



MODELS, DATA, REALITY, AND YOU

Casey C. Ross

Presented virtually for the University of Pennsylvania Weitzman School of Design

Wednesday, October 6th, 2021

ABOUT ME



Haverford College Class of 2010
B.A. in History - Latin American History & History of Science



Apple Inc. (2010 - 2014)
Genius Bar Technician & Failure Analysis Engineer



Penn Weitzman Class of 2017
M.A. in City Planning - Community Economic Development & Transportation Infrastructure



City of Philadelphia (2017 - *Present*)
Transportation Planner



University of Pennsylvania (2021 - *Present*)
Lecturer in the Department of Urban Studies

TECHNOLOGY USED



PTV Visum



R & RStudio



Microsoft Excel



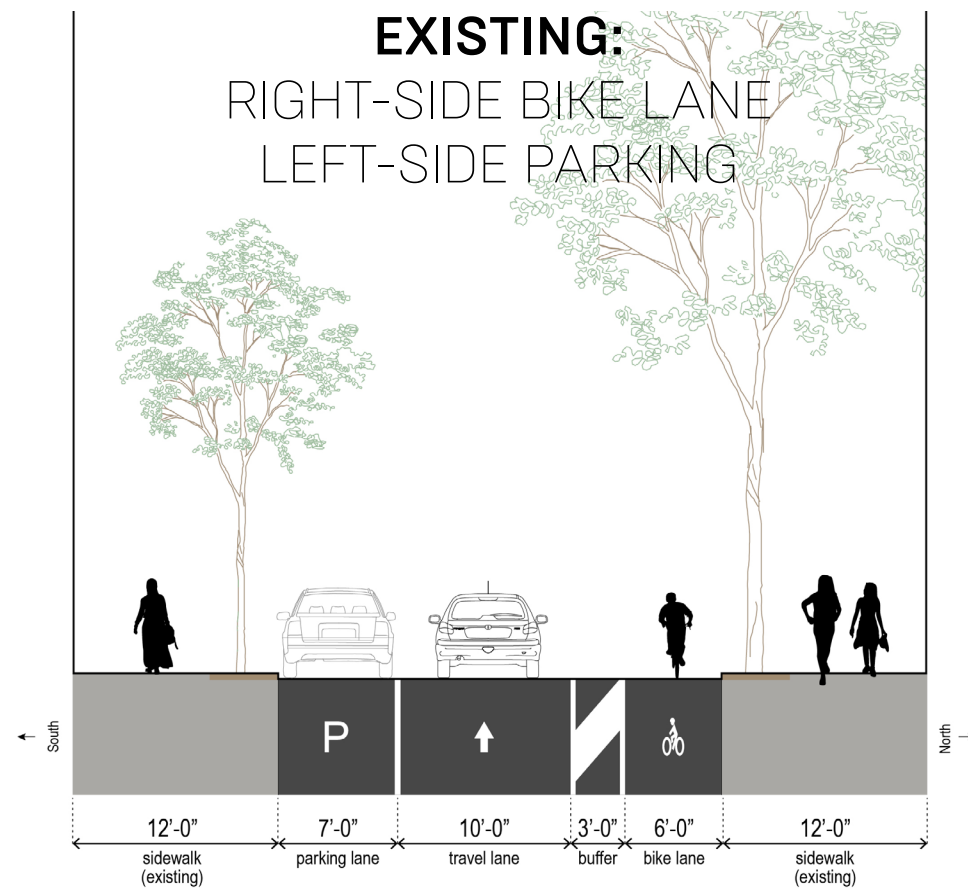
Trafficware Synchro Traffic



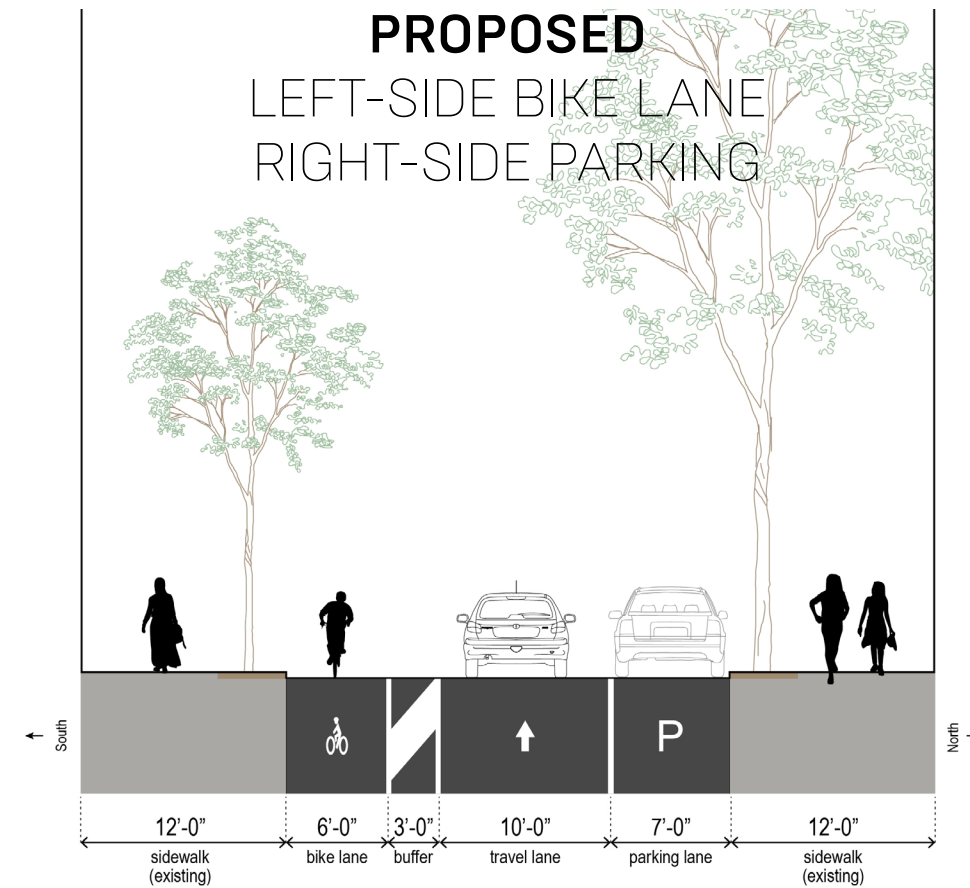
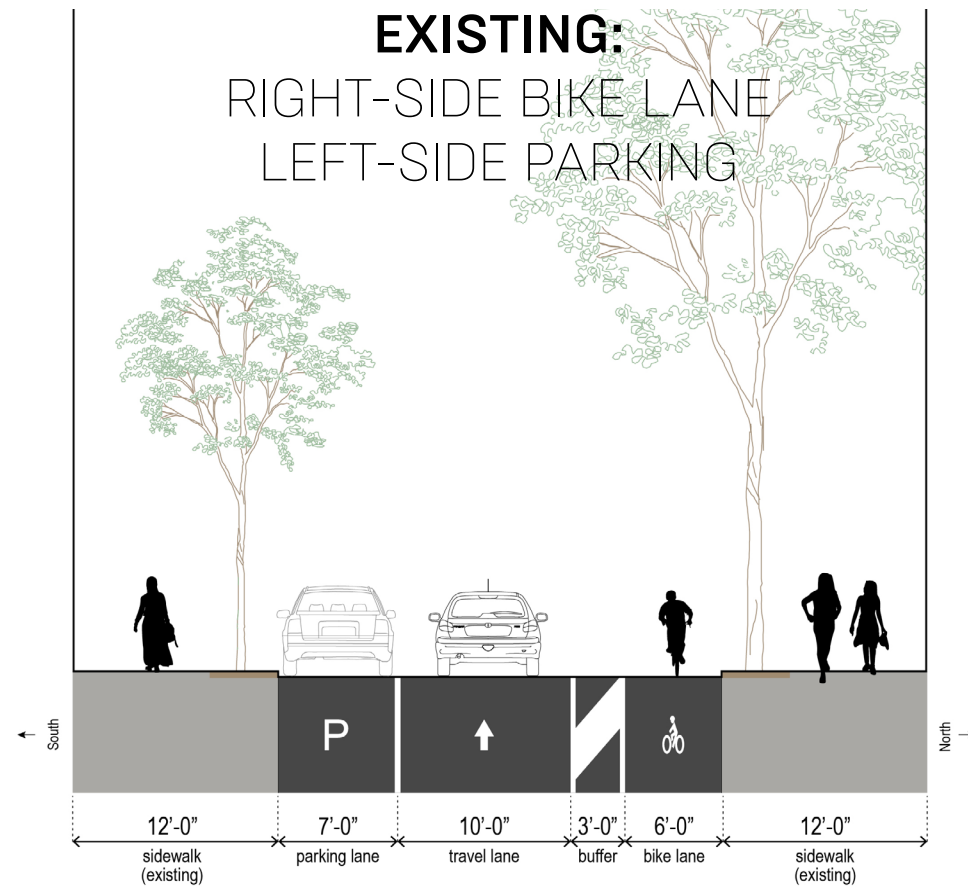
Pen & Paper

SPRUCE & PINE STREET LEFT-SIDE BIKE LANES

SPRUCE & PINE STREET LEFT-SIDE BIKE LANES



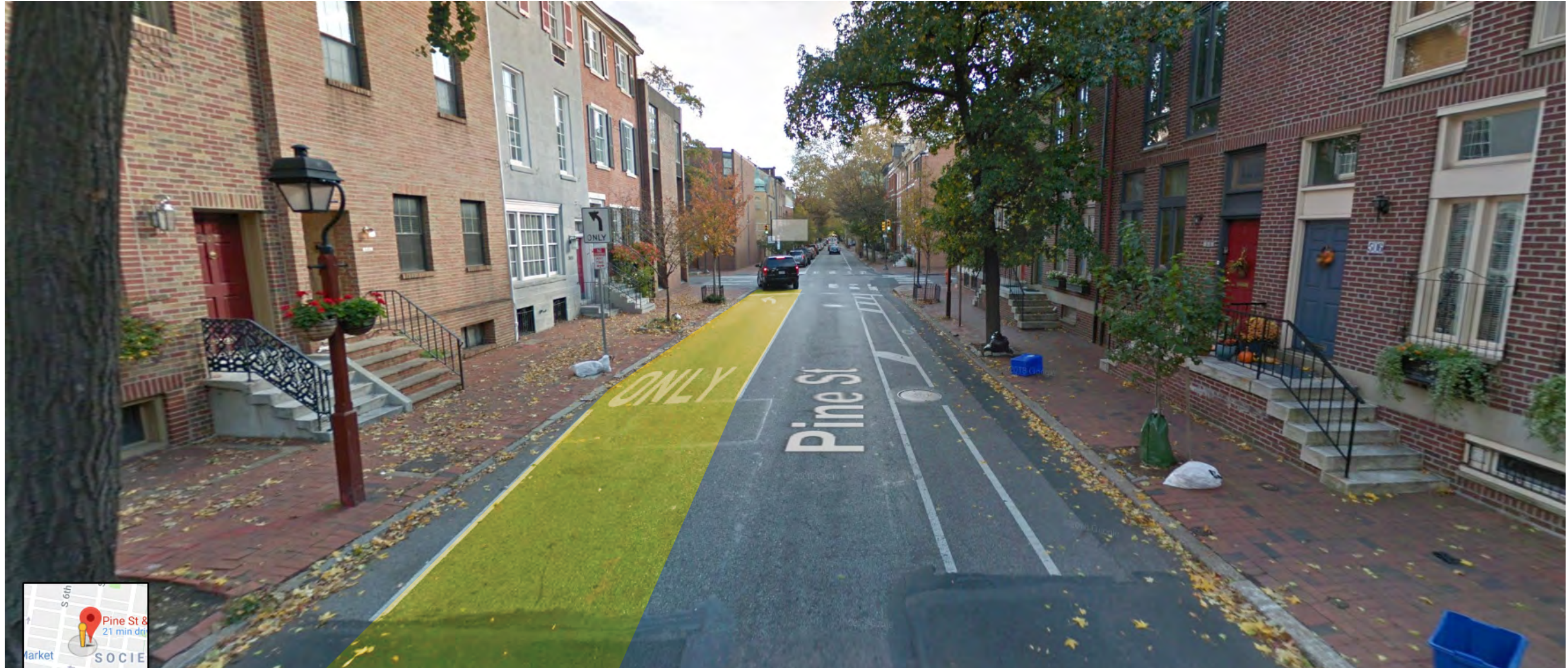
SPRUCE & PINE STREET LEFT-SIDE BIKE LANES



THE PROBLEM:



THE PROBLEM: LEFT-TURN LANES



LOCATIONS WITH LEFT-TURNS

Pine & Front
Pine & 2nd
Pine & 3rd
Pine & 5th
Pine & 7th
Pine & 9th
Pine & 11th
Pine & 13th
Pine & Broad
Pine & 16th
Pine & 18th
Pine & 20th
Pine & 22nd
& 5 small cross streets

Spruce & 2nd
Spruce & 4th
Spruce & 6th
Spruce & 8th
Spruce & 10th
Spruce & 12th
Spruce & Juniper
Spruce & Broad
Spruce & 15th
Spruce & 17th
Spruce & 19th
Spruce & 21st
& 5 small cross streets

LOCATIONS TO LOOK AT

Small, low-volume streets

Pine & Front

Pine & 2nd

Pine & 3rd

Pine & 5th

Pine & 7th

Pine & 9th

Pine & 11th

Pine & 13th

Pine & Broad

Pine & 16th

Pine & 18th

Pine & 20th

Pine & 22nd

~~& 5 small cross streets~~

Spruce & 2nd

Spruce & 4th

Spruce & 6th

Spruce & 8th

Spruce & 10th

Spruce & 12th

~~Spruce & Juniper~~

Spruce & Broad

Spruce & 15th

Spruce & 17th

Spruce & 19th

Spruce & 21st

~~& 5 small cross streets~~

LOCATIONS TO LOOK AT

Small, low-volume streets

Large, high-volume streets

Pine & Front

Pine & 2nd

Pine & 3rd

Pine & 5th

Pine & 7th

Pine & 9th

Pine & 11th

Pine & 13th

~~Pine & Broad~~

Pine & 16th

Pine & 18th

Pine & 20th

Pine & 22nd

~~& 5 small cross streets~~

Spruce & 2nd

Spruce & 4th

Spruce & 6th

Spruce & 8th

Spruce & 10th

Spruce & 12th

~~Spruce & Juniper~~

~~Spruce & Broad~~

Spruce & 15th

Spruce & 17th

Spruce & 19th

Spruce & 21st

~~& 5 small cross streets~~

LOCATIONS TO LOOK AT

Small, low-volume streets

Large, high-volume streets

Streets w/o existing turn lanes

~~Pine & Front~~
~~Pine & 2nd~~
~~Pine & 3rd~~
Pine & 5th
~~Pine & 7th~~
~~Pine & 9th~~
~~Pine & 11th~~
Pine & 13th
~~Pine & Broad~~
~~Pine & 16th~~
~~Pine & 18th~~
~~Pine & 20th~~
~~Pine & 22nd~~
~~& 5 small cross streets~~

~~Spruce & 2nd~~
~~Spruce & 4th~~
~~Spruce & 6th~~
~~Spruce & 8th~~
~~Spruce & 10th~~
~~Spruce & 12th~~
~~Spruce & Juniper~~
~~Spruce & Broad~~
~~Spruce & 15th~~
~~Spruce & 17th~~
~~Spruce & 19th~~
~~Spruce & 21st~~
~~& 5 small cross streets~~

LOCATIONS TO LOOK AT

Pine & Front

Pine & 2nd

Pine & 3rd

Pine & 5th

Pine & 7th

Pine & 9th

Pine & 11th

Pine & 13th

Pine & Broad

Pine & 16th

Pine & 18th

Pine & 20th

Pine & 22nd

& 5 small cross streets

Spruce & 2nd

Spruce & 4th

Spruce & 6th

Spruce & 8th

Spruce & 10th

Spruce & 12th

Spruce & Juniper

Spruce & Broad

Spruce & 15th

Spruce & 17th

Spruce & 19th

Spruce & 21st

& 5 small cross streets

STEPS TO TAKE:

STEPS TO TAKE:

1. Identify intersection nodes on Spruce & Pine in Visum

STEPS TO TAKE:

1. Identify intersection nodes on Spruce & Pine in Visum
2. Identify turn nodes (from/to/via) on Spruce & Pine in Visum

STEPS TO TAKE:

1. Identify intersection nodes on Spruce & Pine in Visum
2. Identify turn nodes (from/to/via) on Spruce & Pine in Visum
3. Export turn volume data from Visum for analysis in R

STEPS TO TAKE:

1. Identify intersection nodes on Spruce & Pine in Visum
2. Identify turn nodes (from/to/via) on Spruce & Pine in Visum
3. Export turn volume data from Visum for analysis in R
4. Create AM, MD, PM, and NT data sets

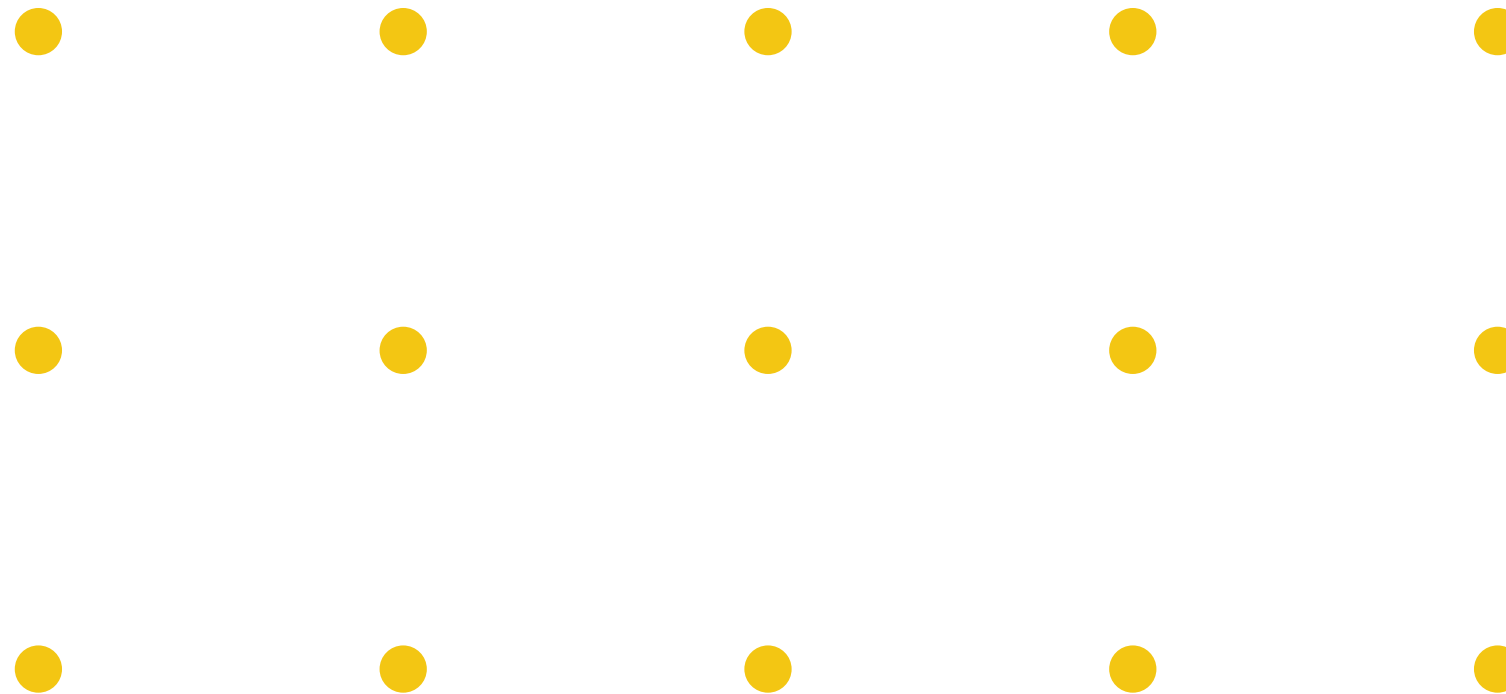
STEPS TO TAKE:

