QUEUE ANALYSIS GUIDELINES

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INTRODUCTION

PURPOSE

The Interstate Highways Congestion Policy (IHCP) establishes statewide requirements for planning, evaluating, reviewing, approving, and implementing work zone–related restrictions on Indiana's interstate system. These restrictions can significantly affect safety, mobility, and overall system performance. When properly planned and executed, they enable essential construction, maintenance, utility, and operational activities to proceed while minimizing congestion and reducing the likelihood of queue-related crashes.

The intent of this document is to formally define INDOT's expectation for how traffic count data should be obtained, adjusted and grown, how to select the capacity for a restriction, and how queue analyses should be performed to model the impacts of the restriction in the context of the IHCP.

RELATIONSHIP TO THE IHCP

This guidance document serves as the procedural companion to the IHCP. It consolidates and expands information formerly contained within prior versions of the Interstate Highways Congestion Policy (IHCP), which focused primarily on obtaining traffic data, adjusting and growing the data, and queue analysis. With the 2026 IHCP, that material has been moved into this stand-alone guidance document.

SCOPE AND APPLICABILITY

This guidance is intended for consultants, contractors, permittees, INDOT staff, and any entity responsible for planning, proposing, or executing restrictions on interstates .

Nothing in this guidance document supersedes the governing policies, standards, regulations, or FHWA requirements that apply to work zones. In any instance of conflict, those governing requirements prevail.

WEEKDAYS AND WEEKENDS

For the purposes of the IHCP, Weekdays are defined as Monday, Tuesday, Wednesday, and Thursday. Weekends are defined as Friday, Saturday and Sunday. For the purposes of IHCP-related analyses, a minimum of two 24-hour Weekday counts are modeled together as an "Average Weekday." Fridays, Saturdays, and Sundays must each be analyzed separately.

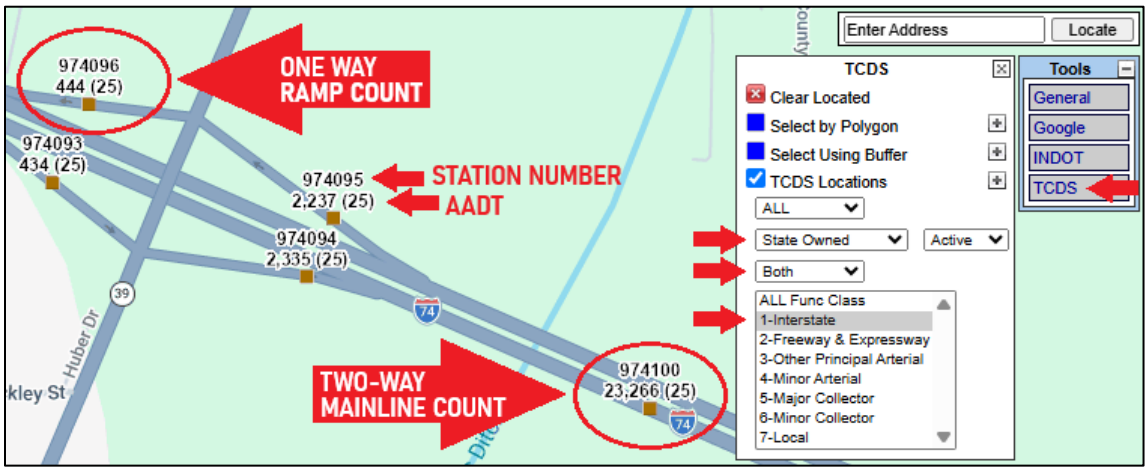
OBTAINING TRAFFIC COUNTS

Traffic counts for the Interstate Highway segments of interest may be retrieved from the INDOT Traffic Count Database System (indot.ms2soft.com/tcds).

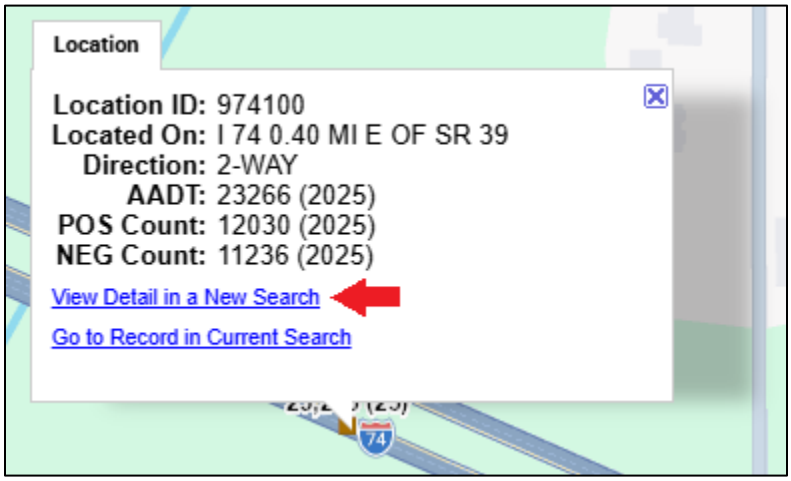
If the traffic counts are from a different source, the source should be cited and information on how the counts were generated should be provided.

