CAMBRIDGE SYSTEMATICS

Think Forward

Express Lanes Coding and PeMS Data Training

presented to

Caltrans District 4

presented by

Cambridge Systematics, Inc.

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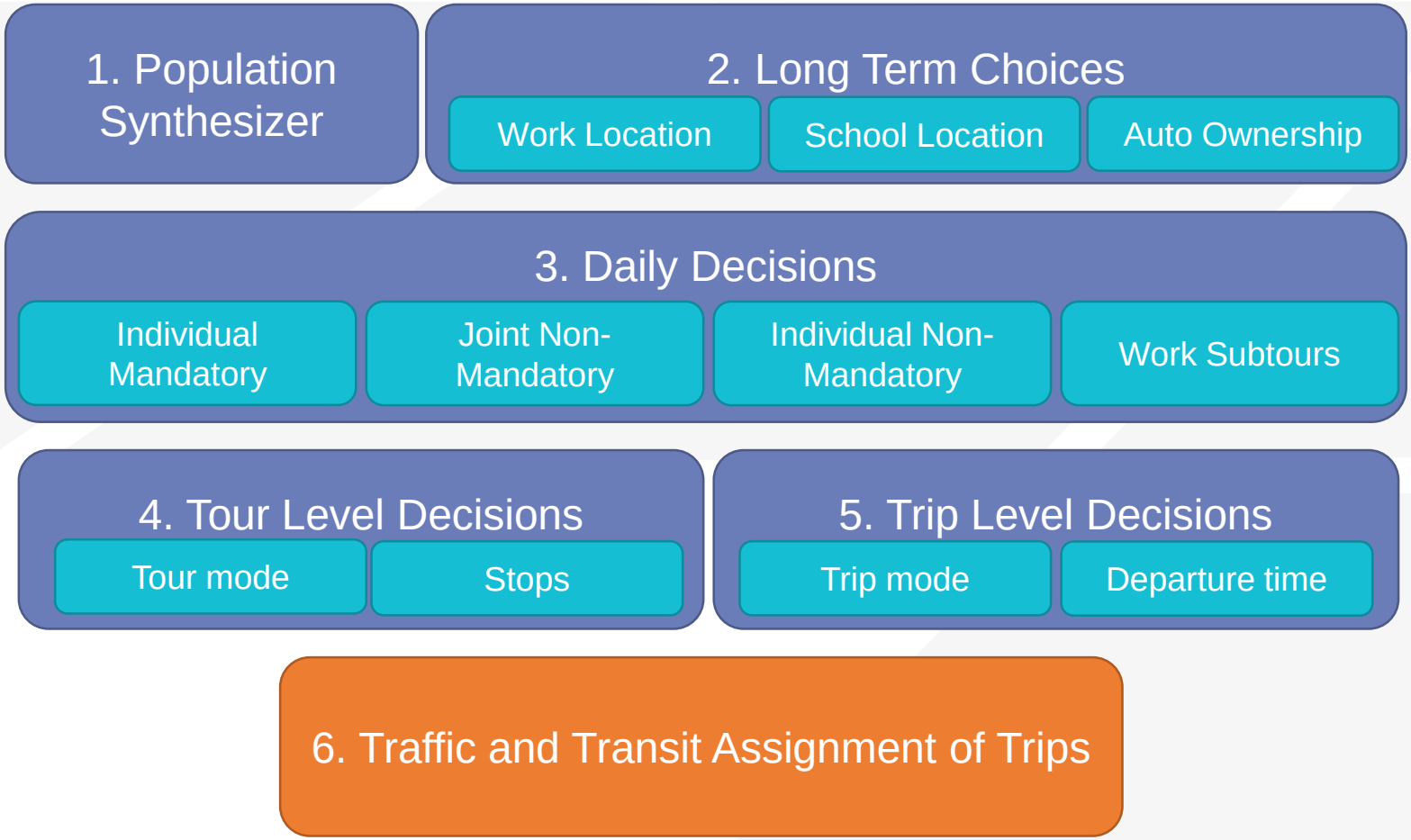
May 2, 2017

Activity-based Model (MTC)