1. Identify intersection nodes on Spruce & Pine in Visum
2. Identify turn nodes (from/to/via) on Spruce & Pine in Visum
3. Export turn volume data from Visum for analysis in R
4. Create AM, MD, PM, and NT data sets
5. Calculate peak-hour AM and PM turn volumes

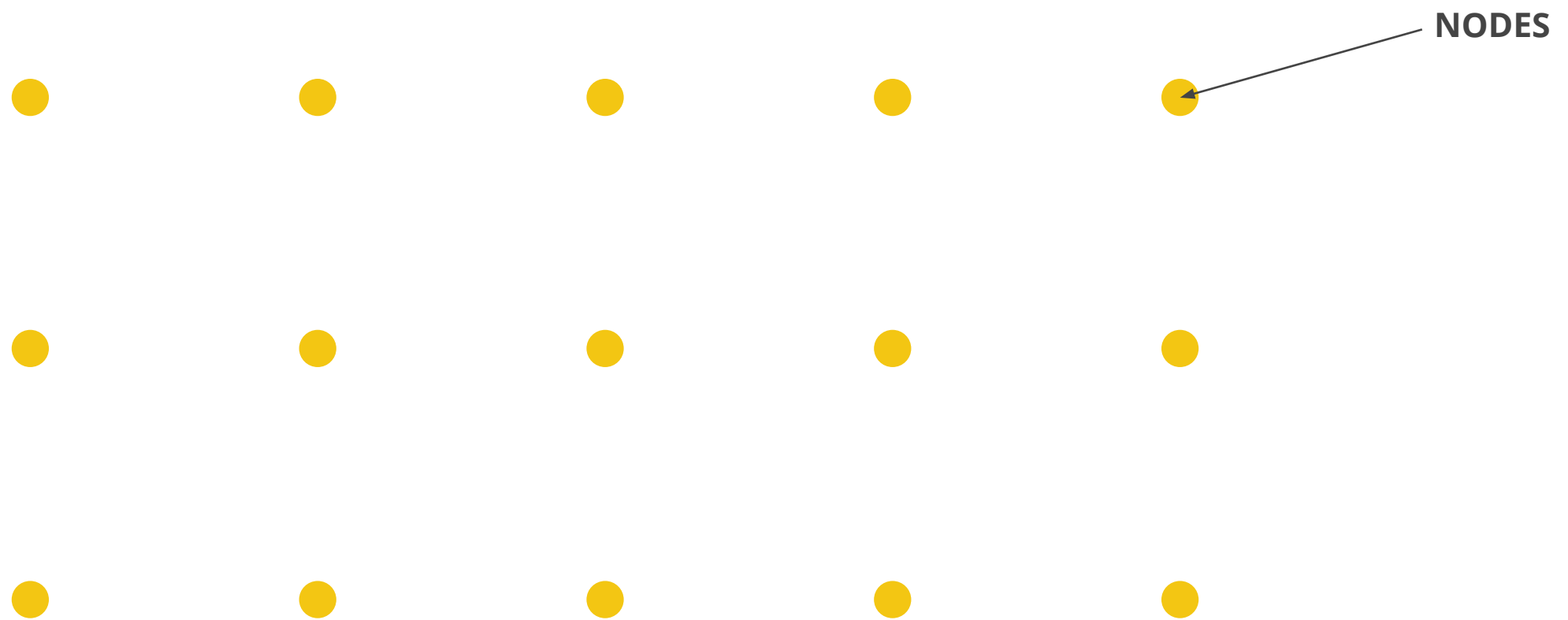
STEPS TO TAKE:

1. Identify intersection nodes on Spruce & Pine in Visum
2. Identify turn nodes (from/to/via) on Spruce & Pine in Visum
3. Export turn volume data from Visum for analysis in R
4. Create AM, MD, PM, and NT data sets
5. Calculate peak-hour AM and PM turn volumes
6. Examine 5th & 13th Streets in context - **do the numbers make sense?**