NAVIGATING TCDS

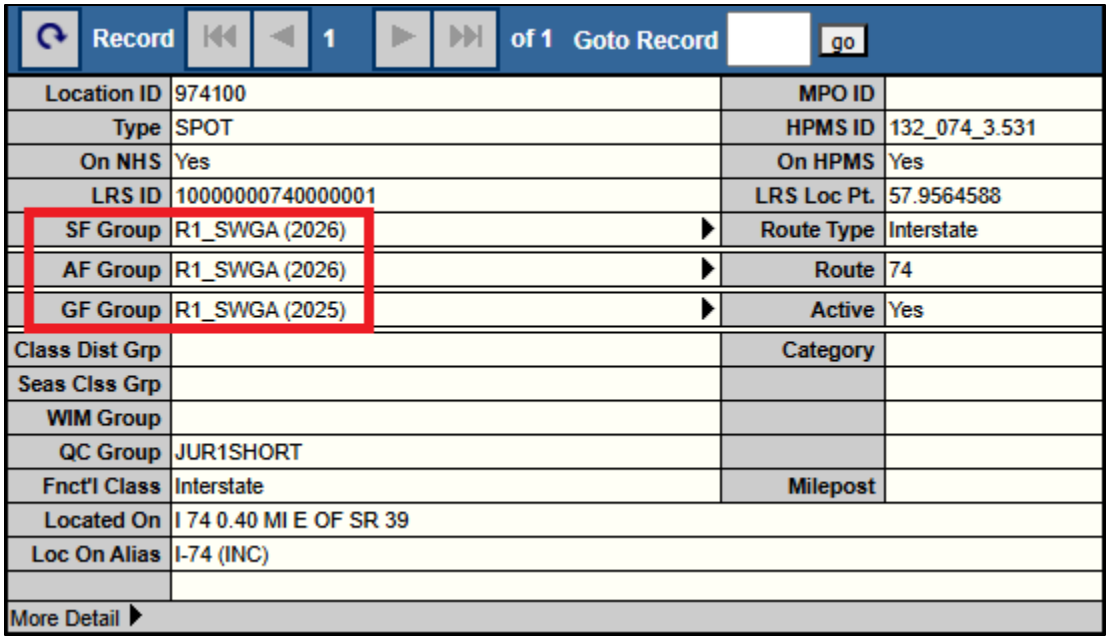
Use the map interface to navigate to the segment of interest.



Click on station and then click on link to view the detail.



In the Station Data panel on the left, note the group designation.

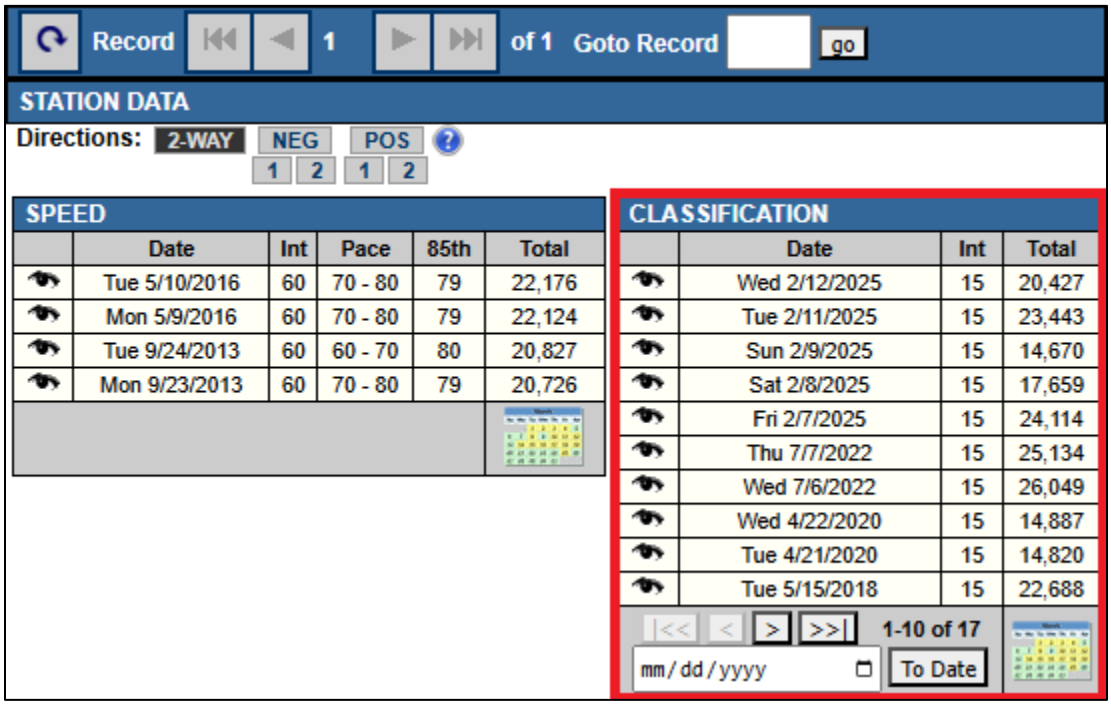


Record	1	of 1	Goto Record	go

Location ID	974100	MPO ID	
Type	SPOT	HPMS ID	132_074_3.531
On NHS	Yes	On HPMS	Yes
LRS ID	10000000740000001	LRS Loc Pt.	57.9564588
SF Group	R1_SWGA (2026)	Route Type	Interstate
AF Group	R1_SWGA (2026)	Route	74
GF Group	R1_SWGA (2025)	Active	Yes
Class Dist Grp		Category	
Seas Clss Grp			
WIM Group			
QC Group	JUR1SHORT		
Fnct'l Class	Interstate	Milepost	
Located On	I 74 0.40 MI E OF SR 39		
Loc On Alias	I-74 (INC)		

More Detail

Scroll down to the in the Classification section and click an eye icon to review a traffic count.



Record	1	of 1	Goto Record	go

STATION DATA

Directions: 2-WAY NEG POS 1 2 1 2

SPEED

	Date	Int	Pace	85th	Total
	Tue 5/10/2016	60	70 - 80	79	22,176
	Mon 5/9/2016	60	70 - 80	79	22,124
	Tue 9/24/2013	60	60 - 70	80	20,827
	Mon 9/23/2013	60	70 - 80	79	20,726

CLASSIFICATION

	Date	Int	Total
	Wed 2/12/2025	15	20,427
	Tue 2/11/2025	15	23,443
	Sun 2/9/2025	15	14,670
	Sat 2/8/2025	15	17,659
	Fri 2/7/2025	15	24,114
	Thu 7/7/2022	15	25,134
	Wed 7/6/2022	15	26,049
	Wed 4/22/2020	15	14,887
	Tue 4/21/2020	15	14,820
	Tue 5/15/2018	15	22,688

|<< < > >>| 1-10 of 17

mm/dd/yyyy To Date

Click the Single Count Class report to download the data for the selected count. The Line Graph offers a plot of the hourly raw counts that can be used to identify trends.

