

## Outline

- Travel forecasting at DVRPC
  - The regional travel model (TIM)
  - The network model
- New data sources
  - Google Transit feeds (GTFS)
  - OpenStreetMap (OSM)
  - Other
- Creation of the network model
- Applications
- Conclusions

## What is ?

**The Delaware Valley Regional Planning Commission**

- The MPO for the Greater Philadelphia region
- Population: 5.5 million
- 9 counties, 353 municipalities in PA and NJ
- Governed by a board of county and state representatives
- Planning for growth and development of the region




## DVRPC's Travel Modeling

**Office of Modeling**

- 8 full time permanent staff
- Responsible for the majority of travel forecasts in the region
- Region-wide forecasts:
  - Air quality conformity analysis
  - Long range planning
- Detailed forecasts for subarea studies:
  - Highway alternatives analysis
  - Transit studies / FTA New Starts

**The regional travel forecasting model TIM**

- TIM 1.0 – Migration: TRANPLAN to VISUM
  - Since April 2010 used in all new projects
- TIM 2.0 – in the works ...
  - New demand model
  - **New network model**
- TIM 3.0 – Future, activity-based model (ABM)



## Purpose of the Network Model

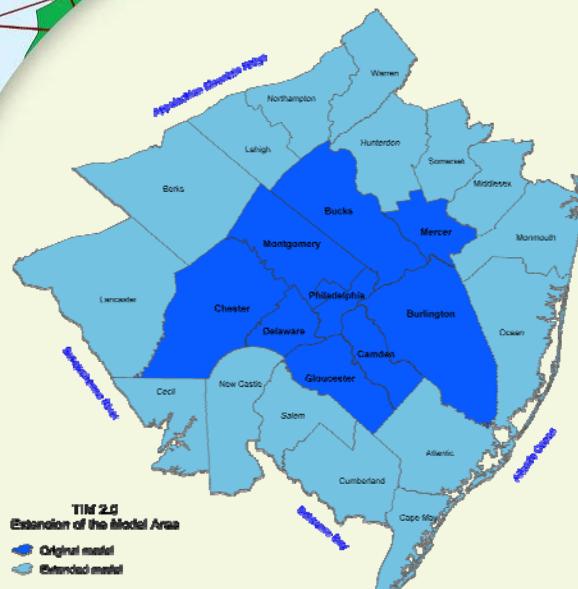
### The network model

- represents transport **supply** in the forecasting model
- allows to compute for the entire region:
  - Travel times
  - Travel cost
  - Routes (paths) for highway vehicles
  - Routes (paths) for transit passengers

### Requirements

- Geographically accurate
- Routable street data
- Reliable transit service data
- Automated updates if possible

## Model Area Extension in TIM 2.0



### Counties

- 9 member counties in TIM 1.0
- 25 counties in TIM 2.0

### Benefits of the extension:

- 99% of journey to work shed
- better forecast at borders
- easier start-up of inter-MPO projects

### Travel analysis zones in TIM 2.0

- internal 3150 (up from 1900)
- external 250
- total 3400

## Data Sources for TIM 2.0 Network

When looking for data sources, we had choices:

- Government GIS
- Commercial street data: NAVTEQ, TeleAtlas
- Web 2.0 data

### Web 2.0

- Everybody can contribute to the content
- "Mash-up": data from various sources are integrated
- Examples: Wikipedia, Facebook etc.

### Geography and transportation are emerging in web 2.0

- Voluntary geographic information (VGI)
  - Everybody can contribute to electronic maps
  - Everybody can use the data
- Examples: OpenStreetMap, Wikimapia, Google Earth

## Data Sources for TIM 2.0 Network

Data sources chosen for TIM 2.0:

- OpenStreetMap (OSM) – main source streets
- Google transit feeds (GTFS) – main source transit
- Regional GIS
  - Street data for two counties (Philadelphia, Montgomery)
  - Boundaries, hydrography

### Why web 2.0 data?

- OSM: Overall fair data quality, routability
- GTFS: Accurate schedules, regular updates, standardization
- Both: No copy right restrictions, no cost

## The OpenStreetMap

[www.osm.org](http://www.osm.org)

- Started in 2004
- Organization: OSM foundation
  - non-profit, based in the U.K.

**Volunteers**

- They generate the map
  - Upload data from their private GPS devices
  - Edit directly on [www.osm.org](http://www.osm.org)
- Local user groups
  - Currently no active user group in the Delaware Valley

**Data distribution**

- Free of charge
- Can be used for any commercial or non-commercial purpose
- Distributed under a "Creative Common" license agreement
  - As users of the data, we give reference to the copy right

**Data content**

- Routable street network plus other geography
- U.S. data derived from an import of the 2005 TIGER file
- In the U.K., the data start being used in commercial navigation services