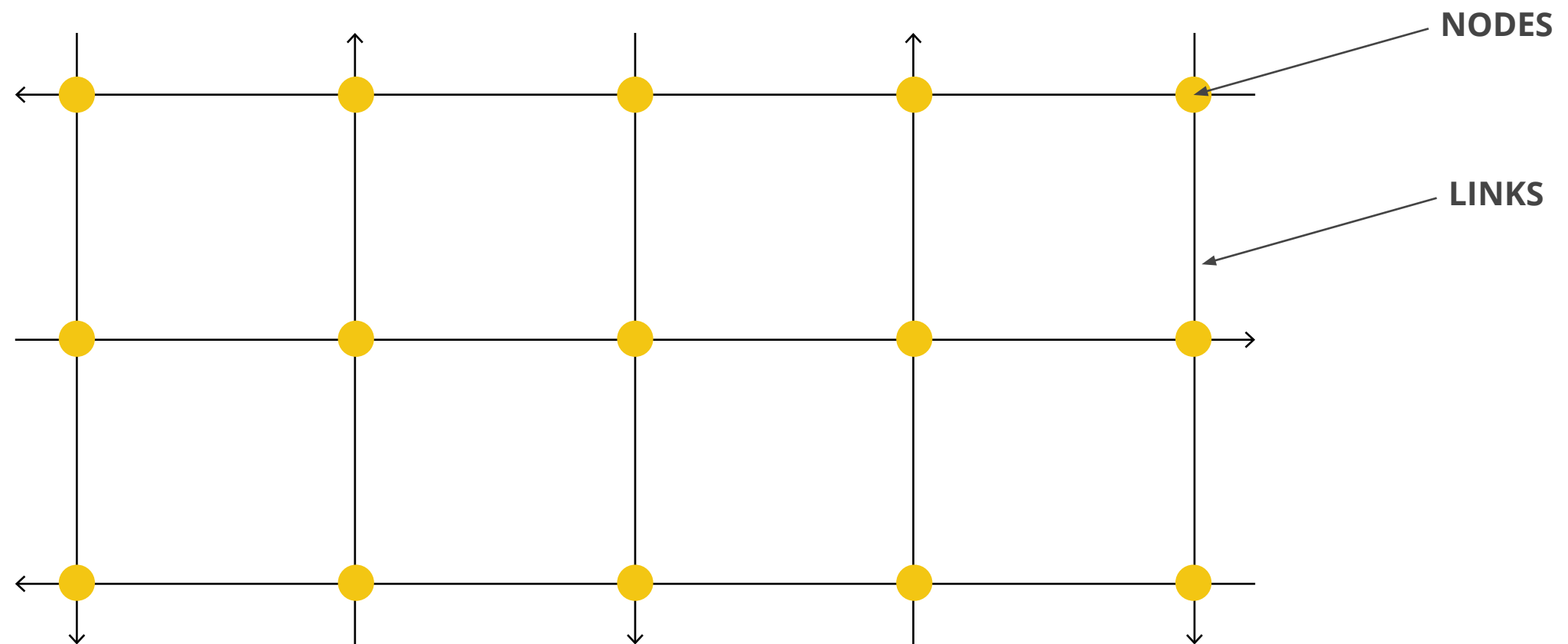
GETTING THE DATA FROM VISUM



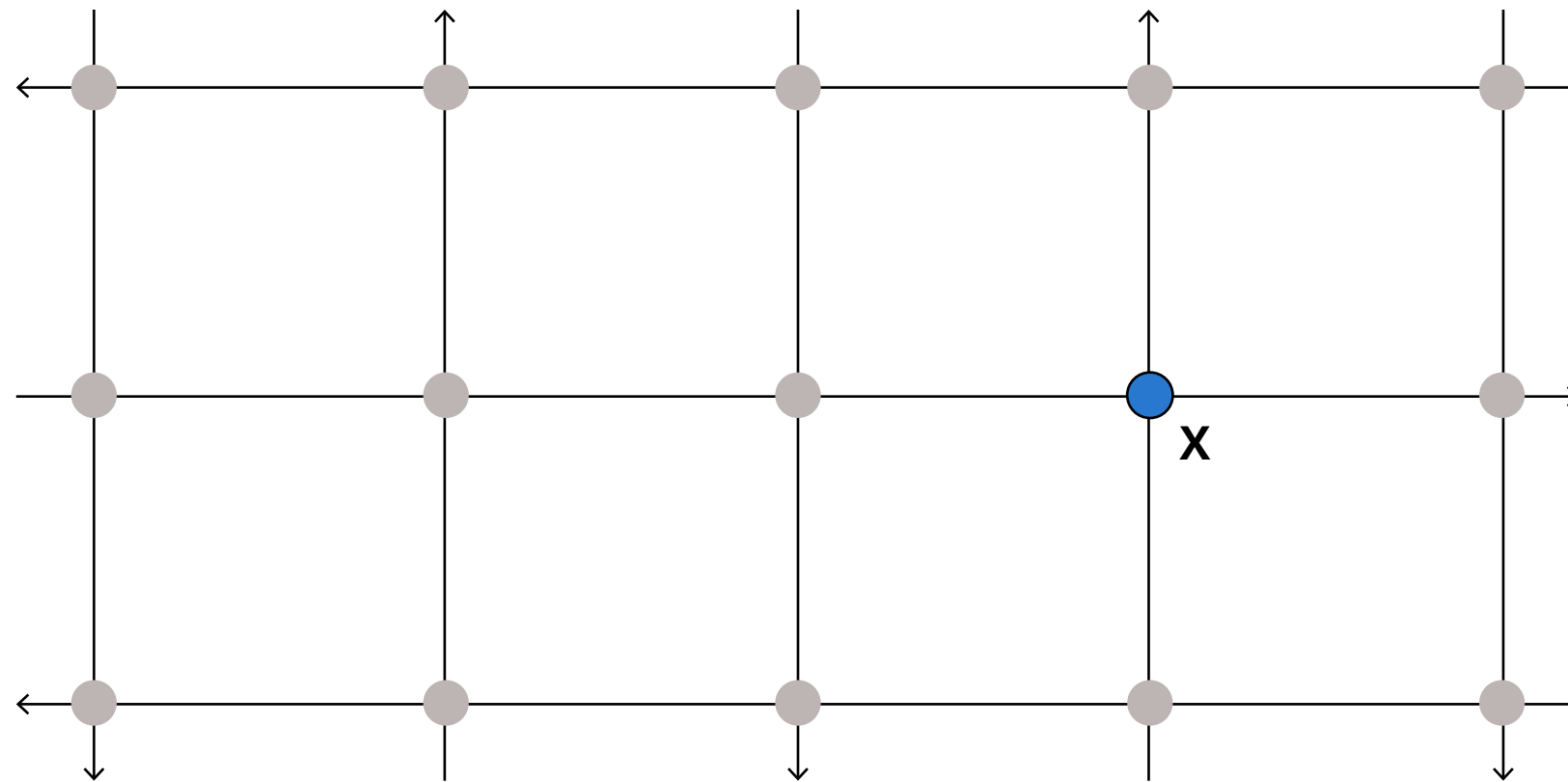
GETTING THE DATA FROM VISUM



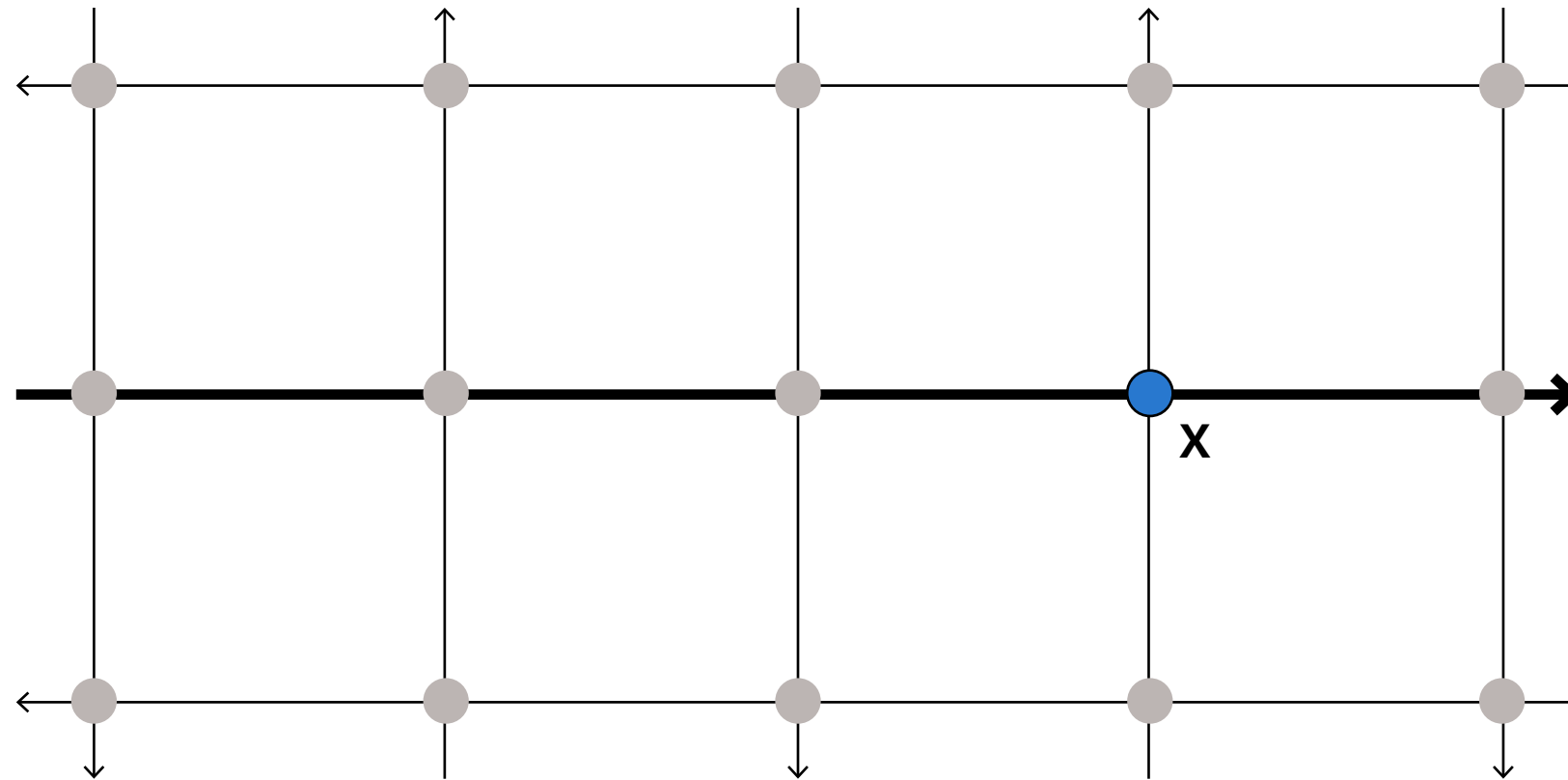
GETTING THE DATA FROM VISUM



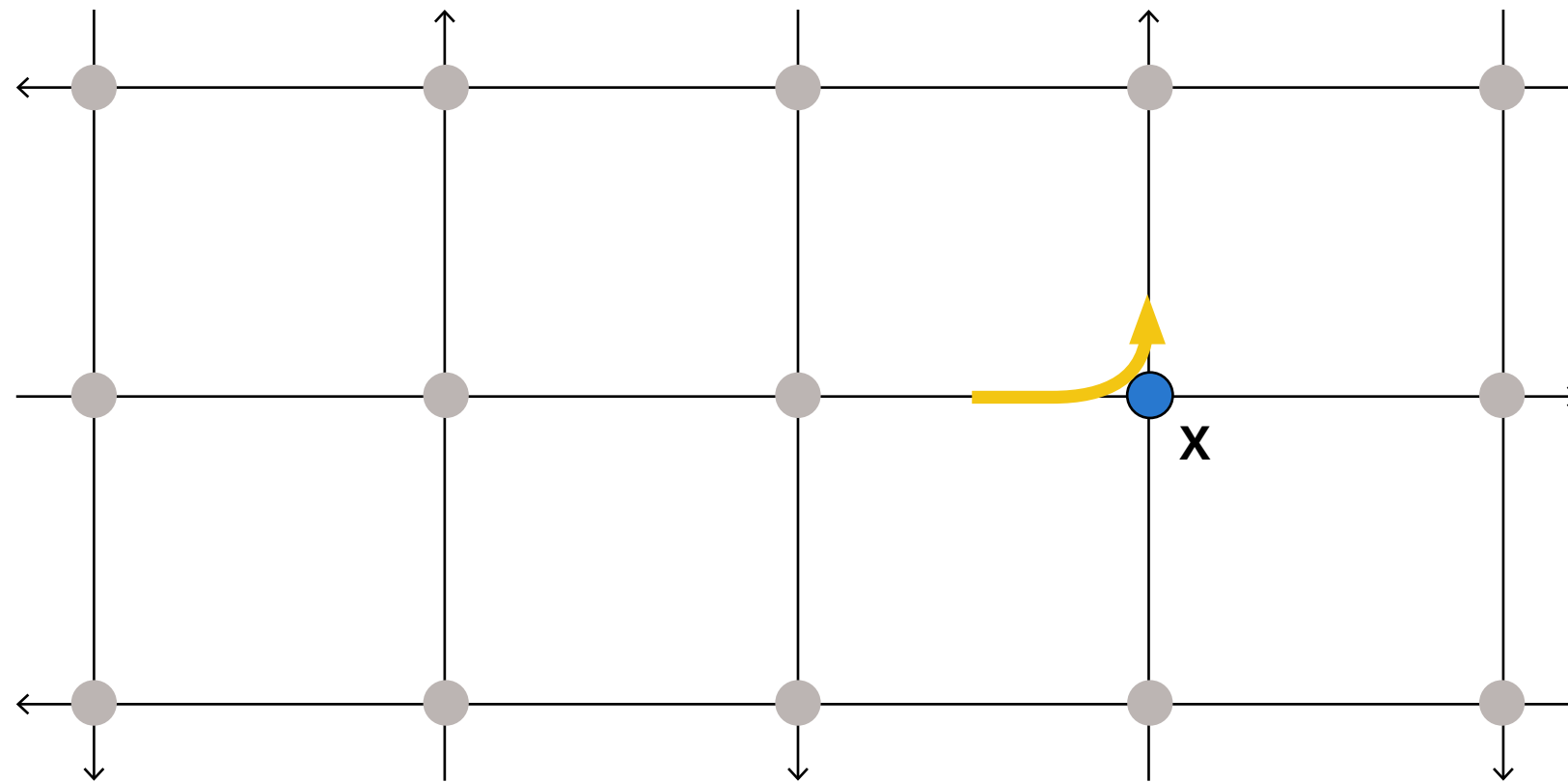
GETTING THE DATA FROM VISUM



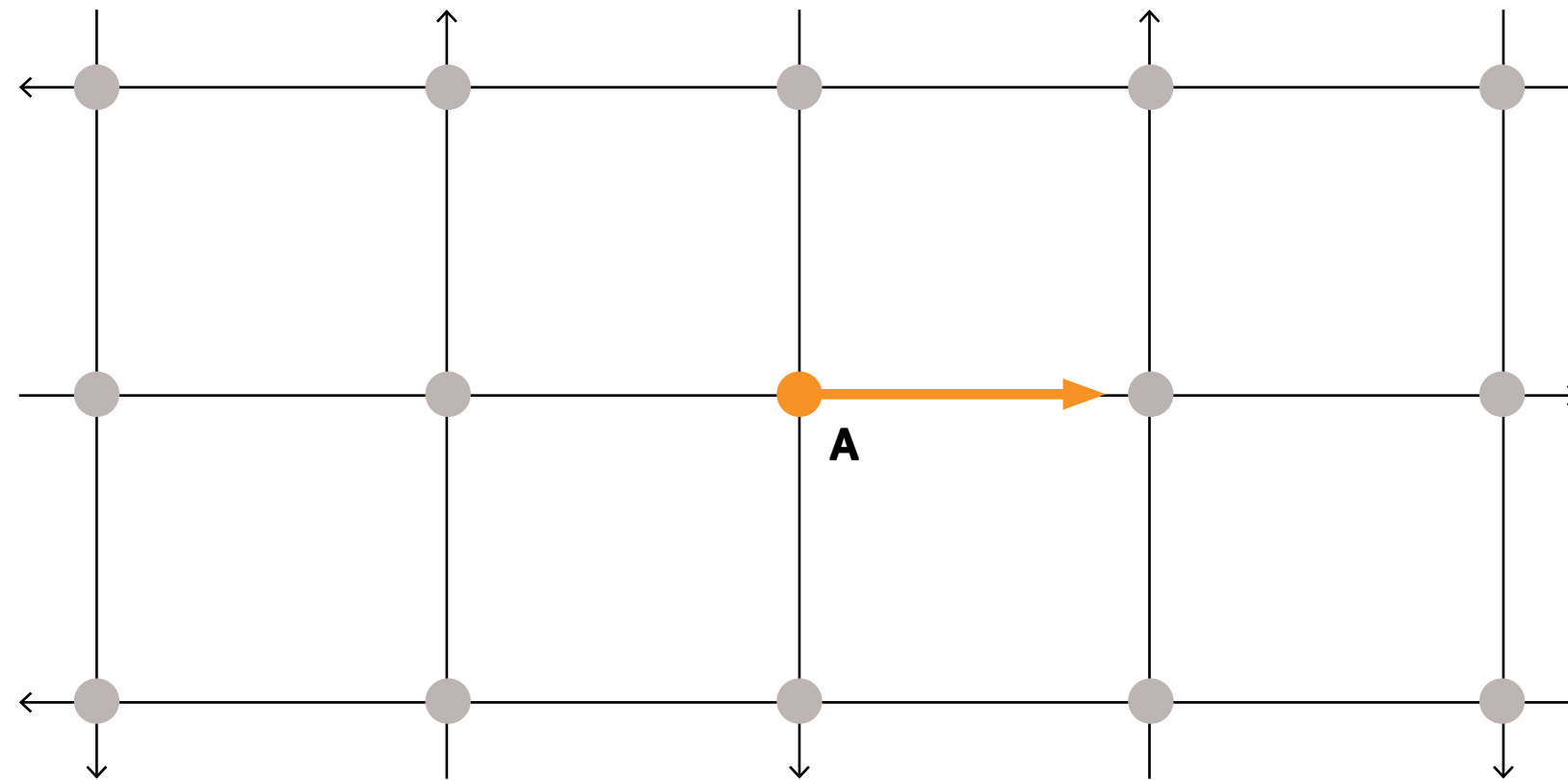
GETTING THE DATA FROM VISUM



GETTING THE DATA FROM VISUM

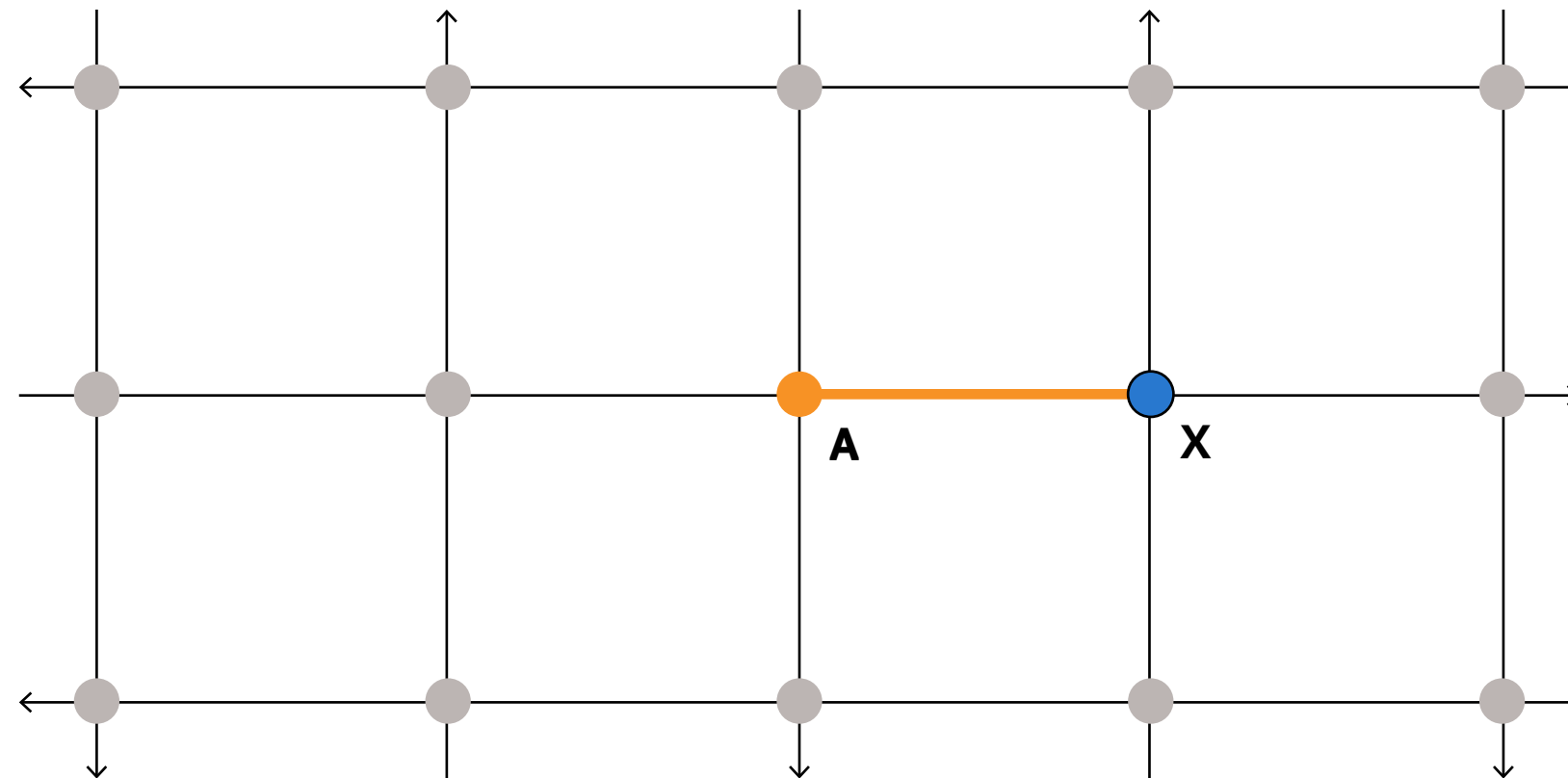


GETTING THE DATA FROM VISUM



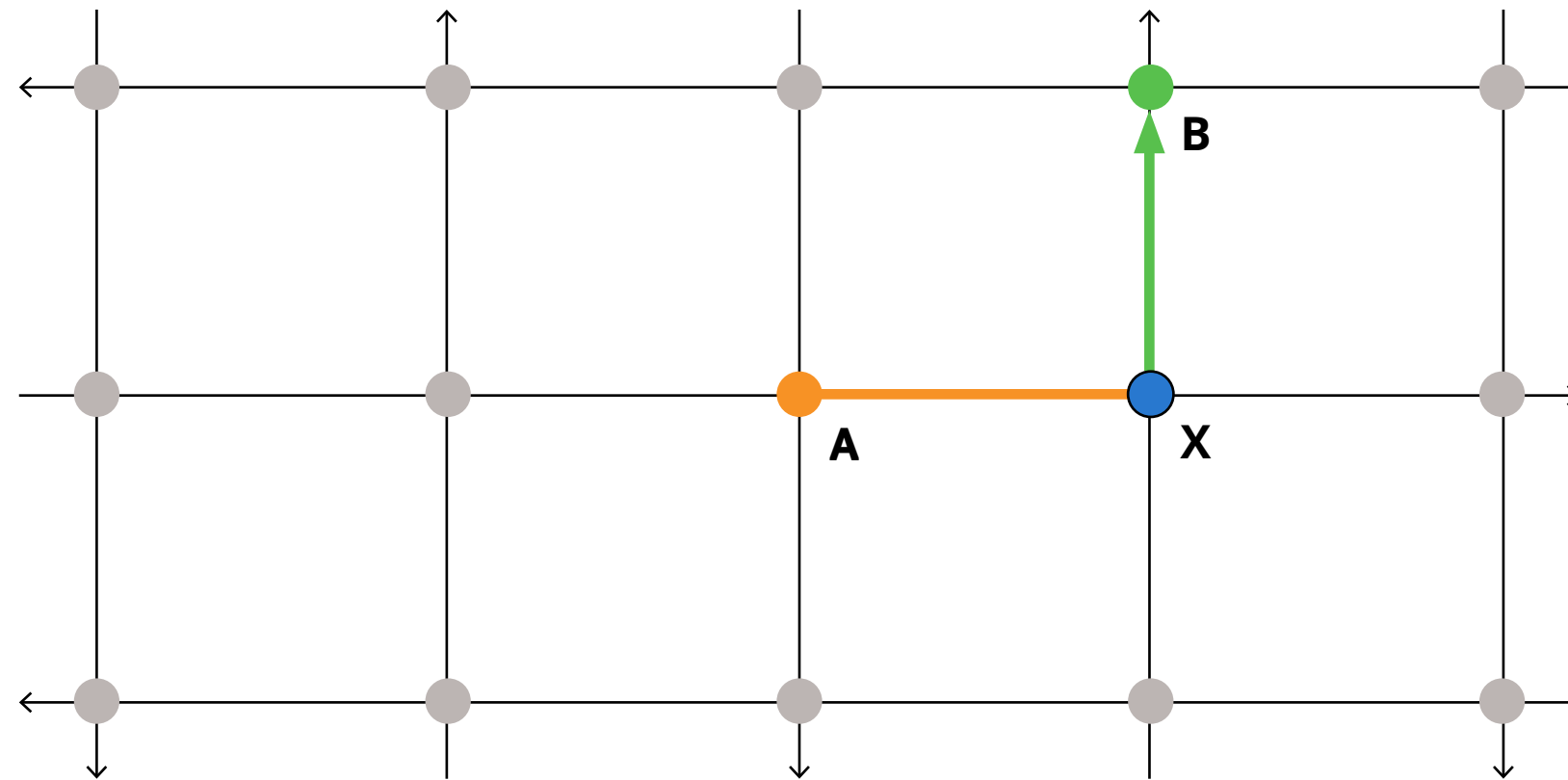
FROM NODE A

GETTING THE DATA FROM VISUM



**FROM NODE A
VIA NODE X**

GETTING THE DATA FROM VISUM



**FROM NODE A
VIA NODE X
TO NODE B**

GETTING THE DATA FROM VISUM

Looking at the nodes
in my regional model
network

The screenshot displays the PTV Visum 64 Bit 15.00-22 interface. The title bar indicates the network file: "PTV Visum 64 Bit 15.00-22 - Network: TIM23_2015_Base_170612_FINAL_TMC_AM.ver - [Network editor]".

The left sidebar contains a "Network" panel with a tree view of network elements:

- Nodes (selected)
- Links
- Turns
- Zones
- Connectors
- Main nodes
- Main turns
- Main zones
- Territories
- OD pairs
- Main OD pairs
- PrT paths
- POIs
- GIS objects
- Screenlines

Below the sidebar is a "Quick view (Nodes)" table:

No	Code	Name	ControlType	CapPrT	tOPrT	VolPrT

The main window shows a "Network editor (Edit: Nodes)" view of a dense regional road network. Major roads are labeled, including "NORTHEAST CORRIDOR LINE", "AMTRAK HARRISBURG LINE", and "AMTRAK BALTIMORE LINE". A yellow arrow points from the "Nodes" list in the sidebar to the network map. In the bottom right corner of the map area, there is a box labeled "INRIX Speed @ AM". The status bar at the bottom shows "Node: Select by mouse-click." and several numerical values: "1:828467", "419056.9304", and "4532426.8614".

GETTING THE DATA FROM VISUM

The screenshot shows the PTV Visum 64 Bit 15.00-22 Network editor interface. The main window displays a network of streets including 07TH, 06TH, 05TH, 04TH, SPRUCE, LAWRENCE, CYPRESS, DELANCEY, PINE, ADDISON, LOMBARD, and ROBMAN. A specific node at the intersection of 5th Street and Pine Street is highlighted with a yellow circle and labeled with the ID 410848. A yellow arrow points from this node to a text box on the right.

Intersection of 5th Street and Pine Street

This specific node will be my **Via Node**, which I'll use later on.

INRIX Speed @ AM

Network editor (Edit: Nodes)

Quick view (Nodes)

Count:	1
No:	410848
Code:	
Name:	
ControlType:	unknown
CapPrT:	100000
tOPrT:	0min
VolPrT:	3280

Network editor x Junction editor (node 410848) List (Links) List (Zones) Matrix editor (Matrix '20 TDistr_Penalty') Procedure sequence List (Lines)

No. 410848 pos. 487156.4518/4421522.8325 type 0

GETTING THE DATA FROM VISUM

Within an individual node, I can choose the Turns option.

I'm looking at all possible turns that pass through the node that represents 5th and Pine Streets, my **Via Node**.

Turns: 4	1	2	3	4
FromNodeNo	410756	410756	410846	410846
FromLinkNo	169461	169461	169474	169474
FromLink\ToNodeOrientation	W	W	S	S
ToLinkNo	169479	171408	169479	171408
ToLink\FromNodeOrientation	E	N	E	N
ToNodeNo	410819	423137	410819	423137
TypeNo	2	3	1	2
TSysSet	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Trf	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Trf	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Trf	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Trf
CapPrT	99999	99999	99999	99999
t0PrT	0min	0min	0min	0min
VolPCUPrT(AH)	752	227	339	1961
VolPCUPrT(AP)	752	227	339	1961
TCur_PrTsys(Blk)	0h	0h	0h	0h
TCur_PrTsys(Car)	0h	0h	0h	0h
TCur_PrTsys(Ped)	0h	0h	0h	0h
TCur_PrTsys(Trk)	0h	0h	0h	0h
AddVal1	0	0	0	0
AddVal2	0	0	0	0
AddVal3	0	0	0	0

GETTING THE DATA: INDIVIDUAL TURNS

Within an individual node, I can choose the Turns option.

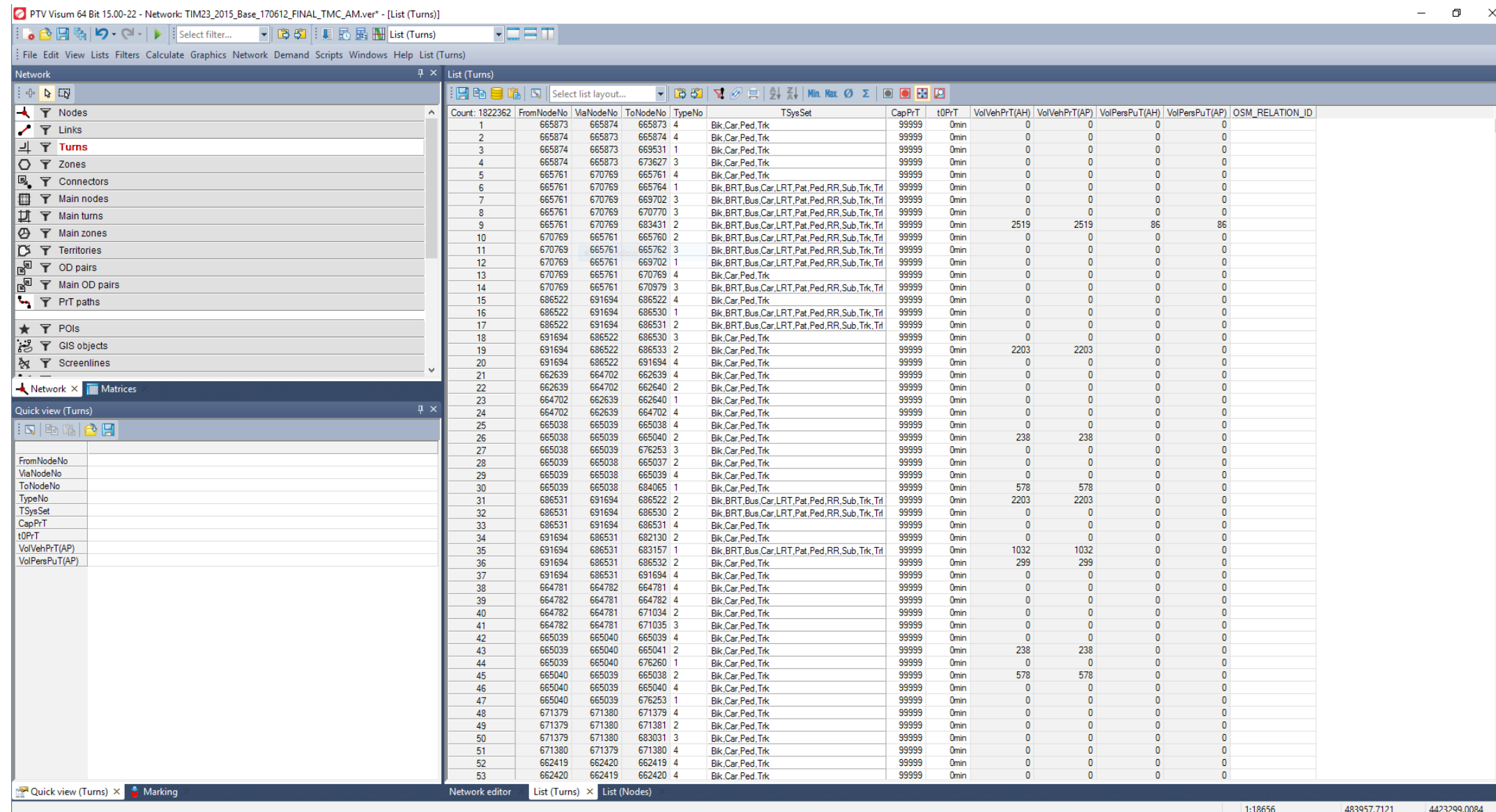
FromNodeNo	ToNodeNo	3	4
410756	410756	410846	410846
		169474	169474
FromLink\ToNodeOrientation	ToLinkNo		
W	W	S	S
169479	171408	169479	171408
ToNodeNo		N	
410819	423137	410819	423137
		2	
TSysSet	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Trl	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Trl	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Trl
CapPrT	99999	99999	99999
tOPrT	0min	0min	0min
VolPCUPrT(AH)	752	227	339
VolPCUPrT(AP)	752	227	339
TCur_PrTsys(Blk)	0h	0h	0h
TCur_PrTsys(Car)	0h	0h	0h
TCur_PrTsys(Ped)	0h	0h	0h
TCur_PrTsys(Trk)	0h	0h	0h
AddVal1	0	0	0
AddVal2	0	0	0
AddVal3	0	0	0

If I select a specific turn movement within the Turns view, I can identify my **From Node** and my **To Node**.