Classification Report

Directions: 2-WAY | NEG 1 2 | POS 1 2

Count Navigation: |<< < > >>| Display Class Numbers: ☐ Count Type: CLASS

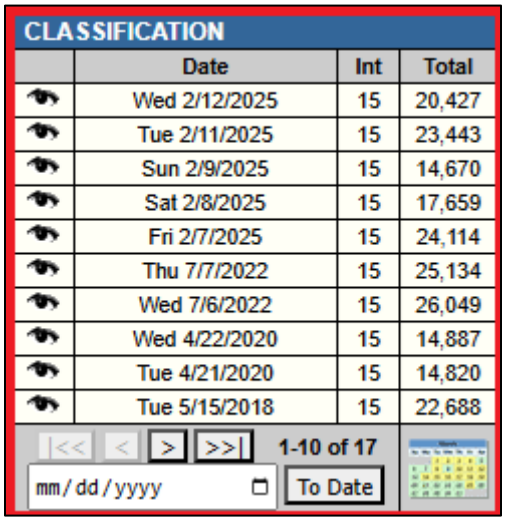
FHWA Classification

Start Time	Motor cycle	Car	Pick up	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	Unk	Err	TOTAL
12:00 AM	0	84	2	0	0	9	0	0	118	0	0	0	0	0	0	213
1:00 AM	0	44	4	3	0	6	0	0	127	0	0	0	0	0	0	184
2:00 AM	0	80	1	0	0	3	0	0	104	0	0	0	0	0	0	188
3:00 AM	0	79	3	0	0	10	0	0	89	0	0	0	0	0	0	181
4:00 AM	0	204	9	0	0	12	0	0	144	0	0	0	0	0	0	369
5:00 AM	0	490	72	1	0	19	0	0	76	0	0	0	0	0	0	658
6:00 AM	0	899	112	0	0	45	0	0	248	0	0	0	0	0	0	1304
7:00 AM	0	1029	245	0	0	54	0	0	243	0	0	0	0	0	0	1571
8:00 AM	0	673	270	4	0	44	0	0	251	0	0	0	0	0	0	1242
9:00 AM	1	538	233	1	0	48	0	0	383	0	0	0	0	0	0	1204
10:00 AM	0	489	180	1	0	50	0	0	331	0	0	0	0	0	0	1051
11:00 AM	0	464	197	1	0	52	0	0	367	0	0	0	0	0	0	1081
12:00 PM	0	585	184	0	0	72	0	0	358	0	0	0	0	0	0	1199
1:00 PM	0	512	257	2	0	65	0	0	299	0	0	0	0	0	0	1135
2:00 PM	0	615	250	0	0	45	0	0	320	0	0	0	0	0	0	1230
3:00 PM	1	758	345	4	0	51	0	0	291	0	0	0	0	0	0	1450
4:00 PM	0	1011	315	3	0	54	0	0	346	0	0	0	0	0	0	1729
5:00 PM	0	848	324	0	0	35	0	0	290	0	0	0	0	0	0	1497
6:00 PM	0	526	106	1	0	21	0	0	251	0	0	0	0	0	0	905
7:00 PM	0	391	29	1	0	9	0	0	224	0	0	0	0	0	0	654
8:00 PM	0	272	5	1	0	27	0	0	166	0	0	0	0	0	0	471
9:00 PM	0	195	3	0	0	9	0	0	165	0	0	0	0	0	0	372
10:00 PM	0	158	6	0	0	8	0	0	129	0	0	0	0	0	0	301
11:00 PM	0	106	5	0	0	45	0	0	82	0	0	0	0	0	0	238
TOTAL	2	11050	3157	23	0	793	0	0	5402	0	0	0	0	0	0	20427

Count Navigation: |<< < > >>|

View Calendar | Bar Graph | Line Graph | View in Excel | Monthly Report | Weekly Class Report | Single Count Class Report

SELECTING COUNTS



CLASSIFICATION

	Date	Int	Total
	Wed 2/12/2025	15	20,427
	Tue 2/11/2025	15	23,443
	Sun 2/9/2025	15	14,670
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	Fri 2/7/2025	15	24,114
	Thu 7/7/2022	15	25,134
	Wed 7/6/2022	15	26,049
	Wed 4/22/2020	15	14,887
	Tue 4/21/2020	15	14,820
	Tue 5/15/2018	15	22,688

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mm/dd/yyyy To Date

Typically, the Classification table will have many counts from which to select. Select the most recent counts that meet the following requirements:

- Complete traffic counts from the most recent year available should be used.
- For weekday counts, select counts that provide 48 hours of data.
- For weekend counts, use 24 hour counts.
- For mainline counts, ensure data is 2-way. 1-way data indicates a ramp or collector/distributers.
- Hourly traffic volumes should be used.
- Ideally counts are close together within the same month and year. (If not, it may require manually adjusting your traffic counts.)

Early consultation with the District Traffic Office is recommended to gather input on preferred stations and the selection of specific counts.

CHECK THE DAYS OF THE WEEK

Ensure the dates for the data in the downloaded file are the days of the week you were seeking and intended to download. A quick and easy way to check this is to format Column A of the spreadsheet as a “long date.” Then click on a date in column A to edit it and press enter. The date should be reformatted to a long-date format, which shows the day of the week.

CHECK THE HOURS OF THE COUNTS

Ensure that for weekday data, there is at least 48 hours of data and that Weekend data includes 24-hour counts for Friday, Saturday and Sunday each.