## Google Transit Feeds (GTFS)

**The GTFS format**

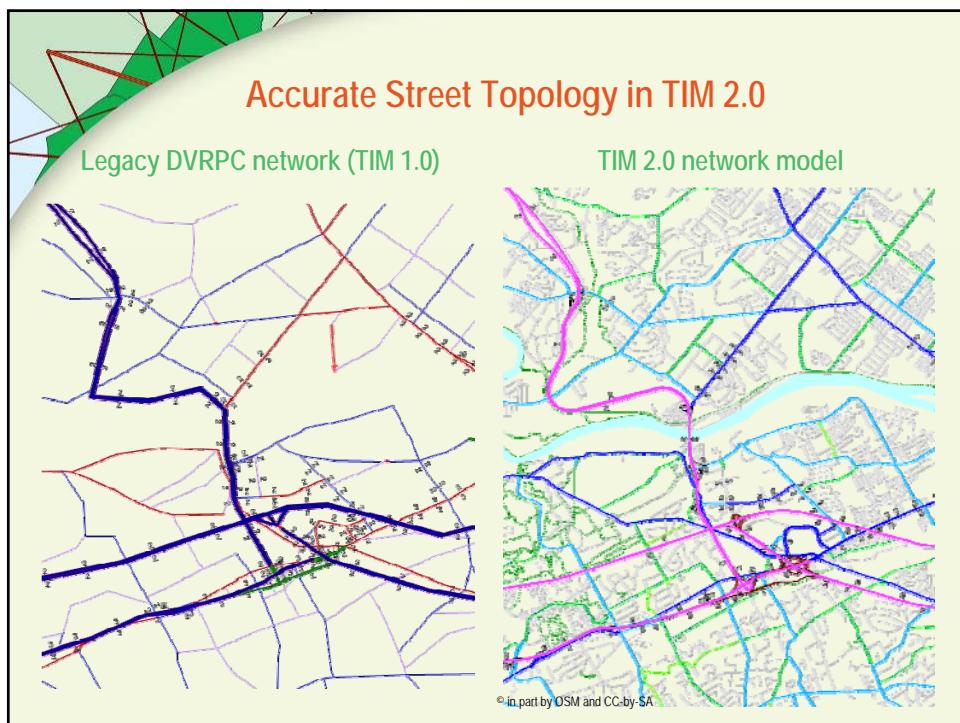
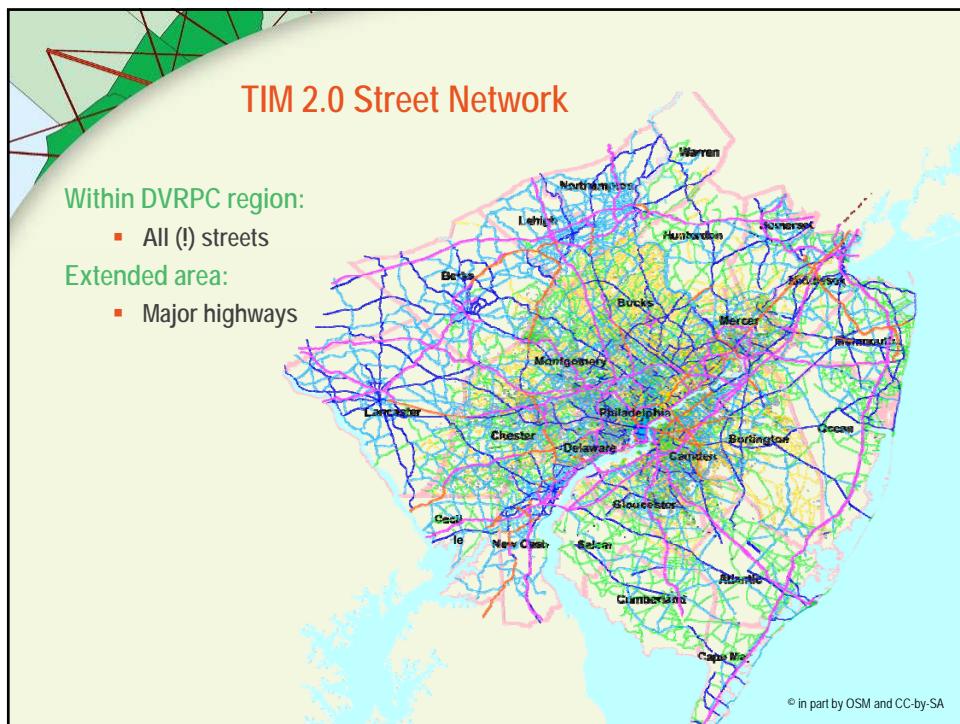
- = General Transit Feed Specification
- released by Google as open-source format in 2005
- has emerged as new industry standard for transit data
- Many applications use the data, not only Google Transit™

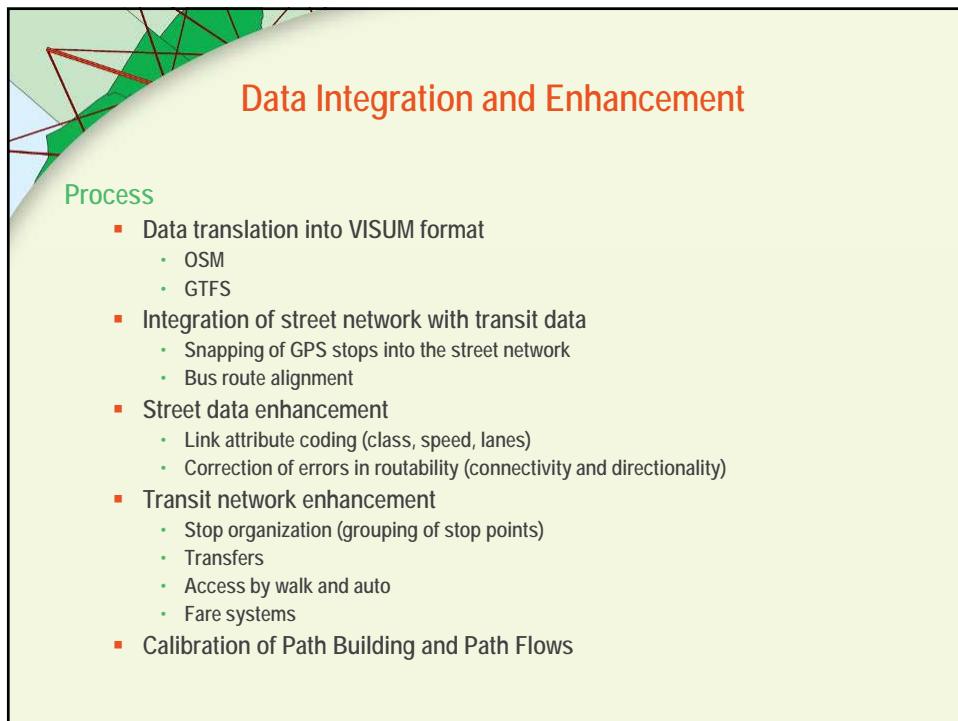
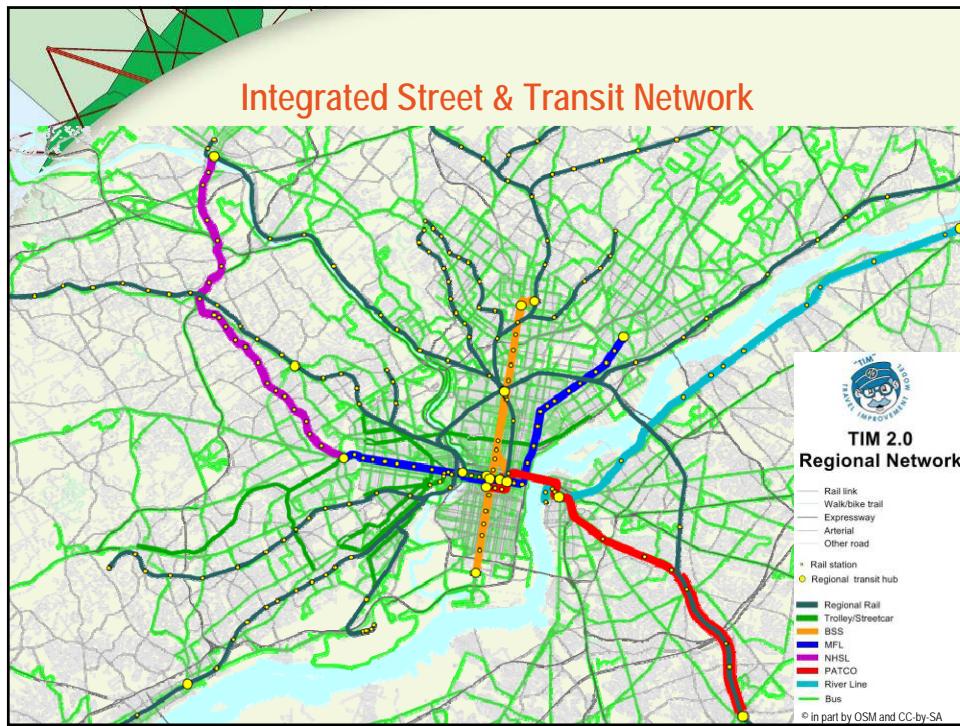
**Data content**

