

# PBII & Vision Zero Overview

## Human Services Commission – February 6, 2018



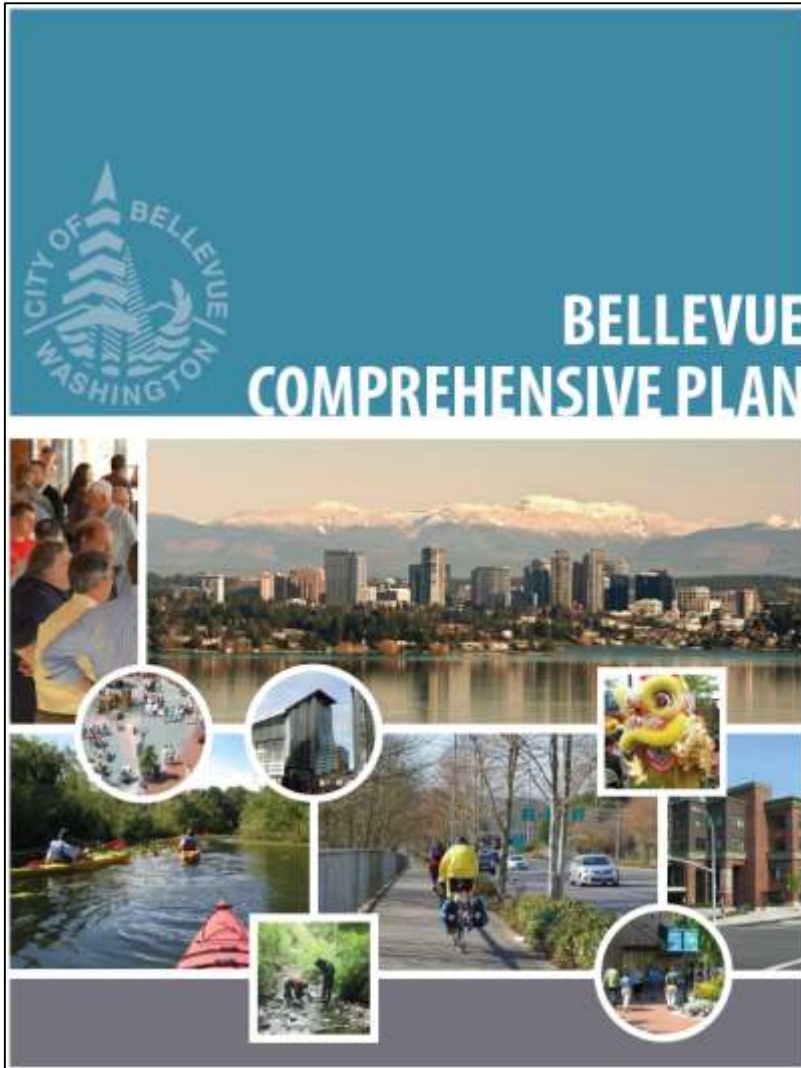
**Franz Loewenherz**  
Principal Planner  
Transportation Department

# PBII Briefing



- **Policy context**
- **Downtown demonstration bikeway project**
- **Citywide bike share pilot program**

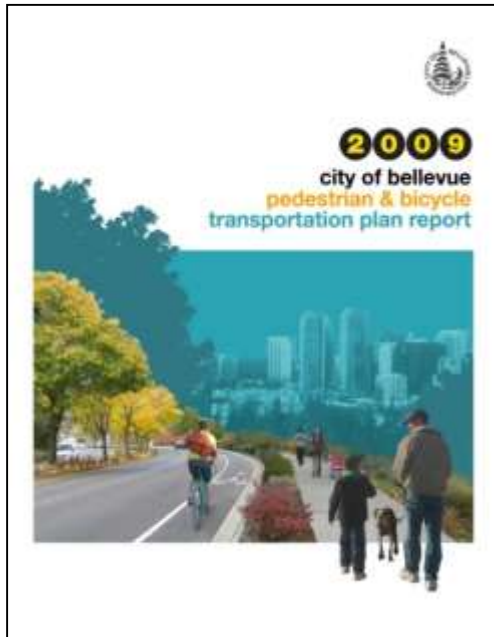
# PBII | Policy Context



**“Building and maintaining a seamless network of walkways, bikeways, and off-street trails requires a coordinated effort that is documented in the Pedestrian and Bicycle Transportation Plan and the Pedestrian and Bicycle Implementation Initiative.”**

***- Transportation Element***

# 2019 Target | Citywide Corridors



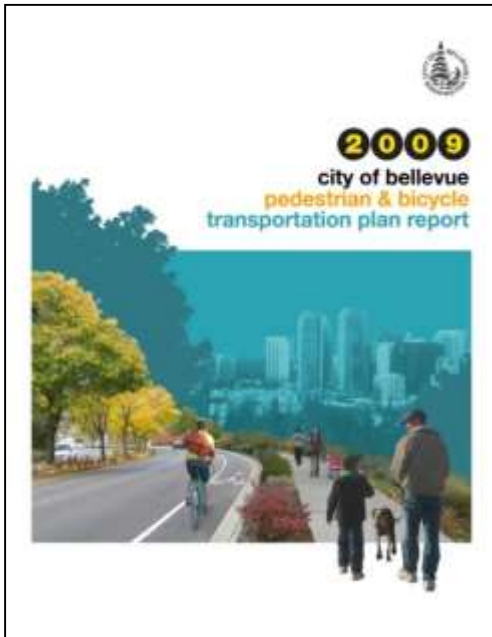
Ordinance No. 5861  
(2/17/2009)



**“Within 10 years, implement at least two completed, connected, and integrated north-south and at least two east-west bicycle routes that connects the boundaries of the city limits, and connects to the broader regional bicycle system.”**

***- 2009 Pedestrian & Bicycle Transportation Plan***

# 2014 Target | Downtown Corridors



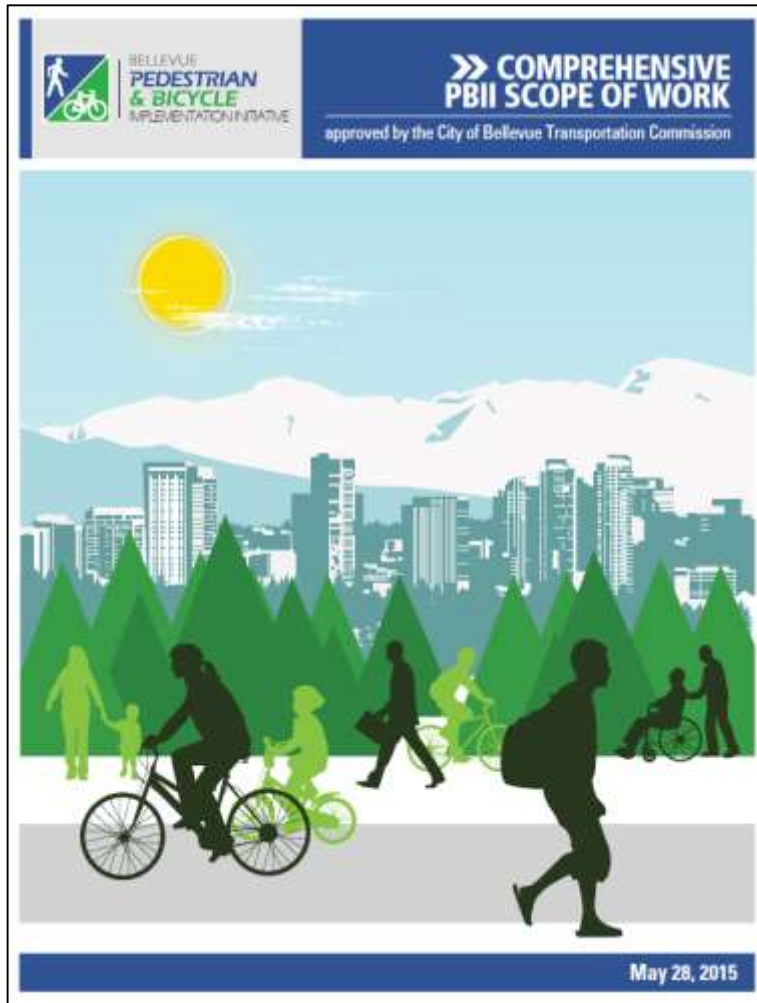
Ordinance No. 5861  
(2/17/2009)



**“Within 5 years, implement at least one completed and connected east-west and north-south bicycle route through Downtown Bellevue.”**

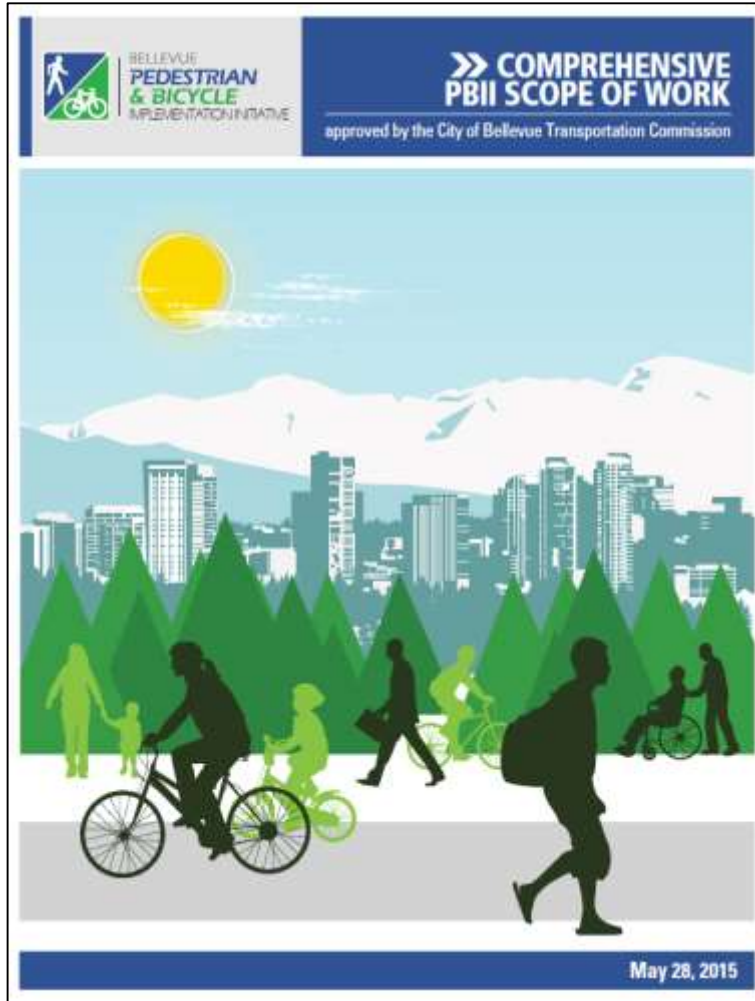
***- 2009 Pedestrian & Bicycle Transportation Plan***