ESTIMATING TRAFFIC DEMAND

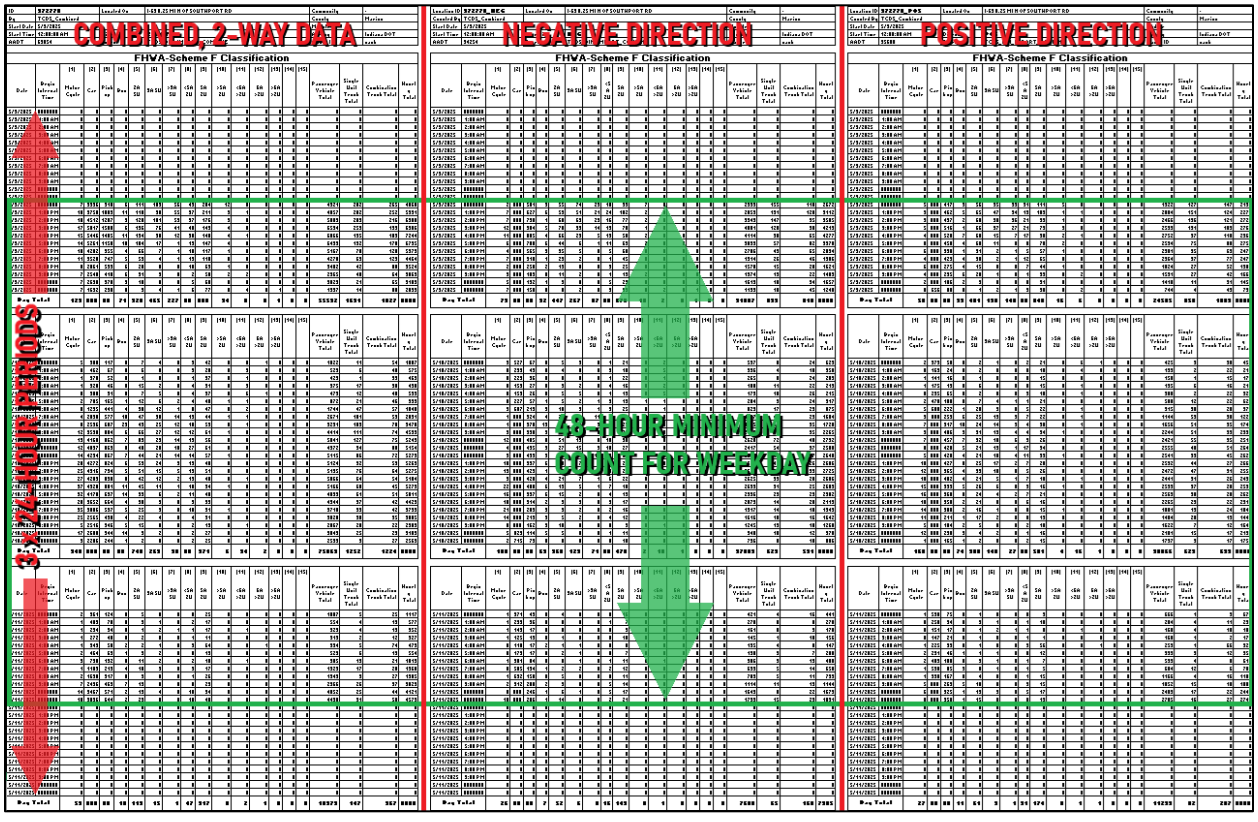
Traffic counts estimate the traffic demand for a particular segment. However, before the data is used in modeling, the raw traffic counts as downloaded from TCDS must be converted to passenger car equivalents (PCE) and adjusted.

WHEN THE CONVERSION AND ADJUSTMENT PROCESS IS NEEDED

Depending on the restriction being modeled and the tool used, the process to convert raw traffic counts to PCEs and adjust them may be handled by the tool. For cases where the tool does not or for cases requiring advanced combining of traffic data from different stations, this process details the necessary steps to properly convert and adjust the traffic counts manually. For example, the Queue Analysis Tool (QAT) spreadsheet used for a mainline lane or shoulder restriction handles the conversion covered by this section.

TCDS TRAFFIC COUNT DATA TABLE FORMAT

Inspecting downloaded class count data, you should see something similar to the following.



The spreadsheet is broken into 3 vertical sections: combined, 2-way data, negative direction data, and positive direction. Below the headers, the data is usually broken down into 2 or 3 24-hour periods. For most analyses, we are interested in the separate positive and negative directional counts, not the combined 2-way counts. For weekday counts, ensure you have 48 hours of data. For weekends (Fridays, Saturdays and Sundays), obtain 24-hour counts if data is available. Further

below, these instructions provide a methodology for dealing with the case where a segment does not have weekend data.

Each of the hourly data tables has the following header that shows the FHWA-Scheme F Classifications.

FHWA-Scheme F Classification																			
Date	Begin Interval Time	(1) Motor Cycle	(2) Car	(3) Pick up	(4) Bus	(5) 2A SU	(6) 3A SU	(7) >3A SU	(8) <5A 2U	(9) 5A 2U	(10) >5A 2U	(11) <6A >2U	(12) 6A >2U	(13) >6A >2U	(14)	(15)	Passenger Vehicle Total	Single Unit Truck Total	Combination Truck Total	Hourly Total

The following table highlights the classifications and the bin numbers assigned to each type, which are used in to convert the raw counts to PCEs. Bin 14 contains trucks that were not classifiable into bins 4 through 13. Bin 15 contains unclassified vehicles and may contain both passenger cars and trucks. In the conversion process, a portion of Bin 15 is assigned to passenger cars and the a portion to trucks.