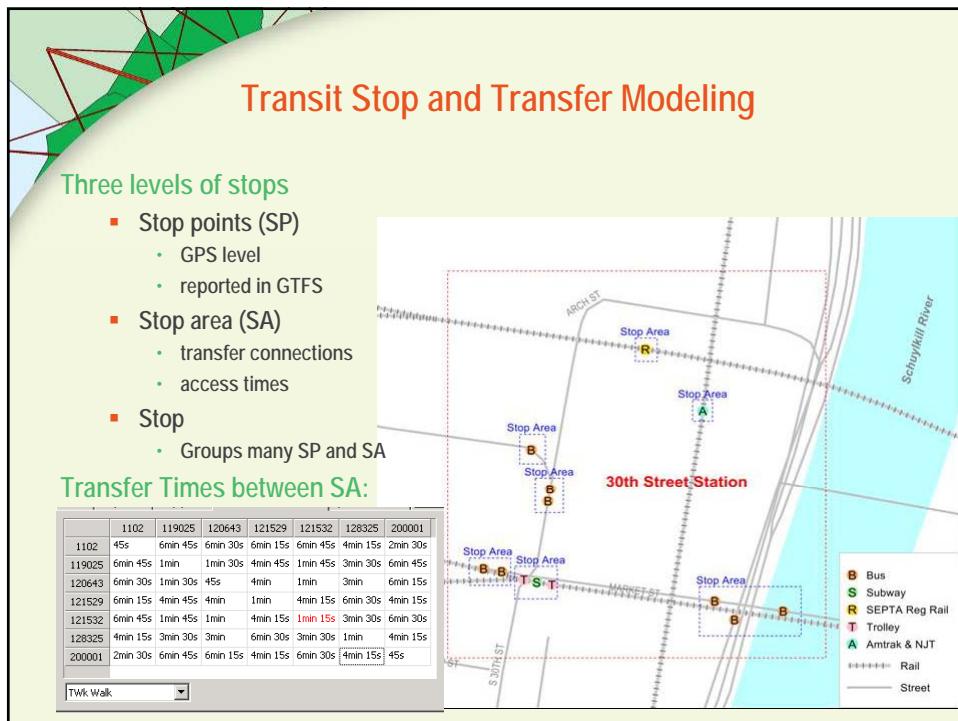
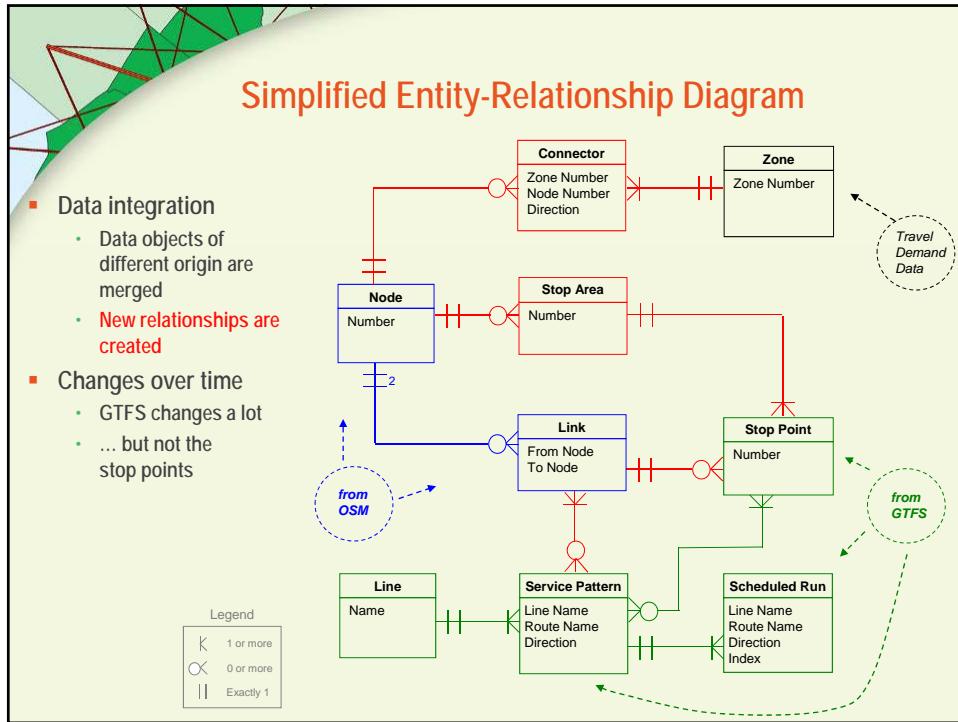
- Operations schedule with routes, patterns, vehicle/train trips
- Stop locations (GPS detail)
- Optional: fare information, route alignments