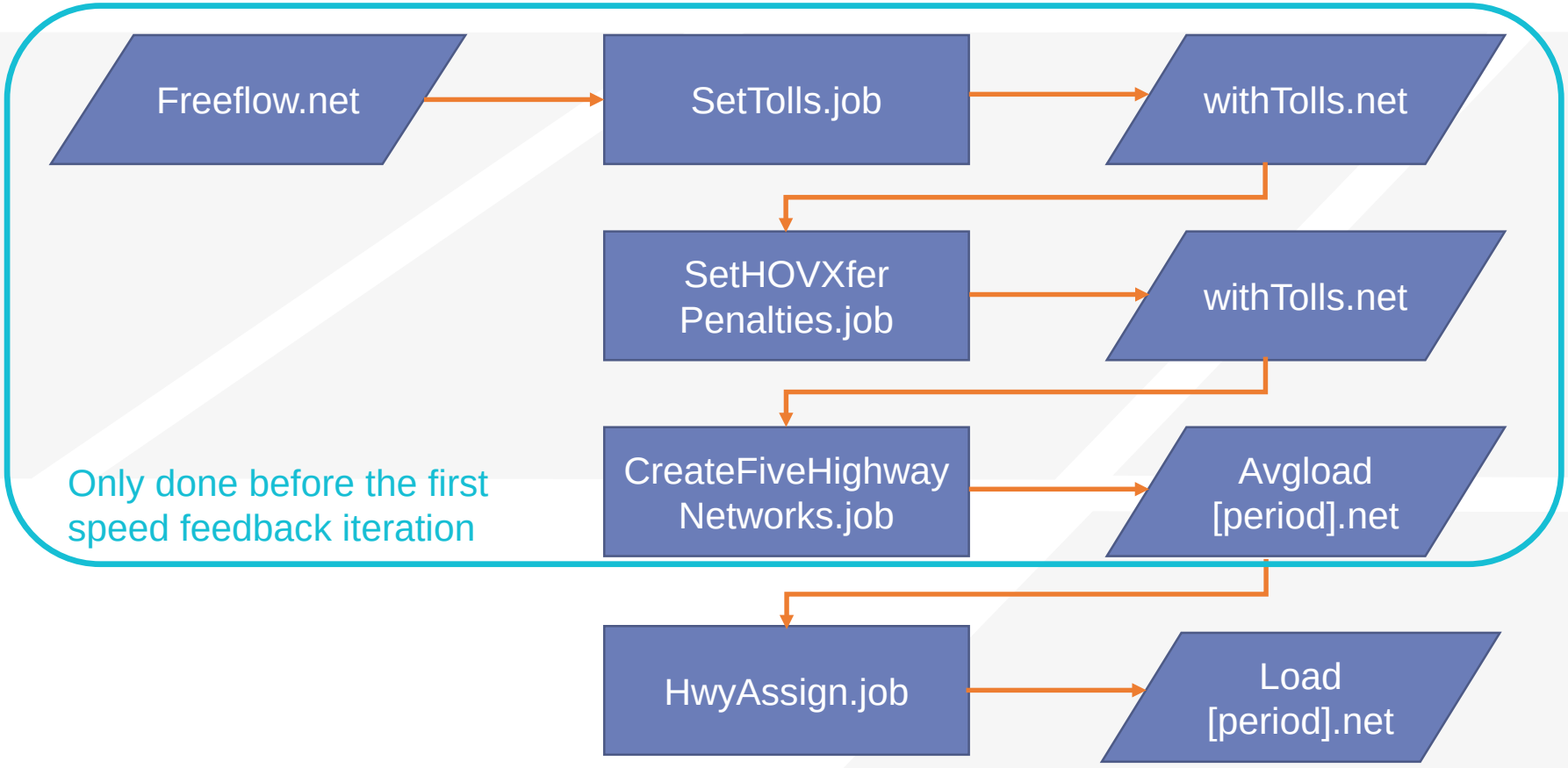
MTC Model

- Activity-based model with 9 Bay Area counties
- Current version is Travel Model One 0.6
  - Very recently updated
- Uses Plan Bay Area land use through 2040
- Used to evaluate projects for the RTP
- Large part of the model is a “black box”: many of the components are written in Java and Python and pre-compiled
- Highway and transit assignment are implemented in Citilabs Cube

Highway Assignment Periods

- Early AM, 3 am to 6 am;
- AM peak period, 6 am to 10 am;
- Midday, 10 am to 3 pm;
- PM peak period, 3 pm to 7 pm;
- Evening, 7 pm to 3 am

Highway Assignment



Uses relative gap of 0.0005 for AM and PM peak periods

Coding Express Lanes

- Add link if necessary
- Assign a TOLLCLASS value that is not used elsewhere
- Update SetTolls.job script with new TOLLCLASS and toll value
- Run the preprocessing and assignment scripts

In- Class Exercise

- Copy MTCnoExpLane folder to ExpLane folder
- Open freeflow.net
- Add links 9878-6112 and 6116-9879
  - Right-click on a neighboring link on Hwy 101 and select “Copy”
  - Right click somewhere else and select “Paste”
  - Drag link from A node to B node
- Make sure TOLLCLASS is set to 43
- Run SetTolls.job, SetHOVXferPenalties.job, CreateFiveHighwayNetworks.job

