CHAPTER 9
GLOSSARY AND SYMBOLS

CONTENTS

1. GLOSSARY

Chapter 9, Glossary and Symbols, defines the terms used in the *Highway Capacity Manual* (HCM) and presents the symbols used in the manual's equations. Highway transportation terminology has evolved over time to create multiple definitions, and the confusion has been compounded by technical jargon. The definitions, abbreviations, and symbols presented here are intended to establish a consistent terminology for use in the HCM. It is recognized that other definitions and usage could exist.

Acceleration/deceleration delay – Delay experienced by vehicles slowing from and subsequently returning to their running speed.

Acceleration lane – A paved noncontinuous lane, including tapered areas, allowing vehicles to accelerate when they enter the through-traffic lane of the roadway.

Access point – An unsignalized intersection, driveway, or opening on either side of a roadway. See also *active access point*.

Access point density – The total number of access points on both sides of the roadway, divided by the length of the segment.

Accessibility – The percentage of the populace able to complete a selected trip within a specified time.

Accuracy – The degree of an estimate's agreement with a standard or true value.

Active access point – An access point whose volume is sufficient to affect segment operations during the analysis period; as a rule of thumb, an access point approach is considered active if it has an entering flow rate of 10 veh/h or more during the analysis period.

Active bottleneck – A segment with a demand-to-capacity ratio greater than 1.0, an actual flow-to-capacity ratio equal to 1.0, and queuing upstream of the bottleneck segment.

Active passings – The number of other path users traveling in the same direction as the average bicyclist who are passed by that bicyclist.

Active traffic and demand management (ATDM) – The dynamic management, control, and influence of travel demand, traffic demand, and traffic flow on transportation facilities.

Actuated control – A defined phase sequence in which the presentation of each phase depends on whether the phase is on recall or the associated traffic movement has submitted a call for service through a detector.

Actuation – A detection of a roadway user that is forwarded to the controller by a detector.

Adaptive control – Second-by-second optimization of signal timings according to the current monitor information and the priorities assigned to each vehicle and pedestrian type by the operating agency.

Adjacent friction effect – A speed reduction that occurs in a single managed lane without barrier separation when densities in the adjacent general purpose lane are relatively high.

Adjusted saturation flow rate – See *saturation flow rate, adjusted*.

Adjustment – An additive or subtractive quantity that adjusts a parameter for a base condition to represent a prevailing condition.

Adjustment factor – A factor that adjusts a parameter for a base condition to represent a prevailing condition.

Aggregate delay – The summation of delays for multiple lanes or lane groups, usually aggregated for an approach, an intersection, or an arterial route.

Algorithm – A set of rules for solving a problem in a finite number of steps.

All-way STOP-controlled (AWSC) intersection – An intersection with STOP signs on all approaches. The driver's decision to proceed is based on a consensus of right-of-way governed by the traffic conditions of the other approaches and the rules of the road (e.g., the driver on the right has the right-of-way if two vehicles arrive simultaneously).

Alternative dataset – An HCM dataset that describes changes in base conditions (e.g., demand, traffic control, available lanes) associated with a work zone or special event,

along with the times when the alternative dataset is in effect.

Alternative intersection – An intersection created by rerouting one or more movements (often left turns) from their usual places to secondary junctions.

Alternative tool – An analysis procedure outside of the HCM that may be used to compute measures of transportation system performance for analysis and decision support.

Analysis hour – A single hour for which a capacity analysis is performed on a system element.

Analysis period – The time interval evaluated by a single application of an HCM methodology, typically 15 min.

Analytical model – A model based on traffic flow theory, combined with the use of field measures of driver behavior, resulting in an analytic formulation of the relationship between the field measures and performance measures such as capacity and delay.

Annual average daily traffic (AADT) – The total volume of traffic passing a point or segment of a highway facility in both directions for 1 year divided by the number of days in the year.

Approach – A set of lanes at an intersection that accommodates all left-turn, through, and right-turn movements from a given direction.

Approach delay – The control delay for a given approach.

Approach grade – The average grade along the approach, as measured from the stop line to a point 100 ft upstream of the stop line along a line parallel to the direction of travel. An uphill condition has a positive grade, and a downhill condition has a negative grade.

Area – An interconnected set of transportation facilities serving movements within a specified geographic space, as well as movements to and from adjoining areas.

Area type – A description of the environment in which a system element is located.

Arrival–departure polygon – A graphic tool for computing the number of full stops.

Arrival rate – The mean of the statistical distribution of vehicles arriving at a point or uniform segment of a lane or roadway.

Arrival type – Six assigned categories for the quality of progression for a given approach to a signalized intersection.

Arterial street – A street interrupted by traffic control devices (e.g., signals, STOP signs, or YIELD signs) that primarily serves through traffic and that secondarily provides access to abutting properties. See also *urban street*.

ATDM – See *active traffic and demand management*.

At grade – At ground level.

Automobile – A two-axle, four-wheeled vehicle.

Automobile mode – A submode of the motorized vehicle mode in which an automobile is used on a roadway.

Automobile traveler perception score – A numerical output from a traveler perception model that indicates the average rating that automobile travelers would give an urban street under a given set of conditions.

Autonomous vehicle – A partially or fully self-driving vehicle.

Auxiliary lane – See *freeway auxiliary lane*.

Available time-space – The product of available time and available space for pedestrian circulation on a crosswalk at a signalized intersection.

Average bicyclist – A bicyclist traveling at the average speed of all bicycles.

Average running speed – The length of a segment divided by the average running time of vehicles that traverse the segment.

Average spot speed – See *time mean speed*.

Average travel speed – The length of the highway segment divided by the average travel time of all vehicles traversing the segment, including all stopped delay times. Equal to *space mean speed*.

Back of queue – The maximum backward extent of queued vehicles during a typical cycle, as measured from the stop line to the last queued vehicle.

Barrier – 1. A reference point in the cycle at which one phase in each ring must reach a common point of termination, to ensure that there will be no concurrent selection and timing of conflicting movements in different rings. **2.** A physical object or pavement marking designed to prevent vehicles from entering or departing a section of roadway.

Barrier 1 managed lane segment – A single managed lane separated from the adjacent general purpose lane by a physical object; movements between the managed and general purpose lanes take place at designated locations.

Barrier 2 managed lane segment – Multiple managed lanes separated from the adjacent general purpose lane by a physical object; movements between the managed and general purpose lanes take place at designated locations.

Barrier pair – A pair of phases within the same ring and barrier that cannot be displayed concurrently.

Base capacity – The flow rate achievable under base conditions. Base capacity reflects ideal conditions on a facility with no capacity-reducing effects.

Base conditions – A set of specified standard conditions (e.g., good weather, good and dry pavement conditions, familiar users, no impediments to traffic flow) that must be adjusted to account for prevailing conditions that do not match.

Base dataset – An HCM dataset that describes base conditions (particularly demand and factors influencing capacity and free-flow speed) when work zones and special events are not present.

Base free-flow speed – The potential free-flow speed based only on the highway's horizontal and vertical alignment, not including the impacts of lane widths, lateral clearances, median type, and access points.

Base length – The distance between the points in a weaving segment where the edges of the travel lanes of the merging and diverging roadways converge.

Base saturation flow rate – See *saturation flow rate, base*.

Base scenario – See *scenario, base*.

Baseline uniform delay – The average uniform delay when there is no initial queue.

Basic freeway segment – A length of freeway facility whose undersaturated operations are unaffected by weaving, diverging, or merging.

Bicycle – A vehicle with two wheels tandem, propelled by human power, and usually ridden by one person.

Bicycle, electric – A vehicle with two wheels tandem, propelled by an electric motor that does not require pedaling effort to engage.

Bicycle, electric assist – A vehicle with two wheels tandem, with an electric motor that boosts human pedaling effort up to a designated motor-assisted top speed.

Bicycle facility – A road, path, or way specifically designated for bicycle travel, whether exclusively or with other vehicles or pedestrians.

Bicycle lane – A portion of a roadway designated by striping, signing, and pavement markings for the preferential or exclusive use of bicycles.

Bicycle LOS score – see *level-of-service score*.

Bicycle mode – A travel mode under which a nonmotorized bicycle is used on a roadway or pathway.

Bicycle path – A bikeway physically separated from motorized traffic by an open space or barrier, either within the highway right-of-way or within an independent right-of-way.

Boarding island – A raised area within the roadway that allows buses to stop to serve passengers from an inside lane.

Boarding lost time – Time spent waiting for passengers to travel from their waiting position at the bus stop to the bus door.

Body ellipse – The practical minimum area for standing pedestrians.

Bottleneck – A system element on which demand exceeds capacity.

Boundary intersection – An intersection defining the endpoint of an urban street segment.

Breakdown – **1.** The transition from noncongested to congested conditions typically observed as a speed drop accompanied by queue formation. **2.** A sudden drop in speed of at least 25% below the free-flow speed for a sustained period of at least 15 min that results in queuing upstream of the bottleneck.

Breakdown flow – The flow at which operations transition from noncongested to congested.

Buffer 1 managed lane segment – A single managed lane separated from the adjacent general purpose lane by a painted buffer; movements between the managed and general purpose lanes take place at designated locations.

Buffer 2 managed lane segment – Multiple managed lanes separated from the adjacent general purpose lane by a painted buffer; movements between the managed and general purpose lanes take place at designated locations.

Buffer width – The distance between the outside edge of the paved roadway (or face of curb, if present) and the near edge of the sidewalk.

Buffered bicycle lane – A bicycle lane paired with a designated space buffering it from parked or moving motor vehicles.

Bus – A self-propelled, rubber-tired road vehicle designed to carry a substantial number of passengers (at least 16) and commonly operated on streets and highways.

Bus lane – See *exclusive bus lane.*

Bus mode – A transit mode operated by rubber-tired vehicles that follow fixed routes and schedules along roadways.

Bus shelter – See *shelter.*

Bus stop – A designated area along a street where one or more buses can simultaneously stop to load and unload passengers.

Bus stop failure – A condition that occurs when a bus arriving at a stop finds all loading areas occupied and must wait for space to become available.

Bypass lane – A lane provided at a roundabout that allows a particular traffic movement to avoid using the circulatory roadway.

C **Calibration** – The process by which the analyst selects the model parameters that result in the best reproduction of field-measured local traffic conditions by the model.

Call – A request for service by vehicles or pedestrians to a controller.

Capacity – The maximum sustainable hourly flow rate at which persons or vehicles reasonably can be expected to traverse a point or a uniform section of a lane or roadway during a given time period under prevailing roadway, environmental, traffic, and control conditions.

Capacity adjustment factor – An adjustment to base capacity to reflect the effects of severe weather, incidents, and work zones. It can also be used to calibrate the freeway facility model to reflect local conditions.

Capacity drop phenomenon – See *queue discharge capacity drop.*

Case – See *degree-of-conflict case.*

C-D roadway – See *collector–distributor roadway.*

Centerline – On a shared-use path, a paint stripe separating opposing directions of path users.

Central area pricing – An areawide implementation of congestion pricing that imposes tolls for vehicles entering a central area street network during certain hours of certain days.

Central business district (CBD) – An area with characteristics including narrow street

rights-of-way, frequent parking maneuvers, vehicle blockages, taxi and bus activity, small-radius turns, limited use of exclusive turn lanes, high pedestrian activity, dense population, and midblock curb cuts.

Change interval – See *yellow change interval.*

Change period – The sum of the yellow change interval and red clearance interval for a given phase.

Circulating flow – The flow conflicting with the entry flow on the subject approach to a roundabout (i.e., the flow passing in front of the splitter island next to the subject entry).

Circulation area – 1. The portion of a sidewalk intended to be used for pedestrian movement. 2. The average area available to each person using a pedestrian facility.

Circulation time-space – The total available time-space minus the time-space occupied by pedestrians waiting to cross a crosswalk.

Circulatory roadway – The continuous-flow section of a roundabout that requires other vehicles entering the roadway to yield.