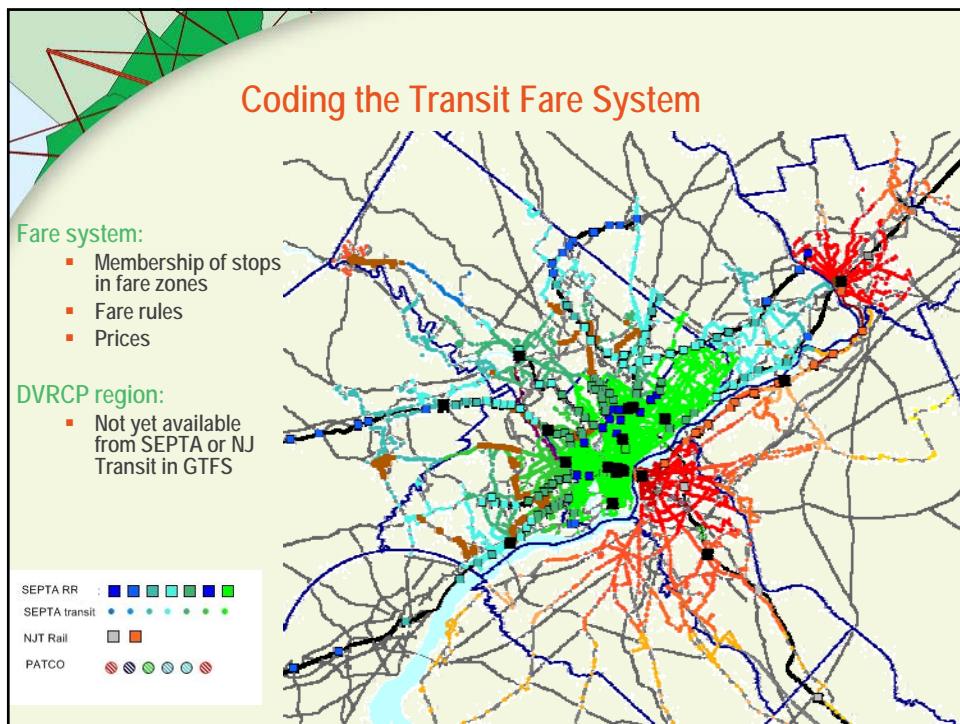
**Data distribution**

- Over 170 transit agencies in the U.S. and Canada publish schedules in GTFS
- In the DVRPC region:
  - SEPTA ([www.septa.org/developer](http://www.septa.org/developer))
  - NJ Transit ([njtransit.com/developer](http://njtransit.com/developer))
  - PATCO since 2010
  - AMTRAK, TMACC: working on their first feed









### The New Network in Numbers

Number of network objects	Legacy network (TIM 1.0)	New network (TIM 2.0)
Street segments	50,000	580,000
Transit stops (stop points)	5,000	18,000
Transit service patterns	2,000	6,000
TAZ (traffic analysis zones)	2,000	3,400

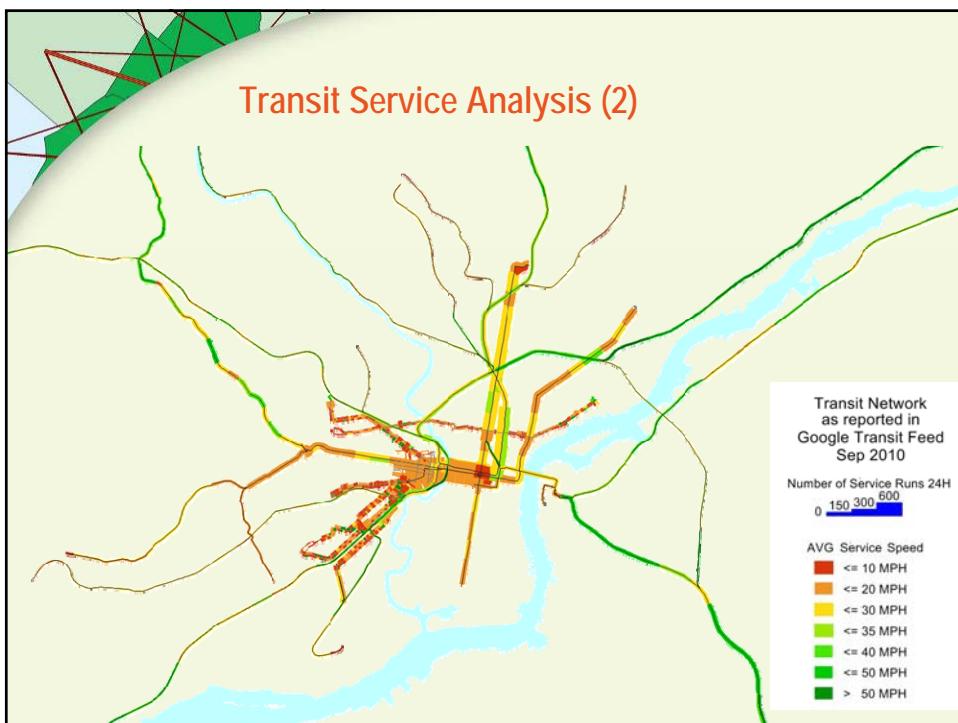
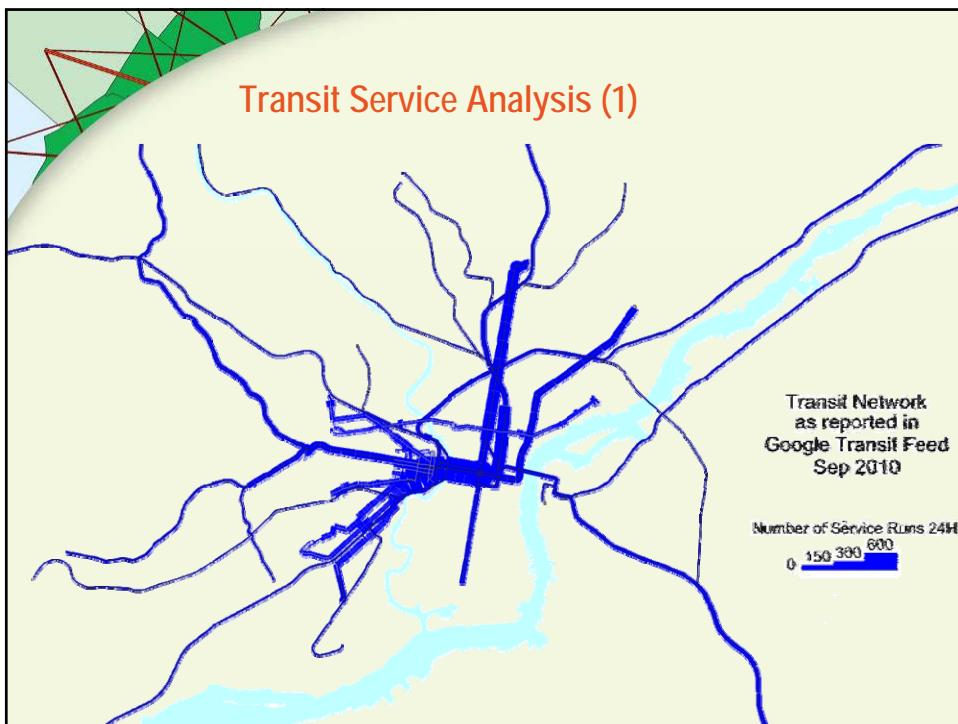
## The Effort in Numbers (Feb 2011)