PeMS Data

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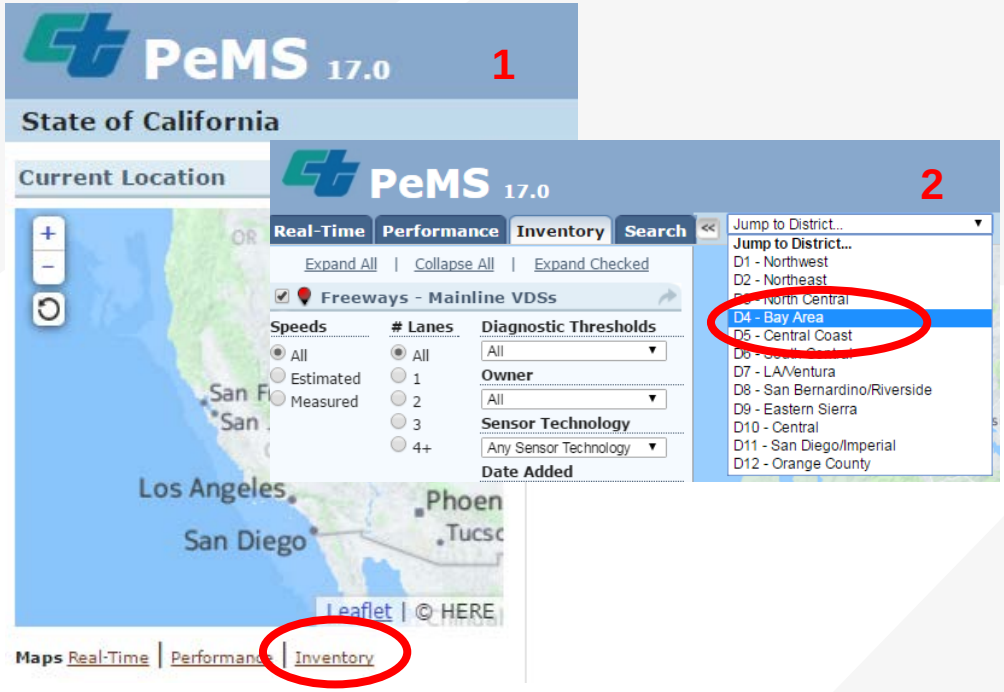
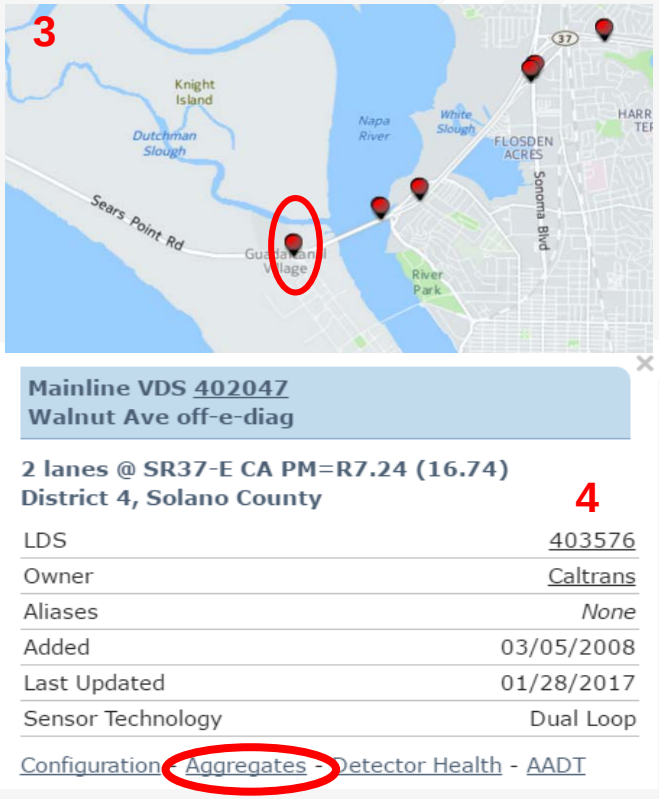
Outline

- PeMS Single Detector Counts Extraction
- Peak Period to Peak Hour Calculation
- PeMS Multiple Detectors Counts Extraction
- Analyzing corridor-level data
- Data Quality Control
- PeMS vs Model Volume

Single Detector Counts Extraction

1. Click “Inventory” on the left side
2. Select District 4 on “Jump to District…”
3. Locate and zoom in to SR 37 detectors and pick detectors on Mare Island
4. Click “Aggregates”





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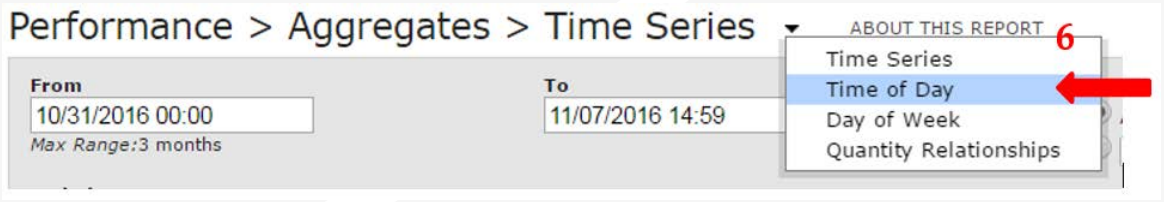
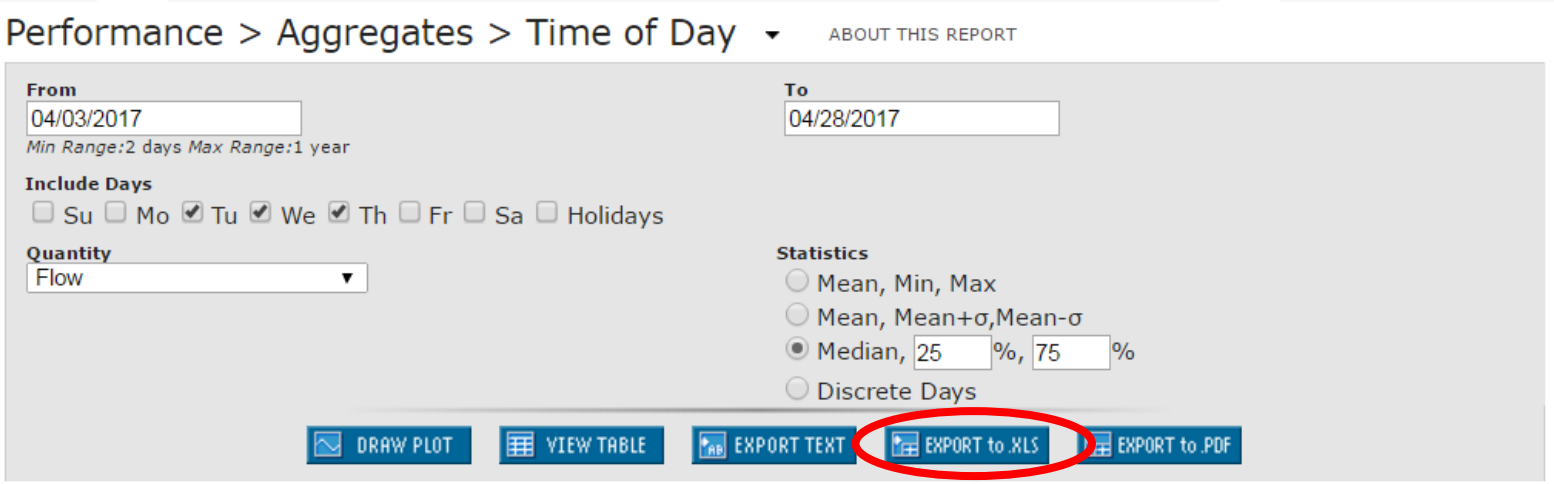
Single Detector Counts Extraction