# PBII Council Direction



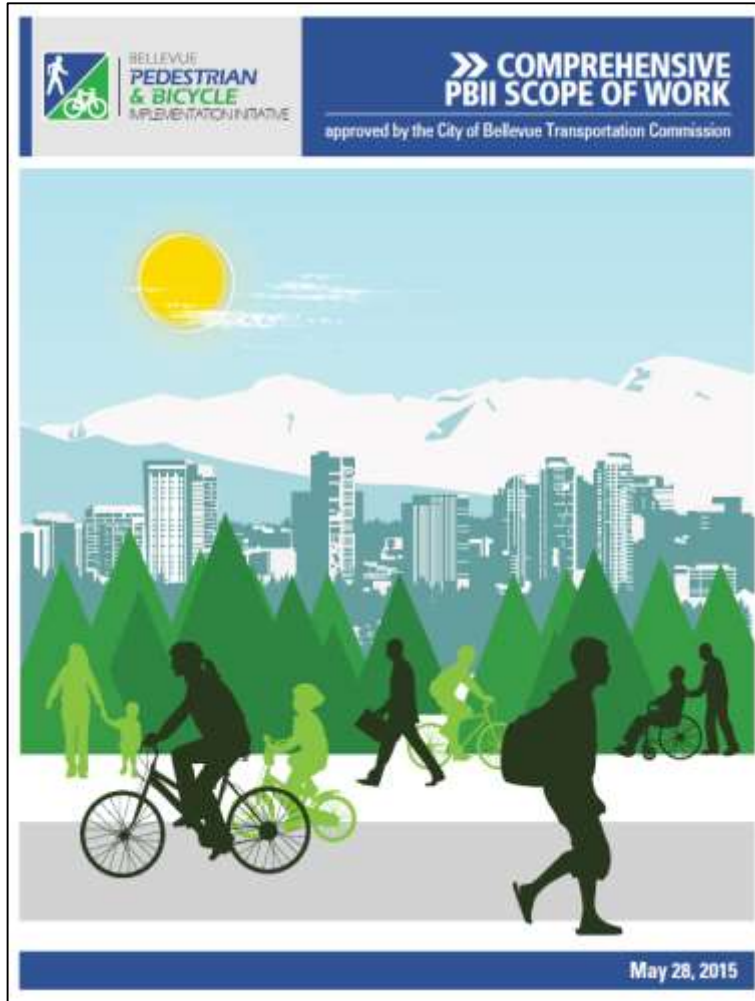
- Links planning with implementation
- Promotes coordinated solutions (5Es)
- Advances a “Complete Streets” philosophy
- Considers creative & affordable strategies
- Leverages best practices and innovative tools
- Investigates “Vision Zero” techniques
- Advances demonstration projects
- Identifies early-win opportunities
- Balances the needs of various roadway users
- Maximizes construction efficiencies
- Promotes physically separated facilities
- Prioritizes “filling the gaps”
- Engages stakeholders early

# PBII Scope of Work



1. **Ped-Bike Safety Assessment Report**
2. **Bicycle Priority Corridor Design Report**
3. **Transit Master Plan Integration Report**
4. **Implementation/Funding Strategy Report**
5. **Count Technology Report**
6. **Bike-Share Implementation Report**
7. **Performance Management Report**

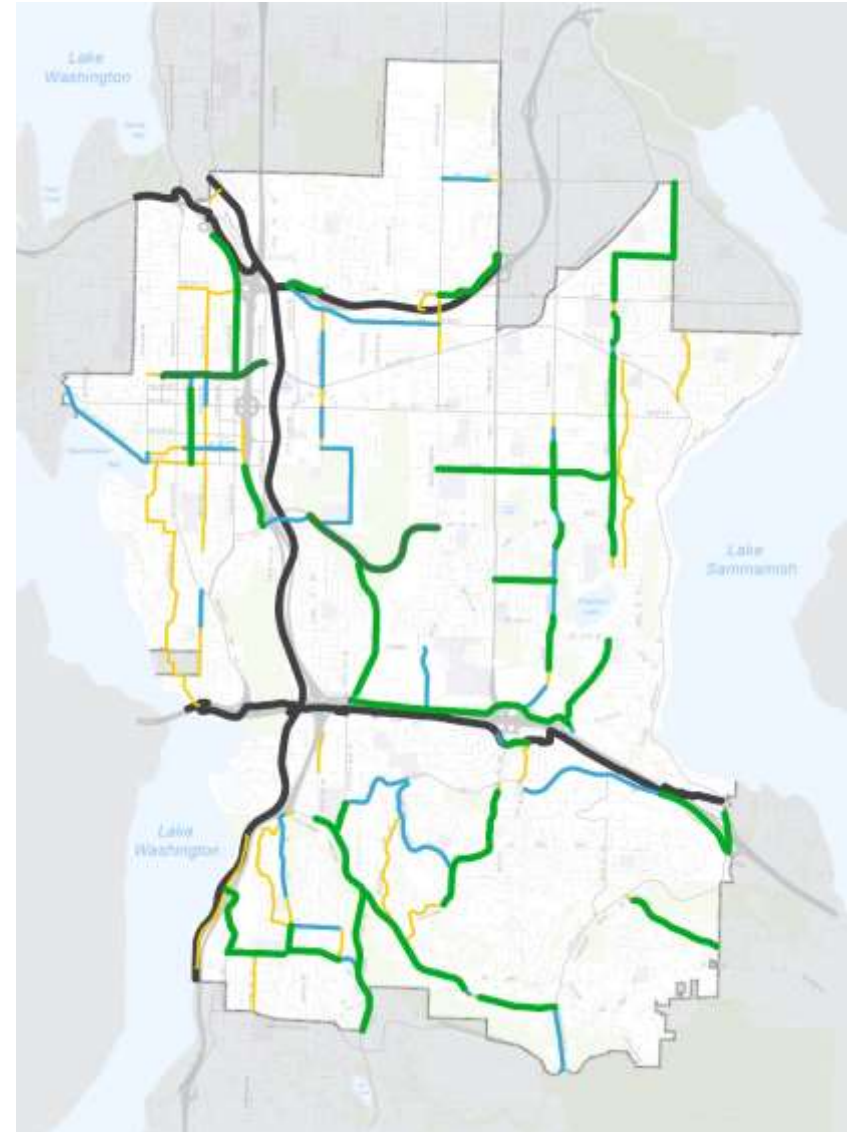
# PBII Scope of Work



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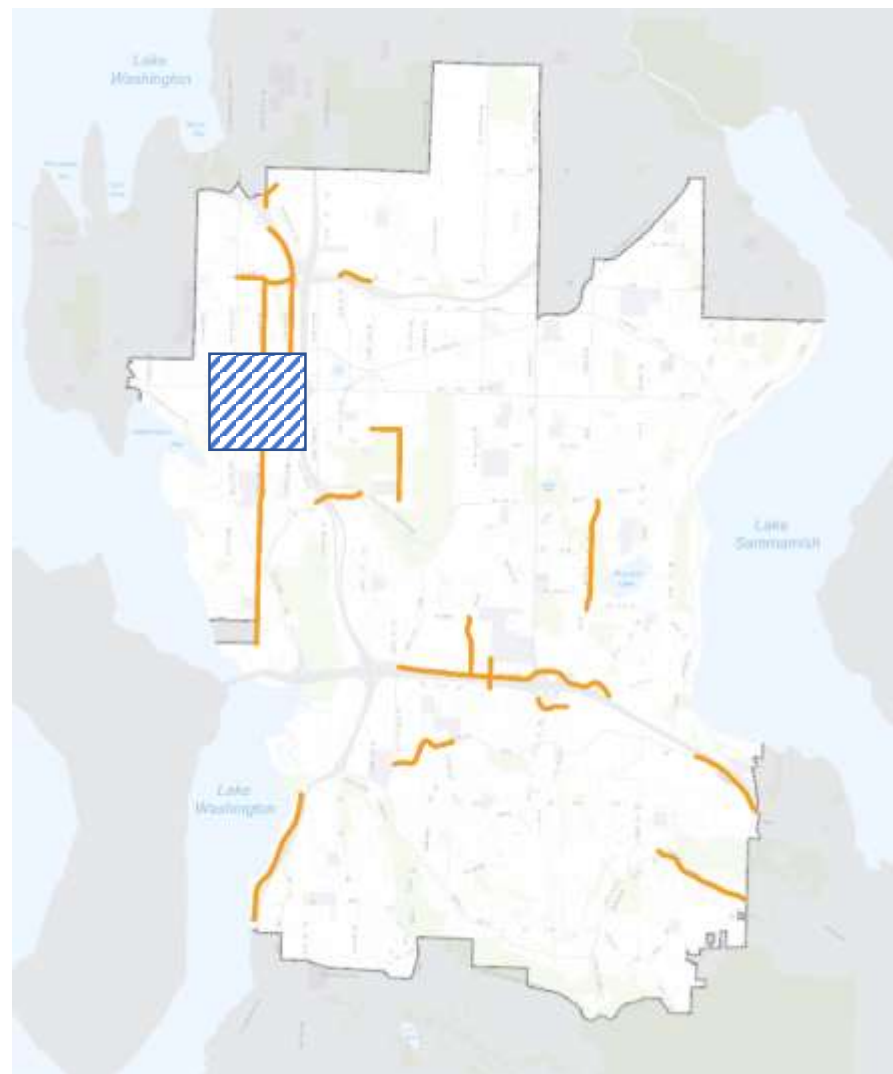
# BRIP | Connected + Protected + Rapid