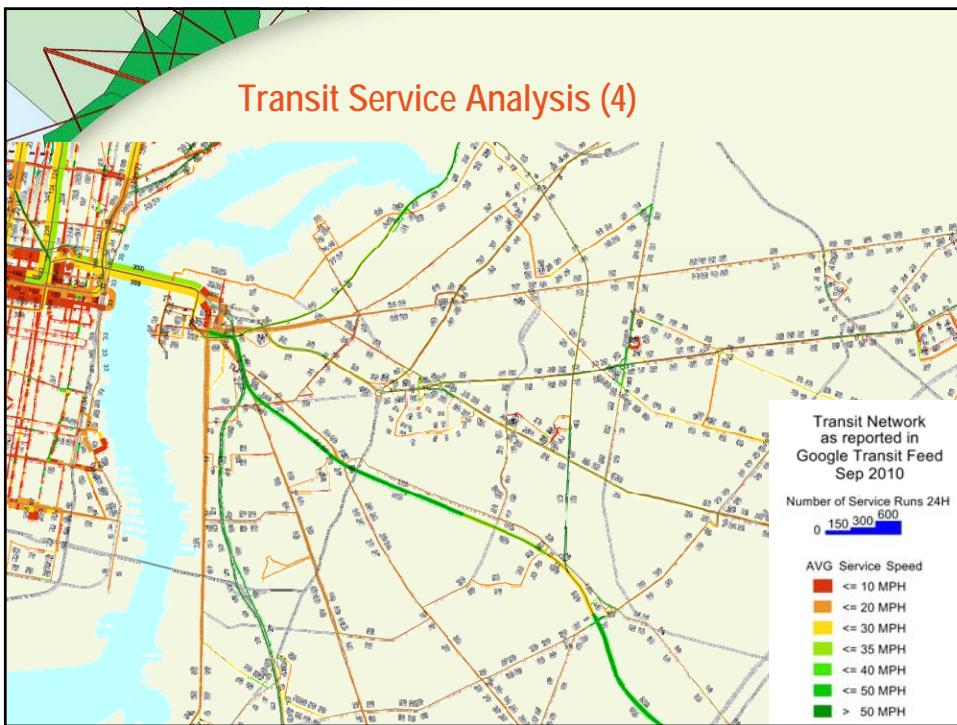
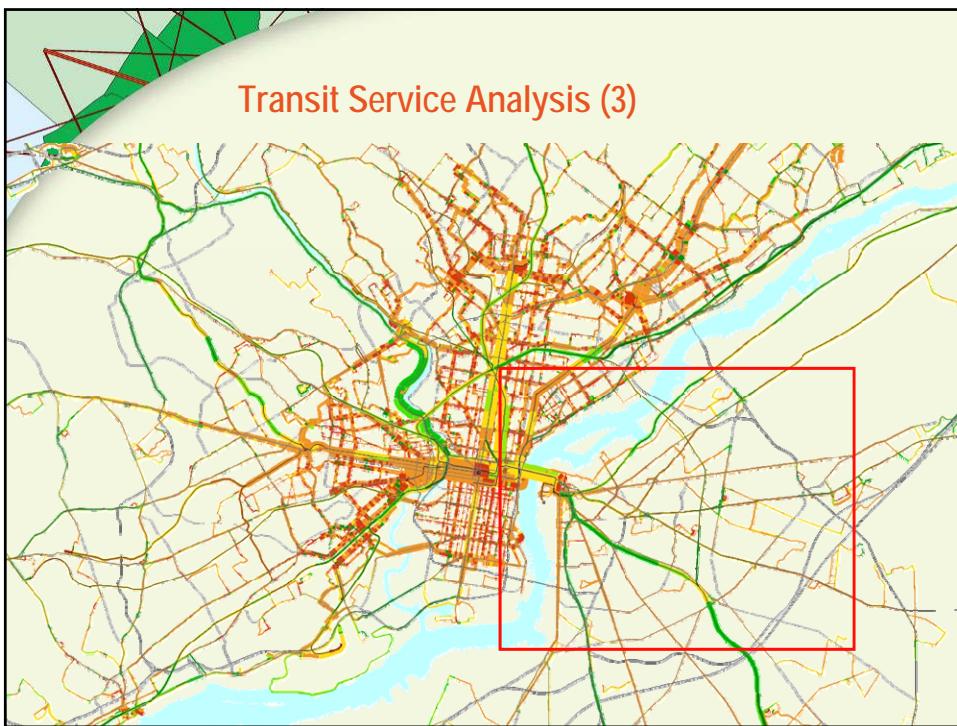
Task	Man-Months	% Full-time	% Intern
Process raw OSM&GTFS data	2.3	80%	20%
Coding of street attributes, parking	6.6	62%	38%
Integration hwy with transit	7.6	48%	52%
Transit transfers & fare system	5.0	82%	18%
Development, integration of TAZ	3.7	13%	88%
Calibration, hwy assignment	6.5	77%	23%
Calibration, transit assignment	5.6	86%	14%
<b>TOTAL</b>	<b>37.3</b>	<b>64%</b>	<b>36%</b>