Class I two-lane highways – Highways where motorists expect to travel at relatively high speeds, such as major intercity routes, primary connectors of major traffic generators, daily commuter routes, or major links in state or national highway networks.

Class II two-lane highways – Highways where motorists do not necessarily expect to travel at high speeds, such as access routes to Class I facilities, scenic or recreational routes, or routes passing through rugged terrain.

Class III two-lane highways – Highways serving moderately developed areas, such as portions of a Class I or Class II highway that pass through small towns or developed recreational areas.

Clearance interval – See *red clearance interval.*

Clearance lost time – The latter part of the change period that is not typically used by drivers to proceed through the intersection (i.e., they use this time to stop in advance of the stop line).

Clearance time – 1. The interval after a bus is ready to depart during which a loading area is not available for use by a following bus, consisting of the sum of reentry delay and the time for a bus to start up and travel its own length, clearing the stop. 2. See *clearance lost time* and *red clearance interval.*

Climbing lane – A lane added on an upgrade on a two-lane highway to allow traffic to pass heavy vehicles whose speeds are reduced.

Cloverleaf interchange – An interchange with four loop ramps and four diagonal ramps, with no traffic control on either crossing roadway.

Collector street – A surface street providing land access and traffic circulation within residential, commercial, and industrial areas.

Collector–distributor roadway (C-D roadway) – A continuous roadway without local access provided parallel to a freeway mainline through one or more interchanges for the purpose of removing weaving movements or closely spaced merges and diverges from the mainline.

Common green time – The period of time when the phases at the two intersections of an interchange both provide a green indication to a particular origin–destination movement.

Complete trip – A vehicle that enters the spatial domain of an analysis during the analysis period and is able to exit the domain successfully before the end of the analysis period.

Composite grade – A series of adjacent grades along a highway that cumulatively has a more severe effect on operations than each grade separately.

Compressed diamond interchange – A diamond interchange with a separation of 400 to 800 ft between the two intersections.

Computational engine – A software implementation of one or more models.

Concurrency groups – Phase pairs that can operate concurrently with each other.

Conflict – The crossing, merging, or diverging of two traffic movements at an intersection.

Conflicting approach – At an all-way STOP-controlled intersection, an approach to the left or right of the subject approach.

Conflicting flow rate – The total flow rate in conflict with a specific movement at an unsignalized intersection.

Conflicting movements – Vehicular, pedestrian, or bicycle streams that seek to occupy the same space at the same time.

Congestion – 1. A traffic operation condition that arises when demand approaches or exceeds a system element's capacity and that is characterized by high vehicular density and vehicle speeds that are lower than the desired speeds. 2. A difference between highway system performance in terms of travel time expected by users and actual system performance—for example, an intersection that may appear congested in a rural community may not even register as an

annoyance in a large metropolitan area. See also *recurring congestion* and *nonrecurring congestion.*

Congestion pricing – The practice of charging tolls for use of all or part of a facility or a central area according to the expected or actual severity of congestion.

Connected vehicle – A vehicle with the capability of identifying threats and hazards on the roadway and communicating this information over wireless networks to other vehicles as well as the traffic management center to give drivers alerts and warnings.

Continuous access managed lane segment – A single managed lane where vehicles can move between the managed and adjacent general purpose lane at any point within the segment.

Continuous-flow intersection – See *displaced left-turn intersection.*

Control – 1. The driver's interaction with the vehicle in terms of speed and direction (accelerating, braking, and steering). 2. The use of signs, signals, markings, and other devices to regulate, warn, and guide drivers.

Control condition – The traffic controls and regulations in effect for a segment of street or highway, including the type, phasing, and timing of traffic signals; STOP signs; lane use and turn controls; and similar measures.

Control delay – Delay brought about by the presence of a traffic control device, including delay associated with vehicles slowing in advance of an intersection, the time spent stopped on an intersection approach, the time spent as vehicles move up in the queue, and the time needed for vehicles to accelerate to their desired speed.

Controlled – Having a traffic control device that interrupts traffic flow (e.g., a traffic signal, STOP sign, or YIELD sign).

Controller – The piece of hardware that determines how a traffic signal responds to calls based on signal timing parameters.

Conventional diamond interchange – A diamond interchange with a separation of 800 ft or more between the two intersections.

Coordinated actuated control – A variation of semiactuated control that uses the controller's force-off settings to constrain the noncoordinated phases associated with the minor movements such that the coordinated phases are served at the appropriate time during the signal cycle and progression for the major movements is maintained.

Coordination – The ability to synchronize multiple intersections to enhance the operation of one or more directional movements in a system.

Corridor – A set of parallel transportation facilities designed to move people between two locations, for example, a freeway and an arterial street.

Crawl speed – 1. The maximum sustained speed that can be maintained by a specified type of vehicle on a constant upgrade of a given percent. 2. The speed at which trucks descend a steep downgrade when they operate in a low gear to apply engine braking.

Critical density – The density at which capacity occurs for a given facility.

Critical headway – The minimum headway in the major traffic stream that will allow the entry of one minor-street vehicle.

Critical lane groups – The lane groups that have the highest flow ratio for a given signal phase.

Critical phase – One phase of a set of phases that occur in sequence and whose combined flow ratio is the largest for the signal cycle.

Critical platoon flow rate – The minimum flow rate associated with platoon headways that are too short to be entered (or crossed) by minor movements.

Critical segment – The segment that will break down first, given that all traffic, roadway, and control conditions do not change, including the spatial distribution of demands on each component segment.

Critical speed – The speed at which capacity occurs for a segment.

Critical volume-to-capacity ratio – The proportion of available intersection capacity used by vehicles in critical lane groups.

Cross flow – A pedestrian flow that is approximately perpendicular to and crosses another pedestrian stream (e.g., where two walkways intersect or at a building entrance); in general, the lesser of the two flows is referred to as the cross-flow condition.

Cross weave – A condition that occurs when traffic from a general purpose on-ramp must cross multiple general purpose lanes to access the managed lane at a nearby ramp or access segment, or when traffic from a managed lane must cross multiple general purpose lanes to access a general purpose off-ramp.

Crossing time – The curb-to-curb crossing distance divided by the pedestrian walking speed specified in the *Manual on Uniform Traffic Control Devices*.

Crossover – A section of a freeway work zone where traffic in one direction is shifted across the median on a temporary roadway to or from the (normally) opposite-direction roadway, which is temporarily used in two-directional operation.

Crosswalk – See *pedestrian crosswalk*.

Crosswalk occupancy time – The product of the pedestrian service time and the number of pedestrians using a crosswalk during one signal cycle.

Cumulative distribution function – A function giving the number or percent of all observations in the travel time distribution at or below a specified travel time bin.

Curb extension – An extension of the sidewalk to the edge of the travel or bicycle lane.

Cycle – A complete sequence of signal indications.

Cycle failure – A condition where one or more queued vehicles are not able to depart an intersection as a result of insufficient capacity during the cycle in which they arrive.

Cycle length – 1. The total time for a signal to complete one cycle. 2. For a work zone involving alternating one-way operation, the average time taken to serve each direction of travel once.

Cycle lost time – The time lost during the cycle. It represents the sum of the lost time for each critical phase.

Cyclic spillback – Queue spillback that occurs when the queue from a signalized intersection extends back into an upstream intersection during a portion of each signal cycle and then subsides.

D

Daily service volume – The maximum total daily volume in both directions that can be sustained in a given segment without violating the criteria for a given LOS in the peak direction in the worst 15 min of the peak hour under prevailing roadway, traffic, and control conditions.

Dallas phasing – A phasing option that allows the left-turn movements to operate in the protected–permitted mode without causing a "yellow trap" safety concern. It effectively ties the left turn's permitted-period signal indication to the opposing through movement signal indication. It is also used with a flashing yellow arrow left-turn signal display.

Deceleration delay – See *acceleration/deceleration delay*.

Deceleration lane – A paved noncontinuous lane, including tapered areas, allowing vehicles leaving the through-traffic lane of the roadway to decelerate.

De facto lane – A lane designated for multiple movements but that may operate as an exclusive lane because of a dominant movement demand.

Default value – A representative value entered into a model that may be appropriate in the absence of local data.

Degree-of-conflict case – For all-way STOP-controlled intersections, a particular combination of vehicle presence on other approaches with respect to the subject approach.

Degree of saturation – See *demand-to-capacity ratio*.

Degree of utilization – The product of the arrival rate and the mean departure headway.

Delay – Additional travel time experienced by a driver, passenger, bicyclist, or pedestrian beyond that required to travel at the desired speed. See also specific types of delay (e.g., *control delay, queue delay*).

Delay due to environmental conditions – Additional travel time experienced due to severe weather conditions.

Delayed crossing – A condition under which a pedestrian is unable to cross immediately on reaching an unsignalized crossing.

Delayed passing maneuver – The inability of an average bicyclist to make a passing maneuver immediately due to the presence of both another path user ahead of the overtaking average bicyclist in the subject direction and a path user in the opposing direction.

Demand – The number of vehicles or other roadway users desiring to use a given system element during a specific time period, typically 1 h or 15 min.

Demand adjustment factor – An adjustment to base demand to reflect the effects of severe weather, incidents, and work zones. It can also be used to calibrate the freeway facility model.

Demand flow rate – The count of vehicles arriving at the system element during the analysis period, converted to an hourly rate. When this flow rate is measured in the field, it is based on a traffic count taken upstream of the queue associated with the system element. This distinction is important for counts made during congested periods because the count of vehicles departing the system element will produce a demand flow rate that is lower than the true rate.

Demand multiplier – The ratio of the daily (weekday–month combination) facility demand to the average daily traffic (or to any combination of day of week and month of year).

Demand starvation – A condition occurring when a signalized approach has adequate capacity but a significant portion of the traffic demand is held upstream and cannot use the capacity provided because of the signalization pattern.

Demand-to-capacity ratio – The ratio of demand volume to capacity for a system element.

Demand volume – The number of vehicles that arrive to use the facility. Under noncongested conditions, demand volume is equal to the observed volume.

Density – The number of vehicles occupying a given length of a lane or roadway at a particular instant. See also *pedestrian density*.

Departure headway – The average time between departures of successive vehicles on a given approach at an all-way STOP-controlled intersection.

Descriptive model – A model that shows how events unfold given a logic that describes how the objects involved will behave.

Design analysis – An application of the HCM to establish the detailed physical features that will allow a new or modified facility to operate at a desired LOS. Inputs are based substantially on proposed design attributes; however, the intermediate- to long-term focus of the analysis will require use of some default values.

Design hour – An hour with a traffic volume that represents a reasonable value for designing the geometric and control elements of a facility.

Design speed – A speed used to design the horizontal and vertical alignments of a highway.

Detection mode – One of two modes—presence or pulse—that determine the duration of the actuation submitted to the controller by the detection unit.

Detection zone – The portion of a signalized intersection approach where a vehicle can be detected by the signal controller (with use of in-pavement loops or other technology), resulting in the display of the green indication for the approach being extended.

Detector – A device used to count or determine the presence of a motorized vehicle, bicycle, or pedestrian.

Deterministic model – A mathematical model that is not subject to randomness. For a given set of inputs, the result from the model is the same with each application.

D-factor – The proportion of traffic moving in the peak direction of travel on a given roadway during the peak hour.

Diamond interchange – An interchange form where one diagonal connection is made for each freeway entry and exit, with one connection per quadrant.

Directional design hour volume – The traffic volume for the design hour in the peak direction of flow.

Directional distribution – A characteristic of traffic that volume may be greater in one direction than in the other during any particular hour on a highway. See also *D-factor*.

Directional flow rate – The flow rate of a highway in one direction.

Directional segment – A length of two-lane highway in one travel direction with homogeneous cross sections and relatively constant demand volume and vehicle mix.

Directional split – See *D-factor*.