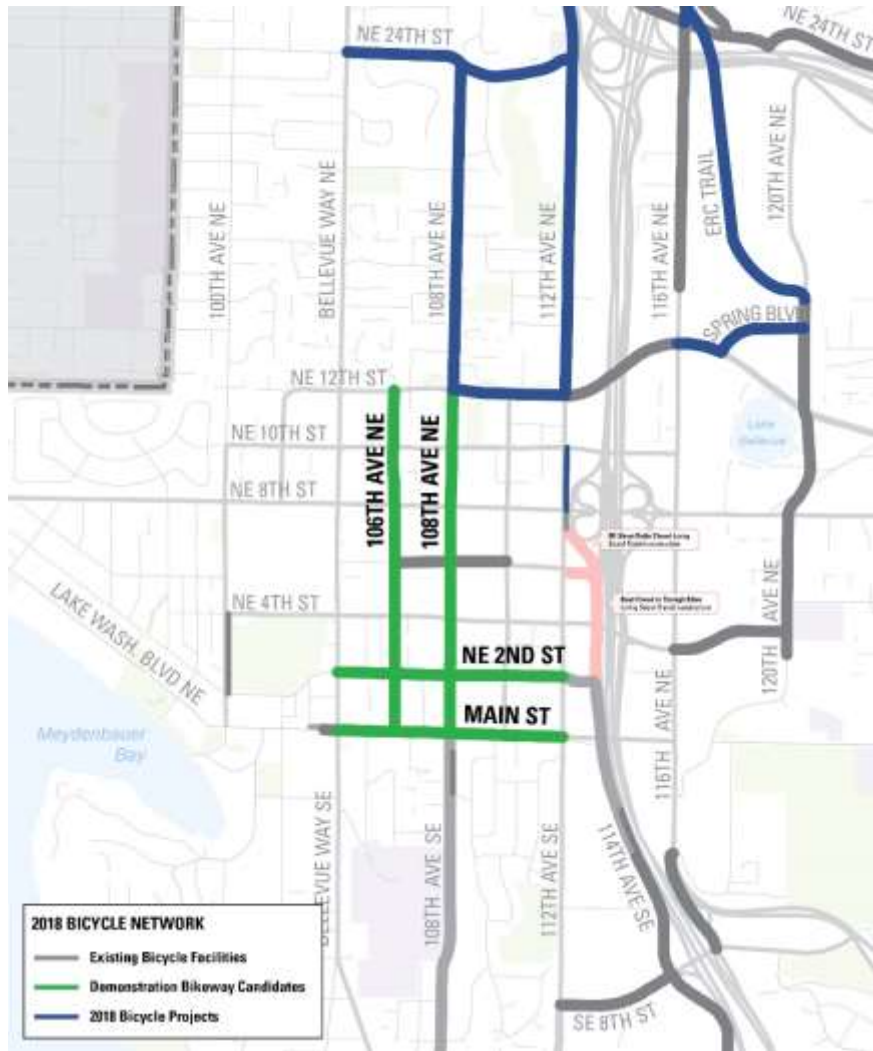
# 2017-2018 Bicycle Projects



**In 2017-2018, the BRIP program will leverage roughly \$1.7M of funding from the Transportation Levy.**

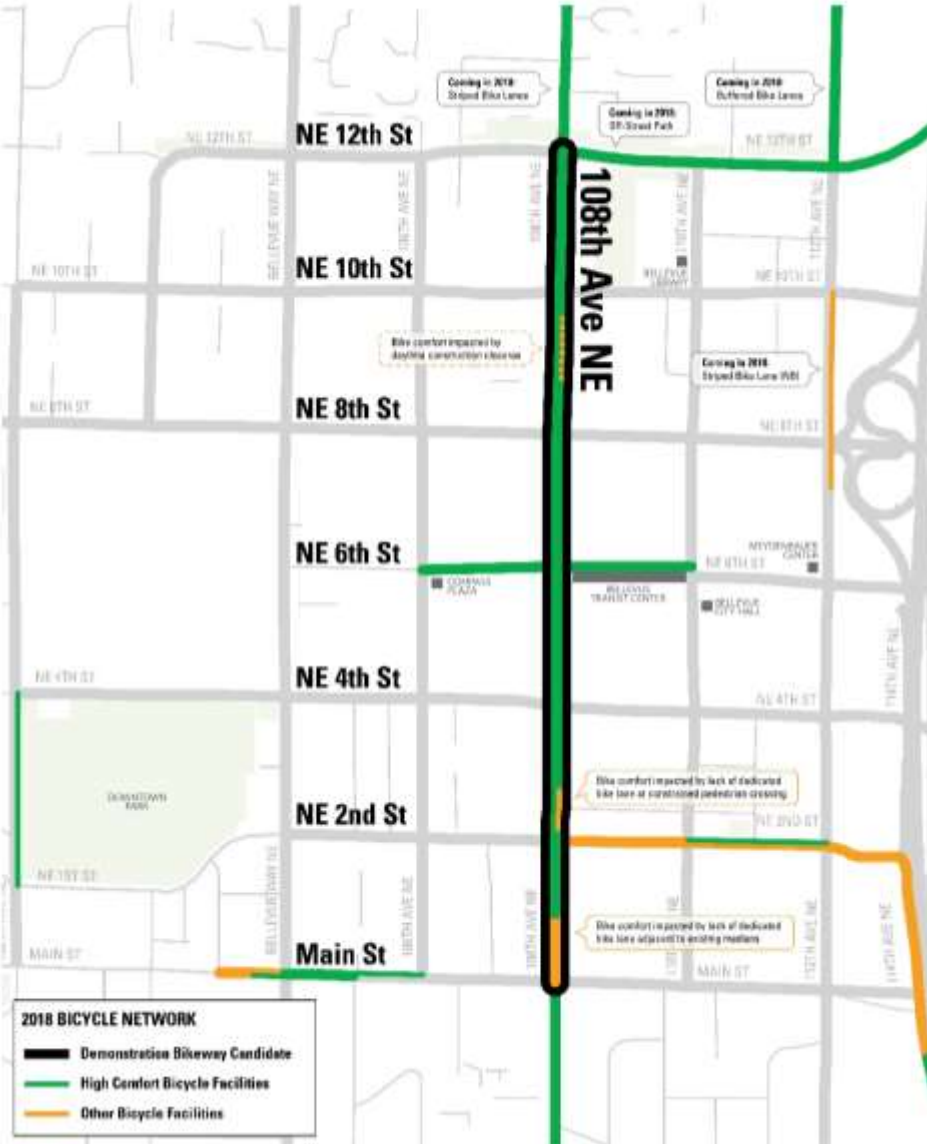


# Downtown Bicycle Network Candidate Corridors



- **108th Ave NE**  
Main St to NE 12th St
- **Main St**  
105th Ave to 112th Ave
- **NE 2nd St**  
Bellevue Way NE to 110th Ave NE
- **106th Ave NE**  
Main St to NE 12th St

# 108<sup>th</sup> Avenue NE (Main Street to NE 12<sup>th</sup> Street)



CONCEPT AT NE 6TH ST (BELLEVUE TRANSIT CENTER), LOOKING NORTH



CONCEPT AT MAIN ST, LOOKING NORTH



# Business Support

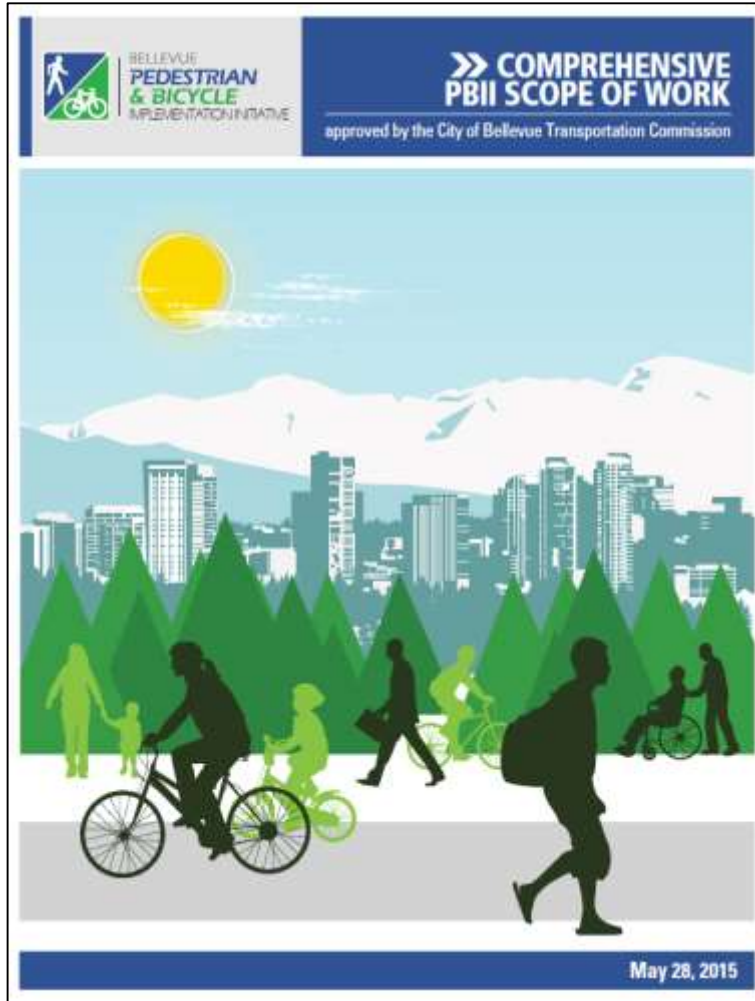


# 108<sup>th</sup> Avenue NE Demonstration Bikeway Project

*On January 11 the Transportation Commission voted five in favor and two opposed in proceeding with implementing the downtown demonstration bikeway project.*

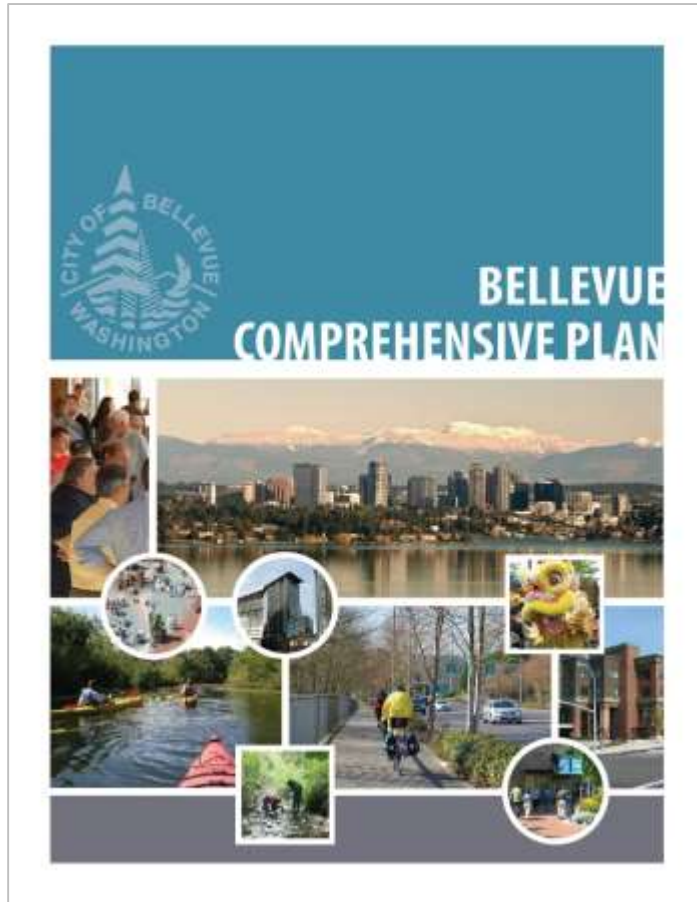


# PBII Scope of Work



1. Ped-Bike Safety Assessment Report
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6. **Bike-Share Implementation Report**
7. Performance Management Report

