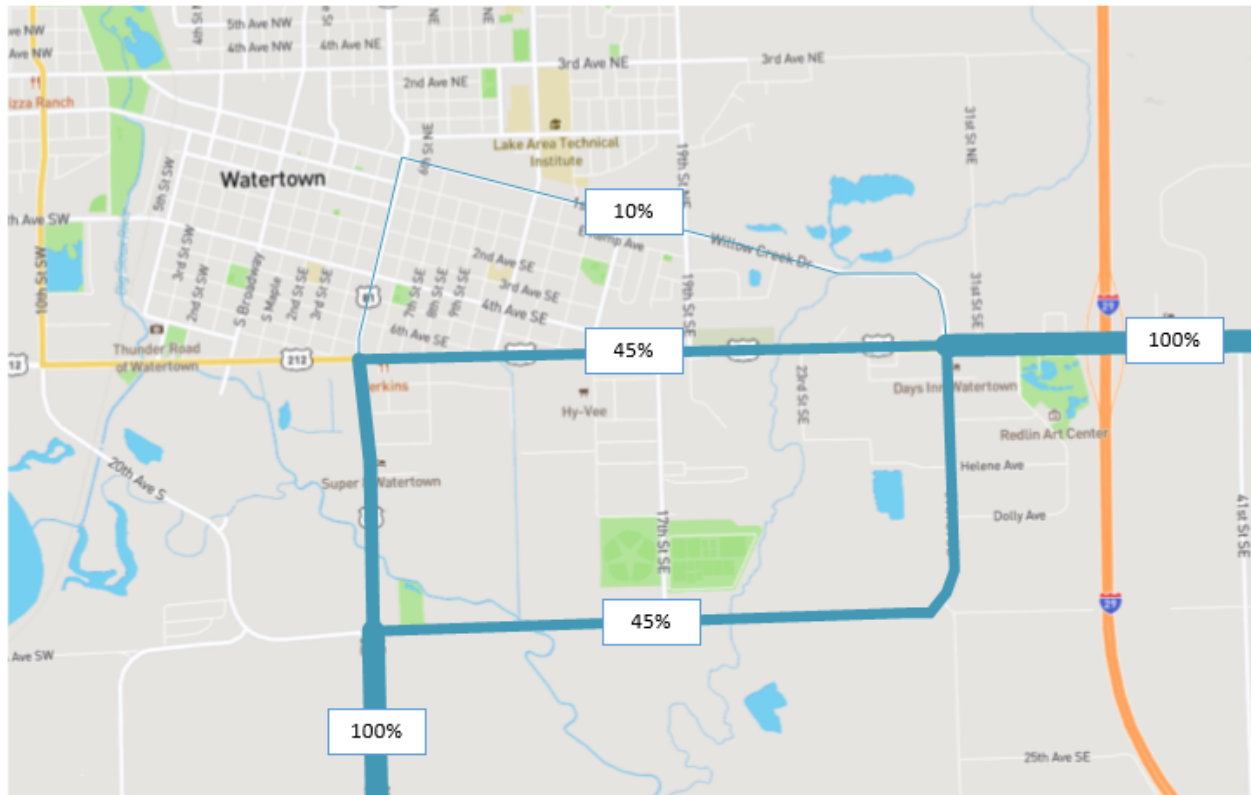
### Highway 212 W External Station to I-29 N External Station



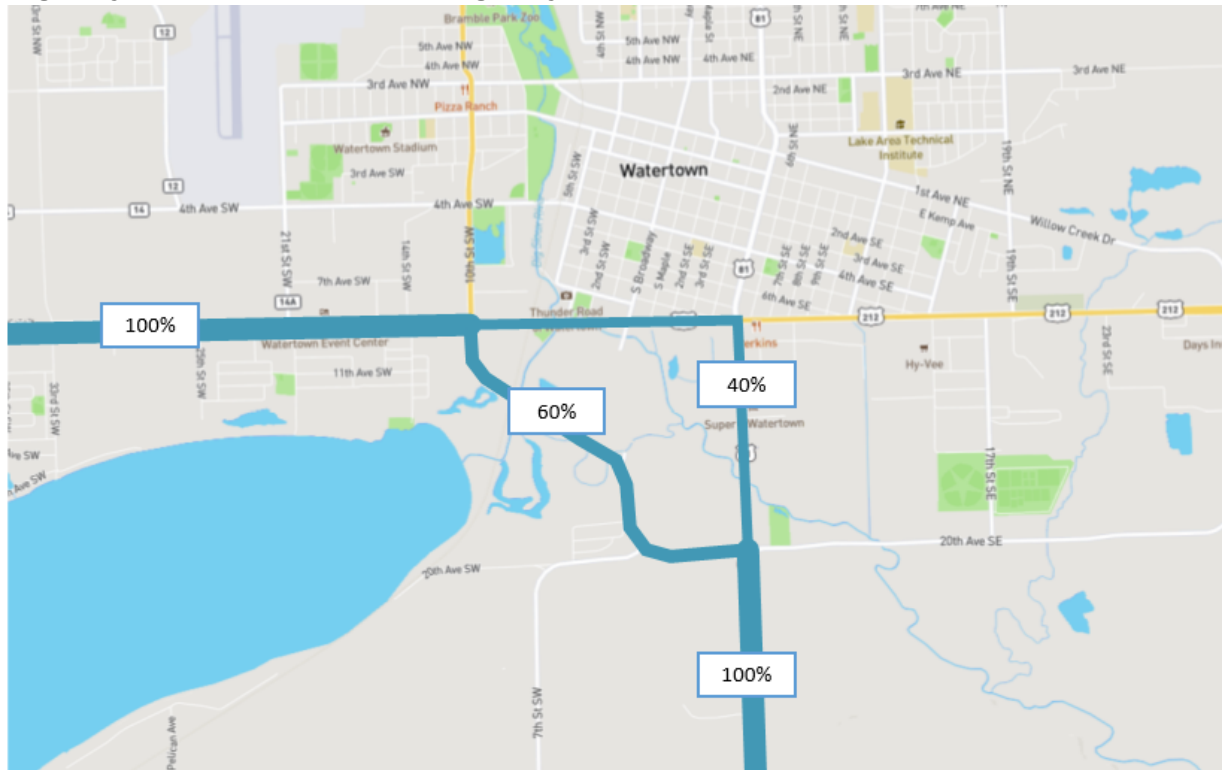
### Highway 212 W External Station to I-29 S External Station



### Highway 81 External Station to Highway 212 E External Station



### Highway 81 External Station to Highway 212 W External Station



### I-29 N External Station to Highway 81 External Station