Displaced left-turn (DLT) intersection – An alternative intersection that reroutes left turns to crossovers upstream of the central junction; the left-turn traffic streams then approach the central junction to the left of the opposing through movement. DLTs can move left-turn and through vehicles during the same signal phase without conflict.

Distributed intersection – A group of two or more intersections that, by virtue of close spacing and displaced or distributed traffic movements, are operationally interdependent and are thus best analyzed as a single unit.

Diverge – A movement in which a single stream of traffic separates into two streams without the aid of traffic control devices.

Diverge segment – See *freeway diverge segment*.

Diverging diamond interchange (DDI) – A diamond interchange form where through traffic on the arterial switches sides of the street at each of the ramp terminals, allowing left turns to ramps to be made without conflict from opposing through vehicular traffic.

Divided highway – A highway where opposing directions of travel are separated by a physical barrier.

Divided median type – An urban street where opposing directions of travel are separated by a nonrestrictive median (e.g., two-way left-turn lane) or a restrictive median (e.g., raised curb).

Double-crossover diamond interchange – See *diverging diamond interchange*.

Downstream – The direction of traffic flow.

Driver population – The familiarity of motorists with a roadway's geometrics and traffic conditions; for example, commuters or weekend recreational travelers.

Dual entry – A mode of operation (in a multiring controller) in which one phase in each ring must be in service. If a call does not exist in a ring when it crosses the barrier, a phase is selected in that ring to be activated by the controller in a predetermined manner.

Duration – The length of time that a condition persists.

Dwell time – The sum of passenger service time and boarding lost time.

Dwell time variability – The distribution of dwell times at a stop because of fluctuations in passenger demand for buses and routes.

Dynamic speed limits – An ATDM strategy that adjusts speed limits on the basis of real-time traffic, roadway, or weather conditions.

Dynamic traffic assignment model – A descriptive model that is based on an objective (e.g., minimize the travel time or disutility associated with a trip) that is gradually improved over a sequence of iterations until the network reaches a state of equilibrium.

E **Effective available time-space** – The available crosswalk time-space, adjusted to account for the effect turning vehicles have on pedestrians.

Effective green time – The time that can be used by vehicles to proceed effectively at the saturation flow rate.

Effective red time – The cycle length minus the effective green time.

Effective walk time – The time that a WALK indication is displayed to a crosswalk, plus the portion of the DON'T WALK indication used by pedestrians to initiate their crossing.

Effective walkway width – The portion of a pedestrian facility's width that is usable for pedestrian circulation.

85th percentile speed – A speed value that is exceeded by 15% of the vehicles in a traffic stream.

Empirical model – A model that describes system performance and that is based on the statistical analysis of field data.

Entrance ramp – See *on-ramp*.

Entry flow – The traffic flow entering a roundabout on the subject approach.

Environmental conditions – Conditions such as adverse weather, bright sunlight directly in drivers' eyes, and abrupt transitions from light to dark (such as at a tunnel entrance on a sunny day) that may cause drivers to slow down and increase their spacing, resulting in a drop in a roadway's capacity.

Event – A bicycle meeting or passing a pedestrian on a shared-use path.

Excess wait time – The average number of minutes transit passengers must wait at a stop past the scheduled departure time.

Exclusive bus lane – A highway or street lane reserved primarily for buses during specified periods. It may be used by other traffic for certain purposes, such as making a right or left turn, or by taxis, motorcycles, or carpools that meet the requirements of the jurisdiction's traffic laws.

Exclusive off-street bicycle paths – Paths physically separated from highway traffic provided for the exclusive use of bicycles.

Exclusive turn lane – A designated left- or right-turn lane used only by vehicles making those turns.

Exit flow – The traffic flow exiting a roundabout to the subject leg.

Exit ramp – See *off-ramp*.

Expected demand – The flow that would arrive at each segment if all queues were stacked vertically (i.e., as if the queues had no upstream impacts).

Experienced travel time – For a given origin–destination movement, the sum of extra distance travel time and the control delay experienced at each junction encountered when an interchange or alternative intersection is traversed.

Extension of effective green – The initial portion of the yellow change interval during which a combination of traffic movements is considered to proceed effectively at the saturation flow rate.

Extent of congestion – The physical length of the congested system.

External section – A freeway section occurring between interchanges (i.e., between the final on-ramp at one interchange and the first off-ramp at the next downstream interchange).

Extra distance travel time – The free-flow travel time required to traverse an interchange or alternative intersection minus the hypothetical shortest-path free-flow travel time making right-angle turns.

F

Facility – A length of roadway, bicycle path, or pedestrian walkway composed of a connected series of points and segments.

Failure rate – The probability that a bus will arrive at a bus stop and find all available loading areas already occupied by other buses.

Far-side stop – A transit stop where transit vehicles cross an intersection before stopping to serve passengers.

Fixed force-off – A mode of split management used with coordinated operations under which force-off points cannot move. Under this mode, uncoordinated phases can utilize unused time from previous phases.

Fixed-object effective width – The sum of the physical width of a fixed object along a walkway or sidewalk, any functionally unusable space associated with the object, and the buffer given it by pedestrians.

Flared approach – At two-way STOP-controlled intersections, a shared right-turn lane that allows right-turning vehicles to complete their movement while other vehicles are occupying the lane.

Floating force-off – A force-off mode under which force-off points can move depending on the demand of previous phases. Under this mode, uncoordinated phases are limited to their defined split times, and all unused time is dedicated to the coordinated phases.

Flow profile – A macroscopic representation of steady traffic flow conditions for the average signal cycle during the specified analysis period.

Flow rate – The equivalent hourly rate at which vehicles or other roadway users pass over a given point or section of a lane or roadway during a given time interval of less than 1 h, usually 15 min.

Flow ratio – The ratio of the actual flow rate to the saturation flow rate for a lane group at an intersection.

Follower density – The number of followers per mile per lane; the following state is defined as a condition in which a vehicle is following its leader by no more than 3 s.

Follow-up headway – The time between the departure of one vehicle from the minor street and the departure of the next vehicle using the

same major-street headway, under a condition of continuous queuing on the minor street.

Force-off – A point within a cycle where an actuated phase must end regardless of continued demand. These points in a coordinated cycle ensure that the coordinated phases are provided a minimum amount of green time. See also *fixed force-off* and *floating force-off*.

Four-phase pattern – A type of operation at an all-way STOP-controlled intersection with multilane approaches, where drivers from a given approach enter the intersection together, as right-of-way passes from one approach to the next and each is served in turn.

Free flow – A flow of traffic unaffected by upstream or downstream conditions.

Free-flow speed – **1.** The average speed of vehicles on a given segment, measured under low-volume conditions, when drivers are free to drive at their desired speed and are not constrained by the presence of other vehicles or downstream traffic control devices. **2.** The theoretical speed when both density and flow rate are zero.

Free-flow travel time – **1.** The travel time on a segment that occurs when vehicles travel at the free-flow speed. **2.** The segment's length divided by its free-flow speed.

Freeway – A fully access-controlled, divided highway with a minimum of two lanes (and frequently more) in each direction.

Freeway auxiliary lane – An additional lane on a freeway to connect an on-ramp and an off-ramp.

Freeway diverge segment – A freeway segment in which a single traffic stream divides to form two or more separate traffic streams.

Freeway facility – An extended length of freeway composed of continuously connected basic freeway, weaving, merge, and diverge segments.

Freeway facility capacity – The capacity of the critical segment among those segments composing a defined freeway facility.

Freeway merge segment – A freeway segment in which two or more traffic streams combine to form a single traffic stream.

Freeway section – A portion of a freeway facility extending from one ramp gore point to the next gore point.

Freeway segment capacity – **1.** The maximum 15-min flow rate that produces an acceptable (e.g., 15%) rate of breakdown. **2.** The maximum

15-min flow rate that ensures stable flow for an acceptable percentage (e.g., 85%) of time.

Freeway weaving segment – Freeway segments in which two or more traffic streams traveling in the same general direction cross paths along a significant length of freeway without the aid of traffic control devices (except for guide signs).

Freight – Any commodity being transported.

Frequency – See *transit frequency*.

Frictional effect – See *adjacent friction effect*.

Full DLT intersection – A displaced left-turn intersection where left turns are displaced on both intersecting streets.

Full stop – **1.** At a signalized intersection, the slowing of a vehicle to 0 mi/h (or a crawl speed, if in queue) as a consequence of the change in signal indication from green to red. **2.** At an unsignalized intersection, the slowing of a vehicle to 0 mi/h (or a crawl speed, if in queue) as a consequence of the control device used to regulate the approach. **3.** In a simulation tool, the slowing of a vehicle to less than a specified speed (e.g., 5 mi/h).

Fully actuated control – Signal control in which all phases are actuated and all intersection traffic movements are detected, with the sequence and duration of each phase determined by traffic demand.

Functional class – A grouping of roadways according to the character of service they are intended to provide.

Furniture zone – The portion of the sidewalk between the curb and the area reserved for pedestrian travel; it may be used for landscaping, utilities, or pedestrian amenities.

G

Gap – The space or time between two vehicles, measured from the rear bumper of the front vehicle to the front bumper of the second vehicle. See also *headway*.

Gap acceptance – The process by which a driver accepts an available gap in traffic to perform a maneuver.

Gap out – A type of actuated operation for a given phase under which the phase terminates because of a lack of vehicle calls within the passage time.

General purpose lane – A lane open to all traffic at all times under normal operating conditions.

General terrain – An extended length of highway containing a number of upgrades and downgrades where no single grade is

long enough or steep enough to have a significant impact on the operation of the overall segment.

Generalized service volume table – A sketch-planning tool that provides an estimate of the maximum volume a system element can carry at a given level of service, given a default set of assumptions about the system element.

Geometric condition – The spatial characteristics of a facility, including approach grade, the number and width of lanes, lane use, and parking lanes.

Geometric delay – Extra travel time created by geometric features that cause drivers to reduce their speed (e.g., delay experienced where an arterial street makes a sharp turn, causing vehicles to slow, or the delay caused by the indirect route that through vehicles must take through a roundabout).

Gore area – The area located immediately between the left edge of a ramp pavement and the right edge of the roadway pavement at a merge or diverge area.

Grade – The longitudinal slope of a roadway.

Grade separated – Separated vertically from other transportation facilities (e.g., through the use of over- or underpasses).

Green interval – The interval during which a green indication is displayed at a signalized intersection.

Green time – The duration of the green interval.

Green time (*g/C*) ratio – The ratio of the effective green time of a phase to the cycle length.

Growth factor – A percentage increase applied to current traffic demands to estimate future demands.

Guidance – The driver's interaction with the vehicle in terms of maintaining a safe path and keeping the vehicle in the proper lane.

H

Half diamond interchange – See *partial diamond interchange*.

HCM dataset – The input data needed to evaluate an urban street facility for one analysis period.

Headway – The time between two successive vehicles as they pass a point on the roadway, measured from the same common feature of both vehicles (for example, the front axle or the front bumper).

Heavy vehicle – A vehicle with more than four wheels touching the pavement during normal operation.

Hidden bottleneck – A segment with a demand-to-capacity ratio greater than 1.0 but an actual flow-to-capacity ratio typically less than 1.0 (or equal to 1.0 in some cases), with no queues forming upstream of the segment.

High-occupancy vehicle (HOV) – A vehicle with a defined minimum number of occupants (>1); HOVs often include buses, taxis, and carpools, when a lane is reserved for their use.

Highway – A general term for denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

Hindrance – Discomfort and inconvenience to a bicyclist as a result of meeting, passing, or being overtaken by other pathway users.

Holding area waiting time – The average time that pedestrians wait to cross the street in departing from the subject corner.

Hybrid models – Models used with very large networks that apply microscopic modeling to critical subnetworks and mesoscopic or macroscopic modeling to the connecting facilities.

I

Impedance – The reduction in the potential capacity of lower-rank movements caused by the congestion of a higher-rank movement at a two-way STOP-controlled intersection.

Incident – Any occurrence on a roadway, such as crashes, stalled cars, and debris in the roadway, that impedes the normal flow of traffic.