GETTING THE DATA: LISTS OF TURNS

Once I have the following information, I can export my turns list:

FromNodeNo
ViaNodeNo
ToNodeNo



PTV Visum 64 Bit 15.00-22 - Network: TIM23_2015_Base_170612_FINAL_TMC_AM.ver* - [List (Turns)]

File Edit View Lists Filters Calculate Graphics Network Demand Scripts Windows Help List (Turns)

Network

- Nodes
- Links
- Turns**
- Zones
- Connectors
- Main nodes
- Main turns
- Main zones
- Territories
- OD pairs
- Main OD pairs
- PrT paths

Quick view (Turns)

Count	FromNodeNo	ViaNodeNo	ToNodeNo	TypeNo	TSysSet	CapPrT	t0PrT	VolVehPrT(AH)	VolVehPrT(AP)	VolPersPuT(AH)	VolPersPuT(AP)	OSM_RELATION_ID
1	665873	665874	665873	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
2	665874	665873	665874	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
3	665874	665873	669531	1	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
4	665874	665873	673627	3	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
5	665761	670769	665761	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
6	665761	670769	665764	1	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	0	0	0	0	
7	665761	670769	669702	3	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	0	0	0	0	
8	665761	670769	670770	3	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	0	0	0	0	
9	665761	670769	683431	2	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	2519	2519	86	86	
10	670769	665761	665760	2	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	0	0	0	0	
11	670769	665761	665762	3	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	0	0	0	0	
12	670769	665761	669702	1	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	0	0	0	0	
13	670769	665761	670769	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
14	670769	665761	670979	3	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	0	0	0	0	
15	686522	691694	686522	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
16	686522	691694	686530	1	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	0	0	0	0	
17	686522	691694	686531	2	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	0	0	0	0	
18	691694	686522	686530	3	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
19	691694	686522	686533	2	Bik,Car,Ped,Trk	99999	0min	2203	2203	0	0	
20	691694	686522	691694	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
21	662639	664702	662639	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
22	662639	664702	662640	2	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
23	664702	662639	662640	1	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
24	664702	662639	664702	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
25	665038	665039	665038	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
26	665038	665039	665040	2	Bik,Car,Ped,Trk	99999	0min	238	238	0	0	
27	665038	665039	676253	3	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
28	665039	665038	665037	2	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
29	665039	665038	665039	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
30	665039	665038	684065	1	Bik,Car,Ped,Trk	99999	0min	578	578	0	0	
31	686531	691694	686522	2	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	2203	2203	0	0	
32	686531	691694	686530	2	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	0	0	0	0	
33	686531	691694	686531	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
34	691694	686531	682130	2	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
35	691694	686531	683157	1	Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Trf	99999	0min	1032	1032	0	0	
36	691694	686531	686532	2	Bik,Car,Ped,Trk	99999	0min	299	299	0	0	
37	691694	686531	691694	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
38	664781	664782	664781	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
39	664782	664781	664782	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
40	664782	664781	671034	2	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
41	664782	664781	671035	3	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
42	665039	665040	665039	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
43	665039	665040	665041	2	Bik,Car,Ped,Trk	99999	0min	238	238	0	0	
44	665039	665040	676260	1	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
45	665040	665039	665038	2	Bik,Car,Ped,Trk	99999	0min	578	578	0	0	
46	665040	665039	665040	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
47	665040	665039	676253	1	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
48	671379	671380	671379	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
49	671379	671380	671381	2	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
50	671379	671380	683031	3	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
51	671380	671379	671380	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
52	662419	662420	662419	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	
53	662420	662419	662420	4	Bik,Car,Ped,Trk	99999	0min	0	0	0	0	

Quick view (Turns) × Marking

Network editor List (Turns) × List (Nodes)

1:18656 483957.7121 4423299.0084

GETTING THE DATA: EXPORTING AS TEXT

PTV Visum 64 Bit 15.00-22 - Network: TIM23_2015_Base_170612_FINAL_TMC_AM.ver* - [List (Turns)]

Select filter... List (Turns)

File Edit View Lists Filters Calculate Graphics Network Demand Scripts Windows Help List (Turns)

Network

- Nodes
- Links
- Turns**
- Zones
- Connectors
- Main nodes
- Main turns
- Main zones
- Territories
- OD pairs
- Main OD pairs
- PrT paths

Count: 1822362 FromNodeNo ViaNodeNo ToNodeNo TypeNo TSysSe

Count	FromNodeNo	ViaNodeNo	ToNodeNo	TypeNo	TSysSe
1	665873	665874	665873	4	Bik,Car,Ped,Trk
2	665874	665873	665874	4	Bik,Car,Ped,Trk
3	665874	665873	669531	1	Bik,Car,Ped,Trk
4	665874	665873	673627	3	Bik,Car,Ped,Trk
5	665761	670769	665761	4	Bik,Car,Ped,Trk
6	665761	670769	665764	1	Bik,BRT,Bus,Car,LRT,Pat
7	665761	670769	669702	3	Bik,BRT,Bus,Car,LRT,Pat
8	665761	670769	670770	3	Bik,BRT,Bus,Car,LRT,Pat
9	665761	670769	683431	2	Bik,BRT,Bus,Car,LRT,Pat
10	670769	665761	665760	2	Bik,BRT,Bus,Car,LRT,Pat
11	670769	665761	665762	3	Bik,BRT,Bus,Car,LRT,Pat
12	670769	665761	669702	1	Bik,BRT,Bus,Car,LRT,Pat
13	670769	665761	670769	4	Bik,Car,Ped,Trk
14	670769	665761	670979	3	Bik,BRT,Bus,Car,LRT,Pat
15	686522	691694	686522	4	Bik,Car,Ped,Trk
16	686522	691694	686530	1	Bik,BRT,Bus,Car,LRT,Pat
17	686522	691694	686531	2	Bik,BRT,Bus,Car,LRT,Pat
18	691694	686522	686530	3	Bik,Car,Ped,Trk
19	691694	686522	686533	2	Bik,Car,Ped,Trk
20	691694	686522	691694	4	Bik,Car,Ped,Trk
21	662639	664702	662639	4	Bik,Car,Ped,Trk
22	662639	664702	662640	2	Bik,Car,Ped,Trk
23	664702	662639	662640	1	Bik,Car,Ped,Trk
24	664702	662639	664702	4	Bik,Car,Ped,Trk
25	665038	665039	665038	4	Bik,Car,Ped,Trk

Quick view (Turns)

GETTING THE DATA: EXPORTING AS TEXT

```

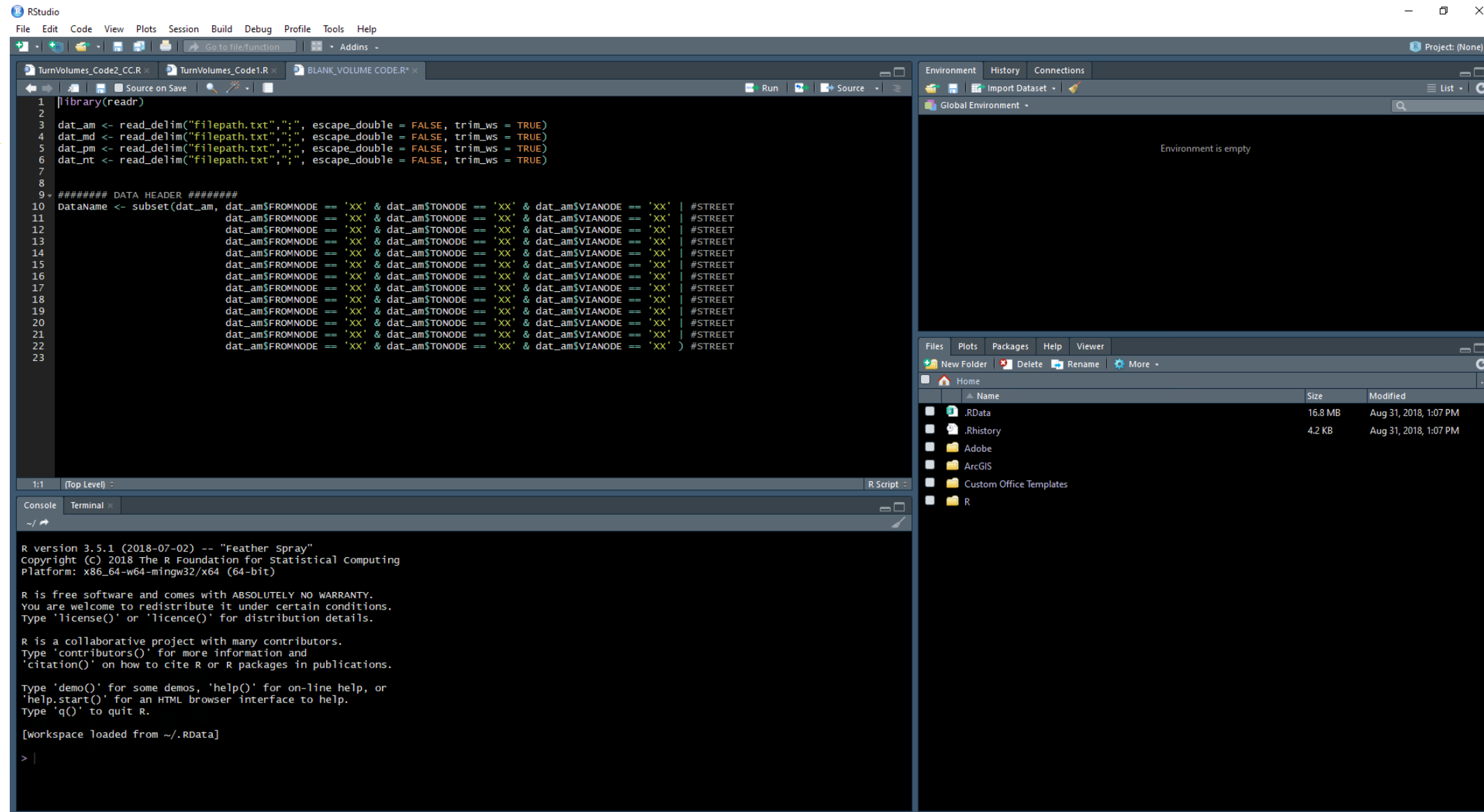
AM_Turns - Notepad
File Edit Format View Help
FROMNODE;VIANODE;TONODE;TYPE;TSYSET;CAPRT;TOPRT;VOLVHPRT(AH);VOLVHPRT(AP);VOLPERSPUT(AH);VOLPERSPUT(AP);OSM_RELATION_ID
665873;665874;665873;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665874;665873;665874;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665874;665873;669531;1;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665874;665873;673627;3;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665761;670769;665761;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665761;670769;665764;1;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;0;0;0;0;
665761;670769;669702;3;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;0;0;0;0;
665761;670769;670770;3;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;0;0;0;0;
665761;670769;683431;2;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;2519;2519;86;86;
670769;665761;665760;2;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;0;0;0;0;
670769;665761;665762;3;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;0;0;0;0;
670769;665761;669702;1;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;0;0;0;0;
670769;665761;670769;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
670769;665761;670979;3;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;0;0;0;0;
686522;691694;686522;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
686522;691694;686530;1;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;0;0;0;0;
686522;691694;686531;2;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;0;0;0;0;
691694;686522;686530;3;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
691694;686522;686533;2;Bik,Car,Ped,Trk;99999;0min;2203;2203;0;0;
691694;686522;691694;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
662639;664702;662639;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
662639;664702;662640;2;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
664702;662639;662640;1;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
664702;662639;664702;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665038;665039;665038;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665038;665039;665040;2;Bik,Car,Ped,Trk;99999;0min;238;238;0;0;
665038;665039;676253;3;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665039;665038;665037;2;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665039;665038;665039;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665039;665038;684065;1;Bik,Car,Ped,Trk;99999;0min;578;578;0;0;
686531;691694;686522;2;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;2203;2203;0;0;
686531;691694;686530;2;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;0;0;0;0;
686531;691694;686531;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
691694;686531;682130;2;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
691694;686531;683157;1;Bik,BRT,Bus,Car,LRT,Pat,Ped,RR,Sub,Trk,Tr1;99999;0min;1032;1032;0;0;
691694;686531;686532;2;Bik,Car,Ped,Trk;99999;0min;299;299;0;0;
691694;686531;691694;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
664781;664782;664781;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
664782;664781;664782;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
664782;664781;671034;2;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
664782;664781;671035;3;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665039;665040;665039;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665039;665040;665041;2;Bik,Car,Ped,Trk;99999;0min;238;238;0;0;
665039;665040;676260;1;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665040;665039;665038;2;Bik,Car,Ped,Trk;99999;0min;578;578;0;0;
665040;665039;665040;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
665040;665039;676253;1;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
671379;671380;671379;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
671379;671380;671381;2;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
671379;671380;683031;3;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
671380;671379;671380;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
662419;662420;662419;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
662420;662419;662420;4;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;
662420;662419;672666;1;Bik,Car,Ped,Trk;99999;0min;0;0;0;0;

```

This is an absolute mess and I hate it. Luckily, I have R.

BASE CODE FOR ALL INTERSECTIONS

Seriously, I am so thankful for R all the time. ALL the time.



```

1 library(readr)
2
3 dat_am <- read_delim("filepath.txt", ";", escape_double = FALSE, trim_ws = TRUE)
4 dat_md <- read_delim("filepath.txt", ";", escape_double = FALSE, trim_ws = TRUE)
5 dat_pm <- read_delim("filepath.txt", ";", escape_double = FALSE, trim_ws = TRUE)
6 dat_nt <- read_delim("filepath.txt", ";", escape_double = FALSE, trim_ws = TRUE)
7
8
9 ##### DATA HEADER #####
10 dataName <- subset(dat_am, dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
11 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
12 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
13 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
14 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
15 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
16 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
17 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
18 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
19 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
20 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
21 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
22 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' | #STREET
23 dat_am$FROMNODE == 'XX' & dat_am$TONODE == 'XX' & dat_am$VIANODE == 'XX' ) #STREET

```

R version 3.5.1 (2018-07-02) -- "Feather Spray"
 Copyright (C) 2018 The R Foundation for Statistical Computing
 Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
 You are welcome to redistribute it under certain conditions.
 Type 'license()' or 'licence()' for distribution details.

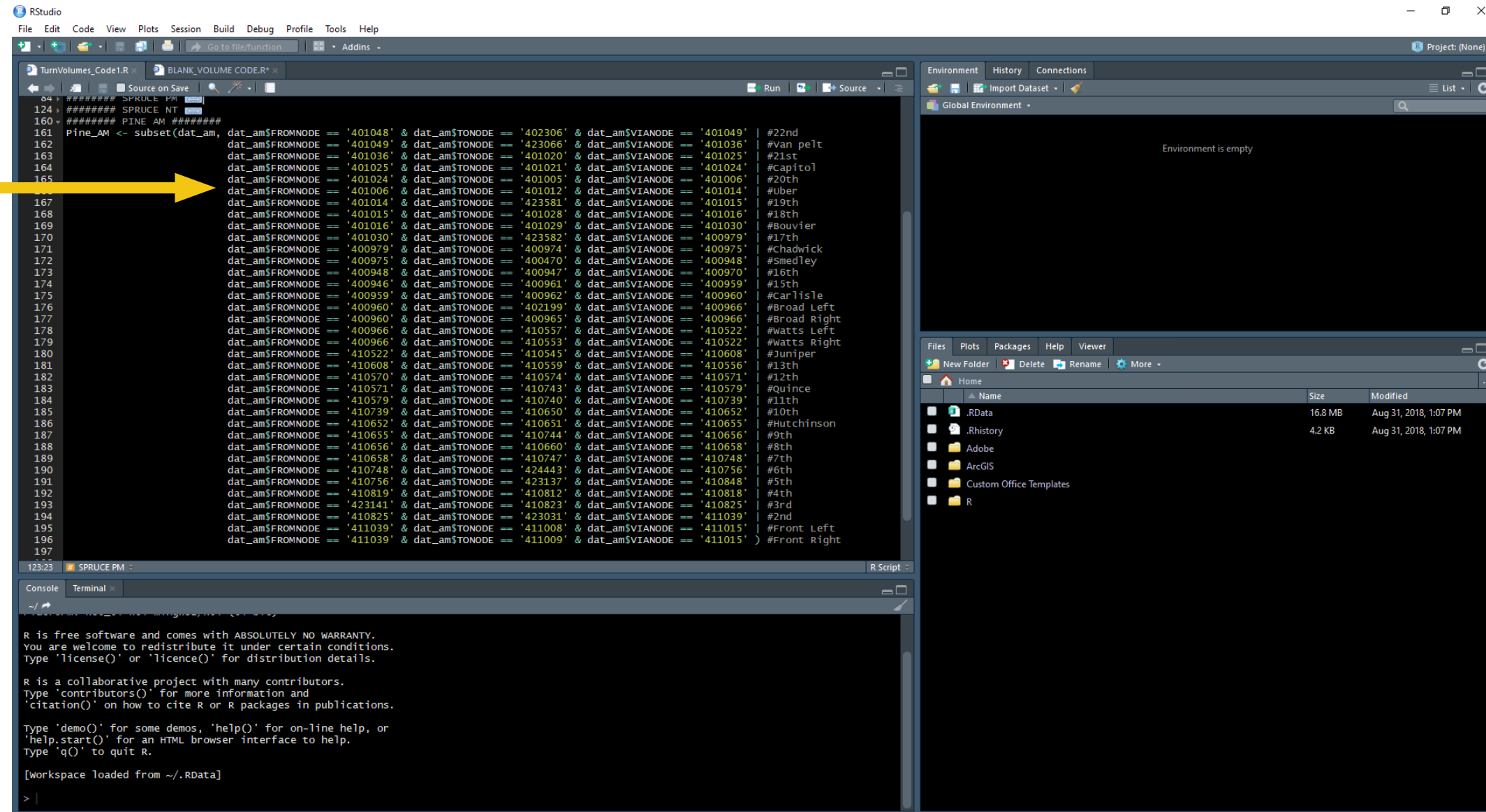
R is a collaborative project with many contributors.
 Type 'contributors()' for more information and
 'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
 'help.start()' for an HTML browser interface to help.
 Type 'q()' to quit R.

[workspace loaded from ~/.RData]

FULL CODE FOR ALL INTERSECTIONS

This code is still tedious, even with the help of R. I have the From, To, and Via nodes for every intersection under analysis. I'll use that to create a subset of the full table so I'm only looking at the turns I want.