PCE Grouping	BIN	FHWA Classification
Passenger Cars	(1)	Motorcycle
	(2)	Car
	(3)	Pick up
Trucks	(4)	Bus
	(5)	2A SU
	(6)	3A SU
	(7)	>3A SU
	(8)	<5A 2U
	(9)	5A 2U
	(10)	>5A 2U
	(11)	<6A >2U
	(12)	6A >2U
	(13)	>6A >2U
	(14)	Uknown
	(15)	Error

CONVERTING RAW TRAFFIC COUNTS TO PASSENGER CAR EQUIVALENTS

The following computational method is used to convert raw hourly traffic counts (vehicles) into Passenger Car Equivalents (PCEs). Because modeling is performed on an hourly basis, this conversion is also performed hourly. This method assumes that the traffic data has been sorted using the FHWA-Scheme F classification bins. For most analyses, the Positive-direction and Negative-direction counts are used rather than the combined 2-way counts. The steps detailed below should be performed separately for each bound, consistent with the Positive and Negative directions identified in the data.

$$PCEs = (A + C) + 2 \times (B + D)$$

where

A = ∑ (Vehicles in Bins 1 through 3)

B = ∑ (Vehicles in Bins 4 through 14)

C = [A / (A + B)] x (Vehicles in Bin 15)
= Estimated portion of Bin 15 that is cars
(Round C to the nearest whole number)

D = (Vehicles in Bin 15) – C
= Estimated portion of Bin 15 that is trucks

PCE TRAFFIC COUNTS ADJUSTMENT PROCESS OVERVIEW

Once the traffic counts have been converted from raw vehicles to PCEs, the following method should be used to adjust traffic counts for use in the analysis. The following is an overview of the process and with the five steps to adjust traffic counts for use in modeling. Each step is described thereafter in greater detail.

1. Average Weekday 24-hour hourly counts to produce average-weekday 24-hour hourly counts.
2. If Weekend data is not available, estimate weekend hourly counts.
3. Adjust each day's hourly counts from the month the count was taken to an annualized average for the count year using Seasonal Adjustment Factors.
4. Grow each day's annualized average hourly counts from the count year to the year of interest.
5. Adjust each day's annualized counts grown to the year of interest to monthly counts using Seasonal Adjustment Factors contained in the latest version of the INDOT Traffic Adjustment Factors.

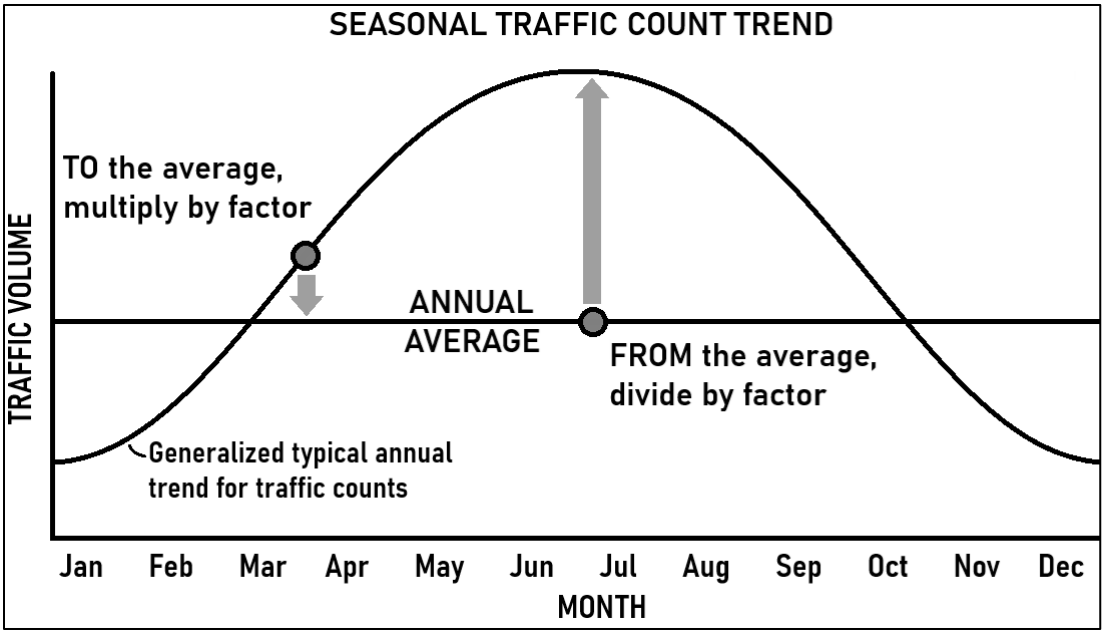
INDOT TRAFFIC ADJUSTMENT FACTORS

The adjustment process makes use of adjustment factors developed by INDOT Traffic Statistics Section. The latest version of these factors should always be used. The Adjustment Factors are provided online on the INDOT Traffic Statistics Site (www.in.gov/indot/3000.htm).

ADJUSTING TO AND FROM THE ANNUALIZED AVERAGE USING SEASONAL FACTORS

When converting counts to and from the annualized average, the same set of Seasonal Adjustment Factors is used. There are two rules:

1. When converting counts to the annualized average, multiply by the adjustment factor.
2. When converting counts from the annualized average, divide by the adjustment factor.



STEP 1 – AVERAGE WEEKDAY COUNTS

Weekday hourly counts are averaged to produce a single average-weekday 24-hour count. A minimum of two 24-hour Weekday counts is required. Once the individual 24-hour counts are averaged together, this becomes the "Average Weekday" used in modeling.

STEP 2 – ESTIMATE WEEKEND TRAFFIC COUNTS (IF NEEDED)

If the restriction will affect weekends, Weekend traffic count data will be needed. If traffic counts are available for Fridays, Saturdays and Sundays, those counts should be used and this step skipped. However, some stations do not provide weekend traffic counts and in these cases may be estimated.