5. Select “Time of Day” as the type of aggregates



6. Input selection time periods “4/3/2016 – 4/28/2016”, “Tu”, “We”, “Th” and use “Median, 25%, 75%”, and then select to “Export to XLS”



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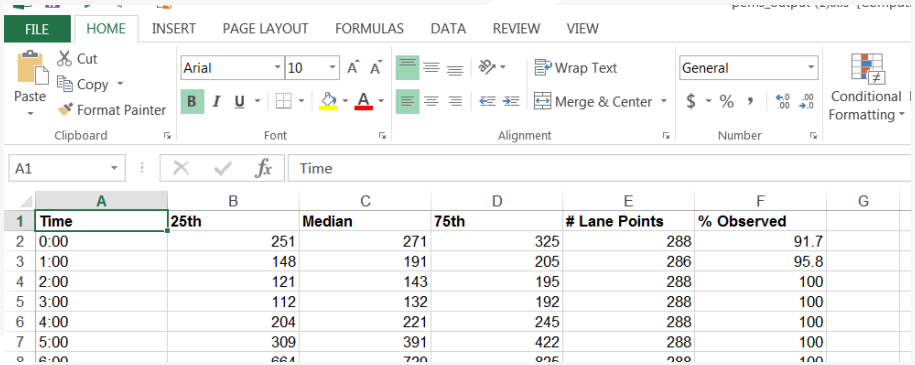
Single Detector Counts Extraction

7. Download and open .xls file

- Data table



	A	B	C	D	E	F	G
1	Time	25th	Median	75th	# Lane Points	% Observed	
2	0:00	251	271	325	288	91.7	
3	1:00	148	191	205	286	95.8	
4	2:00	121	143	195	288	100	
5	3:00	112	132	192	288	100	
6	4:00	204	221	245	288	100	
7	5:00	309	391	422	288	100	

- Detector information

PeMS Report Description		
	Report	Aggregates>Time of Day
	Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content
	Report generated	5/1/2017 13:15
	PeMS version	
Report Parameters		
	Parameter	**Value**
	Quantity	Flow
	Data	6,910 Lane Points
	Data Quality	97% Observed
	Segment Type	VDS
	Segment Name	Mainline VDS 402047 - Walnut Ave off-e-diag
	start date	4/3/2017 0:00
	end date	4/28/2017 23:59

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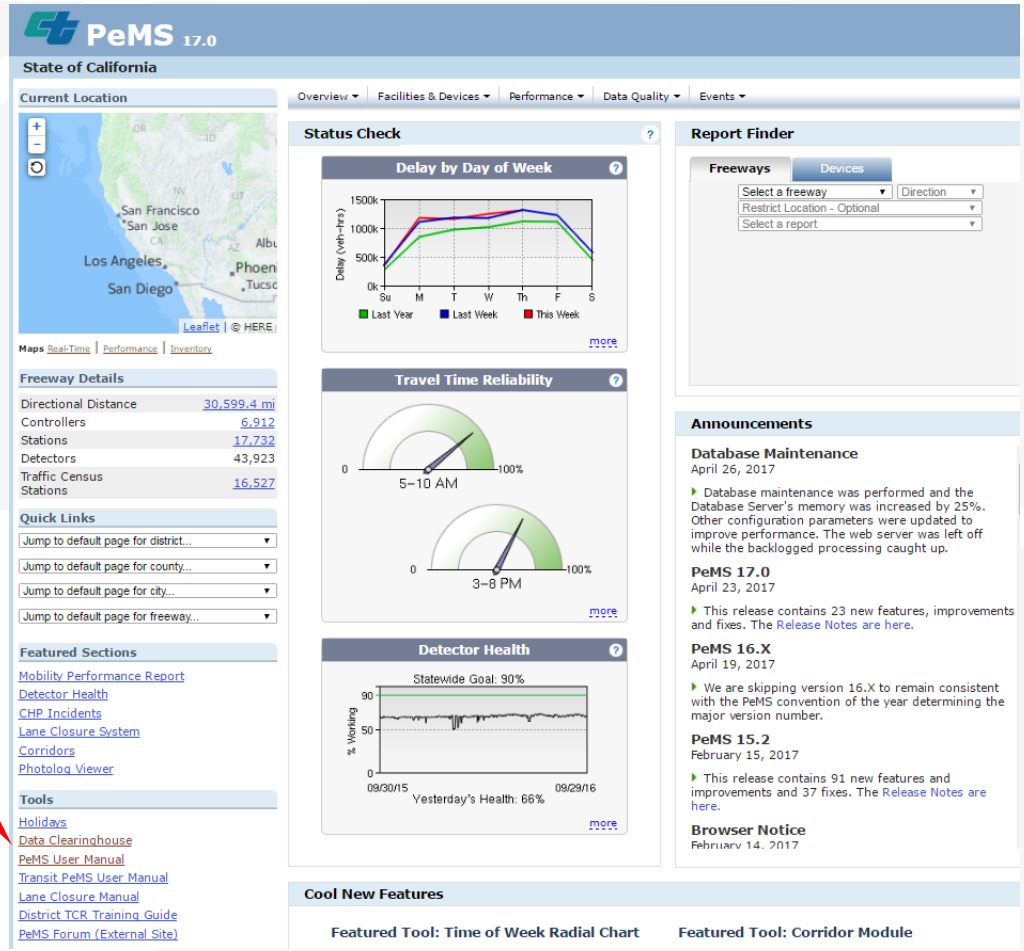
PP2PH Factor from Single Detector