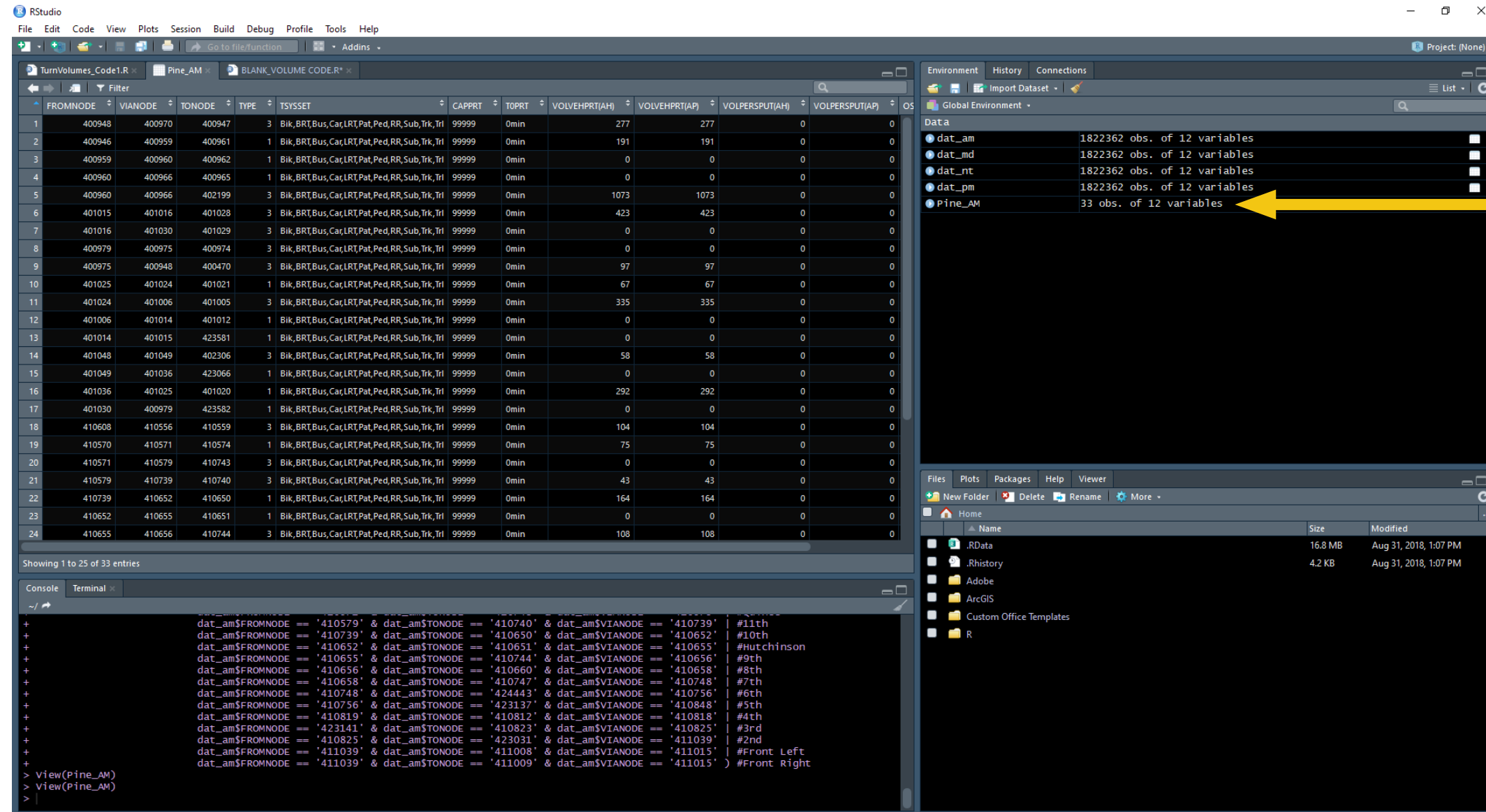


```

124 ##### SPRUCE NT
160 ##### PINE AM #####
161 Pine_AM <- subset(dat_am,
162   dat_am$FROMNODE == '401048' & dat_am$TONODE == '402306' & dat_am$VIANODE == '401049' | #22nd
163   dat_am$FROMNODE == '401049' & dat_am$TONODE == '423066' & dat_am$VIANODE == '401036' | #Van pelt
164   dat_am$FROMNODE == '401036' & dat_am$TONODE == '401020' & dat_am$VIANODE == '401025' | #21st
165   dat_am$FROMNODE == '401025' & dat_am$TONODE == '401021' & dat_am$VIANODE == '401024' | #Capitol
166   dat_am$FROMNODE == '401024' & dat_am$TONODE == '401005' & dat_am$VIANODE == '401006' | #20th
167   dat_am$FROMNODE == '401006' & dat_am$TONODE == '401012' & dat_am$VIANODE == '401014' | #Uber
168   dat_am$FROMNODE == '401014' & dat_am$TONODE == '423581' & dat_am$VIANODE == '401015' | #19th
169   dat_am$FROMNODE == '401015' & dat_am$TONODE == '401028' & dat_am$VIANODE == '401016' | #18th
170   dat_am$FROMNODE == '401016' & dat_am$TONODE == '401029' & dat_am$VIANODE == '401030' | #Bouvier
171   dat_am$FROMNODE == '401030' & dat_am$TONODE == '423582' & dat_am$VIANODE == '400979' | #17th
172   dat_am$FROMNODE == '400979' & dat_am$TONODE == '400974' & dat_am$VIANODE == '400975' | #Chadwick
173   dat_am$FROMNODE == '400975' & dat_am$TONODE == '400470' & dat_am$VIANODE == '400948' | #Smedley
174   dat_am$FROMNODE == '400948' & dat_am$TONODE == '400947' & dat_am$VIANODE == '400970' | #16th
175   dat_am$FROMNODE == '400946' & dat_am$TONODE == '400961' & dat_am$VIANODE == '400959' | #15th
176   dat_am$FROMNODE == '400959' & dat_am$TONODE == '400962' & dat_am$VIANODE == '400960' | #Carlisle
177   dat_am$FROMNODE == '400960' & dat_am$TONODE == '402199' & dat_am$VIANODE == '400966' | #Broad Left
178   dat_am$FROMNODE == '400966' & dat_am$TONODE == '400965' & dat_am$VIANODE == '400966' | #Broad Right
179   dat_am$FROMNODE == '400966' & dat_am$TONODE == '410557' & dat_am$VIANODE == '410522' | #Watts Left
180   dat_am$FROMNODE == '410522' & dat_am$TONODE == '410553' & dat_am$VIANODE == '410522' | #Watts Right
181   dat_am$FROMNODE == '410522' & dat_am$TONODE == '410545' & dat_am$VIANODE == '410608' | #Juniper
182   dat_am$FROMNODE == '410570' & dat_am$TONODE == '410559' & dat_am$VIANODE == '410556' | #13th
183   dat_am$FROMNODE == '410571' & dat_am$TONODE == '410574' & dat_am$VIANODE == '410571' | #12th
184   dat_am$FROMNODE == '410579' & dat_am$TONODE == '410743' & dat_am$VIANODE == '410579' | #Quince
185   dat_am$FROMNODE == '410739' & dat_am$TONODE == '410740' & dat_am$VIANODE == '410739' | #11th
186   dat_am$FROMNODE == '410652' & dat_am$TONODE == '410650' & dat_am$VIANODE == '410652' | #10th
187   dat_am$FROMNODE == '410655' & dat_am$TONODE == '410651' & dat_am$VIANODE == '410655' | #Hutchinson
188   dat_am$FROMNODE == '410656' & dat_am$TONODE == '410744' & dat_am$VIANODE == '410656' | #9th
189   dat_am$FROMNODE == '410658' & dat_am$TONODE == '410660' & dat_am$VIANODE == '410658' | #8th
190   dat_am$FROMNODE == '410748' & dat_am$TONODE == '410747' & dat_am$VIANODE == '410748' | #7th
191   dat_am$FROMNODE == '410756' & dat_am$TONODE == '424443' & dat_am$VIANODE == '410756' | #6th
192   dat_am$FROMNODE == '410819' & dat_am$TONODE == '423137' & dat_am$VIANODE == '410848' | #5th
193   dat_am$FROMNODE == '410819' & dat_am$TONODE == '410812' & dat_am$VIANODE == '410818' | #4th
194   dat_am$FROMNODE == '423141' & dat_am$TONODE == '410823' & dat_am$VIANODE == '410825' | #3rd
195   dat_am$FROMNODE == '410825' & dat_am$TONODE == '423031' & dat_am$VIANODE == '411039' | #2nd
196   dat_am$FROMNODE == '411039' & dat_am$TONODE == '411008' & dat_am$VIANODE == '411015' | #Front Left
197   dat_am$FROMNODE == '411039' & dat_am$TONODE == '411009' & dat_am$VIANODE == '411015' | #Front Right

```

LOOKING AT THE DATA

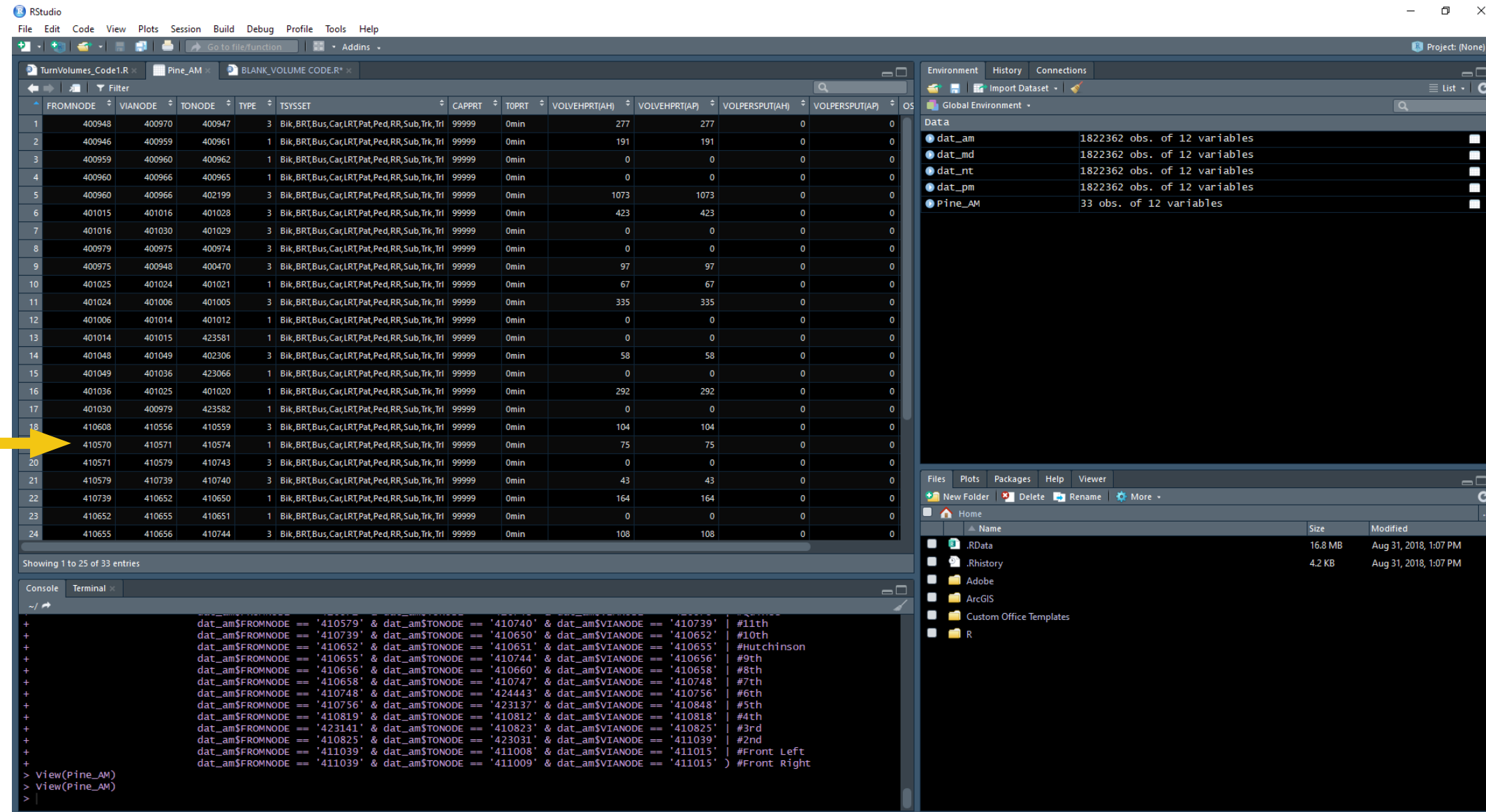


The screenshot shows the RStudio interface. The main window displays a data table with columns: FROMNODE, VIANODE, TONODE, TYPE, TSYSSET, CAPPRT, TOPRT, VOLVEHPRT(AH), VOLVEHPRT(AP), VOLPERSPUT(AH), and VOLPERSPUT(AP). The table contains 25 rows of data. The Environment pane on the right shows a list of objects: dat_am (1822362 obs. of 12 variables), dat_md (1822362 obs. of 12 variables), dat_nt (1822362 obs. of 12 variables), dat_pm (1822362 obs. of 12 variables), and Pine_AM (33 obs. of 12 variables). A yellow arrow points from the Pine_AM object in the Environment pane to a yellow callout box on the right.

But now I have subset called Pine_AM. It has 33 observations of 12 variables, which is much more manageable than the full data, which has 1,822,362 observations of 12 variables.

LOOKING AT THE DATA

Because I know the FromNode, ViaNode, and ToNode for the intersection of 5th Street and Pine Street I can find it in my Pine_AM data and see what the model's turn counts are.



The screenshot shows the RStudio interface with a data table. The table has columns: FROMNODE, VIANODE, TONODE, TYPE, TSYSSET, CAPPRT, TOPRT, VOLVHPRT(AH), VOLVHPRT(AP), VOLPERSPUT(AH), and VOLPERSPUT(AP). A yellow arrow points from the text box to the row where FROMNODE is 410571, VIANODE is 410739, and TONODE is 410740.

FROMNODE	VIANODE	TONODE	TYPE	TSYSSET	CAPPRT	TOPRT	VOLVHPRT(AH)	VOLVHPRT(AP)	VOLPERSPUT(AH)	VOLPERSPUT(AP)
400948	400970	400947	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	277	277	0	0
400946	400959	400961	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	191	191	0	0
400959	400960	400962	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	0	0	0	0
400960	400966	400965	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	0	0	0	0
400960	400966	402199	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	1073	1073	0	0
401015	401016	401028	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	423	423	0	0
401016	401030	401029	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	0	0	0	0
400975	400975	400974	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	0	0	0	0
400975	400948	400470	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	97	97	0	0
401025	401024	401021	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	67	67	0	0
401024	401006	401005	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	335	335	0	0
401006	401014	401012	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	0	0	0	0
401014	401015	423581	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	0	0	0	0
401048	401049	402306	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	58	58	0	0
401049	401036	423066	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	0	0	0	0
401036	401025	401020	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	292	292	0	0
401030	400979	423582	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	0	0	0	0
410608	410556	410559	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	104	104	0	0
410570	410571	410574	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	75	75	0	0
410571	410579	410743	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	0	0	0	0
410579	410739	410740	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	43	43	0	0
410739	410652	410650	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	164	164	0	0
410652	410655	410651	1	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	0	0	0	0
410655	410656	410744	3	Bik, BRT, Bus, Car, LRT, Pat, Ped, RR, Sub, Trk, Tri	99999	0min	108	108	0	0

The console shows the following R code and output:

```

dat_am$FROMNODE == '410579' & dat_am$TONODE == '410740' & dat_am$VIANODE == '410739' | #11th
dat_am$FROMNODE == '410739' & dat_am$TONODE == '410650' & dat_am$VIANODE == '410652' | #10th
dat_am$FROMNODE == '410652' & dat_am$TONODE == '410651' & dat_am$VIANODE == '410655' | #Hutchinson
dat_am$FROMNODE == '410655' & dat_am$TONODE == '410744' & dat_am$VIANODE == '410656' | #9th
dat_am$FROMNODE == '410656' & dat_am$TONODE == '410660' & dat_am$VIANODE == '410658' | #8th
dat_am$FROMNODE == '410658' & dat_am$TONODE == '410747' & dat_am$VIANODE == '410748' | #7th
dat_am$FROMNODE == '410748' & dat_am$TONODE == '424443' & dat_am$VIANODE == '410756' | #6th
dat_am$FROMNODE == '410756' & dat_am$TONODE == '423137' & dat_am$VIANODE == '410848' | #5th
dat_am$FROMNODE == '410819' & dat_am$TONODE == '410812' & dat_am$VIANODE == '410818' | #4th
dat_am$FROMNODE == '423141' & dat_am$TONODE == '410823' & dat_am$VIANODE == '410825' | #3rd
dat_am$FROMNODE == '410825' & dat_am$TONODE == '423031' & dat_am$VIANODE == '411039' | #2nd
dat_am$FROMNODE == '411039' & dat_am$TONODE == '411008' & dat_am$VIANODE == '411015' | #Front Left
dat_am$FROMNODE == '411039' & dat_am$TONODE == '411009' & dat_am$VIANODE == '411015' | #Front Right
> View(Pine_AM)
> View(Pine_AM)

```


CALCULATING PEAK-HOUR NUMBERS

AM VERSION FILE = 6:00am to 10:00am
MD VERSION FILE = 10:00am to 3:00pm
PM VERSION FILE = 3:00pm to 7:00pm
NT VERSION FILE = 7:00pm to 6:00am

CALCULATING PEAK-HOUR NUMBERS

$$\text{Factored AM Peak Hour Volumes} = (P_n * V_{am}) + (V_{am})$$

$$\text{Factored PM Peak Hour Volumes} = (P_n * V_{pm}) + (V_{pm})$$

where

V_{am} = AM turn volumes for a given location in Visum
 V_{pm} = PM turn volumes for a given location in Visum

and

P_n corresponds to the appropriate option provided by the DVRPC:

Pine & 5th factors

P_1 = AM peak = 32%
 P_2 = PM peak = 28%

Pine & 13th factors

P_3 = AM peak = 32%
 P_4 = PM peak = 28%

BUT CAN IT BE TRUSTED?

EXPECTED RESULT

5th Street and 13th Street should have higher left-turn volumes than other streets

BUT CAN IT BE TRUSTED?

EXPECTED RESULT

5th Street and 13th Street should have higher left-turn volumes than other streets

ACTUAL RESULT

5th Street and 13th Street aren't in the top 5 left-turn locations according to Visum

BUT CAN IT BE TRUSTED?

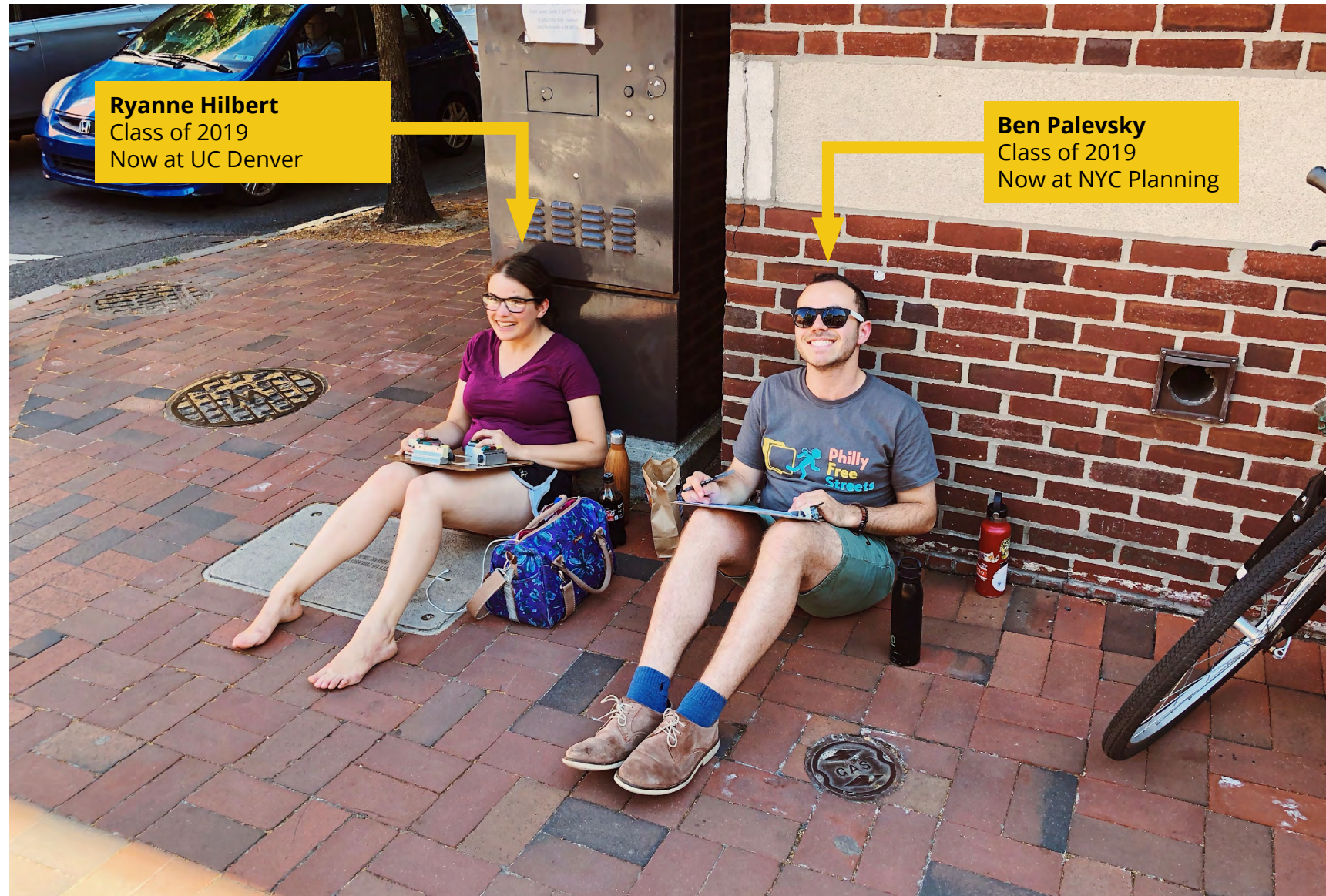
5th Street and 13th Street has more crashes than other streets