Estimated Weekend hourly PCE counts are developed by scaling the target station's Average-Weekday PCE counts using Weekend Hourly Factors. This is done by multiplying the target station's Average-Weekday hourly PCE volumes by corresponding Friday, Saturday, and Sunday Weekend Hourly Factors:

$$PCE_{FRIDAY} = PCE_{WEEKDAY} \times WHF_{FRIDAY}$$
$$PCE_{SATURDAY} = PCE_{WEEKDAY} \times WHF_{SATURDAY}$$
$$PCE_{SUNDAY} = PCE_{WEEKDAY} \times WHF_{SUNDAY}$$

where

PCE_X = the target station's hourly PCEs for the day of the week indicated
WHF_X = the Weekend Hourly Factor for the day of the week indicated

Weekend Hourly Factors may be obtained in the following ways:

1. If available on the INDOT IHCP website, Hourly Day-of-Week Factors may be used. These factors are explicitly intended only for analyses conducted as part of the IHCP.
2. Alternatively, counts from a nearby adjacent station along the corridor may be used to create Weekend Hourly Factors. Selection of the most appropriate adjacent station should be made in consultation with the District Traffic Office. The nearby station should have similar characteristics to the target station and must include both weekday and weekend count data. To develop the Weekend Hourly Factors, divide the nearby station's Friday, Saturday, and Sunday hourly PCE volumes by its Average-Weekday hourly PCE volumes.

STEP 3 – ADJUST DATA TO ANNUALIZED AVERAGE FOR COUNT YEAR

Working with a full set of weekday and weekend traffic data, the hourly volumes are converted from the month the counts were taken to the annualized average of the count year. This is done by using the five-year average Seasonal Adjustment Factors for the month the counts were taken. Use the Seasonal Adjustment Factors provided in the latest version of the INDOT Traffic Adjustment Factors.

STEP 4 – GROW DATA FROM COUNT YEAR TO THE YEAR OF INTEREST

Traffic counts should be grown from the count year to the year of interest. Typically, this is the year for when the work is planned. If the work is anticipated to span multiple years, use the last year in which work will occur.

The annualization is done in 2 steps:

a. Use the Annual Growth Factors contained in the latest version of the INDOT Traffic Adjustment Factors to grow the counts from the year they were taken to the last year covered by the INDOT Adjustment factors.

b. For every year beyond the last year covered by the INDOT Adjustment factors to the year of interest, use a 1% annual growth factor.

STEP 5 – SEASONALIZED COUNTS FOR THE MONTH OF INTEREST

The final step is to adjust the traffic counts, which are now annualized average hourly volumes for the year of interest, to the month of interest. If the work will take place over the course of multiple months, only the month with the highest traffic volumes will be evaluated or each month will be analyzed separately. This should be the worst-case month for the period in which the work will be occurring.

If period is not known or if the work will span most of the year, use the worst-case month indicated by the five-year average Seasonal Adjustment Factors provided in the latest version of the INDOT Traffic Adjustment Factors.

Once the data for both bounds have been processed through all five steps, the traffic demand data is ready to be used in modeling.

ESTIMATING THE CAPACITY OF A RESTRICTION

In the tables that follow, theoretical capacities are provided for various queue analyses and restrictions. All capacities are expressed in Passenger Car Equivalents per Hour per Lane (PCEs/HR/ln).

With District Traffic Office input and concurrence, actual historic capacities may be used to model specific segments under specific conditions based on archived speed data.

CAPACITIES AT FREE FLOW SPEED (NO WORK ZONE)

Free Flow Speed (MPH)	Volume at Capacity (PCEs/HR/ln)
45	1900
55	2250
60	2300
65	2350
70	2400
75	2400

CAPACITIES FOR OPEN LANES ALONG SHOULDER CLOSURES

Work Zone Type	Capacity (PCEs/HR/ln)
For the lane adjacent to a closed shoulder	1400
For the next lane over	1600
For the next lane over	1800
For every other lane	2000

CAPACITIES FOR LANE REDUCTIONS

Lane Reduction			Capacity (PCEs/HR/ln)
Existing	→	Work zone	
2 lanes	→	1 lane	1400
3 lanes	→	2 lanes	1450
	→	1 lane	1350
4 lanes	→	3 lanes	1500
	→	2 lanes	1400
	→	1 lane	1325
5 lanes	→	4 lanes	1540
	→	3 lanes	1460
	→	2 lanes	1380
	→	1 lane	1300
6 lanes	→	5 lanes	1575
	→	4 lanes	1510
	→	3 lanes	1440
	→	2 lanes	1370
	→	1 lane	1280

When traffic is to be placed on the left (inside) shoulder, if the shoulder has a rumble strip, the base work zone capacity for that lane shall be 15% less than the capacity listed.

CAPACITIES FOR DETOUR ROUTE ANALYSIS BY LINK TYPES

These capacities are theoretical and are based on calculated values and conservative assumptions from the cited sources. They should be treated as preliminary estimates rather than definitive limits, and any volumes approaching them should receive additional scrutiny.

Link Type: Interstate (Mainline)
Source: HCM

Free Flow Speed (mph)	Volume at Capacity (PCE/HR/Ln)
45	1900
50	2075
55	2250
60	2300
65	2350
70	2400
75	2400

Link Type: Ramp (Interstate to Interstate or C-D)
Source: HCM 2010 Exhibit 13-10

Ramp Free Flow Speed Max (mph)	Capacity (PCE/HR/Ln)
80	2200
50	2100
40	2000
30	1900
20	1800

Link Type: Ramp w/ TWSC Intersection
Source: HCM 2010 Chapter 19

Conflicting Flow Rate (PCE/HR)	Approx. Capacity (PCE/HR/Ln)
0	1027
200	746
400	540
600	389
800	280
1,000	200
1,200	143
1,400	102
1,600	72
1,800	51
2,000	36

Link Type: Ramp w/ Roundabout
Source: NCHRP Report 672 Exhibit 4-6

Conflicting Flow Rate (PCE/HR)	Approx. Capacity (PCE/HR/Ln)
0	1100
200	950
400	750
600	600
800	500
1,000	400

Link Type: Ramp w/ AWSC Intersection
Source: HCM 2010 Chapter 20

Approx. Capacity (PCE/HR)
380

Link Type: Ramp w/ Signalized Intersection
Source: HCM 2010 Exhibit 18-28

Rural/ Urban	Capacity (PCE/HR/Ln)
Rural	580
Urban	640

QUEUE MODELING OVERVIEW

Queue modeling for IHCP purposes evaluates, on an hourly basis across a full week, whether the traffic demand exceeds the available roadway capacity under a proposed restriction. The objective of queue modeling is to clearly understand and minimize the impacts of each alternative. Queue modeling serves to:

- Assess impacts
- Minimize impacts through strategy and scheduling refinement
- Mitigate residual impacts through appropriate queue-management measures

Any reduction in capacity—such as lane closures, shoulder closures, or other work zone configurations—may lead to congestion and the formation of queue whenever demand surpasses that reduced capacity.