Incident clearance time – The time from the arrival of the first response vehicle to the time when the incident and service vehicles no longer directly affect travel on the roadway.

Incident delay – Additional travel time experienced as a result of an incident, compared with the no-incident condition.

Incident detection time – The time period starting with the occurrence of an incident and ending when the response officials are notified of the incident.

Incident response time – The time period from the receipt of incident notification by officials to the time the first response vehicle arrives at the scene of the incident.

Incomplete trip – A vehicle that is unable to enter and exit successfully the spatial domain of an analysis within the analysis period.

Incremental delay – The second term of lane group control delay, accounting for delay due to the effect of random, cycle-by-cycle fluctuations in demand that occasionally

exceed capacity (i.e., cycle failure) and delay due to sustained oversaturation during the analysis period.

Indication – The signal (e.g., circular green, yellow arrow) shown to a driver at a given point in time to control the driver's movement.

Influence area – **1.** The base length of a freeway weaving segment plus 500 ft upstream of the entry point to the weaving segment and 500 ft downstream of the exit point from the weaving segment; entry and exit points are defined as the points where the appropriate edges of the merging and diverging lanes meet. **2.** From the point where the edges of the travel lanes of merging roadways meet to a point 1,500 ft downstream of that point. **3.** From the point where the edges of the travel lanes of the diverging roadways meet to a point 1,500 ft upstream of that point.

Initial queue – The unmet demand at the beginning of an analysis period, either observed in the field or carried over from the computations of a previous analysis period.

Initial queue delay – The third term of lane group control delay, accounting for delay due to a residual queue identified in a previous analysis period and persisting at the start of the current analysis period. This delay results from the additional time required to clear the initial queue.

Inputs – The data required by a model.

Instantaneous acceleration – An acceleration determined from the relative speeds of a vehicle at time t and time $t - \Delta t$, assuming a constant acceleration during Δt.

Instantaneous speed – A speed determined from the relative positions of a vehicle at time t and time $t - \Delta t$, assuming a constant acceleration during Δt.

Intelligent transportation system (ITS) – Transportation technology that allows drivers and traffic control system operators to gather and use real-time information to improve vehicle navigation, roadway system control, or both.

Intensity of congestion – The amount of congestion experienced by users of a system.

Interchange – A system of interconnecting roadways providing for traffic movement between two or more highways that do not intersect at grade.

Interchange density – The number of interchanges within 3 mi upstream and downstream of the center of the subject weaving segment divided by 6.

Interchange ramp terminal – A junction of a ramp with a surface street serving vehicles entering or exiting a freeway.

Internal link – The segment between two signalized intersections at an interchange ramp terminal.

Internal section – A freeway section occurring within an interchange (for example, between the off-ramp gore and the on-ramp gore in a diamond interchange).

Interrupted-flow facilities – Facilities characterized by traffic signals, STOP signs, YIELD signs, or other fixed causes of periodic delay or interruption to the traffic stream.

Intersection – A point where two or more roadways cross or meet at grade, where vehicular travel between the roadways is accomplished via turning movements, and where right-of-way is typically regulated through the use of traffic control devices.

Intersection delay – The total additional travel time experienced by drivers, passengers, or pedestrians as a result of control measures and interaction with other users of the facility, divided by the volume departing from the corresponding cross section of the facility.

Intersection turn lane – See *exclusive turn lane*.

Interval – A period of time in which all traffic signal indications remain constant.

Island – A defined area between traffic lanes for control of vehicular movements, for toll collection, or for pedestrian refuge.

Isolated intersection – An intersection experiencing negligible influence from upstream signalized intersections, where flow is effectively random over the cycle and without a discernible platoon pattern evident in the cyclic profile of arrivals.

J **Jam density** – The maximum density that can be achieved on a segment. It occurs when speed is zero (i.e., when there is no movement of persons or vehicles).

J-turn – See *restricted crossing U-turn intersection*.

Jughandle – An alternative intersection form where direct left turns from the mainline are prohibited and left-turning traffic is rerouted to (*a*) a loop ramp beyond the primary intersection or (*b*) a diamond ramp in advance of the primary intersection that leads to a

secondary intersection where left turns are allowed.

Junction – A point where two roadways cross, meet, merge, or diverge at grade.

K

K-factor – The proportion of AADT that occurs during the peak hour.

L

Lagging left-turn phase – A phase sequence in which a left-turn phase is served after the opposing through movement.

Lane 1 – The rightmost mainline lane.

Lane 2 – The lane adjacent to and left of Lane 1.

Lane addition – A location along a roadway where the number of continuous through lanes increases by one or more.

Lane balance – The condition of the number of lanes leaving a diverge point being equal to the number of lanes approaching it, plus one.

Lane distribution – A parameter used when two or more lanes are available for traffic in a single direction and the volume distribution varies between lanes, depending on traffic regulation, traffic composition, speed and volume, the number of and location of access points, the origin–destination patterns of drivers, the development environment, and local driver habits.

Lane drop – A location along a roadway where the number of through lanes is reduced by one or more.

Lane group – A lane or set of lanes designated for separate analysis.

Lane group delay – The control delay for a given lane group.

Lane utilization – The distribution of vehicles among lanes when two or more lanes are available for a movement. See also *prepositioning*.

Lane width – The lateral distance between stripes for a given lane.

Lateral clearance – The lateral distance between the outside edge of a travel lane and a fixed obstruction.

Leading left-turn phase – A phase sequence in which a left-turn phase is served before the opposing through movement.

Leg – A set of lanes at an intersection accommodating all approaching movements to and departing movements from a given direction.

Level of service (LOS) – A quantitative stratification of a performance measure or measures that represent quality of service, measured on an A–F scale, with LOS A representing the best operating conditions from the traveler's perspective and LOS F the worst.

Level-of-service score (LOS score) – A numerical output from a traveler perception model that typically indicates the average rating that travelers would give a transportation facility or service under a given set of conditions.

Level terrain – Any combination of grades and horizontal or vertical alignment that permits heavy vehicles to maintain the same speed as passenger cars, typically containing short grades of no more than 2%.

Light rail mode – A transit mode operated by vehicles that receive power from overhead wires and that run on tracks that can be located at grade within street rights-of-way. See also *streetcar mode*.

Light vehicle – A vehicle with four wheels touching the ground under normal operation, including passenger cars, vans, sport-utility vehicles, and four-wheeled pickup trucks. See also *automobile*.

Limited priority – A condition at a roundabout entry experiencing high levels of both entering and conflicting flow under which circulating traffic adjusts its headways to allow entering vehicles to enter.

Link – A length of roadway between two nodes or points.

Link length – The urban street segment length minus the width of the upstream boundary intersection.

Load factor – The number of passengers occupying a transit vehicle divided by the number of seats on the vehicle.

Loading area – 1. A curbside space where a single bus can stop to load and unload passengers; bus stops include one or more loading areas. 2. A curbside space where vehicles can stop briefly to load and unload passengers or freight.

Local street – A street that primarily serves a land-access function.

Local transit service – Transit service making regular stops along a street (typically every 0.25 mi or less).

Loop ramp – A ramp requiring vehicles to execute a left turn by turning right, accomplishing a 90-degree left turn by making a 270-degree right turn.

Lost time – See *clearance lost time, start-up lost time, phase lost time,* and *cycle lost time.*

Macroscopic model – A model that considers traffic operations averaged over specified time intervals and specified segments or links without recognizing individual vehicles in the traffic stream.

Mainline – The primary through roadway as distinct from ramps, auxiliary lanes, and collector–distributor roadways.

Mainline output – The maximum number of vehicles that can exit a freeway node, constrained by downstream bottlenecks or by merging traffic.

Major diverge area – A junction where one freeway segment diverges to form two primary freeway segments with multiple lanes.

Major merge area – A junction where two primary freeway segments, each with multiple lanes, merge to form a single freeway segment.

Major street – The street not controlled by STOP signs at a two-way STOP-controlled intersection.

Major weaving segment – A weaving segment where at least three entry and exit legs have two or more lanes.

Managed lanes – A limited number of lanes set aside within a freeway cross section where multiple operational strategies are utilized and actively adjusted as needed to achieve predefined performance objectives. Examples include priced lanes and special-use lanes such as high-occupancy vehicle, express, bus-only, or truck-only lanes.

Max out – A type of actuated operation for a given phase under which the phase terminates because the designated maximum green time for the phase has been reached.

Maximum allowable headway – The maximum time that can elapse between successive calls for service without terminating the phase by gap out.

Maximum green – The maximum length of time that a green signal indication can be displayed in the presence of conflicting demand.

Maximum recall – A form of phase recall under which the controller places a continuous call for vehicle service on the phase. This results in the presentation of the green indication for its maximum duration every cycle.

Maximum weaving length – The length at which weaving turbulence no longer affects the capacity of the weaving segment.

Median – The area in the middle of a roadway separating opposing traffic flows.

Median U-turn (MUT) intersection – An alternative intersection that reroutes all left turns to one-way U-turn crossovers typically located on the major street 500 to 800 ft from the central junction.

Meetings – The number of path users traveling in the opposing direction to the average bicyclist that the average bicyclist passes on the path segment.

Merge – A movement in which two separate streams of traffic combine to form a single stream without the aid of traffic signals or other right-of-way controls.

Merge segment – See *freeway merge segment.*

Mesoscopic model – A mathematical model for the movement of clusters or platoons of vehicles incorporating equations to indicate how the clusters interact.

Michigan left turn – See *median U-turn intersection.*

Microscopic model – A mathematical model that captures the movement of individual vehicles and their car-following, lane choice, and gap acceptance decisions at small time intervals, usually by simulation.

Midblock stop – A transit stop located at a point away from intersections.

Midsegment flow rate – The count of vehicles traveling along the segment during the analysis period, divided by the analysis period duration.

Minimum green – The smallest length of time that a green signal indication will be displayed when a signal phase is activated.

Minimum recall – A form of phase recall under which the controller places a continuous call for vehicle service on the phase and then services the phase until its minimum green interval times out. The phase can be extended if actuations are received.

Minor movement – A vehicle making a specific directional entry into an unsignalized intersection that must yield to other movements.

Minor street – The street controlled by STOP signs at a two-way STOP-controlled intersection.

Misery index – The average of the worst 5% of travel times divided by the free-flow travel time.

Mixed-traffic operation – Operation of a transit mode in lanes shared with other roadway users.

ML access segment – A managed lane segment where vehicles entering and exiting the managed lane must weave with vehicles in the adjacent general purpose lane.

ML basic segment – One of five types of managed lane segment: continuous access, Buffer 1, Buffer 2, Barrier 1, or Barrier 2.

ML diverge segment – A segment on a managed lane facility with nontraversable separation from the general purpose lanes, where traffic exits the managed lane via an off-ramp.

ML merge segment – A segment on a managed lane facility with nontraversable separation from the general purpose lanes, where traffic enters the managed lane via an on-ramp.

ML weave segment – A segment on a managed lane facility with nontraversable separation from the general purpose lanes, where an on-ramp onto the managed lane is followed by an off-ramp from the managed lane and the two are connected by an auxiliary lane.

Mobility – The movement of people and goods.

Mode – See *travel mode*.

Mode group – One of five categories of users of a shared-use pathway: pedestrians, bicyclists, inline skaters, runners, and child bicyclists.

Model – A procedure that uses one or more algorithms to produce a set of numerical outputs describing the operation of a segment or system, given a set of numerical inputs.

Model application – The physical configuration and operational conditions to which a traffic analysis tool is applied.

Monte Carlo method – A method that uses essentially random inputs (within realistic limits) to model a system and produce probable outcomes.

Motorized vehicle mode – A travel mode that includes all motorized vehicles using a roadway. Submodes of the motorized vehicle mode include automobiles, trucks, and public transit vehicles operating on street.

Motorized vehicles – Automobiles, light and heavy trucks, recreational vehicles, buses, and motorcycles.