# Bike Share | Policy Context



***TR-16. Evaluate and facilitate car-sharing and bike sharing programs.***

***TR-115. Support establishment and operation of a bicycle sharing program in Bellevue.***



# Bike Share 101

## Bike share is...

Shared Fleet



Point-to-Point



Short Term



Spontaneous



Transportation



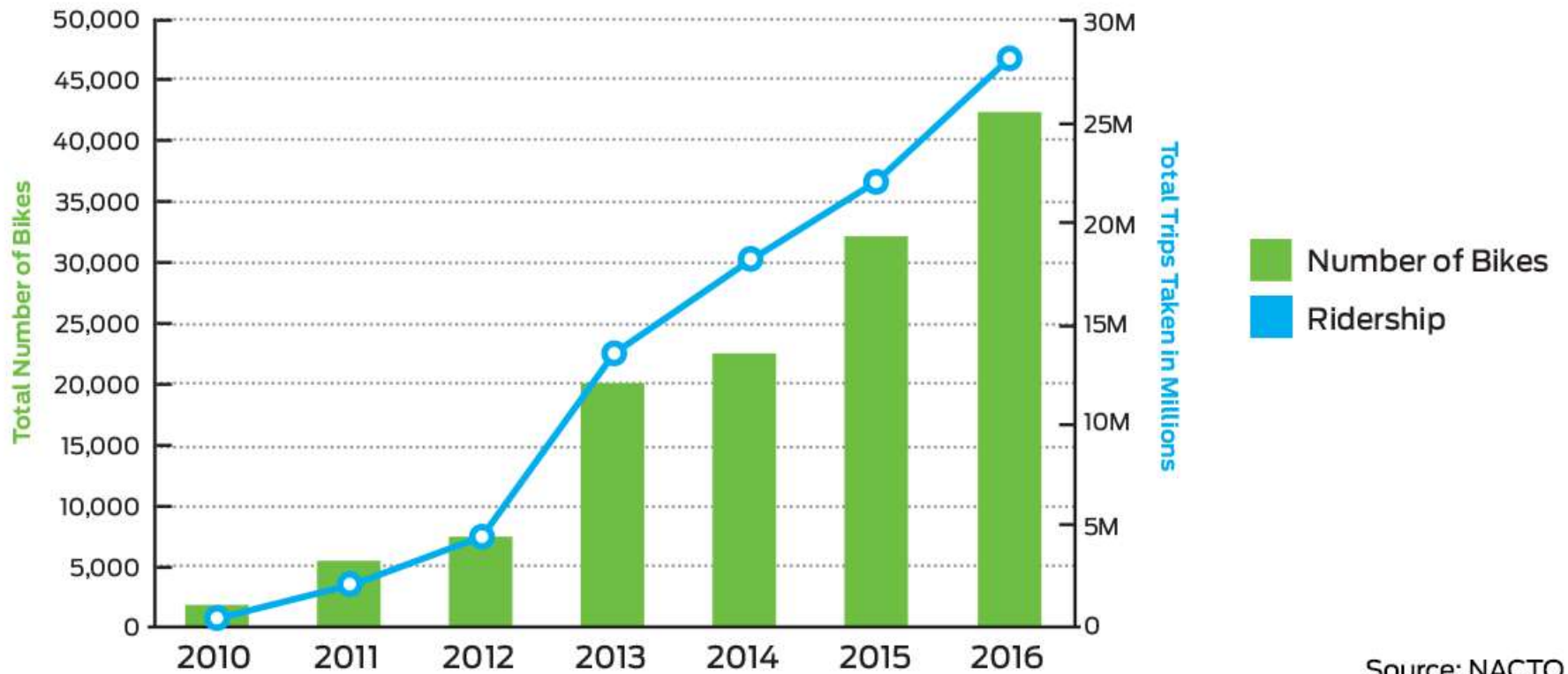
Recreation



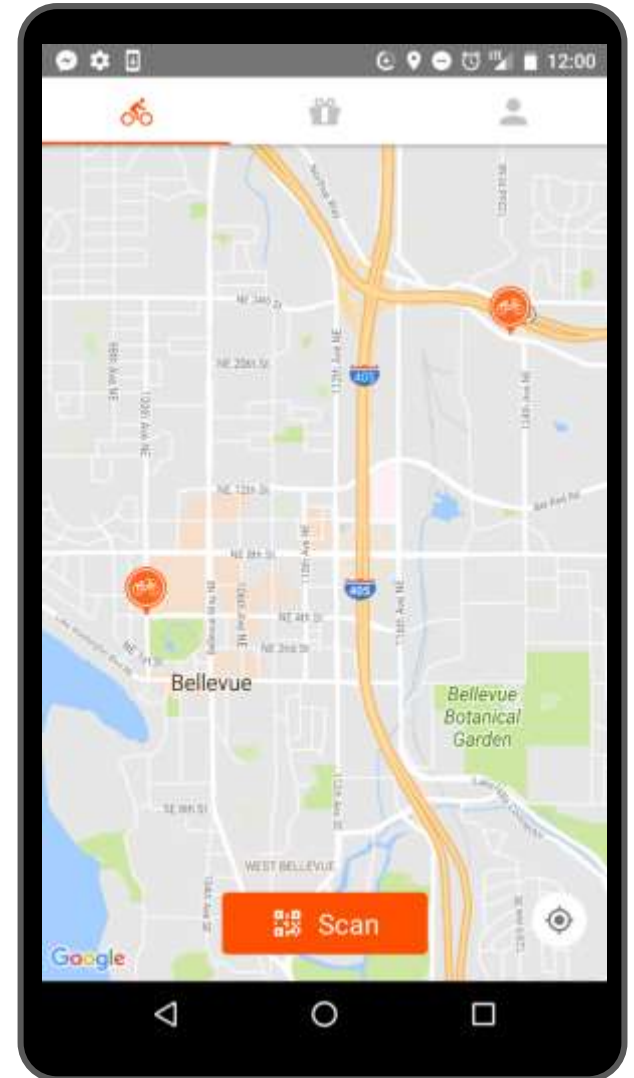
Not Long  
Term Rental



# Bike Share Growth in the US

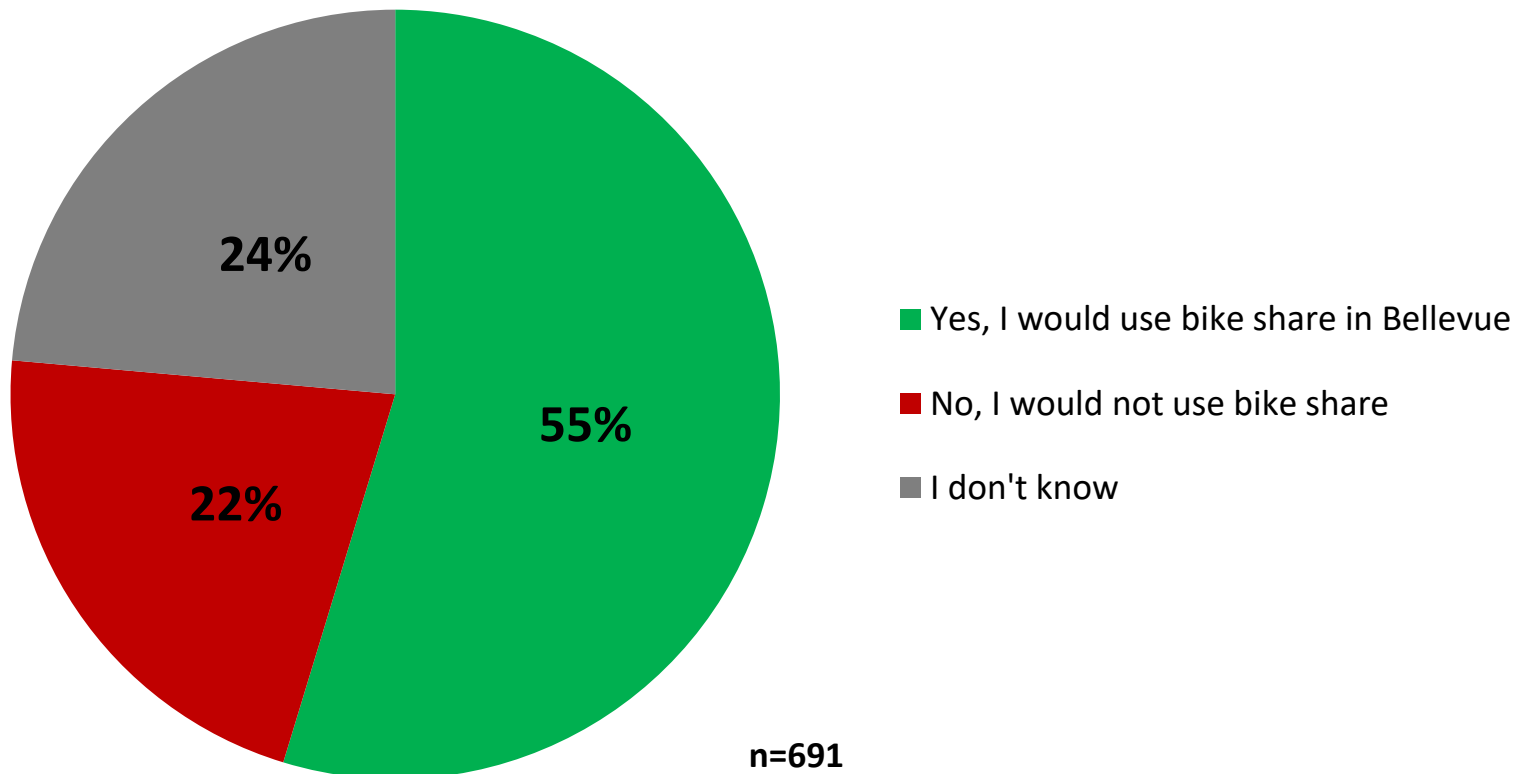


# Bike Share in Bellevue



# Bike Share Survey Results

**If a bike share service was available in Bellevue today, would you use bike share in Bellevue?**



# Citywide Bike Share Pilot Program

*On March 8 the Transportation Commission will consider the implementation of a citywide bike share pilot program.*



# Project Timeline



# Vision Zero



- **Policy context**
- **Video Analytics Partnership**

# Bellevue | A Vision Zero City

## Vision Zero Cities

A Vision Zero City meets the following minimum standards:

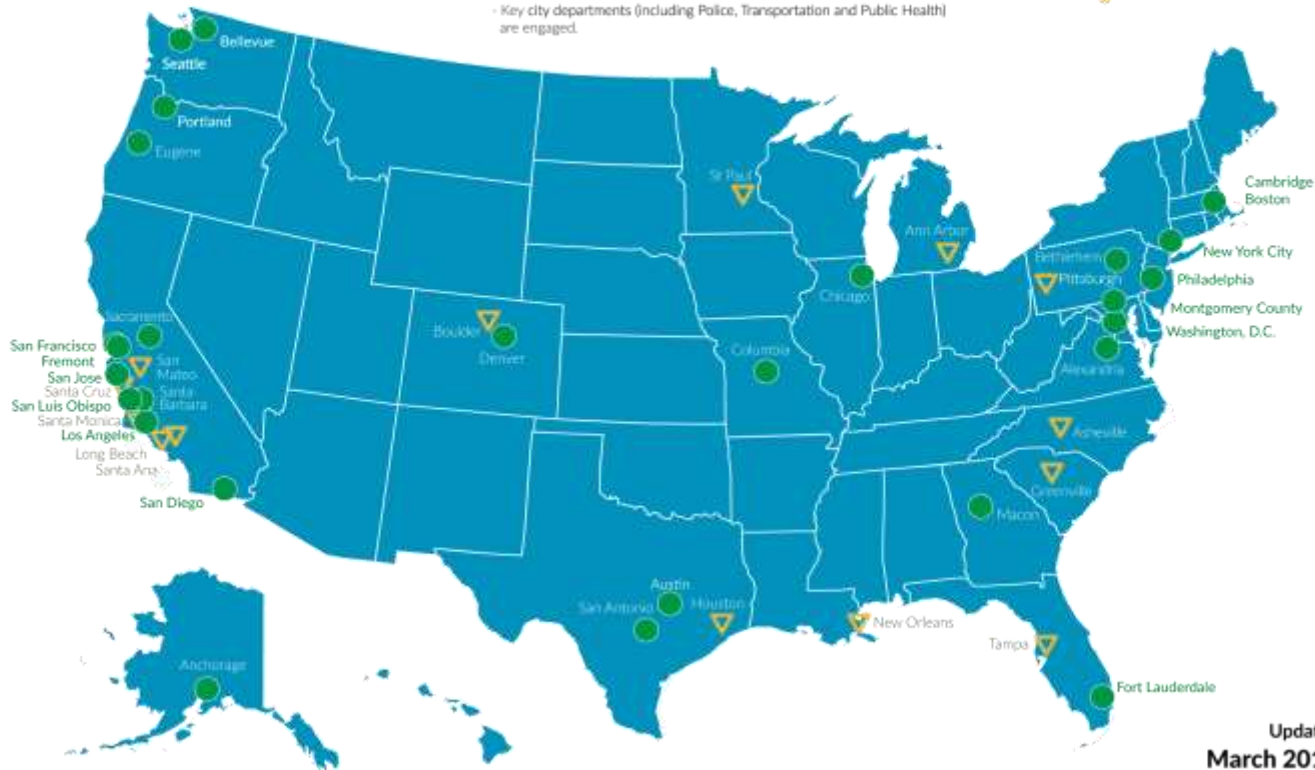
- Sets clear goal of eliminating traffic fatalities and severe injuries
- Mayor has publicly, officially committed to Vision Zero
- Vision Zero plan or strategy is in place, or Mayor has committed to doing so in clear time frame
- Key city departments (including Police, Transportation and Public Health) are engaged.