5th Street and 13th Street according to Visum

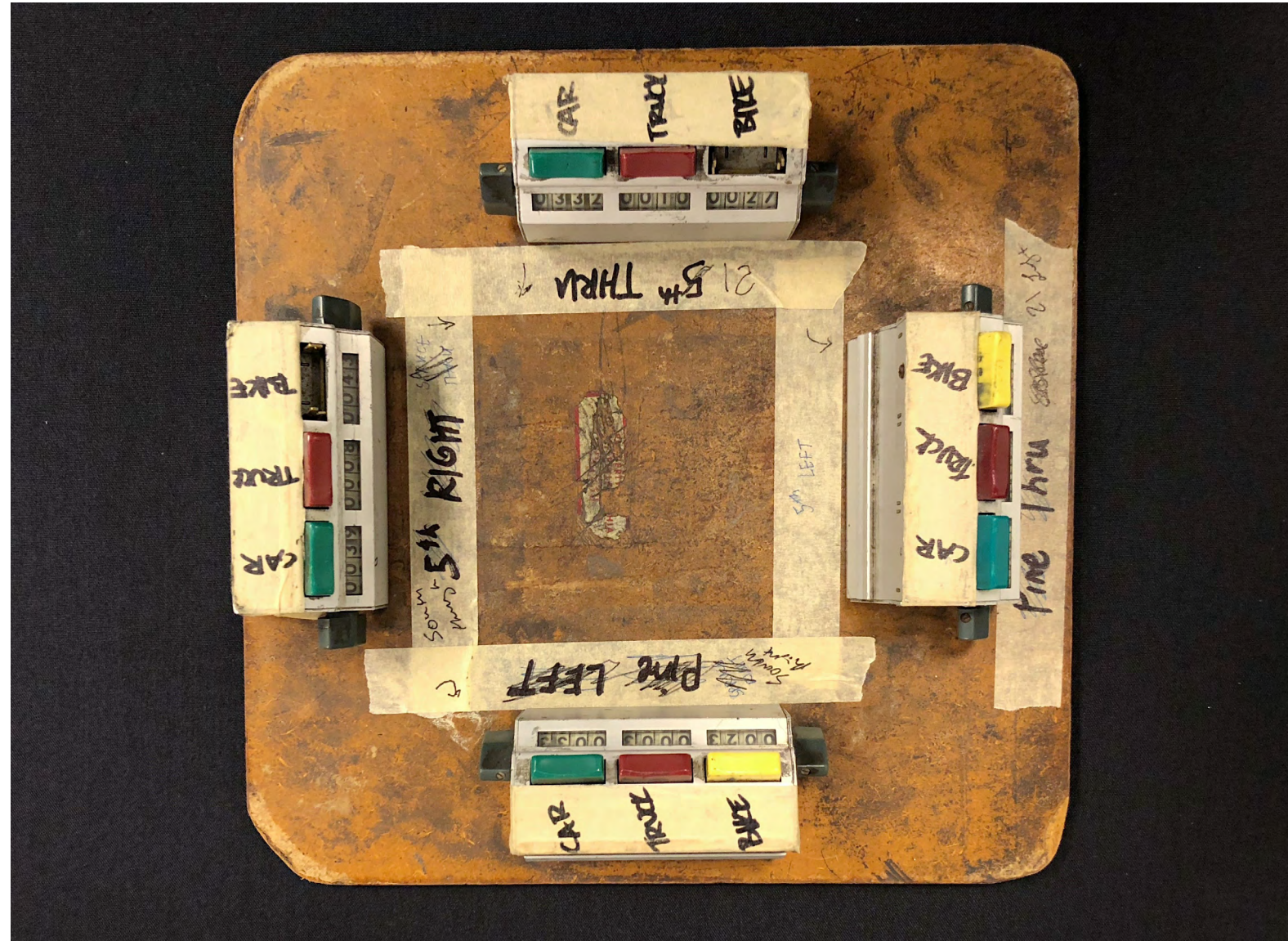


SO WHAT NOW?

MANUAL COUNTS!

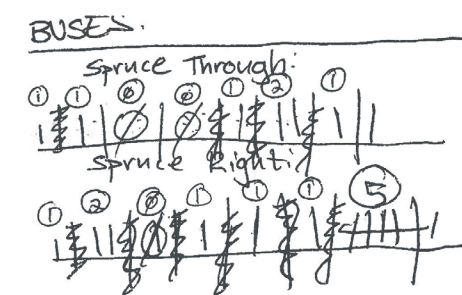


USING THE MOST CUTTING-EDGE TECHNOLOGY



USING THE MOST CUTTING-EDGE TECHNOLOGY

INTERSECTION: North-South Street & East-West Street
 STREETS: 5th Street & Pine Street
 DATE: 7/30/18
 DAY: Monday
 WEATHER: Cloudy, 77°
 TAKEN BY: C. Ross, B. Palevsky



AM INTERVAL COUNTS

5th Street Northbound

STARTING TIME		L	Through	TOTAL
4:45pm - 5:00pm	Cars	8	91	
	Trucks	1	13	
	Bikes	1	6	
5:00pm - 5:15pm	Cars	17	183	
	Trucks	1	23	
	Bikes	5	11	
5:15pm - 5:30pm	Cars	25	293	
	Trucks	1	34	
	Bikes	7	17	
5:30pm - 5:45pm	Cars	37	403	
	Trucks	2	37	
	Bikes	8	25	
5:45pm - 6:00pm	Cars	48	504	
	Trucks	2	43	
	Bikes	11	29	
6:00pm - 6:15pm	Cars	66	607	
	Trucks	2	46	
	Bikes	16	33	
6:15pm - 6:30pm	Cars	91	698	
	Trucks	3	57	
	Bikes	21	40	
6:30pm - 6:45pm	Cars	101	806	
	Trucks	3	62	
	Bikes	22	44	

Spruce Eastbound

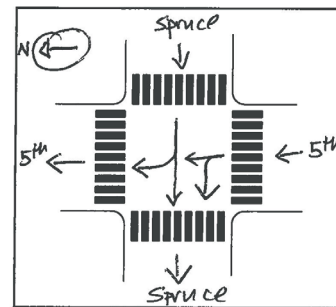
	R	Through	TOTAL
Cars	15	68	
Trucks	1	12	
Bikes	6	6	
Cars	26	136	
Trucks	1	17	
Bikes	8	21	
Cars	37	198	
Trucks	2	25	
Bikes	7	36	
Cars	50	283	
Trucks	4	30	
Bikes	8	41	
Cars	64	350	
Trucks	5	40	
Bikes	11	46	
Cars	79	431	
Trucks	5	41	
Bikes	1	58	
Cars	98	503	
Trucks	5	46	
Bikes	1	65	
Cars	112	581	
Trucks	5	48	
Bikes	1	80	

USING THE MOST CUTTING-EDGE TECHNOLOGY

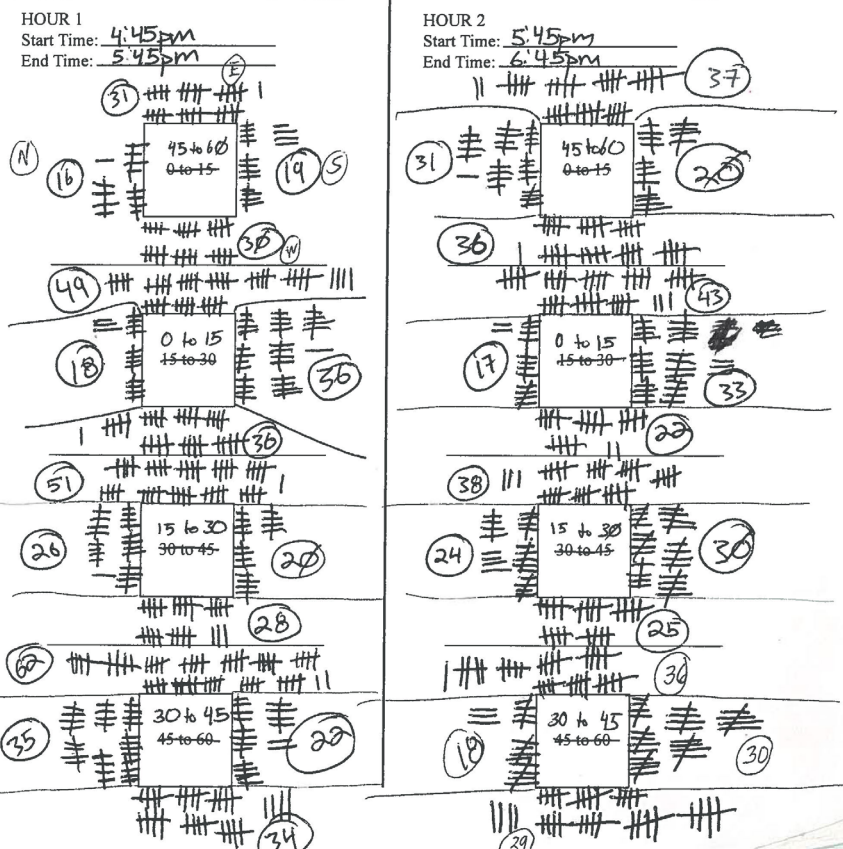
DATE: 7/30/18
 DAY: Monday
 WEATHER: Cloudy, 77°
 TAKEN BY: C. Ross

light drizzle 5:21-5:40

Street Names and Directions:



Notes/Observations:



COMPARING THE NUMBERS

PINE & 5TH
AM PEAK LEFT-TURNS
FROM VISUM

PINE & 5TH
AM PEAK LEFT-TURNS
FROM COUNTS

COMPARING THE NUMBERS

PINE & 5TH
AM PEAK LEFT-TURNS
FACTORED FROM VISUM

99 VEHICLES

PINE & 5TH
AM PEAK LEFT-TURNS
FROM COUNTS

COMPARING THE NUMBERS

PINE & 5TH
AM PEAK LEFT-TURNS
FACTORED FROM VISUM

99 VEHICLES

PINE & 5TH
AM PEAK LEFT-TURNS
FROM COUNTS

247 VEHICLES

MODELING THE INTERSECTION IN SYNCHRO

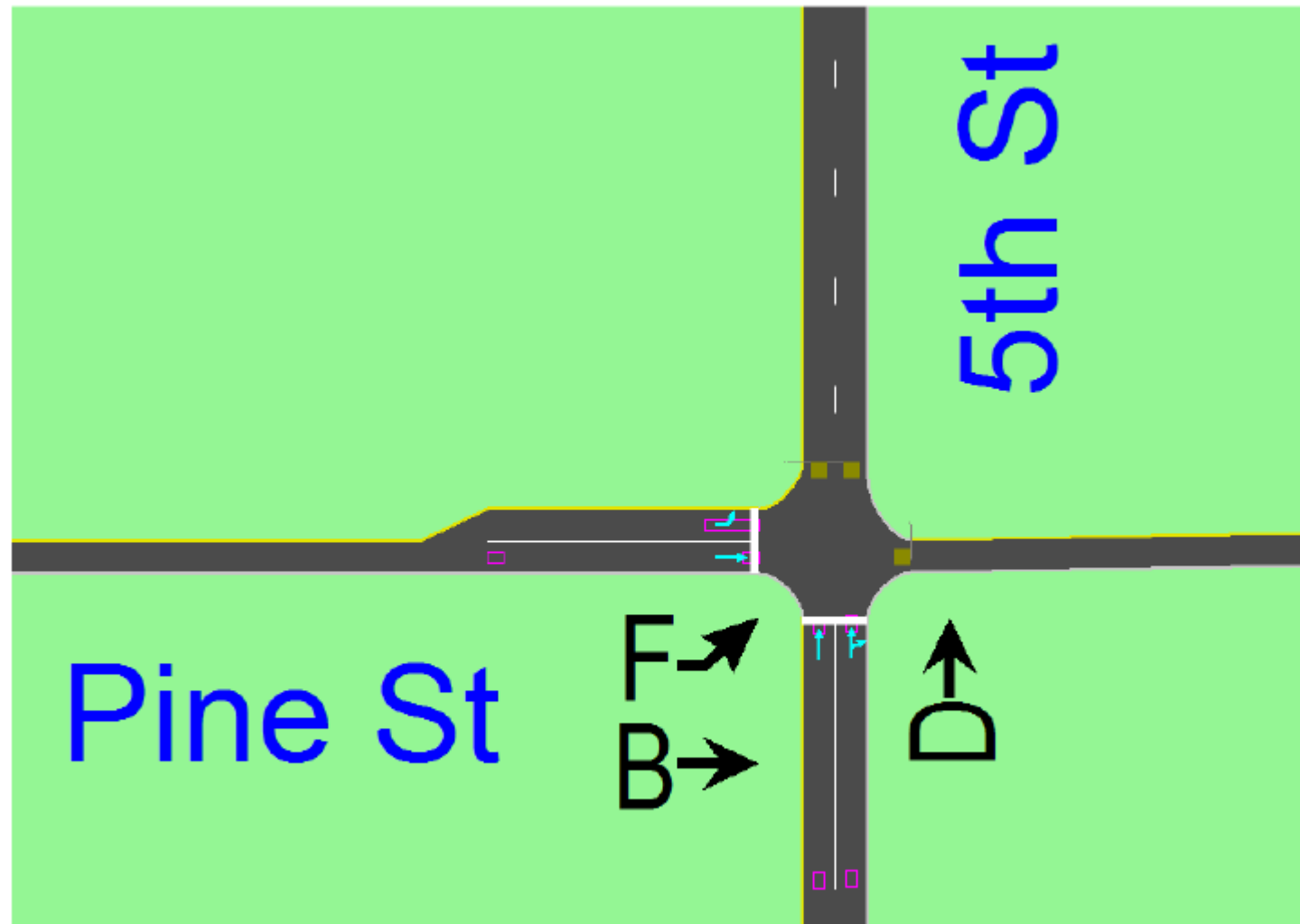


Figure 1: AM Level of Service under existing conditions

Using the count numbers obtained in the field and plugging them into Synchro, we find that the existing left-turn movement operates at an AM peak volume capacity ratio of 1.28 (LOS F), while the through movement maintains LOS B.

MODELING THE INTERSECTION IN SYNCHRO

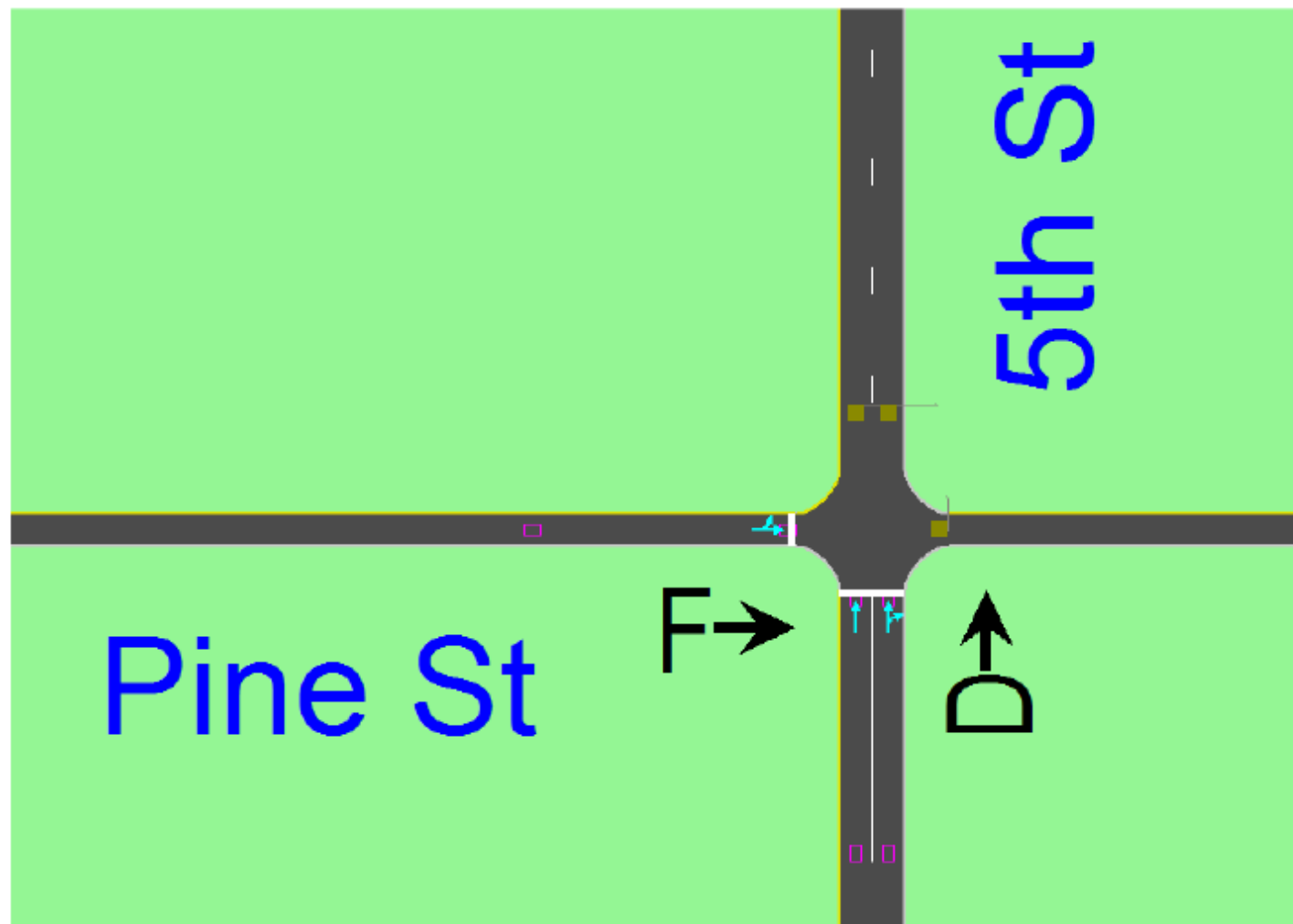
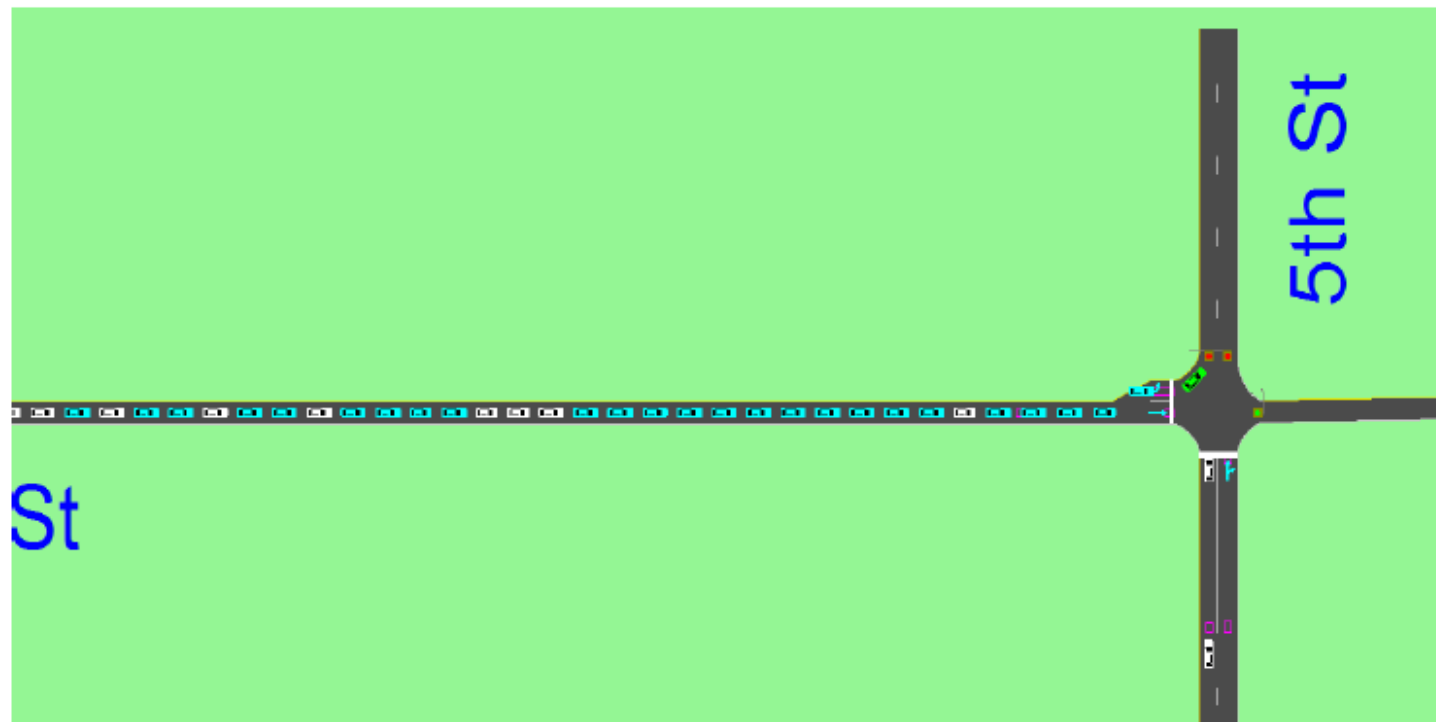


Figure 2: AM Level of Service with EB Lt lane removed.