- Definition
  - Peak period to(2) peak hour factor
    - Peak period: travel demand modeling key word
    - Peak hour: traffic impact study key word
- Calculation
  - $PP2PH = \frac{Peak\ Hour\ Count}{Peak\ Period\ Count}$
  - $PP2PH = \frac{1035}{729+1035+1058+1088} = 0.265$

				Data Quality	
Time	25th	Median	75th	# Lane Points	% Observed
00:00	251.0	271.0	325.0	288	91.7
01:00	148.0	191.0	205.0	286	95.8
02:00	121.0	143.0	195.0	288	100.0
03:00	112.0	132.0	192.0	288	100.0
04:00	204.0	221.0	245.0	288	100.0
05:00	309.0	391.0	422.0	288	100.0
06:00	664.0	729.0	825.0	288	100.0
07:00	1,004.0	1,035.0	1,083.0	288	100.0
08:00	1,007.0	1,058.0	1,126.0	288	100.0
09:00	1,068.0	1,088.0	1,111.0	288	100.0
10:00	869.0	1,048.0	1,065.0	288	96.5
11:00	946.0	1,064.0	1,138.0	288	98.6
12:00	1,085.0	1,134.0	1,169.0	288	86.8
13:00	1,202.0	1,305.0	1,342.0	288	88.2
14:00	1,342.0	1,392.0	1,427.0	288	91.7
15:00	1,255.0	1,311.0	1,378.0	288	91.7
16:00	1,234.0	1,255.0	1,286.0	288	93.8
17:00	1,167.0	1,222.0	1,284.0	288	100.0
18:00	1,154.0	1,192.0	1,235.0	288	100.0
19:00	1,030.0	1,090.0	1,173.0	288	100.0
20:00	812.0	915.0	1,026.0	288	96.5
21:00	731.0	749.0	782.0	288	99.3
22:00	532.0	561.0	611.0	288	100.0
23:00	371.0	396.0	451.0	288	96.5
Total				6,910	97.0

Multiple Detectors Count Extraction

To download multiple detector counts, click on Data Clearinghouse



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Multiple Detectors Count Extraction