Vision Zero City



Considering Vision Zero

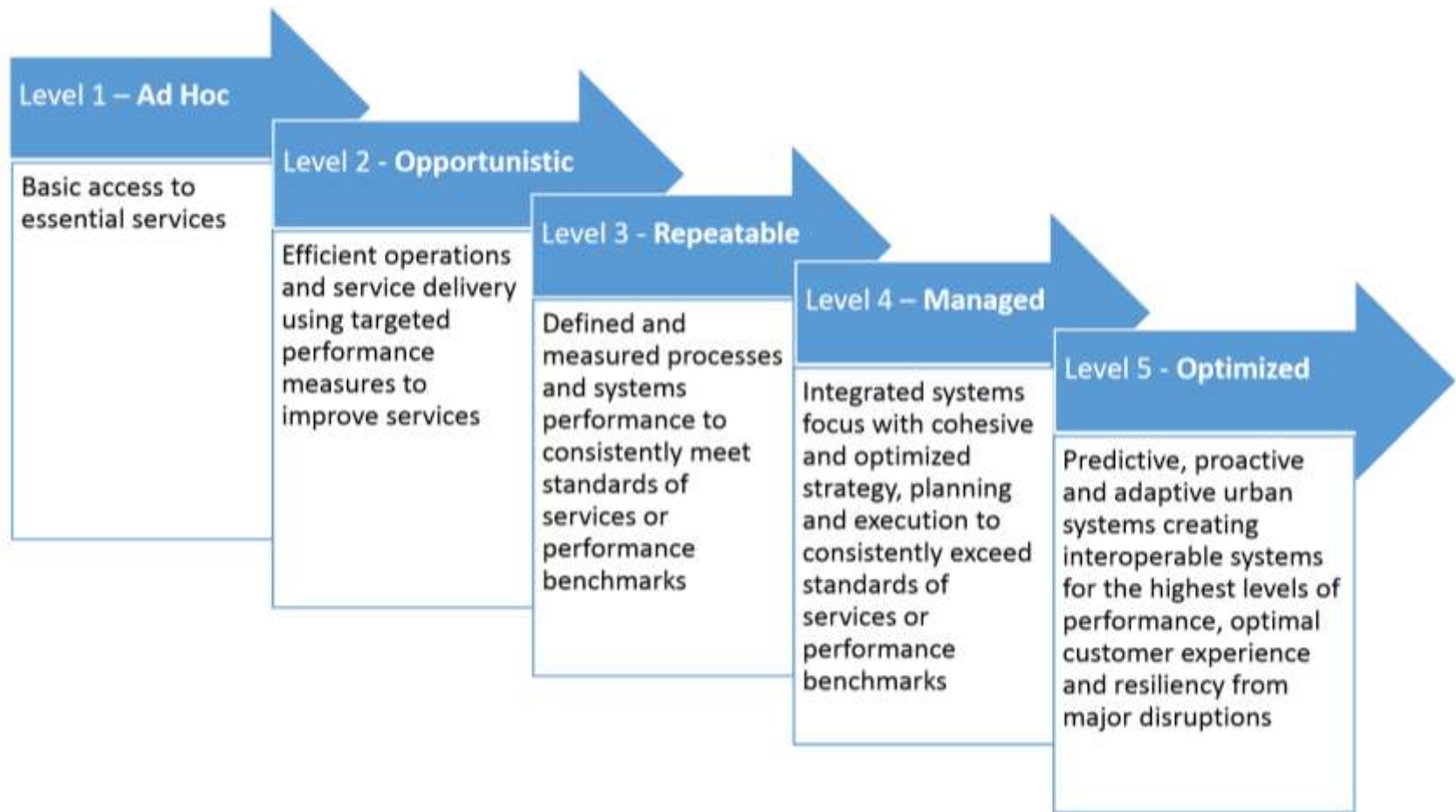


Updated  
March 2017

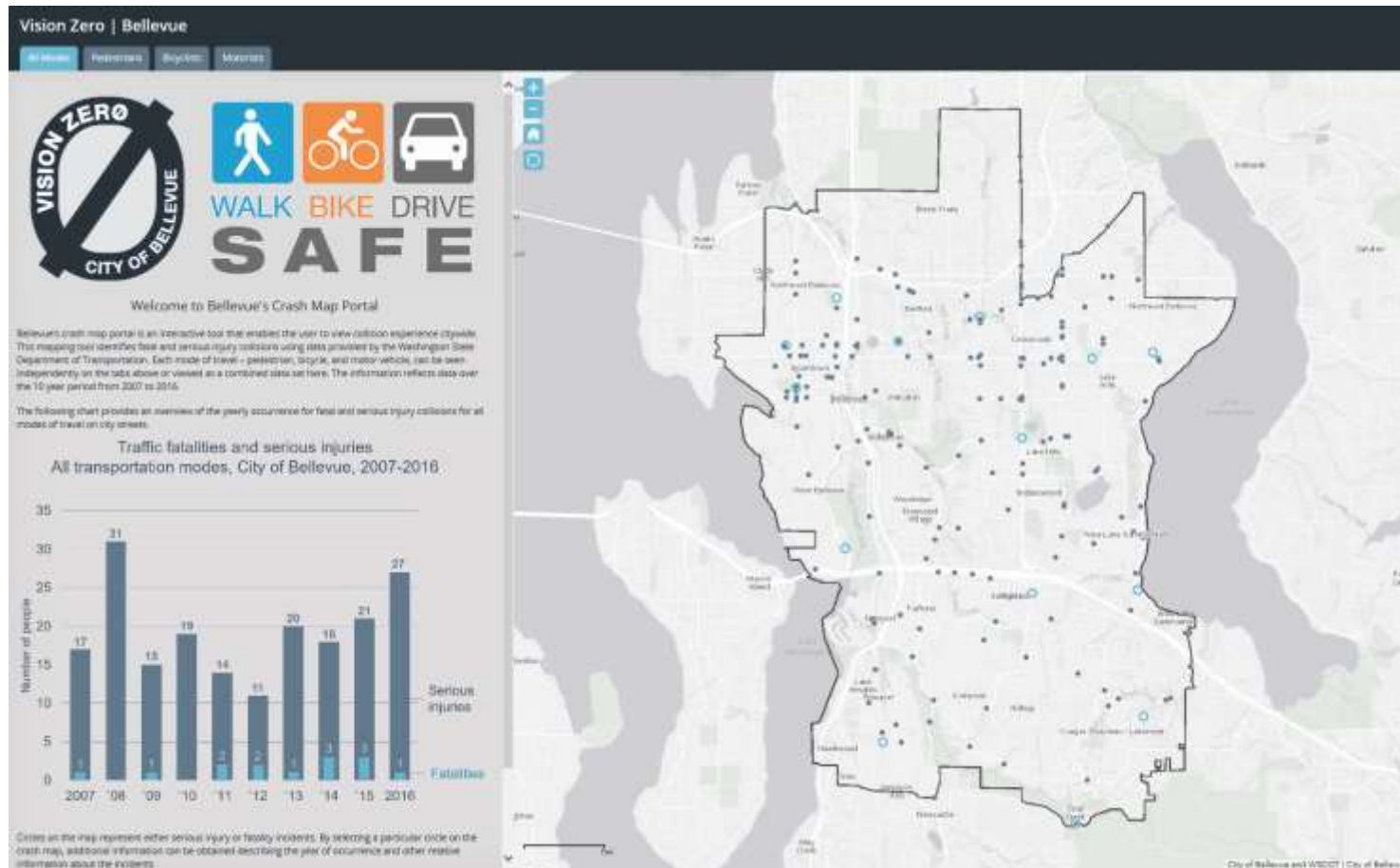
Source: Vision Zero Network



# Bellevue | A Smart City



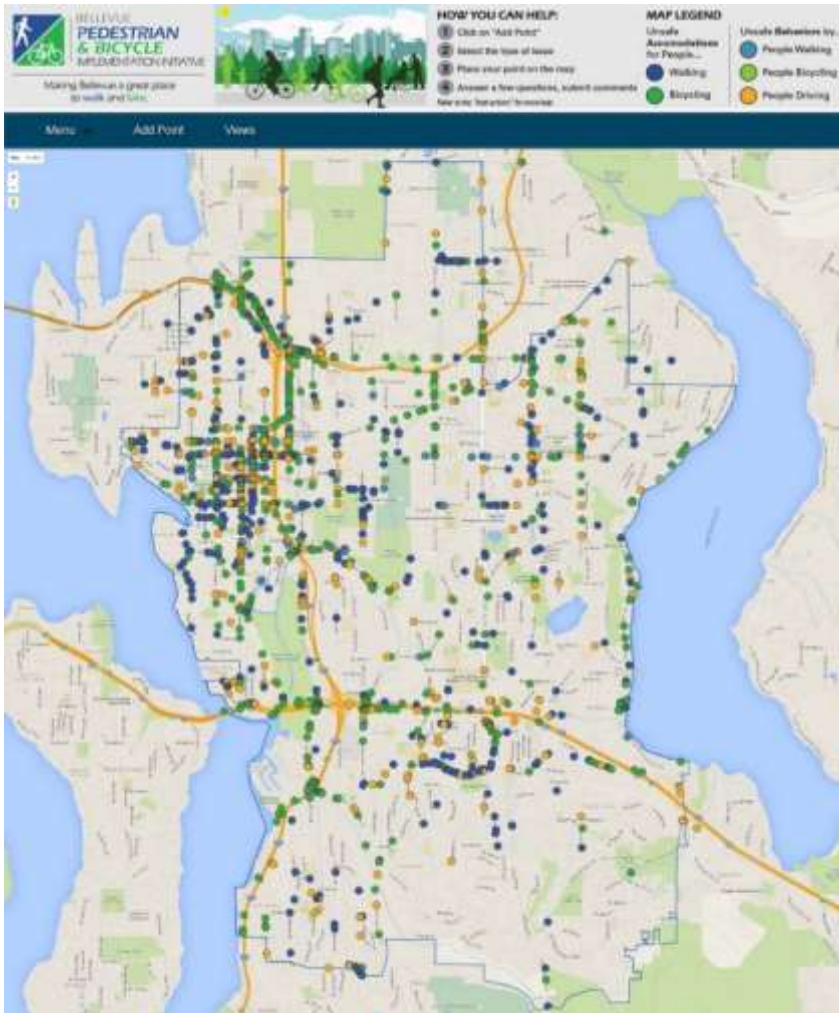
# Bellevue | Traffic Fatalities & Injuries



In 2016, there were 433 traffic collisions in Bellevue involving injuries, 39 bicycle crashes, and 47 involving people walking, including one fatality.

<https://cobgis.maps.arcgis.com/apps/MapSeries/index.html?appid=8964b232b8ec4a0180e0b56b1c29071d>

# Bellevue | Road Safety Concerns



	Total Points Placed	
Ped Facilities	514	32%
Bike Facilities	573	35%
Ped Behaviors	57	4%
Bike Behaviors	22	1%
Car Behaviors	452	28%
Total	1618	

# Video Analytics Platform



- Leverage a city's existing traffic camera system to simultaneously:
- monitor counts and travel speed of all road user groups (vehicle, pedestrian, and bicycle);
  - document the directional volume of all road user groups as they move through an intersection; and,
  - assess unsafe “near-miss” trajectories and interactions between all road user groups.