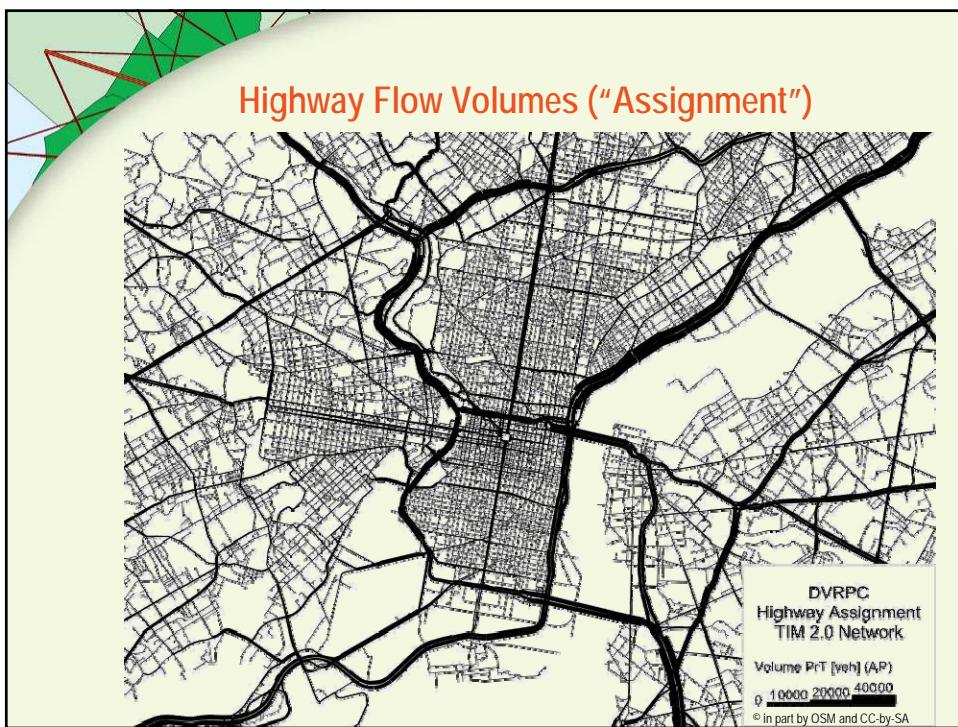
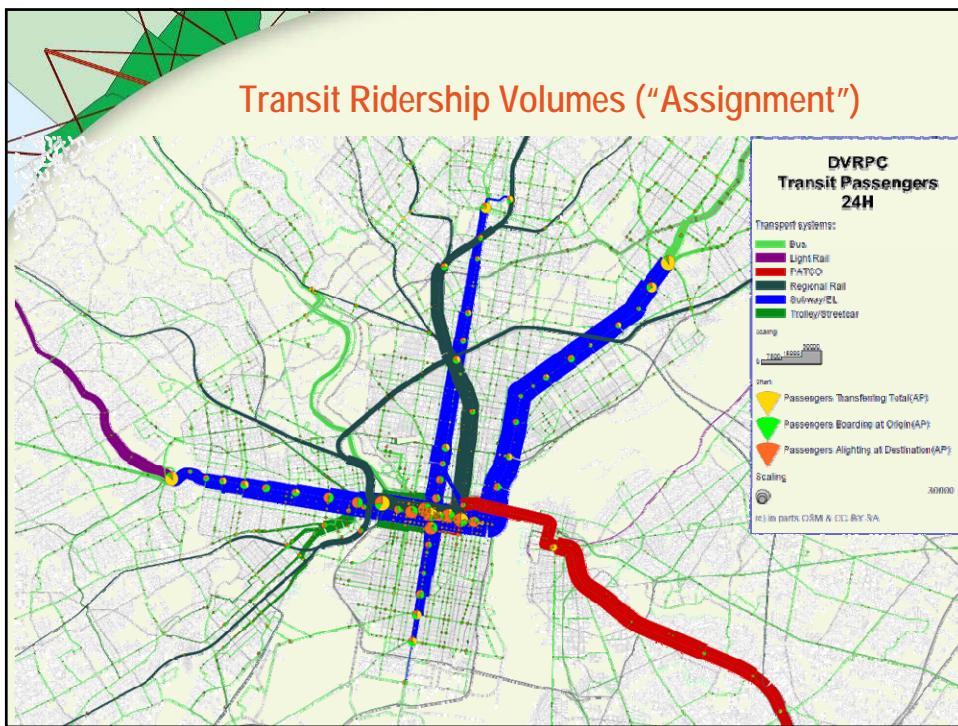
## Applications