Mountainous terrain – Any combination of grades and horizontal and vertical alignment that causes heavy vehicles to operate at crawl speed for significant distances or at frequent intervals.

Movement – The direction taken by a vehicle at an intersection (i.e., through, left turn, right turn, U-turn).

Movement capacity – The capacity of a specific traffic stream at a STOP-controlled intersection approach, assuming that the traffic has exclusive use of a separate lane.

Movement group – An organization of traffic movements at a signalized intersection to facilitate data entry. A separate movement group is established for (*a*) each turn movement with one or more exclusive turn lanes and (*b*) the through movement (inclusive of any turn movements that share a lane).

Move-up time – The time it takes a vehicle to move from second position into first position on an approach to an all-way STOP-controlled intersection.

Multilane highway – A highway with at least two lanes for the exclusive use of traffic in each direction, with no control or partial control of access, but that may have periodic interruptions to flow at signalized intersections no closer than 2 mi.

Multilane roundabout – A roundabout with more than one lane on at least one entry and at least part of the circulatory roadway.

Multimodal – Being used by more than one travel mode.

Multimodal analysis – A type of HCM analysis under which the LOS of each travel mode on a facility is evaluated simultaneously.

Multiple weaving segment – A portion of a freeway where a series of closely spaced merge and diverge areas creates overlapping weaving movements (between different merge–diverge pairs).

N

Navigation – Planning and executing a trip.

Near-side stop – A transit stop located on the approach side of an intersection. Transit vehicles stop to serve passengers before crossing the intersection.

Node – The endpoint of a link. See also *point*.

Non–severe weather – Weather conditions that generate no capacity, demand, or speed adjustments (i.e., weather conditions that have not been shown to reduce capacity by at least 4%).

Nonlocal transit service – Transit service on routes with longer stop spacing than local service (e.g., limited-stop, bus rapid transit, or express routes).

Nonrecurring congestion – Congestion that occurs due to infrequent or one-time events (e.g., incidents, work zones, severe weather) that block lanes or otherwise temporarily reduce a facility's capacity.

Nonrestrictive median – A median (e.g., a two-way left-turn lane) that does not prevent or discourage vehicles from crossing the opposing traffic lanes.

Nonweaving flow – The traffic movements in a weaving segment that are not engaged in weaving movements.

Nonweaving movement – A traffic flow within a weaving segment that does not need to cross paths with another traffic flow while traversing the segment.

No-passing zone – A segment of a two-lane, two-way highway along which passing is prohibited in one or both directions.

Normative model – A mathematical model that identifies a set of parameters providing the best system performance.

O

Off-line bus stop – A bus stop where buses stop out of the travel lane.

Off-ramp – A ramp–freeway junction that accommodates diverging maneuvers.

Offset – The time that the reference phase begins (or ends) relative to the system master time zero.

Off-street pedestrian and bicycle facilities – Facilities used only by nonmotorized modes, on which the characteristics of motor vehicle traffic do not play a strong role in determining the quality of service from the perspective of bicyclists and pedestrians.

One-sided weaving segment – A weaving segment in which no weaving maneuvers require more than two lane changes to be completed successfully and in which the on-ramp and off-ramp are located on the same side of the freeway.

One-stage gap acceptance – A condition at a two-way STOP-controlled intersection requiring minor-street through and left-turning drivers to complete their maneuver in one movement and to evaluate gaps in both major-street directions simultaneously.

On-line bus stop – A bus stop where buses stop wholly or partially in the travel lane.

On-ramp – A ramp–freeway junction that accommodates merging maneuvers.

On-street transitway – A portion of a street right-of-way dedicated to the transit mode, physically segregated from other traffic, and located in the median or adjacent to one side of the street.

On-time arrival – **1.** A trip that arrives within a defined travel time. **2.** For scheduled public transit service, a trip that arrives by the scheduled time.

Operational analysis – An application of an HCM methodology under which the user supplies detailed inputs to HCM procedures, with no or minimal use of default values.

Operational mode – The manner in which the controller serves turning movements. See *protected mode, permitted mode,* and *protected–permitted mode.*

Opposing approach – At an all-way STOP-controlled intersection, the approach approximately 180 degrees opposite the subject approach.

Opposing flow rate – The flow rate for the direction of travel opposite to the direction under analysis.

Outputs – The performance measures produced by a model.

Overflow queue – Queued vehicles left over after a green phase at a signalized intersection.

Oversaturated flow – Traffic flow where (*a*) the arrival flow rate exceeds the capacity of a point or segment, (*b*) a queue created from a prior breakdown of a facility has not yet dissipated, or (*c*) traffic flow is affected by downstream conditions.

P

Parclo A interchange – A partial cloverleaf interchange form where the loop ramps on the mainline are located in advance of the crossover.

Parclo AB interchange – A partial cloverleaf interchange form where loop ramps on the mainline are located on the same side of the crossroad, one in advance of the crossroad for its direction of travel and the other beyond.

Parclo B interchange – A partial cloverleaf interchange form where the loop ramps on the mainline are located beyond the crossover.

Partial cloverleaf interchange (parclo) – An interchange with one to three (typically two) loop ramps and two to four diagonal ramps, with major turning movements desirably being made by right-turn exits and entrances.

Partial diamond interchange – A diamond interchange with fewer than four ramps, so that not all of the freeway–street or street–freeway movements are served.

Partial DLT intersection – A displaced left-turn intersection where left turns are displaced on one of the two intersecting streets.

Partial stop – A situation where a vehicle slows as it approaches the back of a queue but does not come to a full stop.

Passage time – The maximum amount of time one vehicle actuation can extend the green interval while green is displayed. It is input for each actuated signal phase; also referred to as vehicle interval, extension interval, extension, or unit extension.

Passenger car – Federal Highway Administration Vehicle Class 2.

Passenger car equivalent – The number of passenger cars that will result in the same operational conditions as a single heavy vehicle of a particular type under identical roadway, traffic, and control conditions.

Passenger load factor – See *load factor*.

Passenger service time – Time for passenger loading, unloading, and fare payment, as well as time spent opening and closing the doors. See also *dwell time*.

Passenger trip length – The average distance traveled by a passenger on board a transit vehicle.

Passing lane – A lane added to improve passing opportunities in one direction of travel on a conventional two-lane highway.

Pavement condition rating – A description of the road surface in terms of ride quality and surface defects.

Peak hour – The hour of the day in which the maximum volume occurs. See also *analysis hour*.

Peak hour factor (PHF) – The hourly volume during the analysis hour divided by the peak 15-min flow rate within the analysis hour; a measure of traffic demand fluctuation within the analysis hour.

Pedestrian – An individual traveling on foot.

Pedestrian circulation route – A space used by pedestrians crossing a pedestrian plaza.

Pedestrian clear interval – Time provided for pedestrians who depart the curb during the WALK indication to reach the opposite curb (or the median). A flashing DON'T WALK indication is displayed during this interval.

Pedestrian crosswalk – A connection between pedestrian facilities across sections of roadway used by automobiles, bicycles, or transit vehicles. Crosswalks can be marked or unmarked.

Pedestrian density – The number of pedestrians per unit of area within a walkway or queuing area.

Pedestrian flow rate – The number of pedestrians passing a point per unit of time. See also *unit width flow rate*.

Pedestrian LOS score – See *level-of-service score*.

Pedestrian mode – A travel mode under which a journey (or part of a journey) is made on foot along a roadway or pedestrian facility.

Pedestrian overpass – A grade-separated pedestrian facility over such barriers as wide or high-speed roadways, railroad tracks, busways, or topographic features.

Pedestrian plaza – A large, paved area that serves multiple functions, including pedestrian circulation, special events, and seating.

Pedestrian queuing area – See *queuing area*.

Pedestrian recall – A form of phase recall where the controller places a continuous call for pedestrian service on the phase and then services the phase for at least a length of time equal to its walk and pedestrian clear intervals (longer if vehicle detections are received).

Pedestrian service time – The elapsed time starting with the first pedestrian's departure from the corner to the last pedestrian's arrival at the far side of the crosswalk.

Pedestrian space – The average area provided for pedestrians in a moving pedestrian stream or pedestrian queue.

Pedestrian start-up time – The time for a platoon of pedestrians to get under way following the beginning of the walk interval.

Pedestrian street – See *pedestrian zone*.

Pedestrian underpass – A grade-separated pedestrian facility under such barriers as wide or high-speed roadways, railroad tracks, busways, or topographic features.

Pedestrian walkway – See *walkways*.

Pedestrian zone – Streets dedicated to pedestrian use on a full- or part-time basis.

Percentile travel time index – The travel time index that the specified percentage of observations in the travel time distribution fall at or below. For example, an 85th percentile travel time index is exceeded only 15% of the time in the travel time distribution.

Percent of free-flow speed – The average travel speed divided by the free-flow speed.

Percent time-spent-following – The average percentage of total travel time that vehicles must travel in platoons behind slower vehicles because of inability to pass on a two-lane highway.

Performance measure – A quantitative or qualitative characterization of some aspect of the service provided to a specific road user group.

Permanent traffic recorder – A location where traffic volume data (and potentially speed, vehicle classification, and other data) are collected 24 hours a day, 7 days a week and subsequently archived.

Permitted mode – An operational mode requiring turning drivers to yield to conflicting vehicles, bicycles, and pedestrians before completing the turn.

Permitted plus protected – See *protected–permitted mode.*

Person capacity – The maximum number of persons who can pass a given point during a specified period under prevailing conditions.

Phase – The green, yellow change, and red clearance intervals in a cycle that are assigned to a specified traffic movement (or movements).

Phase flow ratio – The largest flow ratio of all lane groups served during the phase.

Phase lost time – The sum of the clearance lost time and start-up lost time.

Phase pair – See *barrier pair.*

Phase pattern – The alternation of right-of-way among various traffic streams at an all-way STOP-controlled intersection.

Phase recall – A setting that causes the controller to place a call for a specified phase each time the controller is servicing a conflicting phase. See also *maximum recall, minimum recall,* and *pedestrian recall.*

Phase sequence – The order of phases in a ring.

Planning analysis – An application of the HCM generally directed toward broad issues such as initial problem identification (e.g., screening a large number of locations for potential operations deficiencies), long-range analyses, and regional and statewide performance monitoring. Nearly all inputs to the analysis may be defaulted.

Planning time index – The 95th percentile travel time index.

Platoon – A group of vehicles or pedestrians traveling together as a group, either voluntarily or involuntarily because of signal control, geometrics, or other factors.

Platoon decay – The degradation of a platoon traveling along an urban street due to the effects of vehicles turning into and out of access points.

Platoon dispersion – The degradation of a platoon with increasing distance traveled along an urban street, due to differing speeds of vehicles within the platoon.

Platoon ratio – A description of the quality of signal progression computed as the demand flow rate during the green indication divided by the average demand flow rate.

Point – A place along a facility where (*a*) conflicting traffic streams cross, merge, or diverge; (*b*) a single traffic stream is regulated by a traffic control device; or (*c*) there is a significant change in the segment capacity (e.g., lane drop, lane addition, narrow bridge, significant upgrade, start or end of a ramp influence area).

Postbreakdown flow rate – See *queue discharge flow rate.*

Potential capacity – The capacity of a specific movement at a STOP-controlled intersection approach, assuming that it is unimpeded by pedestrian or higher-rank movements and has exclusive use of a separate lane.

Prebreakdown capacity – The 15-min flow rate immediately preceding a breakdown event.

Precision – The size of the estimation range for a measured quantity.

Preemption – The interruption of normal traffic signal operations (breaking coordination) to serve a preferred vehicle, without regard for the state of the signal.

Preliminary engineering analysis – An HCM application conducted to support planning decisions related to roadway design concept and scope, when alternatives analyses are performed, or to assess proposed systemic policies. Many of the inputs to the analysis will be defaulted.

Prepositioning – A deliberate driver choice of one lane over another at an intersection in anticipation of a turn at a downstream intersection.