A baseline queue exists where a segment experiences congestion even under normal (pre-work) conditions. These locations must still be modeled; the analysis must determine how the proposed restriction will compound that existing congestion.

The queue modeling method used for IHCP-related analysis and review is fairly simplistic. Its purpose is to provide straightforward, comparative insight regarding the likelihood and severity of queuing. Modeling results generally fall into three qualitative categories:

- No queuing expected
- Some queuing expected
- Catastrophic queuing expected

Catastrophic results signal that an alternative either needs to be rejected or substantially refined to reduce impacts.

With approval from the District Traffic Office, more advanced modeling tools—such as VISSIM, Synchro, or other proprietary simulation software—may be used when greater insight is needed, particularly in dense urban areas or corridors with complex operational behavior.

Queue modeling is inherently iterative. Designers should begin with work zone strategies that preserve as many lanes as possible while maintaining minimum required lane and shoulder widths. Next, alternatives should focus on selecting work hours that avoid peak-demand periods. Initial results may indicate long queue lengths or durations; adjustments to work hours, staging, or strategy typically yield refined alternatives that balance operational needs, safety, and mobility consistent with IHCP requirements. Catastrophic queuing should be avoided whenever possible.

A useful metric for comparing alternatives is the total queue mile-hours generated by each option. From a mobility standpoint, the preferred alternative is the one producing the lowest total queue mile-hours.

ELIMINATION OF LEGACY "POLICY LIMITS"

Under the 2026 IHCP, the former concept of "Policy Limits" has been removed. Terms such as "within policy limits" and "outside policy limits" are no longer applicable. Historically, these limits were sometimes misinterpreted based on the flawed assumption that no further action was needed below those thresholds. Any queue, of any length or duration, creates a back-of-queue hazard: a location where free-flow traffic encounters slowing or stopped vehicles without adequate warning. These situations generate hard-braking events and can result in severe crashes and if present must be mitigated.

For historical reference only, the legacy IHCP limits defined the following thresholds as unacceptable: queue of any length for more than 6 continuous hours; queue of any length for more than 12 total hours in a calendar day, queue exceeding 2 mile-hours. These limits no longer govern IHCP analyses but may help illustrate the magnitude of impacts when comparing past and present approaches.

MAINLINE LANE CLOSURE ANALYSIS

A mainline lane closure can be evaluated using the INDOT Queuing Analysis Tool (QAT), which is designed to model capacity, demand, and expected queuing under proposed work zone configurations. Users should always download the most recent version of the QAT spreadsheet, available on the INDOT IHCP website.

Each roadway segment, defined from interchange to interchange, should be assessed and analyzed for each phase of the Temporary Traffic Control Plan (Maintenance of Traffic Plan) separately to ensure that each unique traffic pattern and geometric condition is properly captured. Although diversion patterns should not be modeled directly within the tool, any expected diversions should be noted and documented in the accompanying report so reviewers understand anticipated changes in traffic behavior.

Generally, to use the spreadsheet tool, begin with the About tab and work through the tabs from left to right.

STEP 1: ABOUT TAB

- Review the About tab for the tool's purpose, legend, and general instructions.
- Note the queue calculation formula and the default jam density (k = 190 PCE/mi/lane).

STEP 2: USER INPUT TAB

- Enter contact information for the requestor and analyst.
- Fill in route information: route, mile markers, rural/urban designation (from TCDS), positive/negative direction.
- Enter work information: work type, contract number, description, planned month/year, speed limits, lane widths, channelizing devices, and any additional relevant details.
- Detoured Traffic: Do not model diversions in the analysis, but document expected diversion patterns in the report if applicable. (Default is 0%; discuss any proposed diversions with your reviewer).
- Jam Density: Use the default value of 190 unless otherwise justified.
- Specify the number of pre-work lanes for each direction.
- For each alternative, provide a brief, distinguishing description (e.g., "Nighttime," "Weekend," "No Work Fridays").

STEP 3: RAW WEEKDAY HOURLY TRAFFIC VOLS TAB

- Copy and paste the TCDS volumes (including header) for weekdays into this tab (A2:BM91).
- Double-check that you are using weekday data, not weekend data.

STEP 4: RAW WEEKEND HOURLY TRAFFIC VOLS TAB

- If weekend counts are available in TCDS, copy and paste them (including header) into this tab (A2:BM91).
- If no weekend counts are available, skip this tab and proceed to the next step.

STEP 5: WEEKEND ADJUSTMENT FACTORS TAB

- If you have pasted actual weekend counts to the Raw Weekend Hourly Traffic Vols tab, set all factors to 1 and go to the next step.
- If you do not have weekend counts, use this tab to enter Weekend Hourly Conversion factors to estimate weekend volumes from weekday data.
- Document the source and justification for any factors used.

STEP 6: INDOT ADJUSTMENT FACTORS TAB

- Ensure the seasonal and annual growth factors are up to date (see the latest INDOT factors).
- Enter the adjustment factor year and current year.
- Enter the appropriate factors for Urban/Rural Interstate as needed.