# Neural Network Architecture

## training

during the training phase, a neural network is fed thousands of labeled images of various objects, learning to classify them



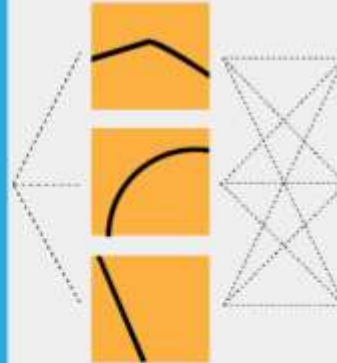
## input

new image is shown to the pretrained network



## first layer

the neurons respond to simple shapes, like edges



## higher layer

the neurons respond to complex shapes



## top layer

neurons respond to highly complex abstract concepts that we would identify as different objects

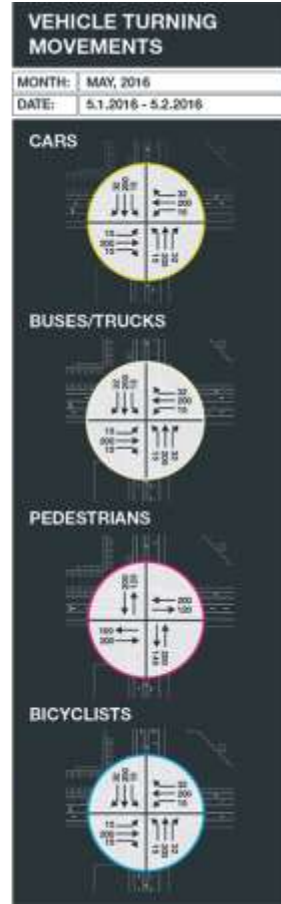
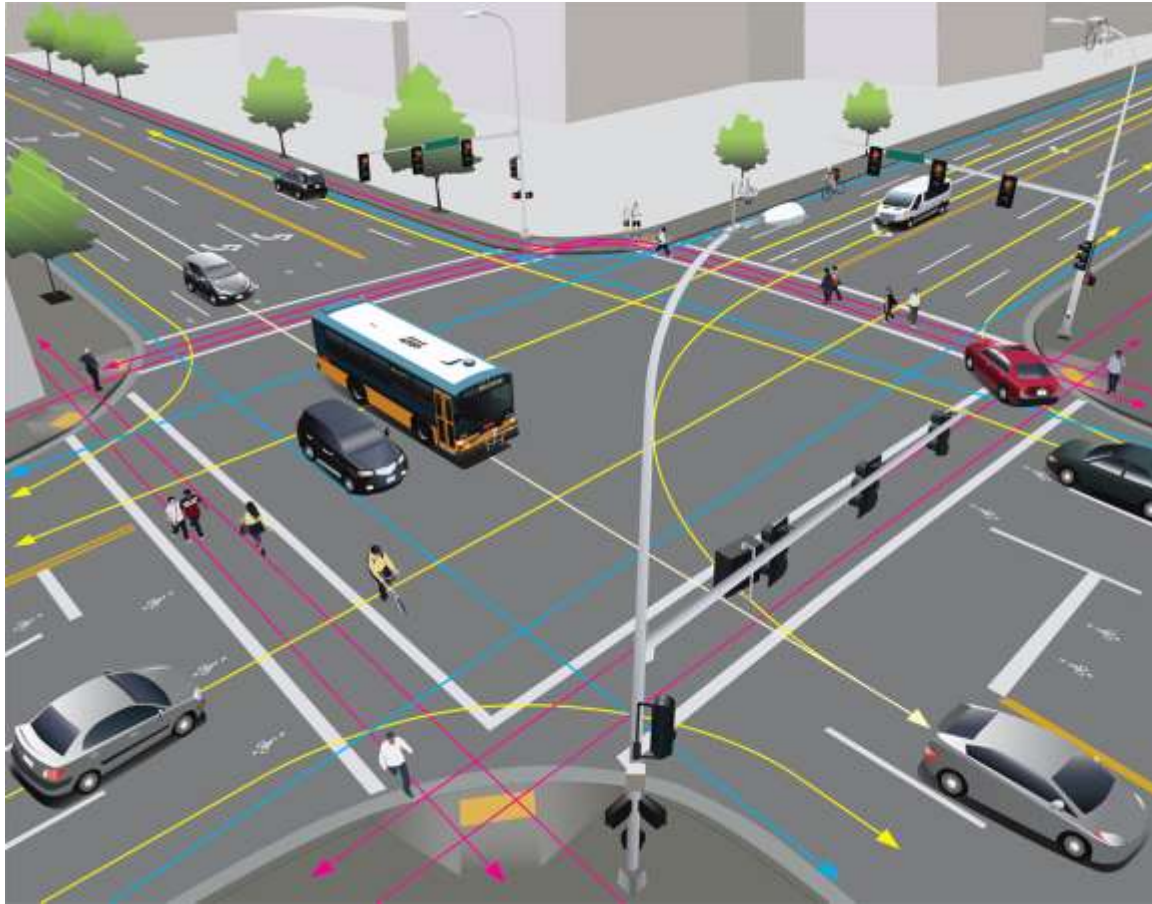


## output

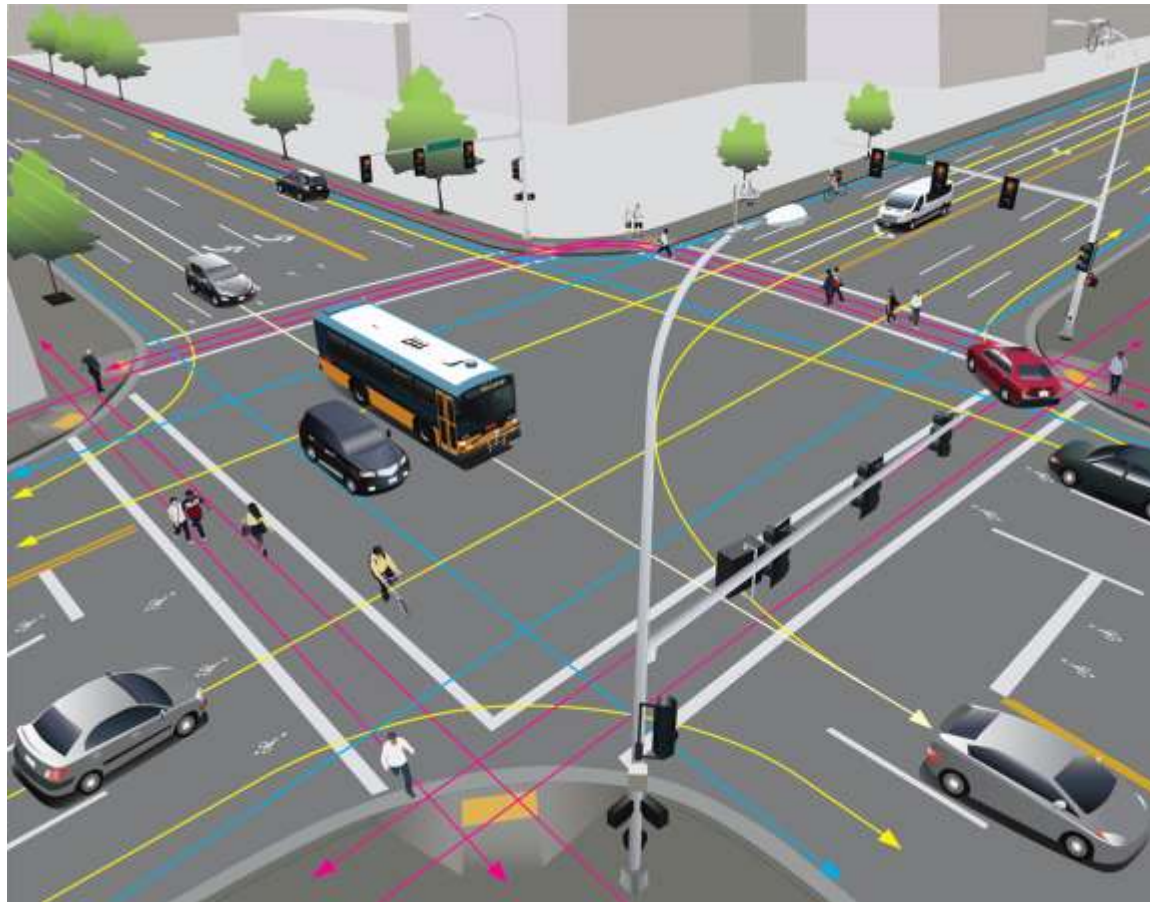
the network predicts what the object most likely is based on its training.