Presence detection – A detection mode under which the actuation starts with the vehicle arriving in the detection zone and ends with the vehicle leaving the detection zone.

Pretimed control – A fixed sequence of phases that are displayed in repetitive order.

Prevailing condition – The geometric, traffic, control, and environmental conditions during the analysis period.

Priority reversal – A condition at a roundabout entry experiencing high levels of both entering and conflicting flow, where entering traffic forces circulating traffic to yield.

Probability density function – A function giving the number or percent of all observations in the travel time distribution within a specified travel time (or travel time index) bin.

Probe vehicles – Vehicles within a traffic stream whose position is known continuously or at specific detector locations that can be used to determine travel times and speeds between defined locations.

Progression – The act of various controllers providing specific green indications in accordance with a time schedule to permit continuous operation of groups of vehicles along the street at a planned speed.

Protected mode – An operational mode under which turning drivers are given the right-of-way during the associated turn phase while all conflicting movements are required to stop.

Protected–permitted mode – An operational mode combining the permitted and protected modes. Turning drivers have the right-of-way during the associated turn phase. Turning drivers can also complete the turn "permissively" when the adjacent through movement receives its circular green (or when the turning driver receives a flashing yellow arrow) indication.

Pseudo right turns – A concept applied to the analysis of full DLT intersections with the HCM signalized intersection model, where the displaced left turns are modeled as right turns from the opposing approach.

Pulse detection – A detection mode under which the actuation starts and ends with the vehicle arriving at the detector (the actuation consists of a short "on" pulse of 0.10 to 0.15 s).

Q **Quality of service** – A description of how well a transportation facility or service operates from a traveler's perspective.

Quantity of service – The utilization of the transportation system in terms of the number of people using the system, the distance they travel, and the time they require to travel.

Queue – A line of vehicles, bicycles, or persons waiting to be served because of traffic control, a bottleneck, or other reasons.

Queue accumulation polygon – A graphic tool for describing the deterministic relationship between vehicle arrivals, departures, queue service time, and delay.

Queue delay – **1.** The length of time that a vehicle spends in a queued state. **2.** When queue delay is computed from vehicle trajectories, it is the accumulated time step delay over all time steps in which the vehicle is in a queue.

Queue discharge capacity drop – The percent reduction in the prebreakdown capacity following breakdown at an active bottleneck.

Queue discharge flow – Traffic flow that has just passed through a bottleneck and, in the absence of another bottleneck downstream, is accelerating back to the facility's free-flow speed.

Queue discharge flow rate – The average 15-min flow rate during oversaturated conditions (i.e., during the time interval after breakdown and before recovery).

Queued state – A condition when a vehicle is within one car length of a stopped vehicle or the stop bar and is itself about to stop.

Queue jump – A short bus lane section (often shared with a right-turn lane), in combination with an advance green indication for the lane, that allows buses to move past a queue of cars at a signal.

Queue length – The distance between the upstream and downstream ends of the queue.

Queue spillback – A condition where the back of a queue extends beyond the available storage length, resulting in potential interference with upstream traffic movements. See also *cyclic spillback, sustained spillback,* and *turn bay spillback.*

Queue storage ratio – The maximum back of queue as a proportion of the available storage on the subject lane or link.

Queuing area – A place where pedestrians stand while waiting to be served, such as at the corner of a signalized intersection.

R **Ramp** – **1.** A dedicated roadway providing a connection between two other roadways; at least one of the roadways a ramp connects is typically a high-speed facility such as a freeway, multilane highway, or C-D roadway.

2. A sloped walkway connecting pedestrian facilities at different elevations.

Ramp–freeway junction – The point of connection between a ramp and a high-speed facility, such as a freeway, multilane highway, or C-D roadway, designed for high-speed merging or diverging without control.

Ramp meter – A traffic signal that controls the entry of vehicles from a ramp onto a limited-access facility; the signal allows one or two vehicles to enter on each green or green flash.

Ramp roadway – See *ramp*.

Ramp–street junction – See *interchange ramp terminal*.

Ramp weave – A weaving segment where a one-lane on-ramp is closely followed by a one-lane off-ramp, connected by a continuous freeway auxiliary lane. All weaving drivers must execute a lane change across the lane line separating the freeway auxiliary lane from the right lane of the freeway mainline.

Rank – The hierarchy of right-of-way among conflicting traffic streams at a two-way STOP-controlled intersection.

Reasonable expectancy – The concept that the stated capacity for a given system element is one that can be achieved repeatedly during peak periods rather than being the absolute maximum flow rate that could be observed.

Receiving lanes – Lanes departing an intersection.

Recovery – **1.** A return of freeway operations to near prebreakdown conditions for at least 15 min. **2.** A return of the prevailing speed to within 10% of the free-flow speed for a sustained period of at least 15 min, without the presence of queuing upstream of the bottleneck.

Recreational vehicle – A heavy vehicle, generally operated by a private motorist, for transporting recreational equipment or facilities; examples include campers, motor homes, and vehicles towing boat trailers.

Recurring congestion – Congestion that regularly occurs at a particular location and time of day due, for example, to a bottleneck.

Red clearance interval – This interval follows the yellow change interval and is optionally used to provide additional time before conflicting movements receive a green indication.

Red time – The period in the signal cycle during which, for a given phase or lane group, the signal is red.

Reduced conflict intersection – See *restricted crossing U-turn intersection*.

Reentry delay – Delay experienced by buses leaving a bus stop, when they must wait for a gap in traffic before reentering the travel lane.

Reference phase – One of the two coordinated phases (i.e., Phase 2 or 6).

Regression model – A model that uses field or simulated data to derive statistical relationships between particular model inputs and performance measures such as capacity and delay.

Reliability rating – The percentage of vehicle miles traveled on the facility that experiences a travel time index less than 1.33 (freeways) or 2.50 (urban streets).

Reliability reporting period – The specific set of days over which travel time reliability is computed (e.g., all nonholiday weekdays in a year).

Residual queue – The unmet demand at the end of an analysis period resulting from operation while demand exceeded capacity.

Rest-in-walk mode – A controller mode in which the phase will dwell in walk as long as there are no conflicting calls. When a conflicting call is received, the pedestrian clear interval will time to its setting value before ending the phase.

Restricted crossing U-turn (RCUT) intersection – An alternative intersection that reroutes the minor-street left turn and through movements to one-way U-turn crossovers on the major street. These crossovers are typically located 450 ft or more from the central junction.

Restrictive median – A median (e.g., a raised curb) that prevents or discourages vehicles from crossing the opposing traffic lanes.

Reverse priority – See *priority reversal*.

Right-of-way – **1.** The permitting of vehicles or pedestrians to proceed in a lawful manner in preference to other vehicles or pedestrians by the display of a sign or signal indications. **2.** Land used for the provision of a public roadway.

Right-turn bypass lane – At a roundabout, a lane provided adjacent to but separated from the circulatory roadway. It allows right-turning movements to bypass the roundabout.

Right turn on red – The ability to make a right turn at a signalized intersection when a red indication is displayed, after stopping and only when no conflicting motorized vehicle, bicycle, or pedestrian traffic is present.

Ring – A set of phases operating in sequence.

Roadside obstruction – An object or barrier along a roadside or median that affects traffic

flow, whether continuous (e.g., a retaining wall) or not continuous (e.g., light supports or bridge abutments).

Roadway – That portion of a highway improved, designed, or ordinarily used for vehicular travel and parking lanes but exclusive of the sidewalk, berm, or shoulder even though such sidewalk, berm, or shoulder is used by persons riding bicycles or other human-powered vehicles.

Roadway characteristic – A geometric characteristic of a street or highway, including the type of facility, number and width of lanes (by direction), shoulder widths and lateral clearances, design speed, and horizontal and vertical alignments.

Roadway metering – The storing of surges in demand at various points in the transportation network. Typical examples of roadway metering include freeway on-ramp metering, freeway-to-freeway ramp metering, freeway mainline metering, peak period freeway ramp closures, and arterial signal metering.

Roadway occupancy – **1.** The proportion of roadway length covered by vehicles. **2.** The proportion of time a roadway cross section is occupied by vehicles.

Rolling terrain – Any combination of grades and horizontal or vertical alignment that causes heavy vehicles to reduce their speed substantially below that of passenger cars but that does not cause heavy vehicles to operate at crawl speeds for any significant length of time or at frequent intervals.

Roundabout – An intersection with a generally circular shape, characterized by yield on entry and circulation around a central island.

Rubbernecking – The slowing of motorists to observe a traffic incident.

Running speed – See *average running speed*.

Running time – The time a vehicle spends in motion.

Rural – **1.** An area with widely scattered development and a low density of housing and employment. **2.** A location outside any urbanized area boundary, as defined by the Federal Highway Administration.

S **Saturation flow rate** – The equivalent hourly rate at which previously queued vehicles can traverse an intersection approach under prevailing conditions, assuming that the green indication is available at all times and no lost times are experienced.

Saturation flow rate, adjusted – The saturation flow rate under prevailing geometric and traffic conditions.

Saturation flow rate, base – The expected average flow rate for a through-traffic lane for exceptionally favorable geometric and traffic conditions (no grade, no trucks, and so forth).

Saturation headway – **1.** At a signalized intersection, the average headway between vehicles occurring after the fourth vehicle in the queue and continuing until the last vehicle in the initial queue clears the intersection. **2.** At an all-way STOP-controlled intersection, the time between departures of successive vehicles on a given approach for a particular case, assuming a continuous queue.

Scenario – **1.** A single instance of a study period for the facility, with a unique combination of traffic demands, capacities, geometries, and free-flow speeds represented in its analysis periods. **2.** See *model application*.

Scenario, base – A set of parameters representing the facility's calibrated operating conditions during one study period. All other scenarios are developed by adjusting the base scenario's inputs to reflect the effects of varying demand, weather, incidents, work zones, or a combination occurring in other study periods. See also *seed file* and *base dataset*.

Scenario generation – The enumeration of the different operational conditions on a freeway or urban street facility on the basis of varying combinations of factors affecting the facility travel time.

Section – A portion of a freeway facility between points where either demand or capacity changes.

Section, study – The length of facility over which reliability is to be computed.

Seed file – The inputs provided to a computational engine corresponding to the base scenario.

Segment – **1.** For interrupted-flow facilities, a link and its boundary points. **2.** For uninterrupted-flow facilities, a portion of a facility between two points.

Segment delay – **1.** The delay experienced by a vehicle since it left the upstream node (usually another signal), including traffic delay, incident delay, control delay, and geometric delay. **2.** When calculated from vehicle trajectories, the time actually taken to traverse a segment minus the time it would have taken to traverse the segment at the target speed. The segment delay on any time step is equal to the time step delay; segment

delays accumulated over all time steps in which a vehicle is present on the segment represent the segment delay for that vehicle.

Segment initialization – The process of determining the appropriate number of vehicles in each segment as a precursor to estimating the number of vehicles on each freeway segment for each time step under oversaturated conditions.

Semiactuated control – Signal control in which some approaches (typically on the minor street) have detectors and some approaches (typically on the major street) have no detectors.

Semi–standard deviation – A one-sided standard deviation, with the reference point being free-flow travel time instead of the mean.

Sensitivity analysis – A technique for exploring how model outputs change in response to changes in model inputs, implemented by varying one input at a time over its reasonable range while holding all other inputs constant.

Service flow rate – The maximum directional rate of flow that can be sustained in a given segment under prevailing roadway, traffic, and control conditions without violating the criteria for a given LOS.

Service measure – A performance measure used to define LOS for a transportation system element.

Service time – At an all-way STOP-controlled intersection, the average time spent by a vehicle in first position waiting to depart, equal to the departure headway minus the move-up time.

Service volume – The maximum number of vehicles that a system element can serve at a given LOS, given a set of assumed conditions.

Service volume table – See *generalized service volume table*.

Severe weather – Weather conditions that generate capacity, demand, or speed adjustments (i.e., weather conditions that have been shown to reduce capacity by at least 4%).