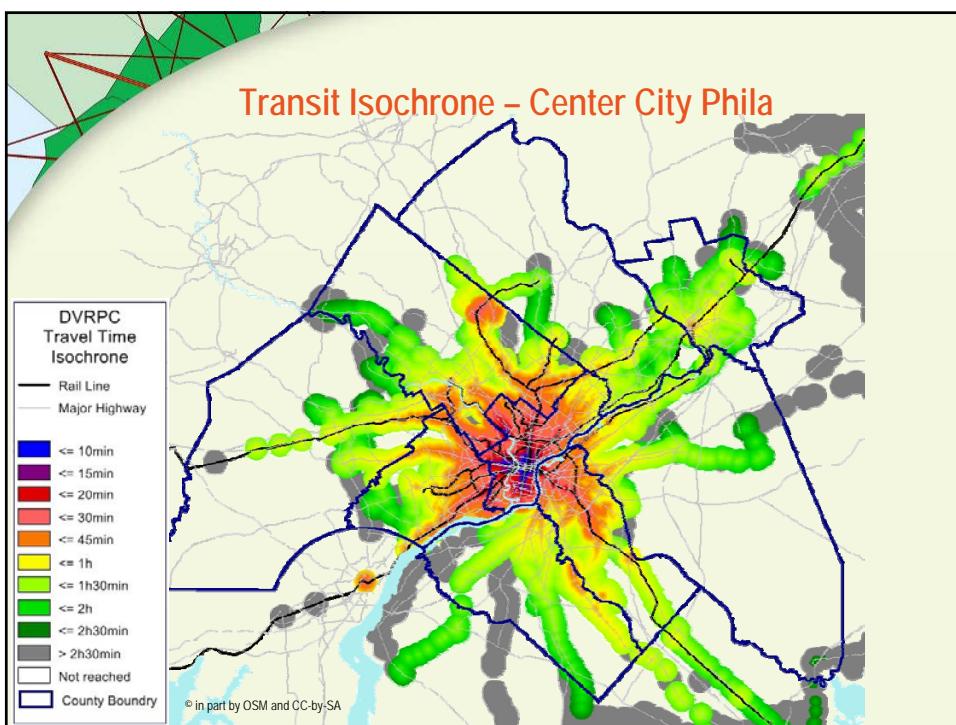
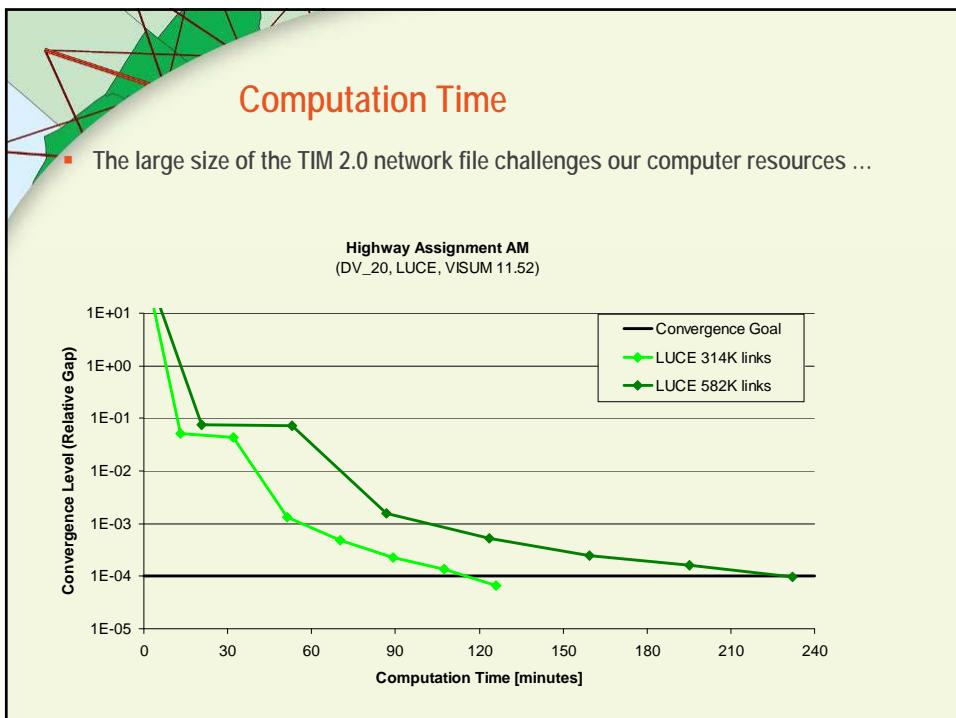
### Examples on the following slides

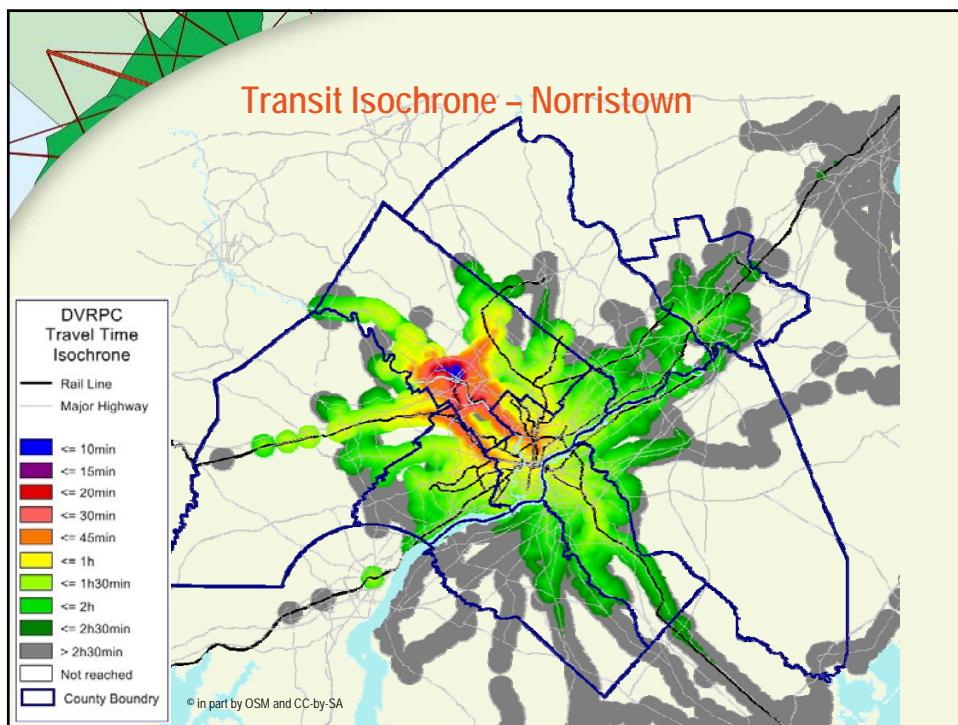
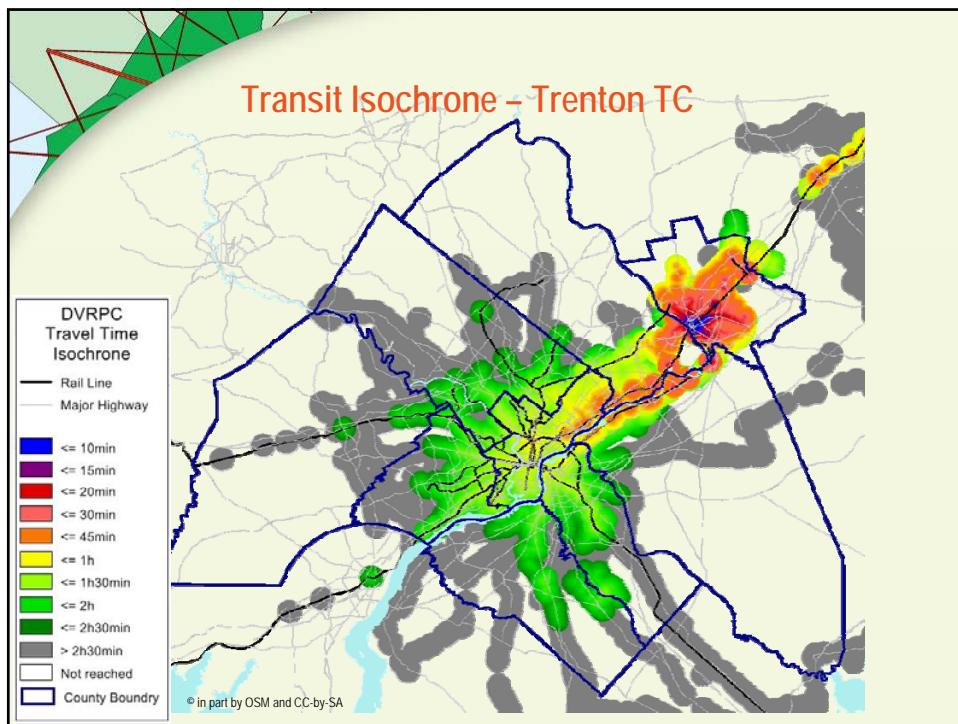
- Transit service analysis (service frequency and speed)
- Network flow simulation (“assignment”)
- Travel time computation (“isochrones”)