STEP 7: HOURLY VOLUMES TAB

- Review the calculated hourly volumes for reasonableness.
- The spreadsheet will convert raw counts to Passenger Car Equivalents (PCEs) and apply all adjustment factors.
- Inspect the results for each day of the week and ensure they align with expectations for the location and season.

STEP 8: WORK INFORMATION TAB

- Enter the expected hourly capacities for the work zone for each segment, direction, and alternative.
- For hours where no restriction will be in place, provide the free flow capacity.
- For hours with where restriction will be in place, provide that reflect the reduced capacity.
- Capacities must be in PCE/hr, calculated by multiplying the per-lane value by the number of available lanes.

STEP 9: QUEUING CALCS TAB

- Review the queuing results for each alternative and direction.
- The spreadsheet will calculate anticipated queue lengths (in miles) for each hour and day.
- Review the results.
- If queue is catastrophic (very long durations or lengths), consider discarding the alternative or modifying it.

STEP 10: CHART INFO (ADVANCED) TAB – OPTIONAL

- Use this tab to add comments or data labels for charts, if needed.
- This tab is mostly automated; only edit if you need to annotate chart outputs.
- If not used, it does not need to be included in the report PDF.

STEP 11: REPORT TAB

- Review the automatically generated report summarizing the analysis, including all key inputs, assumptions, and results.
- Ensure all required fields are complete and that the report is clear and accurate.
- Use the “Ctrl” key to select the Report and Chart tabs, then print to PDF for submittal.
- Remove any unnecessary pages from the PDF before finalizing.

ANALYSIS FOR NON-LANE CLOSURES

To model restrictions other than mainline lane closures, other methods besides the QAT Spreadsheet are needed.

MAINLINE SHOULDER CLOSURES

The impact of a shoulder closure on mainline traffic should be modeled in the following way. The analysis used will be similar to that of a normal lane closure, except for the capacities of the open lanes. See the tables for open lane capacities for shoulder closures.

RAMP LANE CLOSURES

The impact of ramp lane closure should be modeled in the following way. The analysis used will be similar to that of a normal lane closure, except that ramp data is one-way, not two-way.

RAMP SHOULDER CLOSURES

If the ramp is a multilane interstate to interstate ramp it will be treated as a mainline segment for the purpose of analysis and will be subject to the same SIRT listed in Appendix B of the IHCP for the interstate segment from which it originates.

FULL CLOSURE OF A SYSTEM RAMP

For full closure of a system ramp, where traffic is detoured via a freeway-to-freeway interchange involving at least one interstate, the expected traffic impacts on every leg of the detour should be analyzed.

To analyze the traffic impacts on every leg of the detour, the initial base volume of the segment plus the volume being detoured for each hour will be compared to theoretical maximums. If traffic volumes for any hour exceed these maximums, the exception request mention this and propose mitigation. If it is known that two detours will use the same route, combined traffic volumes should be used for analysis. All volumes should be in PCEs. These maximums are listed below:

1. Traffic detoured over a standard interstate segment

   The initial volume of the segment plus the detoured volume should be compared to the maximum hourly volume handled by that interstate segment in a typical week. If it is higher than the maximum hourly volume handled then it should be compared to the number of open interstate lanes times 2200 PCE/hr/ln. If it is higher still, then queue should be anticipated and mitigated.

2. Traffic detoured over a loop ramp that ends in a merge

   The initial volume of the ramp plus the detoured volume should be compared to the maximum hourly volume handled by that ramp in a typical week. If it is higher than the maximum hourly volume handled then it should be compared to the number of ramp

lanes times 1800 PCE/hr/ln. If it is higher still, then queue should be anticipated and mitigated.

3. Traffic detoured over a non-loop ramp that ends in a merge

   The initial volume of the ramp plus the detoured volume should be compared to the maximum hourly volume handled by that ramp in a typical week. If it is higher than the maximum hourly volume handled then it should be compared to the number of ramp lanes times 2200 PCE/hr/ln. If it is higher still, then queue should be anticipated and mitigated.

4. Traffic detoured over a ramp ending with a signal

   The initial volume of the ramp plus the detoured volume should be compared to the maximum hourly volume handled by that ramp in a typical week. If it is higher than the maximum hourly volume handled then it should be compared to the capacity shown in the provided capacity table. If it is higher still, then queue should be anticipated and mitigated unless a detailed signal analysis is performed proving otherwise.

   When planning a detour through a signalized intersection at an interchange, it is strongly recommended that this be discussed with the District Traffic Office and INDOT's Traffic Control Systems Section.

5. Traffic detoured over a ramp ending with a stop controlled intersection or roundabout

   The initial volume of the ramp plus the detoured volume should be compared to the maximum hourly volume handled by that ramp in a typical week. If it is higher than the maximum hourly volume handled then it should be compared to the capacity shown in the provided capacity tables. If it is higher still, then queue should be anticipated and mitigated unless a detailed intersection analysis is performed proving otherwise.

TRAFFIC BREAKS (TEMPORARY STOPPAGE OR ROLLING SLOWDOWN)

Rolling slowdowns are discussed in further detail in INDOT's Temporary Traffic Breaks guidance document. The need for an IHCP Policy Exception is discussed in INDOT's Policy Exceptions guidance document. If an exception is needed for a rolling slowdown or an alternative to a rolling slowdown, the closure will be modeled on paper or in excel as if traffic were completely stopped for the duration of the rolling slowdown (typically this is 20 minutes), and the impact to traffic should be analyzed as described below:

1. Traffic volumes should be converted to PCEs and adjusted.
2. The number of PCEs entering the segment during the hour with the highest volume will be divided by 60 and multiplied by the number of minutes that traffic will be slowed to calculate the approaching volume during that time period.
3. This volume is then divided by the number of open lanes to calculate the volume approaching per lane.
4. Then the volume per lane is multiplied by 27.8 to calculate the length of the theoretical queue in feet. This length should then be converted to miles. This theoretical queue length should be compared to the capacity values provided in these guidelines to evaluate the viability of the closures.