Shared lane – 1. A lane shared by more than one movement. 2. A bicycle facility where bicycles share a travel lane with motorized vehicle traffic.

Shared-lane capacity – The capacity of a lane at an intersection that is shared by two or three movements.

Shared-use path – A path physically separated from highway traffic for the use of pedestrians, bicyclists, runners, inline skaters, and other nonmotorized users.

Shelter – A structure with a roof and (typically) three enclosed sides that protects waiting transit passengers from wind, rain, and sun.

Shock wave – A change or discontinuity in traffic conditions. For example, a shock wave is generated when the signal turns red, and it moves upstream as vehicles arriving at the queue slow down. A shock wave is also generated when the signal turns green, and it moves downstream as the first set of vehicles discharge from the signal.

Short length – The distance within a weaving segment over which lane changing is not prohibited or dissuaded by markings.

Shoulder – A portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles; emergency use; and lateral support of the subbase, base, and surface courses.

Shoulder bypass lane – A portion of the paved shoulder opposite the minor-road leg at a three-leg intersection, marked as a lane for through traffic to bypass vehicles that are slowing or stopped to make a left turn.

Shy distance – The buffer that pedestrians give themselves to avoid accidentally stepping off the curb, brushing against a building face, or getting too close to pedestrians standing under awnings or window shopping.

Sidepath – A shared pedestrian–bicycle path located parallel and in proximity to a roadway.

Side street – See *minor street*.

Sidewalk – A pedestrian facility located parallel and in proximity to a roadway.

Signal priority – See *traffic signal priority*.

Simulation – See *traffic simulation*.

Simultaneous gap out – A controller mode requiring that both phases reach a point of being committed to terminate (via gap out, max out, or force-off) at the same time.

Single entry – A mode of operation (in a multiring controller) in which a phase in one ring can be selected and timed alone if there is no demand for service in a nonconflicting phase on the parallel ring(s).

Single-lane roundabout – A roundabout that has single lanes on all entries and one circulatory lane.

Single-point urban interchange (SPUI) – A diamond interchange that combines all the

left-turning ramp movements into a single signalized intersection.

Single-stage gap acceptance – See *one-stage gap acceptance*.

Single-unit trucks – **1.** Trucks on a single frame. **2.** Federal Highway Administration Vehicle Classifications 5–7.

Sketch-planning tools – Tools that produce general order-of-magnitude estimates of travel demand and transportation system performance under different transportation system improvement alternatives.

Space – See *pedestrian space*.

Space gap – See *gap*.

Space mean speed – An average speed based on the average travel time of vehicles to traverse a length of roadway.

Spacing – The distance between two successive vehicles in a traffic lane, measured from the same common feature of the vehicles (e.g., rear axle, front axle, or front bumper).

Spatial stop rate – The ratio of stop count to facility length. See also *stop rate*.

Spatial variability – Variability in measured values, such as the percentage of trucks in the traffic stream, from one location to another within an area or from one area to another.

Special events – Sources of high demand that occur at known times relatively infrequently, resulting in traffic flow patterns that vary substantially from the typical situation.

Specific grade – A roadway segment with a grade that is steep or long enough to require separate analysis.

Speed – A rate of motion expressed as distance per unit of time.

Speed adjustment factor – An adjustment to base free-flow speed to reflect the effects of severe weather, incidents, and work zones. It can also be used to calibrate the freeway facility model to reflect local conditions.

Speed harmonization – The dynamic slowing of traffic in advance of queues, incidents, and lane closures and the direction of traffic to the remaining lanes.

Spillback – See *queue spillback*.

Spillover – A condition occurring when pedestrians begin to use more than the provided sidewalk or walkway space (e.g., by stepping into the street) to travel at their desired speed.

Split – The segment of the cycle length allocated to each phase or interval that may occur. In an actuated controller unit, split is the time in the cycle allocated to a phase—the sum of the green, yellow change, and red clearance intervals for a phase.

Split-diamond interchange – A diamond interchange in which freeway entry and exit ramps are separated at the street level, creating four intersections.

Split phasing – A phase sequence in which one phase serves all movements on one approach and a second phase serves all movements on the opposing approach.

Splitter island – A raised or painted area on a roundabout approach used to separate entering from exiting traffic, deflect and slow entering traffic, and provide storage space for pedestrians crossing that intersection approach in two stages.

Stairway – A pedestrian facility that ascends a grade via a series of steps and landings.

Start-up lost time – The additional time consumed by the first few vehicles in a queue whose headway exceeds the saturation headway because of the need to react to the initiation of the green interval and accelerate.

Static flow model – A mathematical model in which the traffic flow rate and origin–destination volumes are constant.

Stochastic – Involving an element of randomness.

Stochastic model – A mathematical model that uses random number generation for the determination of at least one parameter.

Stop-line detector length – The length of the detection zone used to extend the green indication.

Stopped delay – The amount of time that a vehicle is stopped. When calculated from vehicle trajectories, it is equal to the time step delay on any step in which the vehicle is in a stopped state. Time step delays accumulated over all time steps in which the vehicle was in the stopped state represent the stopped delay for that vehicle.

Stopped state – A condition when a vehicle is traveling at less than 5 mi/h.

Stop rate – The count of full stops divided by the number of vehicles served. See also *spatial stop rate*.

Storage length – The length of turn lane available for storing queued vehicles.

Street – See *highway*.

Streetcar mode – A transit mode operated by vehicles that receive power from overhead wires and run on tracks. Compared with light rail, streetcars are generally shorter and narrower, are more likely to have onboard

fare collection, make more frequent stops, and are more likely to operate in mixed traffic.

Street corner – The area encompassed within the intersection of two sidewalks.

Study period – The time interval within a day for which facility performance is evaluated, consisting of one or more consecutive analysis periods.

Subject approach – The approach under study at two-way and all-way STOP-controlled intersections.

Suburban street – A street with low-density driveway access on the periphery of an urban area.

Superstreet – See *restricted crossing U-turn intersection.*

Sustained spillback – A result of oversaturation, where a queue does not dissipate at the end of each cycle but remains present until the downstream capacity is increased or the upstream demand is reduced.

Synchronized street – See *restricted crossing U-turn intersection.*

System – All the transportation facilities and modes within a particular region.

System elements – Components of a transportation system, including points, segments, facilities, corridors, and areas.

T

Target speed – In a simulation tool, the speed at which a driver would prefer to travel; it differs from the free-flow speed in that most simulation tools apply a "driver aggressiveness" factor to the free-flow speed to determine a target speed.

Temporal variability – Variability in measured values, such as hourly traffic volumes, that occurs from day to day or month to month at a given location.

Terrain – See *general terrain, level terrain, rolling terrain,* and *mountainous terrain.*

Three-level diamond interchange – A diamond interchange with two divided levels so that both facilities provide continuous through movements.

Threshold delay – The excess travel time that occurs beyond a defined speed or LOS established by norm.

Throughput – The number of persons or vehicles passing a point on a transportation facility during a given time period.

Through vehicles – All vehicles passing directly through a street segment and not turning.

Thru turn – See *median U-turn intersection.*

Tight urban diamond interchange – A diamond interchange with a separation of less than 400 ft between the two intersections.

Time gap – See *gap.*

Time interval – See *analysis period.*

Time interval scale factor – The ratio of the total facility entrance counts to total facility exit counts.

Time mean speed – The average speed of vehicles observed passing a point on a highway.

Time step delay – The length of a time step minus the time it would have taken a vehicle to cover the distance traveled in the step at the target speed.

Time-space – In pedestrian analysis, the product of time and space, combining the constraints of physical design (which limits available space) and signal operation (which limits available time).

Time–space domain – A specification of the freeway sections and segments included in the defined facility and an identification of the time intervals for which the analysis is to be conducted.

Time-varying flow model – A simulation model in which flow changes with time.

Toll plaza – An area along, at the entrance to, or at the exit from a tolled facility where tolls are collected, particularly areas consisting of a row of tollbooths across the roadway.

Tool – See *traffic analysis tool.*

Total lateral clearance (TLC) – The sum of the right-side and left-side lateral clearances along a multilane highway.

Total lost time – See *lost time.*

Total ramp density – The average number of on-ramp, off-ramp, major merge, and major diverge junctions per mile.

Tractor trailers – 1. Trucks consisting of two or more units, one of which is a tractor or straight truck power unit and the others being trailers. 2. Federal Highway Administration Vehicle Classifications 8–13.

Traffic analysis tool – A software product used for traffic analysis that includes, at a minimum, a computational engine and a user interface.

Traffic circle – A circular intersection lacking one or more characteristics of a roundabout.

Traffic composition – The mix of cars, buses, trucks, carpools, bicycles, and pedestrians in the network.

Traffic condition – A characteristic of traffic flow, including distribution of vehicle types in the traffic stream, directional distribution of traffic, lane use distribution of traffic, and type of driver population on a given facility.

Traffic control device – A sign, signal, marking, or other device used to regulate, warn, or guide traffic.

Traffic delay – Extra travel time resulting from the interaction of vehicles, which causes drivers to reduce their speed below the free-flow speed.

Traffic incident – See *incident*.

Traffic pressure – The display of aggressive driving behavior for a large number of drivers during high-demand traffic conditions. Under such conditions, a large number of drivers accept shorter headways during queue discharge than they would under different circumstances.

Traffic signal delay – Delay experienced by a bus that arrives at a near-side stop during the green interval, serves its passengers during portions of the green and red intervals, and then must wait for the traffic signal to turn green again before proceeding. See also *control delay*.

Traffic signal optimization tool – A tool primarily designed to develop optimal signal phasing and timing plans for isolated signalized intersections, arterial streets, or signal networks.

Traffic signal priority – Signal timing adjustments to accommodate preferred vehicles while maintaining coordination.

Traffic simulation – A mathematical representation of a road transportation system, implemented as computer software. Depending on the degree to which the movements of individual vehicles are aggregated, traffic simulation tools can be characterized as *microscopic, mesoscopic,* or *macroscopic.*

Transit frequency – The count of scheduled fixed-route transit vehicles that stop on or near an urban street segment during the analysis period.

Transition – The process of entering into a coordinated signal timing plan from free operations, changing between two plans, or returning to a plan after the loss of coordination.

Transit LOS score – See *level-of-service score.*

Transit mode – A submode of the motorized vehicle mode in which transit vehicles (including buses, streetcars, and street-running light rail) stop at regular intervals along the roadway to pick up and drop off passengers.

Transit reliability – A measure of the time performance and the regularity of headways between successive transit vehicles affecting the length of time passengers must wait at a transit stop as well as the consistency of a passenger's arrival time at a destination.

Transit route – A designated path to which a transit vehicle is assigned. Several routes may traverse a single portion of roadway.

Transit signal priority – See *traffic signal priority.*

Transitway – See *on-street transitway.*

Travel demand models – Models that forecast long-term travel demand on the basis of current conditions and projections of socioeconomic characteristics and changes in transportation system design.

Traveler information systems – An integration of technologies that allow the general public to access real-time or near real-time data on traffic factors such as incident conditions, travel time, and speed.

Traveler perception model – A model that estimates the average response or range of responses of travelers to a given set of conditions (typically operational or design in nature). See also *level-of-service score.*

Travel mode – **1.** A transport category characterized by specific right-of-way, technological, and operational features. **2.** A particular form of travel, for example, walking, bicycling, traveling by automobile, or traveling by bus.

Travel speed – See *average travel speed.*

Travel time – **1.** The average time spent by vehicles traversing a highway segment, including control delay. **2.** The time required for a vehicle to travel the full length of the freeway facility from mainline entry point to mainline exit point without leaving the facility or stopping for reasons unrelated to traffic conditions.

Travel time distribution – The distribution of average facility travel times by analysis period across the reliability reporting period.

Travel time index – The ratio of actual travel time to a target travel time (e.g., the free-flow travel time, or a desirable travel time set by agency policy).