Using the count numbers obtained in the field and plugging them into Synchro, we find that removing the left-turn lane would bring the remaining lane - which would be used by both turning vehicles and through vehicles - down to LOS F during the AM peak, with a volume to capacity ratio of 1.91.

PM peak has lower volumes and functions with acceptable LOS with and without a left-turn lane.

MODELING THE INTERSECTION IN SYNCHRO



Even if you assume that through traffic will somehow be able to squeeze around turning cars at the intersection, removing the left-turn lane results in a queue that is 1,579' long.

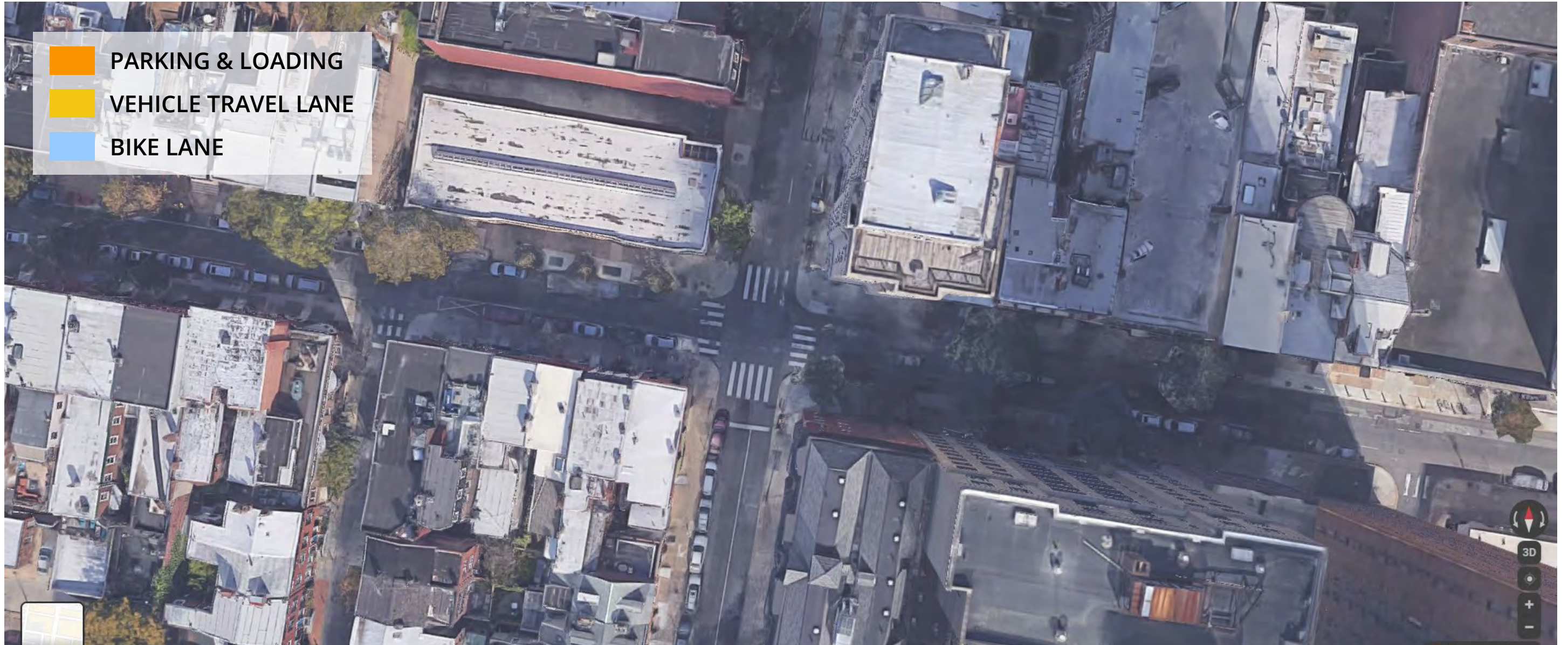
To put that into perspective, the average block in this part of Center City is only 450' long, so we are taking about a backup of cars over 3 blocks long.

MODELING THE INTERSECTION IN SYNCHRO

Conclusion:
KEEP THE LEFT-TURN LANE

WHAT THE MODEL DOESN'T ALWAYS CAPTURE

16TH & SPRUCE



16TH & SPRUCE: BEFORE



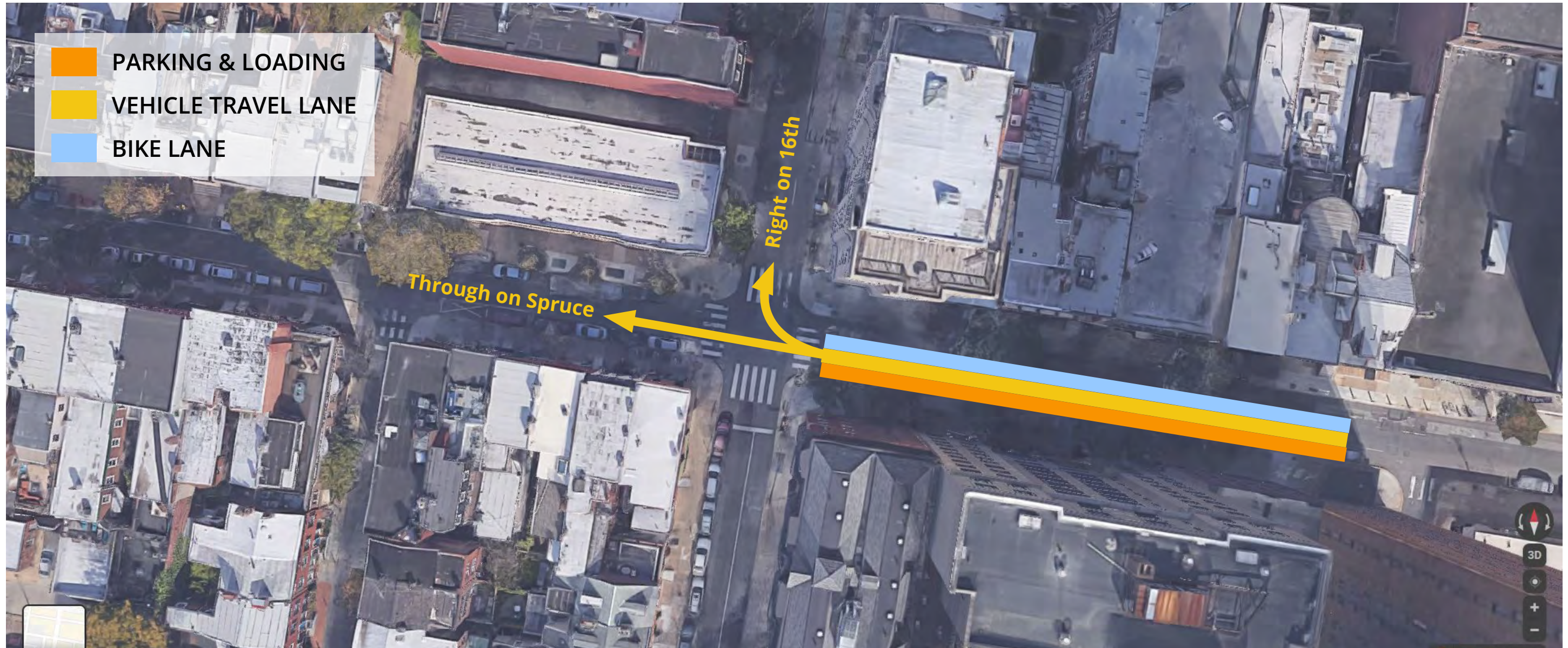
16TH & SPRUCE: BEFORE



16TH & SPRUCE: BEFORE



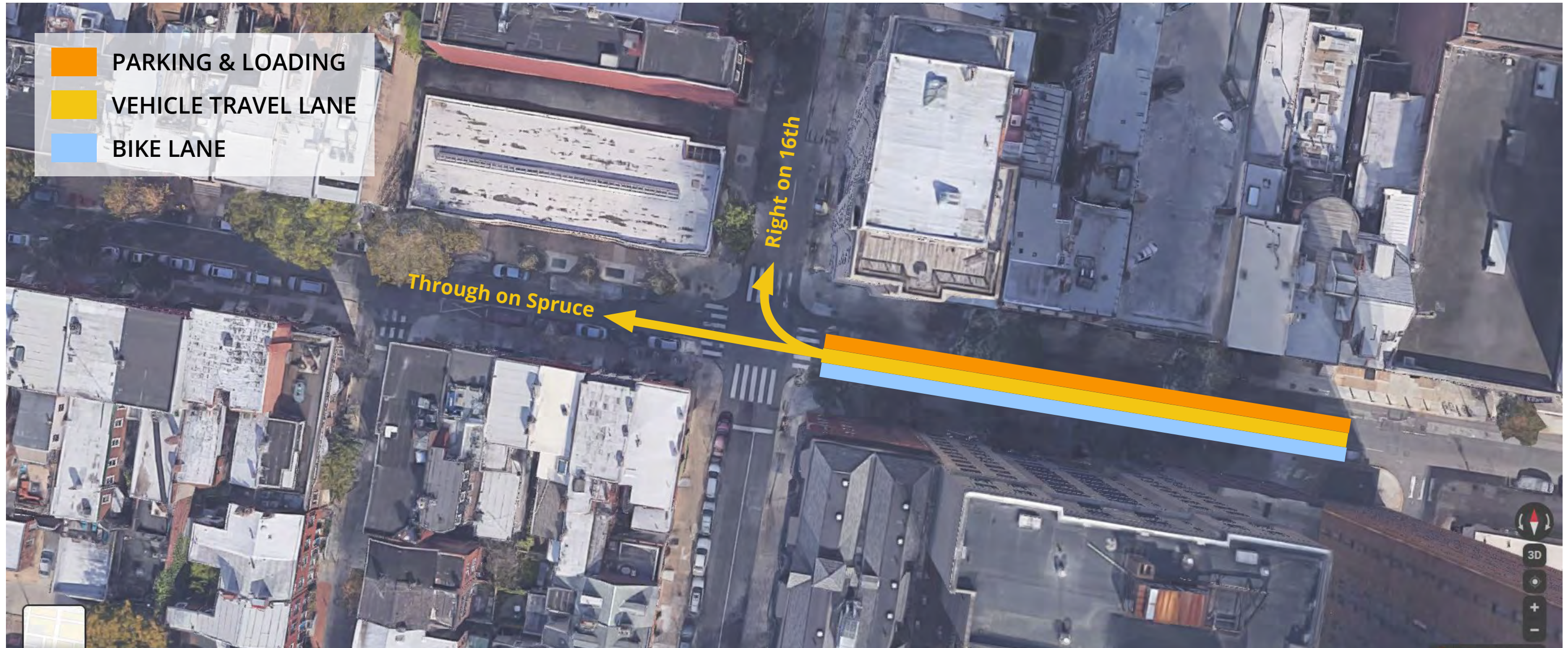
16TH & SPRUCE MOVEMENTS



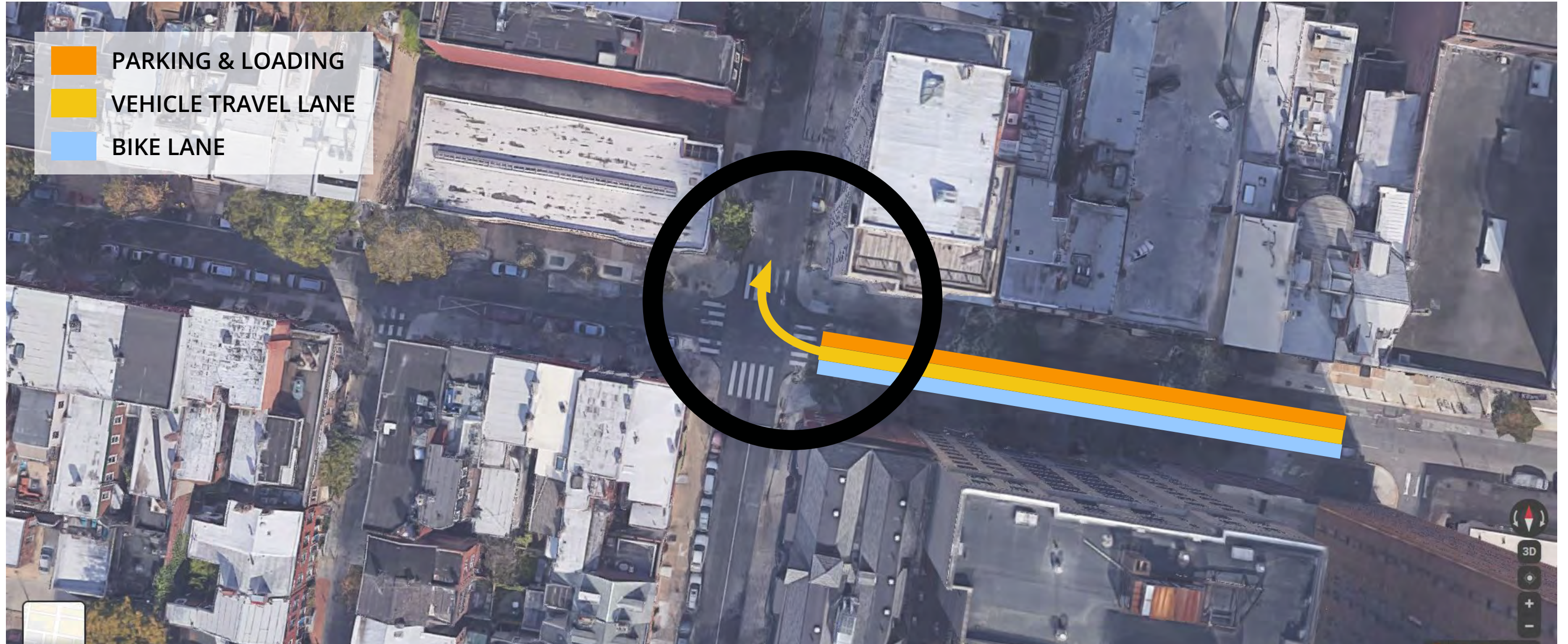
16TH & SPRUCE: AFTER



16TH & SPRUCE MOVEMENTS



A RIGHT-TURN LANE ISN'T NEEDED



UNBEKNOWN TO THE MODEL...



UNBEKNOWN TO THE MODEL...



UNBEKNOWN TO THE MODEL...



UNBEKNOWN TO THE MODEL...



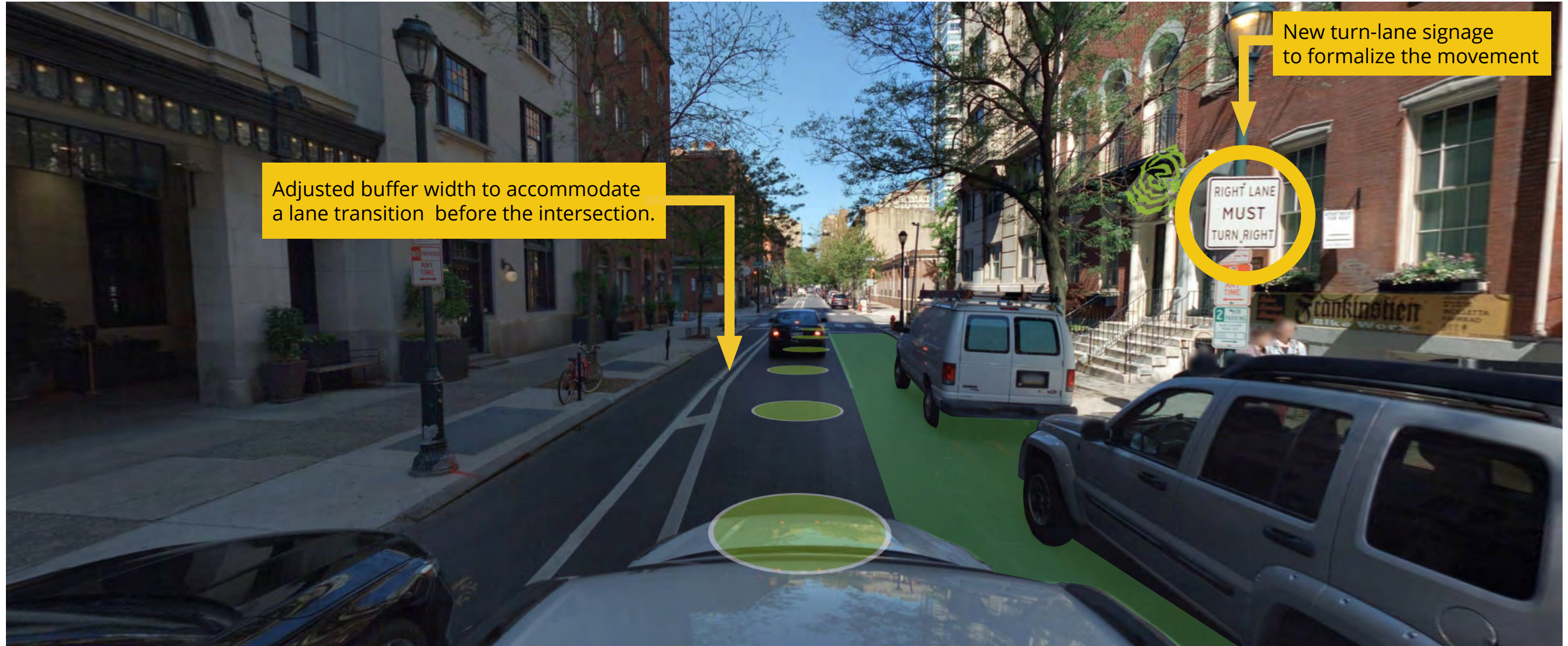
UNBEKNOWN TO THE MODEL...