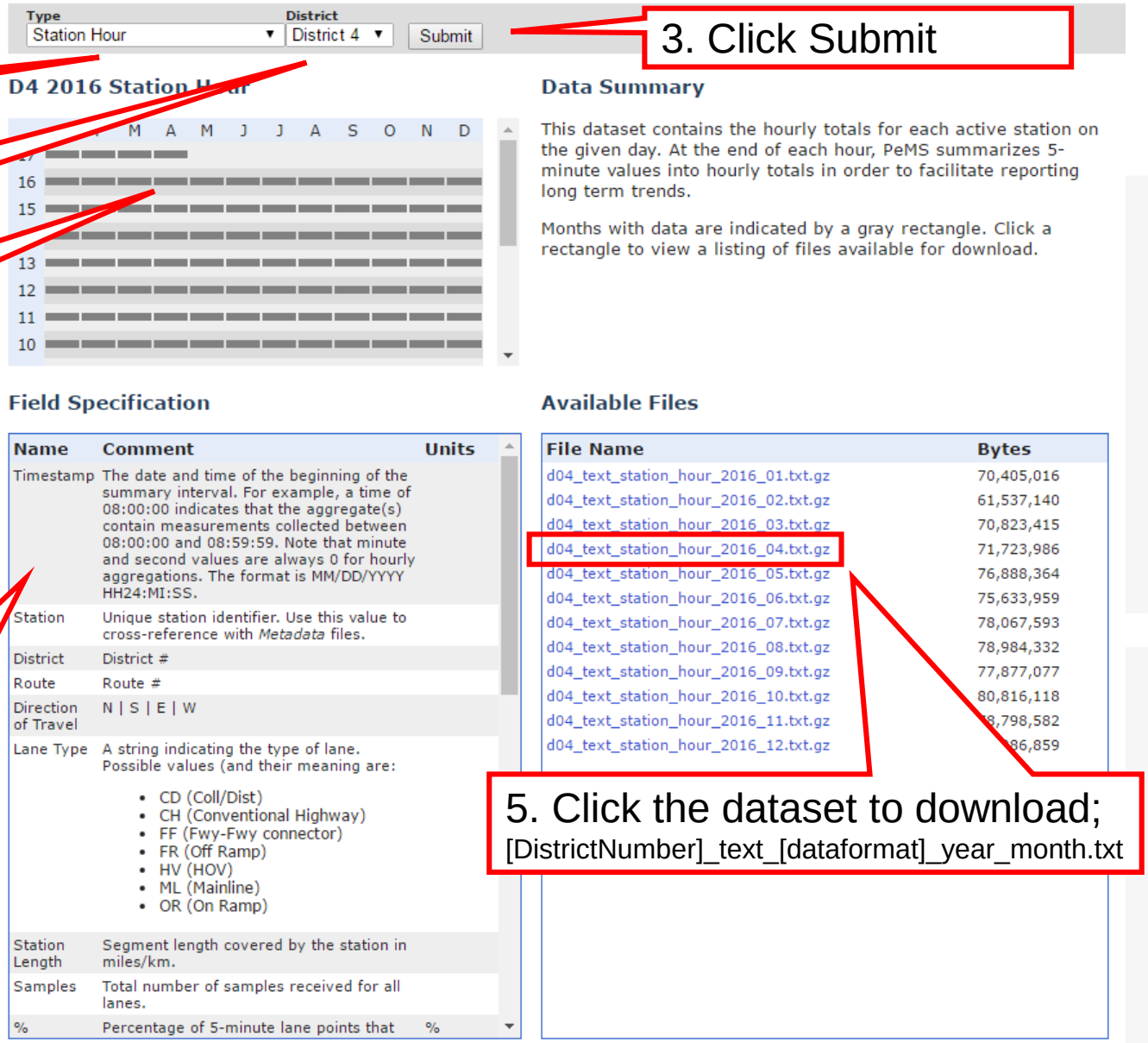
1. Select data format

2. Select district

4. Click the grey bar of year(col) and month(row) to locate dataset

Dataset header

- Field1: timestamp
- Field2: station number
- Field4: route #
- Field5: route direction
- Field6: detector type
- Field9: observation%
- Field10: total flow



5. Click the dataset to download;
[DistrictNumber]_text_[dataformat]_year_month.txt

Analyzing Downloaded Data in MS Access

- Downloaded data contains
  - All days in the specific month
  - All detectors in the district
  - All corridors in the district
  - All detector types in the direct
- Import into MS Access, which is a database tool
- Create a query to filter data as necessary
  - Facility name, direction, etc.
- Reference video
  - PeMS Data Query By Using ACCESS.mp4

Calculate Peak Period to Peak Hour Factor

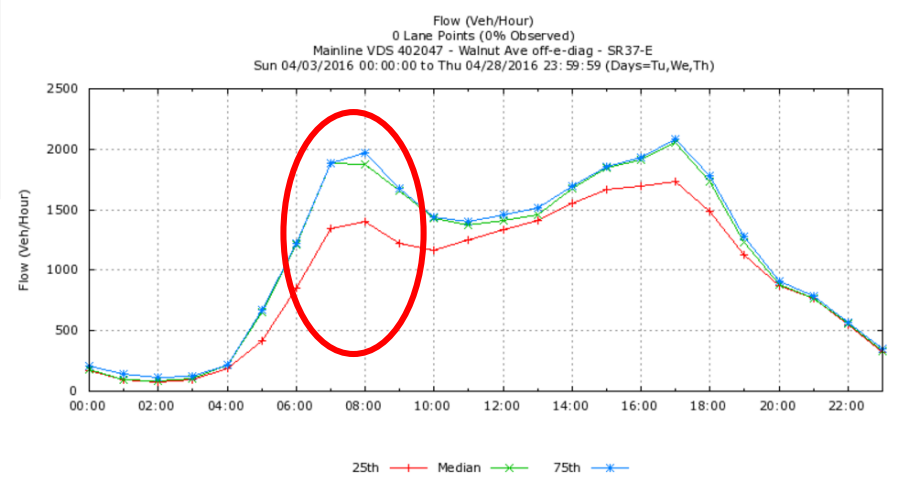
- Open the file created by Access in Excel
- Add columns and calculate weekday and hour for each record
- Use a pivot table to summarize the data by hour
  - Row: detectors
  - Column: hours
  - Filter: weekday and data quality
- Reference video
  - Summarize PeMS Data By Using Excel PivotTable.mp4

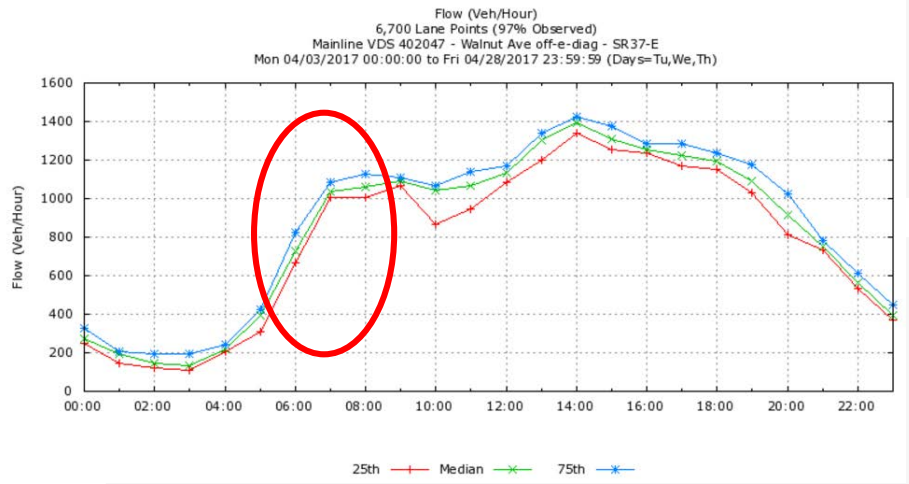
Data Quality Control

- Data Quality Measures
  - Statistics – 25%, Median, 75%
  - % Observed
- Bad Data vs Good Data