# Turning Movements



# Volume Charts



## VEHICLE DISTRIBUTION CHARTS BY TIME OF DAY

MONTH: MAY, 2016  
DATE: 5.1.2016 - 5.1.2016

### CARS



30,000 cars/day

### BUSES/TRUCKS



400 buses & trucks/day

### PEDESTRIANS



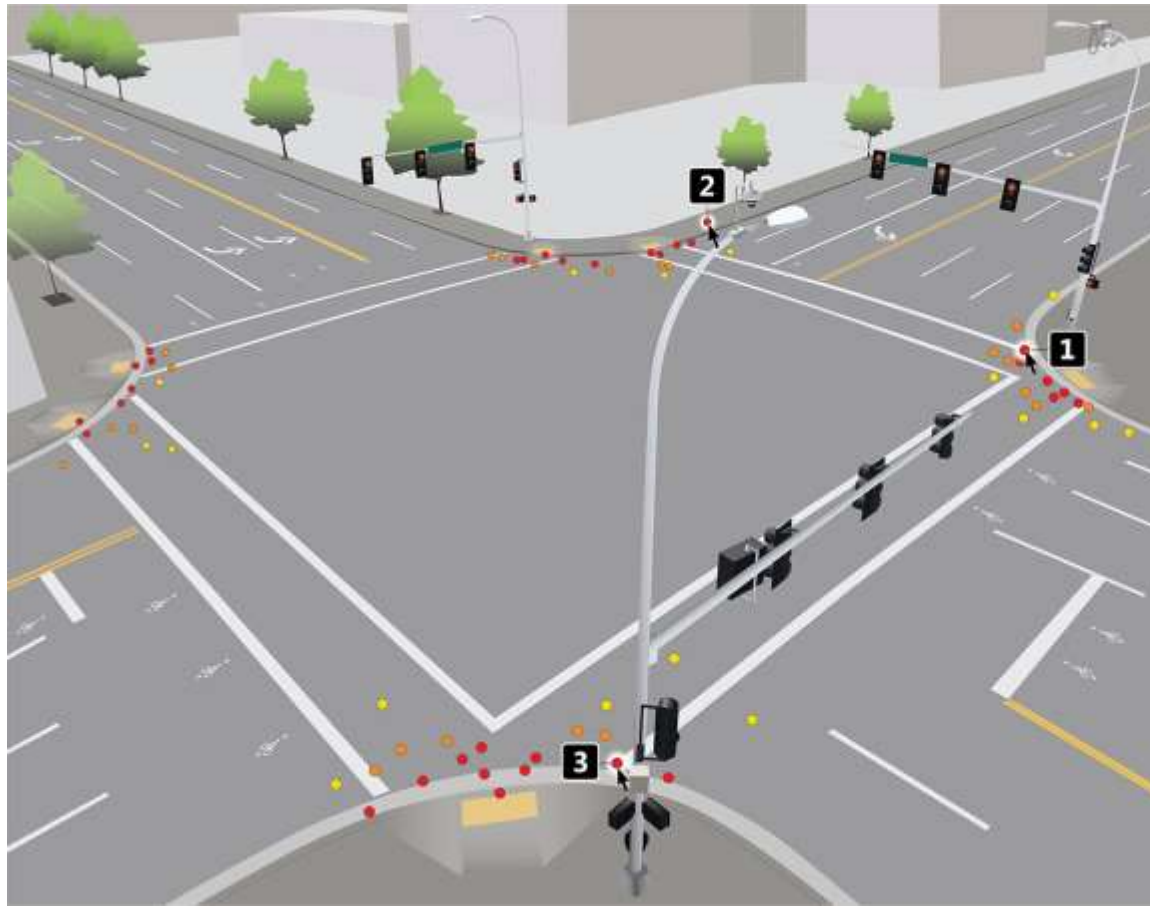
1,000 pedestrians/day

### BICYCLISTS



100 bikes/day

# Traffic Conflict Detection



QUANTITY, LOCATION & SEVERITY OF NEAR MISS EVENTS

MONTH:	MAY, 2016
DATE:	5.1.2016 - 5.31.2016

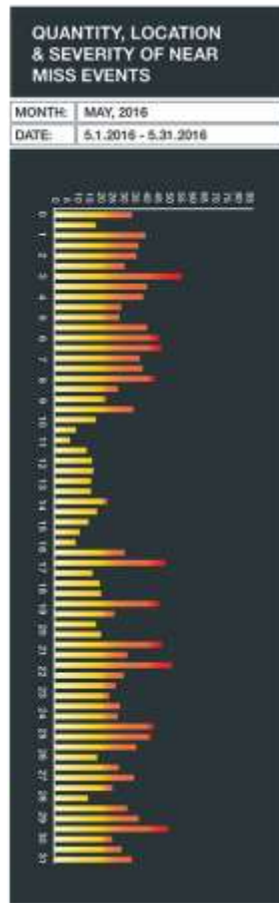
1

2

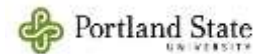
3



# Traffic Conflict Detection



# Partnership Momentum



# Crowdsourcing Initiative

## Video Analytics towards Vision Zero

### Worldwide problems demands bold action



- Worldwide 1.25 million people are killed annually in traffic accidents
- In 2016, road crashes resulted in 40,000 deaths and 4.6 million injuries in the United States.
- Crashes are preventable and we need not wait for someone to be killed or injured before we take action

### Make a difference, teach computers to learn



- Unique opportunity to help prevent traffic crashes and save lives
- "Teach" our computers how to recognize vehicles, people walking and bicyclists
- Cities will be able to rapidly detect road conflicts and traffic engineers can then take preventative action to avoid crashes

Participate starting June →

<http://www.ite.org/visionzero/videoanalytics/>

# Crowdsourcing Initiative

✓ Skip and Get Next Task

✓ Submit and Get Next Task

✓ Submit and Exit

✓ Exit

📄 Instructions

+ New Object

Annotate all objects of interest, moving, stationary, or obstructed, for the entire video.

2015-Sep-10 08:49:30.867 AM (PDT)



What type of object did you just annotate?

- Pedestrian
- BiCycle
- PedestrianWithStroller
- MotorBike
- Car
- Bus
- Truck
- WheelChair

**Pedestrian 2**

- Outside of view frame
- Temporarily not visible
- Crossing Road

**Pedestrian 1**

- Outside of view frame
- Temporarily not visible
- Crossing Road

In this video, please track all of these objects:

- Pedestrian
- BiCycle
- PedestrianWithStroller

⏮ Rewind

▶ Play

Disable Resize

Hide Boxes

Hide Labels

Slower

Slow

Normal

Fast

# Media Coverage

**METROLAB**

### The Road King: Introducing the Vision Analytics Traffic Vision Zero Partnership

The Road King is a partnership between a team of Vision Analytics and a team of Vision Zero, aimed at reducing road deaths and injuries. The partnership is a key part of the Vision Zero initiative, which aims to eliminate road deaths and injuries by 2050. The partnership is a key part of the Vision Zero initiative, which aims to eliminate road deaths and injuries by 2050. The partnership is a key part of the Vision Zero initiative, which aims to eliminate road deaths and injuries by 2050.

**VIDEO: New traffic tech**

**KIRO 7 STUDIOS BELLEVUE**

**NEW AT 5**

**VOLUNTEERS NEEDED FOR NEW TRAFFIC TECH**

**KIRO 7**

**VISION ZERO**  
LOS ANGELES 2019-2022

**HOME ABOUT PROJECTS GALERIES**

When the Vision Zero LA team comes to work every day, we know the statistics about traffic collisions. In addition to the national numbers (30,000 deaths and 4.6 million injuries), we think locally. Every year more than 200 people die on the streets of Los Angeles, half of which are pedestrians or cyclists. Traffic collisions are the leading cause of death for children between the ages of 2 and 14.

Overlooked technology has already changed the way many of us get around L.A. Uber, Lyft, Uber, and so on. When it comes to our technology to predict where vehicle collisions involving pedestrians and bicycles will occur, and then take steps to prevent them? Thanks to a new online platform and analytics called Vision Analytics Traffic Vision Zero, we've got a chance to play a role in tracking, computing how to recognize and prevent potential traffic collisions before they happen.

By using footage from traffic cameras across North America, VAVZ will "teach" computers how to recognize near-miss collisions. Data from these machine learning systems will allow transportation engineers to predict where crashes will occur and take proactive measures to prevent them.

**WSDOT BLOG**

### How researchers are using computers to recognize bad road pavement conditions

Researchers are using computers to recognize bad road pavement conditions. This is a key part of the Vision Zero initiative, which aims to eliminate road deaths and injuries by 2050. The partnership is a key part of the Vision Zero initiative, which aims to eliminate road deaths and injuries by 2050.

**VISION ZERO PROJECT**

**KOMO 4**

**NATIONAL**

**92° 49° 91°**

**KOMONWS.COM NEWS / WEATHER / SPORTS**

**Hamilton**

### Hamilton partners with Microsoft on Vision Zero traffic initiative

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**TREC**

### Vision analytics help train computers to recognize road scene, prevent collisions

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**Hamilton**

### Vision Analytics

City of Hamilton partners with Microsoft on Vision Zero traffic initiative project.

**WASHINGTON POST**

### How analyzing near-miss traffic collisions could help save lives

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**WASHINGTON POST**

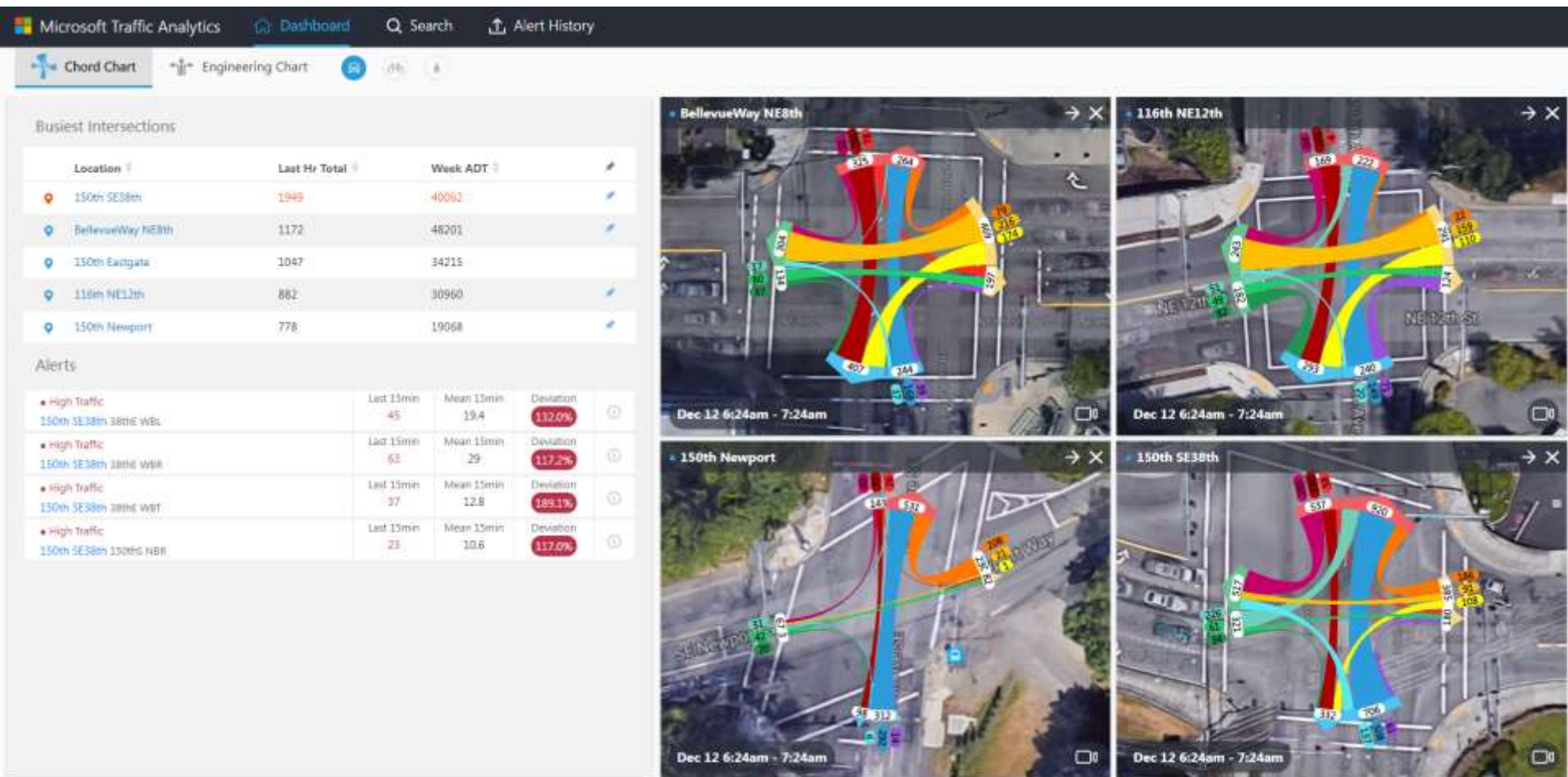
### We can use data to achieve Vision Zero by spotting dangerous places before crashes happen