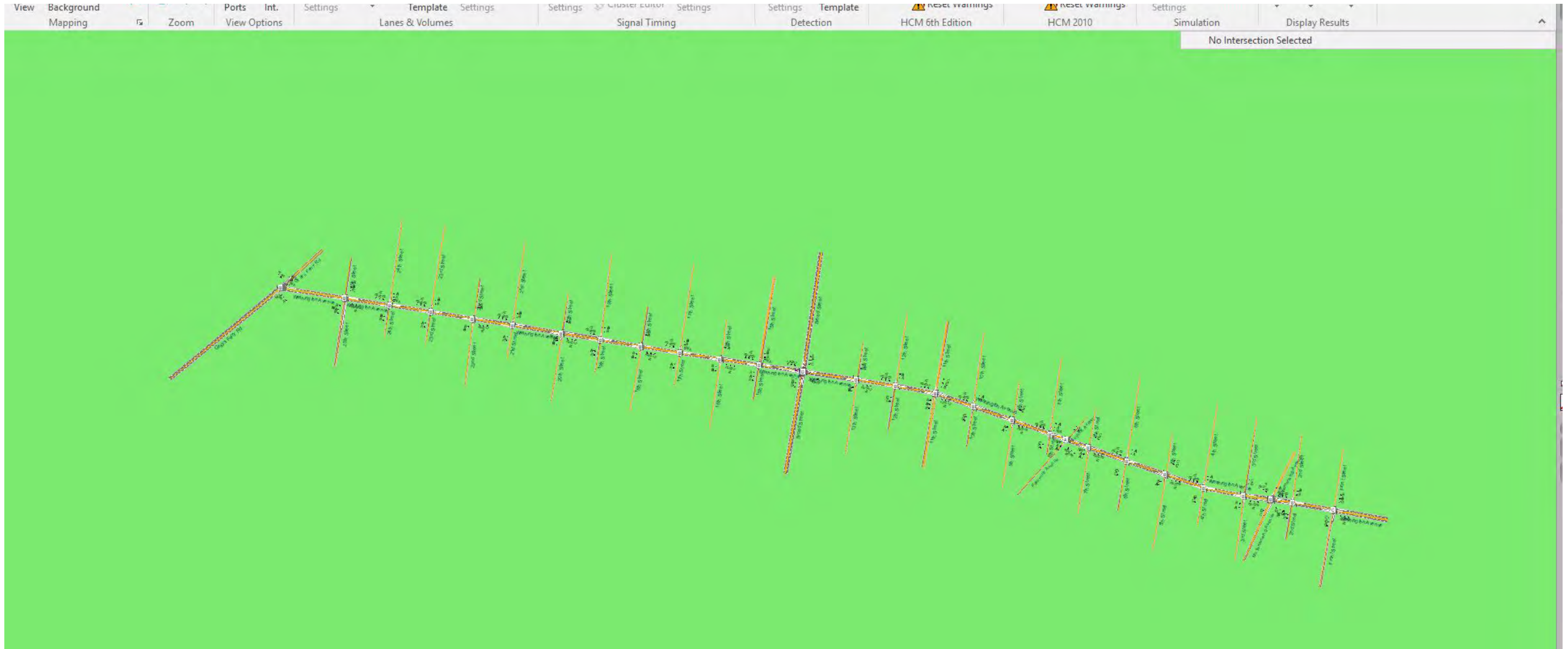
RETROACTIVE ADJUSTMENTS TO THE STREET



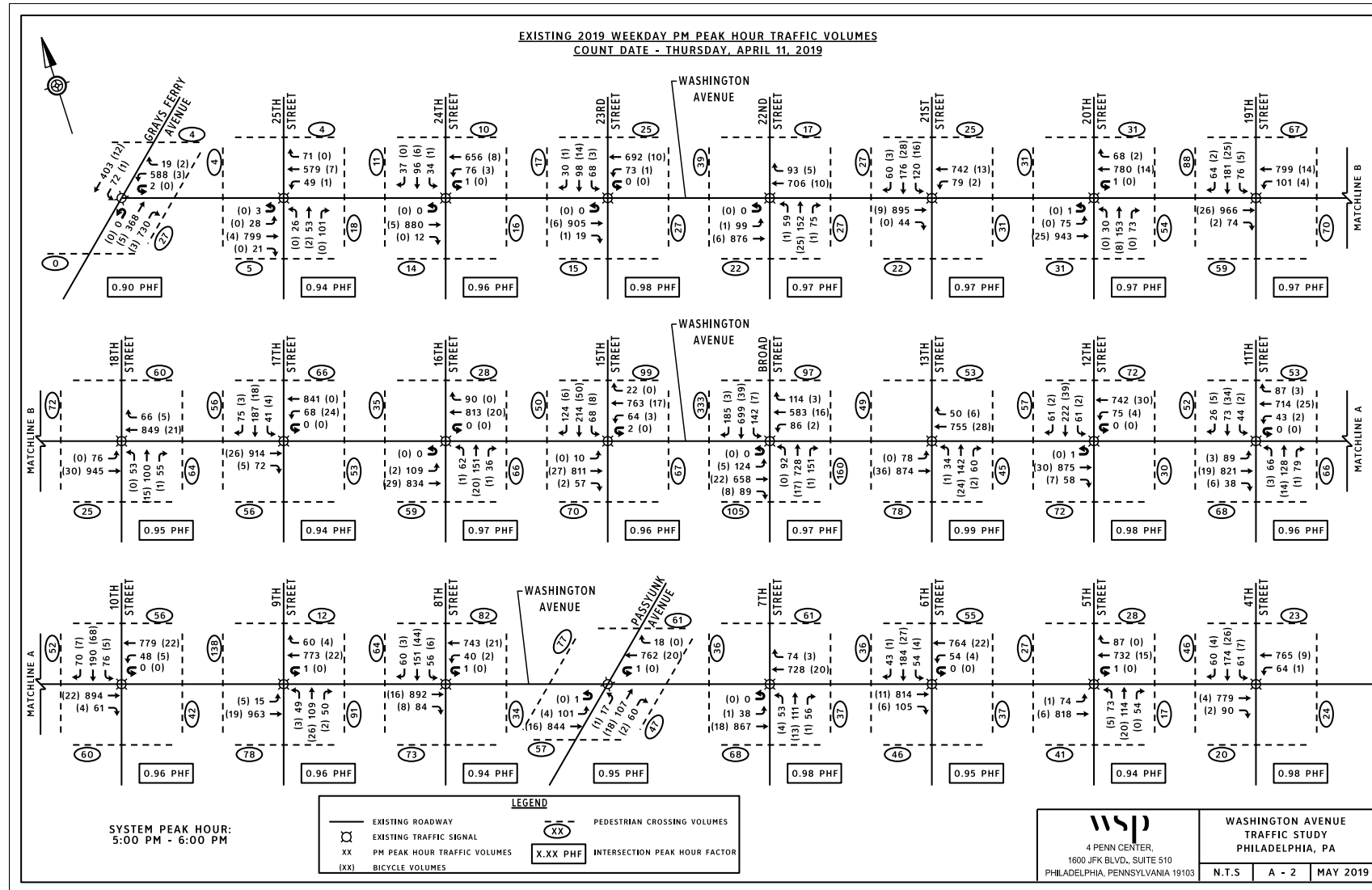
RETROACTIVE ADJUSTMENTS TO THE STREET



A MORE COMPLETE MICRO MODEL



WHAT DOES IT TAKE TO CREATE THAT?



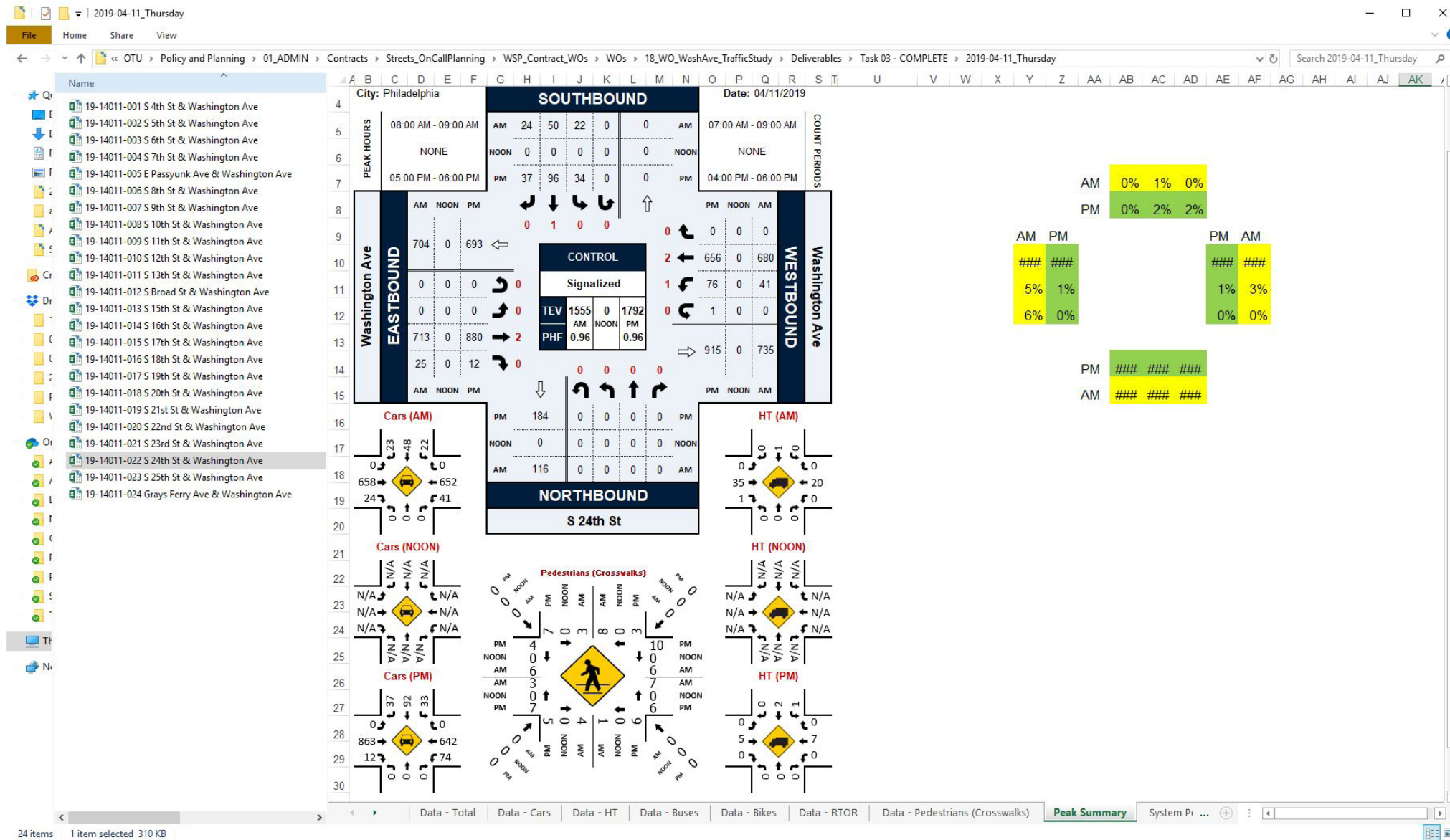
At left:

2019 Weekday PM Peak Hour Traffic Volumes
Washington Avenue, Grays Ferry to 4th Street

Also needed:

2019 Weekday AM Peak Hour Traffic Volumes
2019 Weekend Peak Hour Traffic Volumes

WHAT DOES IT TAKE TO CREATE THAT?



The existing Weekday AM Peak, Weekday PM Peak, and Weekend Peak traffic counts **must be input into the micro model** for each intersection.

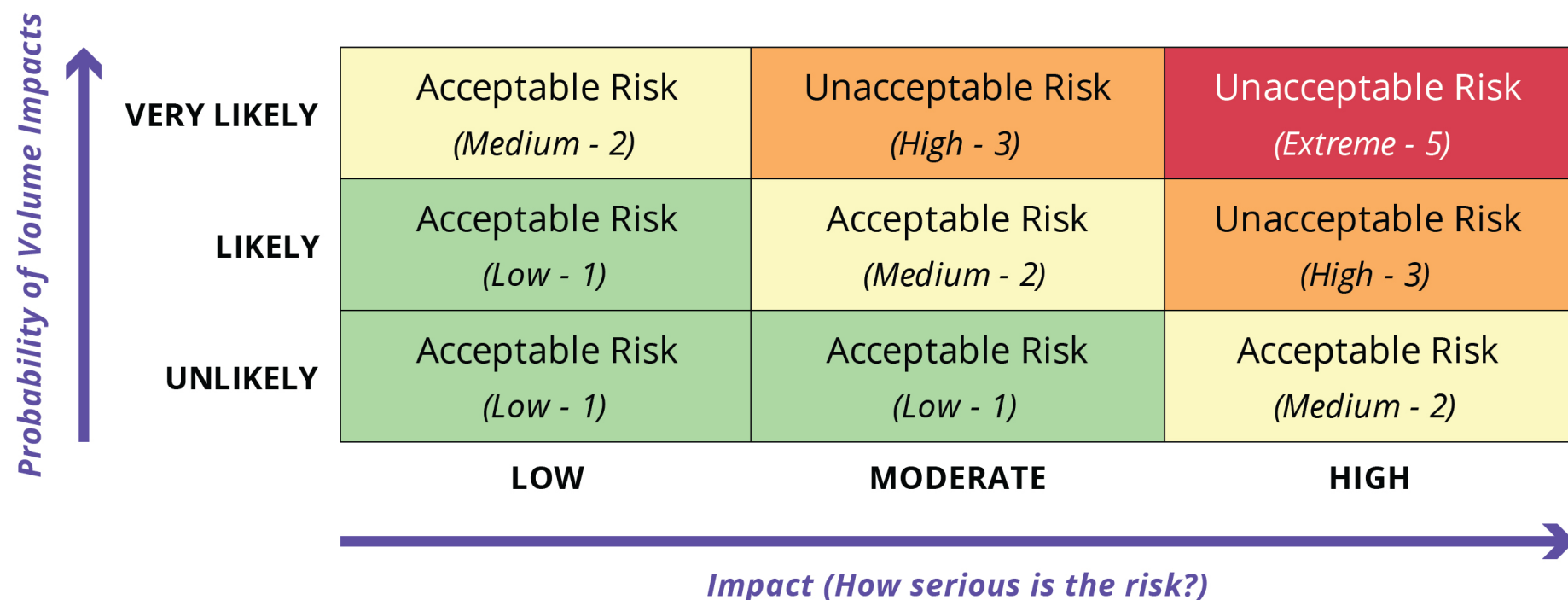
The model must be calibrated to reflect existing travel times, existing delay, and existing roadway uses.

Once the model is calibrated, you can make changes to see **how your design is likely to impact peak-hour traffic.**

RISKS OF TRAFFIC VOLUME PROJECTIONS

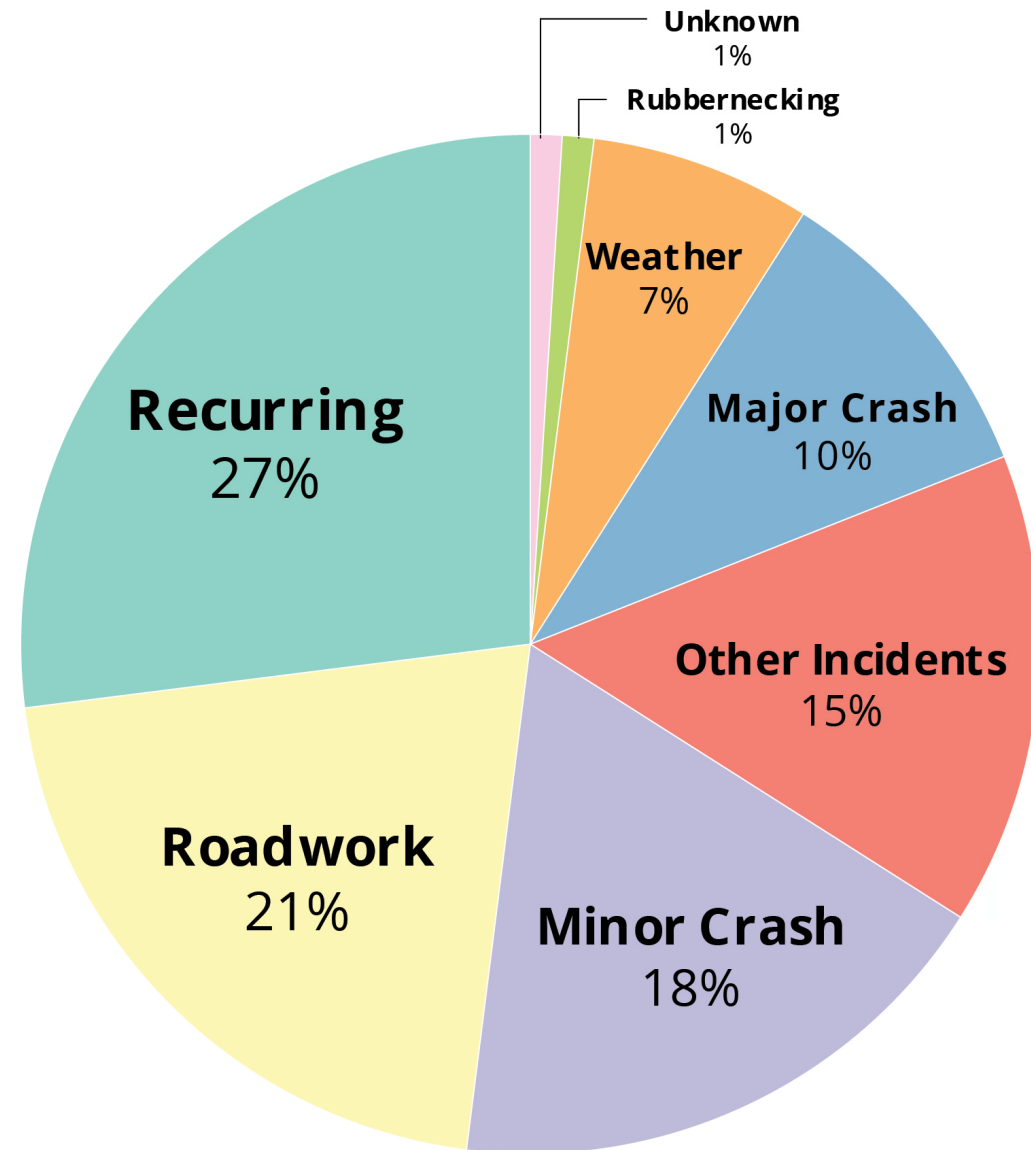
QUESTIONS TO ASK YOURSELF:

What is the probability that the volumes I'm using are not "normal"?
 What is the impact of using bad volumes for analysis?



Source: "What a Transportation Professional Needs to Know About Counts and Studies During a Pandemic," ITE Webinar, 2020.

CONGESTION PIE CHART (2019 DATA)



WHAT ARE YOU DESIGNING FOR?
WHAT ARE YOUR METRICS OF SUCCESS?

Source: "Rethinking Traffic Analysis Post-COVID 19," Steve Gault (PennDOT), 2021 MASITE Annual Meeting

SO WHAT DOES THIS MEAN FOR YOU?

SO WHAT DOES THIS MEAN FOR YOU?

“No models are good but some models are useful.”

SO WHAT DOES THIS MEAN FOR YOU?

“No models are good but some models are useful.”

Always look at your data in context.

SO WHAT DOES THIS MEAN FOR YOU?

“No models are good but some models are useful.”

Always look at your data in context.

When in doubt: **verify in the field.**



THANK YOU // QUESTIONS

Casey C. Ross

Presented virtually for the University of Pennsylvania Weitzman School of Design
Wednesday, October 6th, 2021