Bad Data vs Good Data

- Data Plot
  - Bad data: 4/4/2016 – 4/28/2016
  - Good data: 4/4/2017 – 4/28/2017





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Bad Data vs Good Data

- Data Table
  - Bad data: 0% Observation
  - Good data: > 80% Observation

				Data Quality	
Time	25th	Median	75th	# Lane Points	% Observed
00:00	169.0	176.0	213.0	288	0.0
01:00	96.0	97.0	139.0	288	0.0
02:00	80.0	82.0	112.0	288	0.0
03:00	96.0	101.0	121.0	288	0.0
04:00	193.0	220.0	222.0	288	0.0
05:00	419.0	650.0	672.0	288	0.0
06:00	852.0	1,209.0	1,221.0	288	0.0
07:00	1,349.0	1,885.0	1,887.0	288	0.0
08:00	1,404.0	1,878.0	1,971.0	288	0.0
09:00	1,220.0	1,656.0	1,680.0	288	0.0
10:00	1,169.0	1,434.0	1,444.0	288	0.0
11:00	1,250.0	1,370.0	1,397.0	288	0.0
12:00	1,332.0	1,413.0	1,454.0	288	0.0
13:00	1,413.0	1,460.0	1,519.0	288	0.0
14:00	1,555.0	1,676.0	1,695.0	288	0.0
15:00	1,667.0	1,844.0	1,858.0	288	0.0
16:00	1,691.0	1,911.0	1,934.0	288	0.0
17:00	1,735.0	2,056.0	2,079.0	288	0.0
18:00	1,489.0	1,735.0	1,785.0	288	0.0
19:00	1,124.0	1,235.0	1,275.0	288	0.0
20:00	875.0	878.0	905.0	288	0.0
21:00	766.0	767.0	790.0	288	0.0
22:00	549.0	560.0	567.0	288	0.0
23:00	320.0	333.0	355.0	288	0.0
Total				6,912	0.0

				Data Quality	
Time	25th	Median	75th	# Lane Points	% Observed
00:00	251.0	271.0	325.0	288	91.7
01:00	148.0	191.0	205.0	286	95.8
02:00	121.0	143.0	195.0	288	100.0
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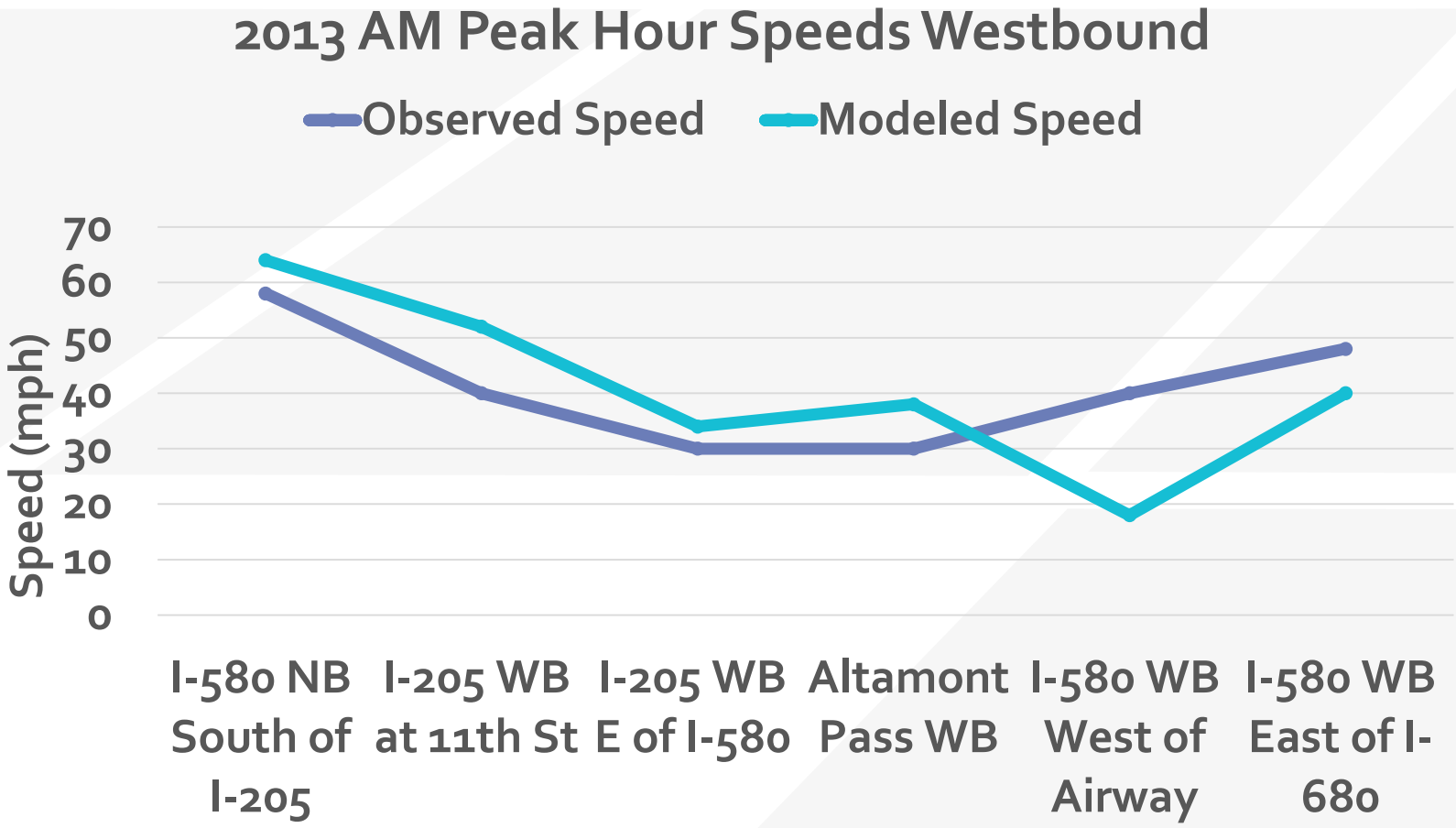
Total				6,910	97.0