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**VISION ZERO PROJECT**

**KOMO 4**

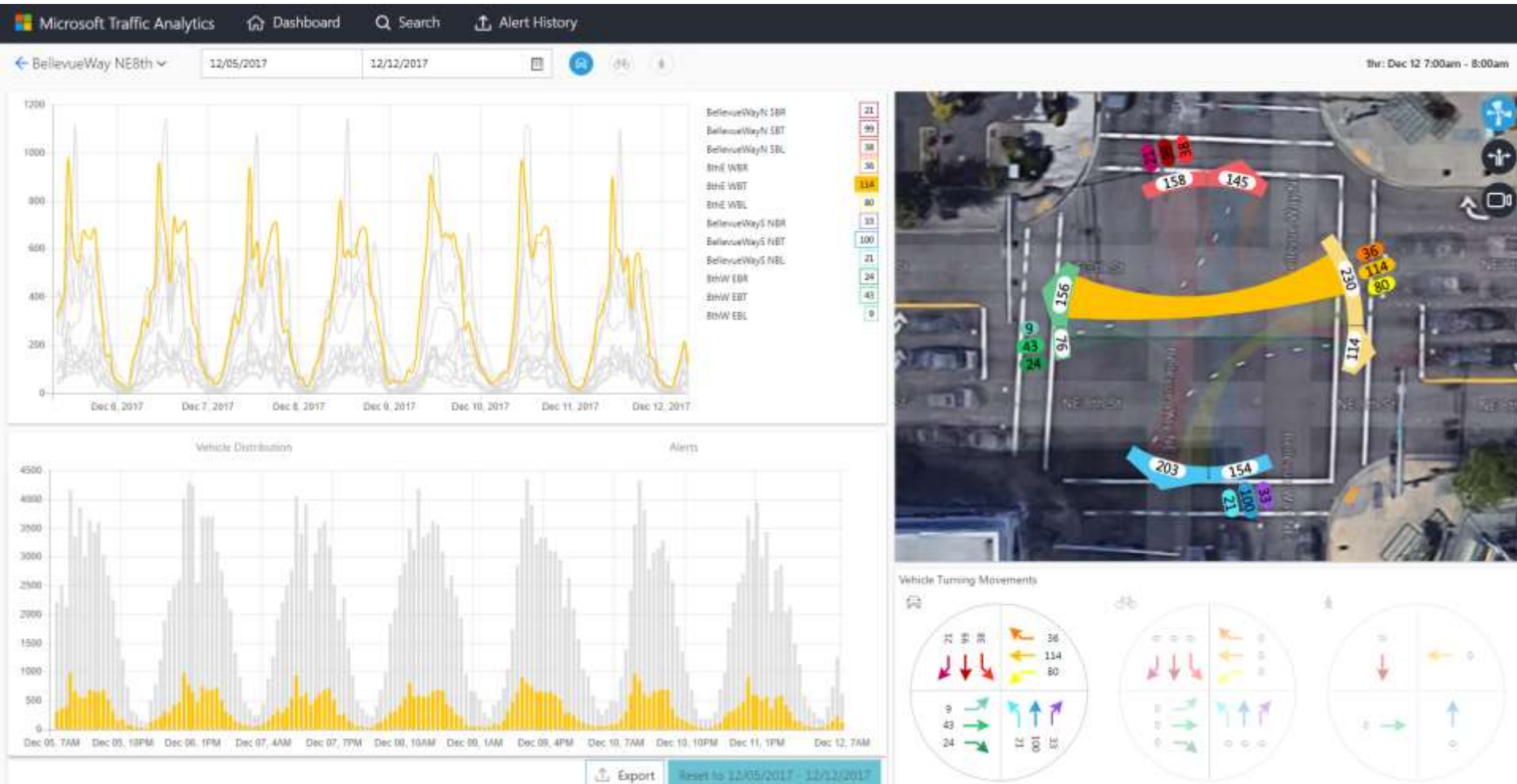
# Traffic Analytics Dashboard



# Traffic Analytics Dashboard (Bellevue Way & NE 8<sup>th</sup>)

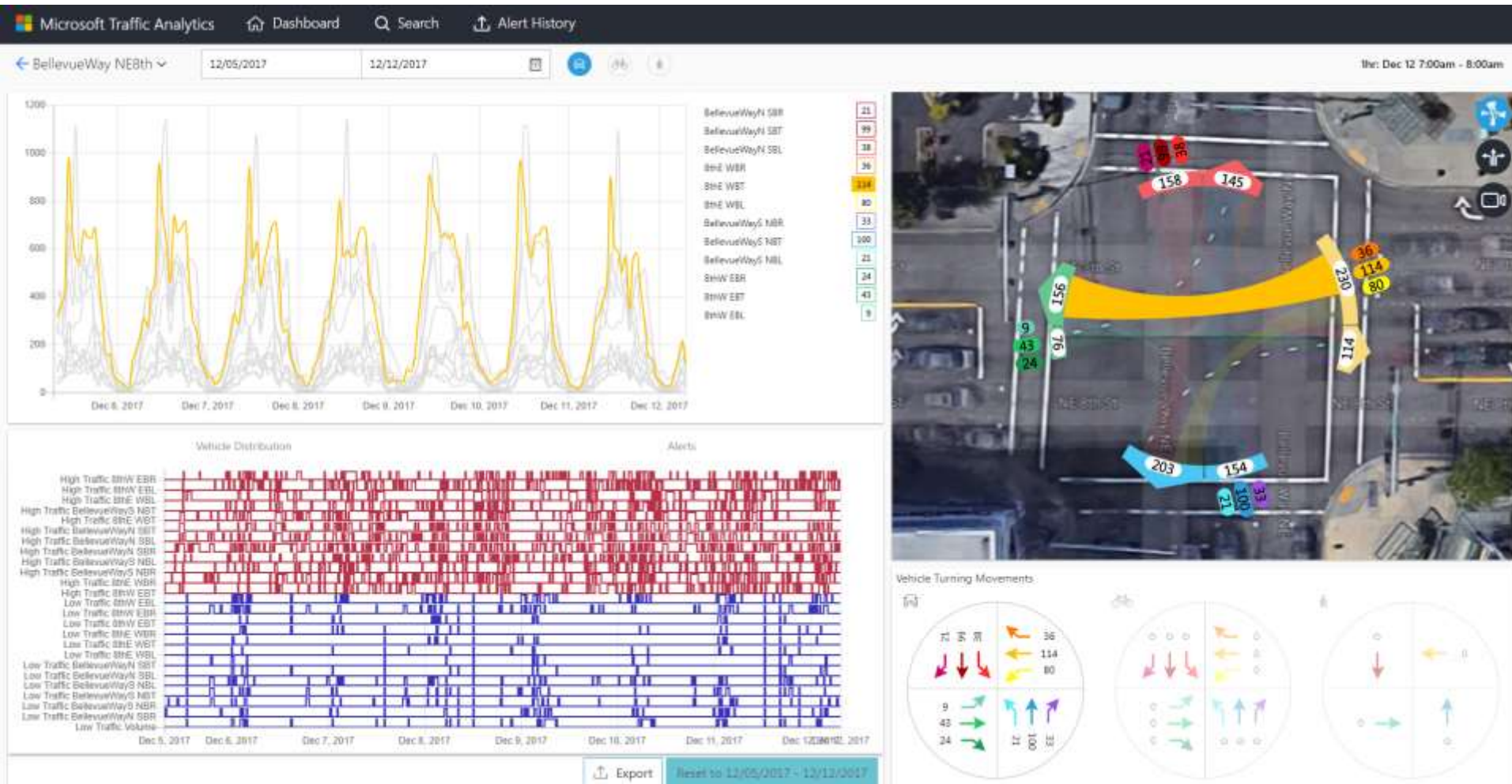


# Traffic Analytics Dashboard (Bellevue Way & NE 8<sup>th</sup>)





# Traffic Analytics Dashboard (Bellevue Way & NE 8<sup>th</sup>)



# Traffic Analytics Dashboard (Alerts)

Microsoft Traffic Analytics									
Dashboard									
Search									
Alert History									
12/05/2017	12/12/2017	Intersection	All	Alert type	All				
Alert	Alert Type	Intersection	Direction	Period					
High Traffic	Traffic Anomaly	116th NE12th	12thE WBR	12/05/2017 08:00 - 08:30					
Low Traffic	Traffic Anomaly	150th Newport	150thS NBL	12/05/2017 08:00 - 08:30					
Low Traffic	Traffic Anomaly	BellevueWay NE8th	BellevueWayS NBR	12/05/2017 08:15 - 08:30	8	28.3	71.7%		
Low Traffic	Traffic Anomaly	150th Newport	NewportW EBT	12/05/2017 08:15 - 08:30	5	19.4	74.2%		
High Traffic	Traffic Anomaly	150th Newport	NewportE WBL	12/05/2017 08:15 - 08:30	1	0	0.0%		
Low Traffic	Traffic Anomaly	150th Newport	150thS NBR	12/05/2017 08:15 - 08:30	2	9.2	78.3%		
Low Traffic	Traffic Anomaly	150th Newport	150thS NBL	12/05/2017 08:15 - 08:30	0	0.4	100.0%		
Low Traffic	Traffic Anomaly	116th NE12th	12thE WBR	12/05/2017 08:15 - 08:30	6	21.8	72.5%		
High Traffic	Traffic Anomaly	150th SE38th	150thS NBR	12/05/2017 08:15 - 08:30	8	4.8	66.7%		
Low Traffic	Traffic Anomaly	150th Newport	150thS NBR	12/05/2017 08:30 - 08:45	1	8.6	88.4%		
High Traffic	Traffic Anomaly	150th Newport	150thS NBL	12/05/2017 08:30 - 08:45	2	1	100.0%		
Low Traffic	Traffic Anomaly	150th Newport	150thS NBL	12/05/2017 08:45 - 09:00	0	1.8	100.0%		
Low Traffic Volume	Traffic Anomaly	150th SE38th		12/05/2017 09:00 - 09:15	305	761.5	59.9%		
Low Traffic	Traffic Anomaly	150th SE38th	38thW EBT	12/05/2017 09:00 - 09:15	7	24	70.8%		
Low Traffic	Traffic Anomaly	150th SE38th	38thE WBR	12/05/2017 09:00 - 09:15	6	23.8	74.8%		
Low Traffic	Traffic Anomaly	150th SE38th	38thE WBT	12/05/2017 09:00 - 09:15	2	7.2	72.2%		
Low Traffic	Traffic Anomaly	150th SE38th	38thE WBL	12/05/2017 09:00 - 09:15	7	27.2	74.3%		
Low Traffic	Traffic Anomaly	150th SE38th	150thN SBL	12/05/2017 09:00 - 09:15	7	31.2	77.6%		
High Traffic	Traffic Anomaly	BellevueWay NE8th	8thE WBR	12/05/2017 09:00 - 09:15	32	20.6	55.3%		

**Information**

Name	High Traffic
Type	Traffic Anomaly
Traffic type	Car
Threshold	0.5
Historical value options	Average of 15mins intervals, over previous 6 Weeks
Comparison method	Relative difference between latest and mean traffic
Directions aggregation	No aggregation - directions are handled independently

# Enhancing Pedestrian & Bicycle Accuracy



<https://youtu.be/I0UmWQJiiN8>

# 2017 Transportation Achievement Award for Safety



**ite** Institute of Transportation Engineers Inc.  
1627 Eye Street, NW, Suite 500, Washington, DC 20006 USA | Tel: 202.785.0080 | Fax: 202.785.0509 | www.ite.org

Marianne Sogian  
Communications and Media Senior Director  
202.785.0668 ext. 123

## NEWS

### VIDEO ANALYTICS TOWARDS VISION ZERO PARTNERSHIP RECEIVES THE TRANSPORTATION ACHIEVEMENT AWARD FOR SAFETY FROM THE INSTITUTE OF TRANSPORTATION ENGINEERS

Toronto, ON, Canada— Video Analytics Towards Vision Zero Partnership, City of Bellevue, Washington USA received the Transportation Achievement Award for Safety at the Institute of Transportation Engineers (ITE) 2017 Annual Meeting & Exhibit, held July 30 – August 2, in Toronto, ON, Canada.

Consistent with its Vision Zero policies, the City of Bellevue, Washington is committed to generating better data on travel behavior, patterns, crashes, and conflicts and developing collaborations with others in the public and private sector to make our intersections smarter and safer. In recognition of the opportunities to enhance traffic operations and public safety, the City of Bellevue entered into a technology development partnership with Microsoft and the University of Washington.

The video analytics platform that was developed leverages cloud computing and machine learning systems to convert raw video footage from the City of Bellevue's existing camera network into useful data that can be searched, managed, and used to provide detailed information on traffic flow and allow a more rapid response to non-crash traffic conflicts.

The Transportation Achievement Awards are awarded annually for excellence in the advancement of transportation to meet human needs, by entities concerned with transportation such as governmental agencies, legislative bodies, consulting firms, industry, and other organizations. Awards are presented in the categories of planning, design, operations, and safety.

Founded in 1930, ITE is a community of transportation professionals including, but not limited to transportation engineers, transportation planners, consultants, educators, and researchers. Through meetings, seminars, publications, and a network of more than 13,000 members, working in more than 90 countries, ITE is your source for expertise, knowledge, and ideas.

For more ITE award Photos, visit the ITE website at  
<http://www.pweddians.ca/clients/awards>

###

# For More Information

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