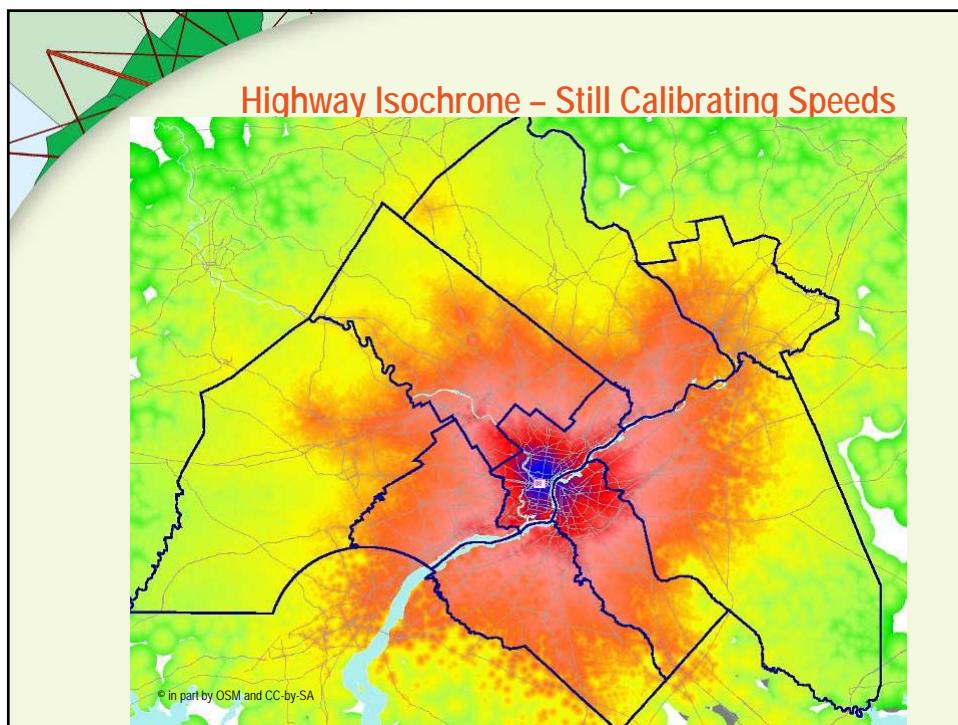
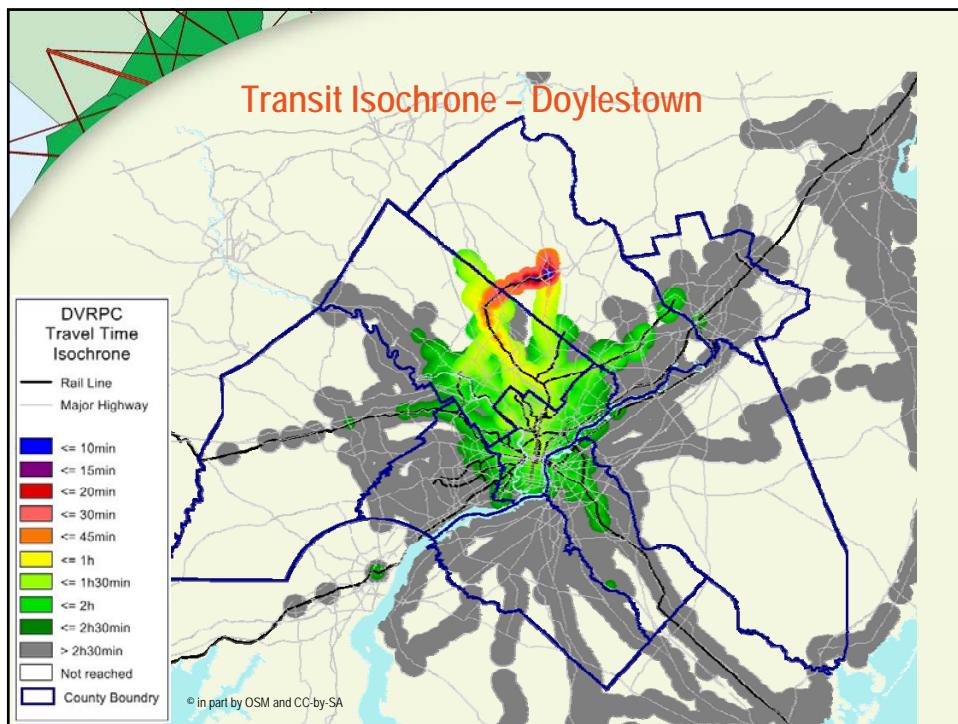


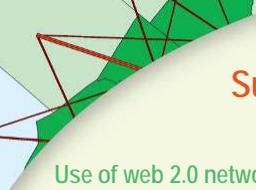












## Summary and Conclusions

### Use of web 2.0 network data in a forecasting model

- To our knowledge, first MPO in the U.S. to do so
- Benefit from the OSM
  - Provided routable street data
  - No cost, without copyright restrictions
- Benefit from Google Transit feeds
  - Accurate representation of transit service in operational detail
  - Ability for regular updates in a standard format

### Open question – future relationships with web 2.0

- OSM was a one-time, one-way data exchange
  - will someone feed our enhancements back?
- Established relationships with people behind the Google feeds (SEPTA, NJ Transit)

### Benefits of the TIM 2.0 network

- High level of detail
  - All streets, GPS bus stops
  - Long term benefits (activity-based model, non-motorized travel, operational studies)
- Interaction between the modes
  - Better modeling of P&R, effect of buses on street capacity
- Better representation of times of day
- Extended model area