PeMS vs ACTC Model Volume



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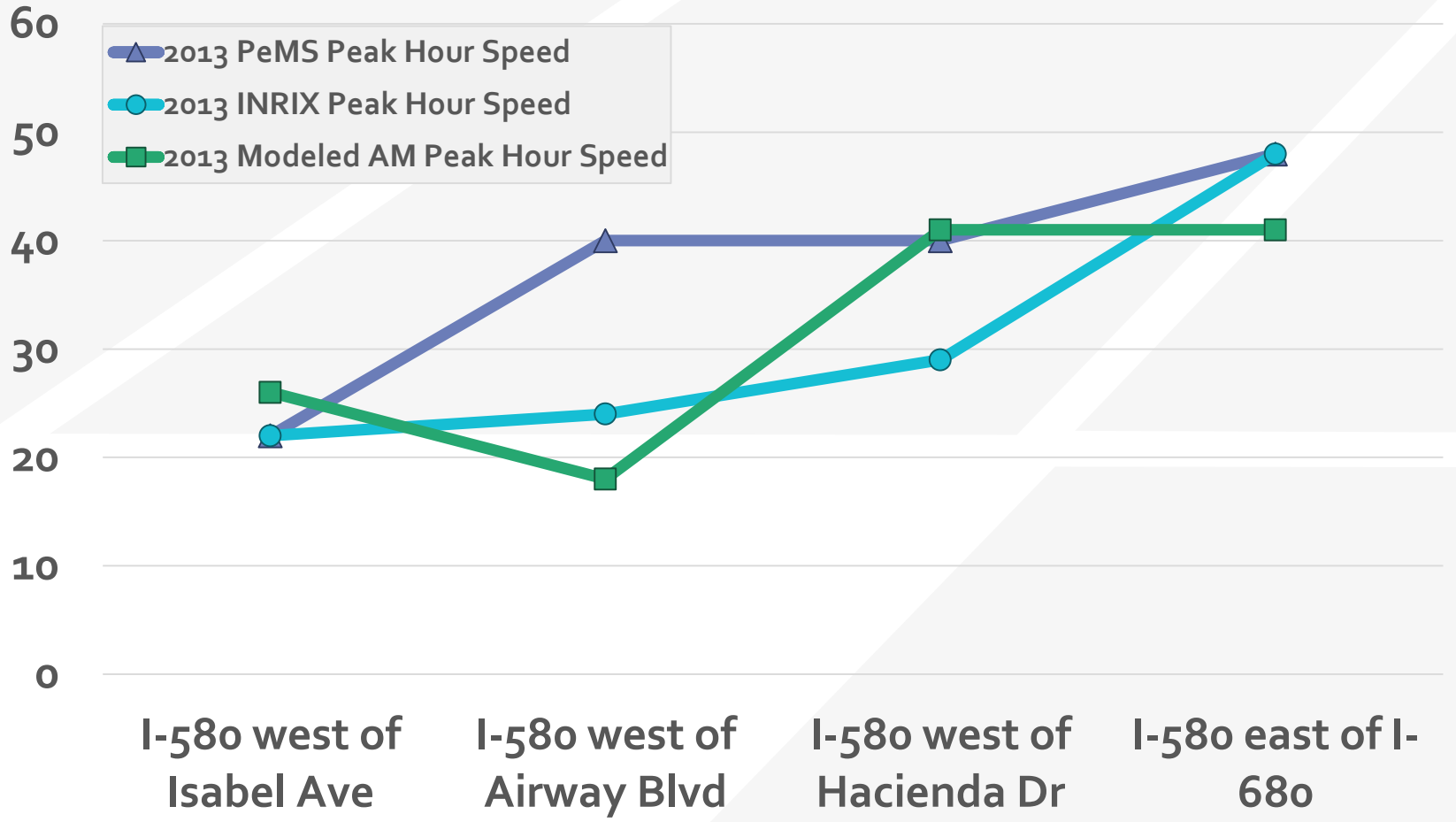
PeMS vs INRIX vs ACTC Model



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