Travel time rate – The reciprocal of speed, expressed as time per unit distance traveled.

Travel time reliability – **1.** The probability of "on-time" arrival (i.e., the probability that a

trip is completed below a certain threshold time). **2.** The variability in travel time for a given trip due to unforeseen causes such as variations in demand or an incident.

Truck – A heavy vehicle engaged primarily in the transport of goods and materials or in the delivery of services other than public transportation. See also *single-unit trucks* and *tractor trailers*.

Truck mode – A submode of the motorized vehicle mode in which single-unit trucks and tractor trailers operate along roadways.

Turn bay spillback – A condition under which a queue of turning vehicles exceeds the turn bay storage and spills back into the adjacent lane that is used by other vehicular movements.

Turning movement – The direction taken by a vehicle when it moves from one roadway to another at an intersection (i.e., left turn, right turn, U-turn). See also *movement*.

Turn lane – See *exclusive turn lane*.

Turnout – A short segment of a lane—usually a widened, unobstructed shoulder area— added to a two-lane, two-way highway, allowing slow-moving vehicles to leave the main roadway and stop so that faster vehicles can pass.

Two-lane highway – A roadway that generally has a two-lane cross section, one lane for each direction of flow, although passing and climbing lanes may be provided periodically. Within the two-lane sections, passing maneuvers must be made in the opposing lane.

Two-phase pattern – A type of operation at an all-way STOP-controlled intersection where drivers from opposing approaches enter the intersection at roughly the same time.

Two-sided weaving segment – A weaving segment in which at least one weaving maneuver requires three or more lane changes to be completed successfully or in which a single-lane on-ramp is closely followed by a single-lane off-ramp on the opposite side of the freeway.

Two-stage crossing – A condition that arises when a raised median refuge island is available, allowing pedestrians to cross one conflicting traffic stream at a time.

Two-stage gap acceptance – A condition where a median refuge area is available for minor-street through and left-turning drivers at a two-way STOP-controlled intersection so that drivers sequentially evaluate and use gaps in the near-side major-street traffic

stream, followed by gaps in the far-side major-street traffic stream.

Two-way left-turn lane – A lane in the median area that extends continuously along a street or highway and is marked to provide a deceleration and storage area, out of the through-traffic stream, for vehicles traveling in either direction to use in making left turns at intersections and driveways.

Two-way STOP-controlled – The type of traffic control at an intersection where drivers on the minor street or drivers turning left from the major street wait for a gap in the major-street traffic to complete a maneuver.

U

Uncertainty – The range within which a model's estimate of a value is statistically likely to vary from the actual value.

Uncontrolled – Lacking a traffic control device that interrupts traffic flow (e.g., a traffic signal, STOP sign, or YIELD sign).

Undersaturated flow – Traffic flow where (*a*) the arrival flow rate is lower than the capacity of a point or segment, (*b*) no residual queue remains from a prior breakdown of the facility, and (*c*) traffic flow is unaffected by downstream conditions.

Undivided highway – A highway where opposing directions of travel are separated by paint stripes or painted buffers.

Undivided median type – An urban street where opposing directions of travel are not separated by a nonrestrictive median (e.g., two-way left-turn lane) or a restrictive median (e.g., raised curb).

Uniform delay – The first term of the equation for lane group control delay, assuming constant arrival and departure rates during a given time period.

Uninterrupted-flow facilities – Facilities that have no fixed causes of delay or interruption external to the traffic stream; examples include freeways and unsignalized sections of multilane and two-lane rural highways.

Unit extension – See *passage time*.

Unit width flow rate – The pedestrian flow rate expressed as pedestrians per minute per unit of walkway or crosswalk width.

Unmet demand – The number of vehicles on a signalized lane group that have not been served at any point in time as a result of operation in which demand exceeds capacity in either the current or the previous analysis period. This does not include the normal cyclical queue formation on the red and

discharge on the green phase. See also *initial queue* and *residual queue*.

Unsignalized intersection – An intersection not controlled by traffic signals.

Upstream – The direction from which traffic is flowing.

Urban – **1.** An area typified by high densities of development or concentrations of population, drawing people from several areas within a region. **2.** A location within an urbanized area boundary, as defined by the Federal Highway Administration.

Urban street – A street with a relatively high density of driveway and cross-street access, located in an urban area, with traffic signals or interrupting STOP or YIELD signs no farther than 2 mi apart. HCM procedures are typically applicable to arterial and collector urban streets, including those in downtown areas.

Urban street facility – A length of roadway that is composed of contiguous urban street segments.

Urban street segment – A length of urban street from one boundary intersection to the next, including the upstream boundary intersection but not the downstream boundary intersection.

User group – See *mode group*.

User perception variability – Variation in user responses that occurs when different users experiencing identical conditions are asked to rate the conditions.

Utility – A measure of the value a traveler places on a trip choice.

V

Validation – The process by which the analyst checks the overall model-predicted traffic performance for a street–road system against field measurements of traffic performance, on the basis of field data not used in the calibration process.

Value pricing – See *congestion pricing*.

Variability – The day-to-day variation in congestion.

Vehicle – Any device in, on, or by which any person or property can be transported or drawn on a highway.

Vehicle capacity – The maximum number of vehicles that can pass a given point during a specified period under prevailing roadway, traffic, and control conditions.

Vehicle trajectory analysis – The development of performance measures from the properties of time–space trajectories of individual vehicles.

Verification – The process by which a software developer and other researchers check the accuracy of a software implementation of traffic operations theory.

Volume – The total number of vehicles or other roadway users that pass over a given point or section of a lane or roadway during a given time interval, often 1 h.

Volume balance – A condition in which the combined volume from all movements entering a segment equals the combined volume exiting the segment, in a given direction of travel.

Volume-to-capacity (*v/c*) ratio – The ratio of flow rate to capacity for a system element.

W

Walk interval – A period of time intended to give pedestrians adequate time to perceive the WALK indication and depart the curb before the pedestrian clear interval begins.

Walkways – Paved paths, ramps, and plazas that are generally located more than 35 ft from an urban street, as well as streets reserved for pedestrian traffic on a full- or part-time basis.

Wave speed – The speed at which a shock wave travels upstream or downstream through traffic.

Weaving – The crossing of two or more traffic streams traveling in the same direction along a significant length of highway, without the aid of traffic control devices (except for guide signs).

Weaving configuration – The linkage between the entry and exit lanes in a weaving segment, which determines lane-changing characteristics.

Weaving flow – The traffic movements in a weaving segment that are engaged in weaving movements.

Weaving length – See *base length, maximum weaving length*, and *short length*.

Weaving movement – A traffic flow within a weaving segment (on-ramp to mainline or mainline to off-ramp) that must cross paths with another traffic flow while traversing the segment.

Weaving segment – See *freeway weaving segment*.

Weaving segment influence area – See *influence area*.

Weaving segment width – The total number of lanes between the entry and exit gore areas

within a weaving segment, including auxiliary lanes, if present.

Weight-to-power ratio – A truck's gross vehicle weight divided by the power produced by its engine; this ratio relates to a truck's ability to accelerate and to maintain a given speed on an upgrade.

Work zone – A segment of highway in which maintenance or construction operations reduce the number of lanes available to traffic or affect the operational characteristics of traffic flowing through the segment.

Y

Yellow change interval – The interval following the green interval, used to warn drivers of the impending red indication. A yellow indication is displayed for this duration.

Yellow time – The duration of the yellow change interval.

Yellow trap – A condition that leads a left-turning driver into the intersection believing the opposing driver is seeing a yellow indication.

Yield point – The earliest point in a coordinated signal operation that the controller can decide to terminate the coordinated phase(s).

2. LIST OF SYMBOLS

This section lists and defines the symbols used in HCM equations, along with their units if applicable. If a symbol has more than one meaning, the chapter or chapters of the specific use are cited in parentheses after the definition. Variations of symbols using the subscripts i, j, k, and m to indicate index values (e.g., segment i, lane group j, movement m) are generally not included; refer to the parent symbol in these cases for the definition and units.

$\%HV$ percentage of heavy vehicles (%)

$\%LL$ percentage of entry traffic using the left lane (decimal)

$\%OHP$ percentage of segment with occupied on-highway parking (decimal)

$\%RL$ percentage of entry traffic using the right lane (decimal)

$\%VL_i$ percentage of traffic present in lane L_i (decimal)

$\%VL_{i,DDI}$ percentage of traffic present in lane L_i for a DDI (decimal)

$\%VL_{max}$ percentage of the total approach flow in the lane with the highest volume (decimal)

2-to-1   indicator variable that is 1 when the work zone has a 2-to-1 configuration and 0 otherwise

2-to-2   indicator variable that is 1 when the work zone has a 2-to-2 configuration and 0 otherwise

3-to-2   indicator variable that is 1 when the work zone has a 3-to-2 configuration and 0 otherwise

4-to-3   indicator variable that is 1 when the work zone has a 4-to-3 configuration and 0 otherwise

a exponent calibration parameter (decimal, Chapter 12); PTSF coefficient for estimating BPTSF (Chapter 15); adjustment factor (Chapter 20); delay due to deceleration into a turn and acceleration after the next turn (s, Chapter 23)

A roundabout capacity model intercept (Chapter 22); parameter for the undersaturated model (Chapter 25); critical flow ratio for the arterial movements (Chapter 34)

a_1 passenger load weighting factor (Chapter 18); lane utilization model coefficient (Chapter 23)

a_2 lane utilization model coefficient

A_2 speed reduction per unit of flow rate in the curvilinear section of the speed–flow curve (mi/h)

A_2^{55} calibration factor for a free-flow speed of 55 mi/h (mi/h)

a_3 lane utilization model coefficient

$AADT$ annual average daily traffic (veh/day)

ACR facility AADT divided by its two-way hourly capacity

$AdjP(i)$ probability adjustment factor for degree-of-conflict case i

A_i expected passings per minute of mode i by average bicyclist

A_I critical flow ratio for the arterial movements for Intersection I

$A_{I,II}$ critical flow ratio for the arterial movements for the interchange

A_{II} critical flow ratio for the arterial movements for Intersection II

a_l indicator variable that is 1 when a vehicle is present in the lane and 0 otherwise

A_p pedestrian space (ft²/p)

$A_{p,F}$ pedestrian space for the facility (ft²/p)

A_{pbT} unoccupied time

A_T expected active passings per minute by the average bicycle during the peak 15 min

ATS_d average travel speed in the analysis direction (mi/h)

ATS_F average travel speed for the facility (mi/h)

ATS_i average travel speed for directional segment i (mi/h)

ATS_{pl} average travel speed in the analysis segment as affected by a passing lane (mi/h)

$AuxLength$ auxiliary lane length (ft)

$AveCap(s)$ average capacity per lane for section s (veh/h/ln)

AVO_i average vehicle occupancy on segment i (p/veh)

a_w approach lane width during work zone (= total width of all open left-turn, through, and right-turn lanes) (ft)

b PTSF coefficient for estimating BPTSF (Chapter 15); intermediate calculation variable (Chapter 30)

B roundabout capacity model coefficient (Chapter 22); parameter for the undersaturated model (Chapter 25)

$b_{d,j}$ destination adjustment factor j

$BFFS$ base free-flow speed (mi/h)

b_i bunching factor for lane group i

$b_{i,j,k}$ proportion of volume at destination j that came from origin i for subperiod k (veh/h)

$b_{ic,int(i),n,ap,d}$ calibration coefficient based on incident severity on leg associated with NEMA phase n at intersection i during analysis period ap and day d

$BLOS$ bicycle level-of-service score

$b_{o,i}$ origin adjustment factor i

BP breakpoint in the speed–flow curve separating the linear and curvilinear sections (pc/h/ln)

BP_{75} breakpoint for a free-flow speed of 75 mi/h (pc/h/ln)

BP_{ao} breakpoint in the automobile-only flow condition (pc/h/ln)

BP_{mix} breakpoint for mixed flow (veh/h/ln)

$BPTSF_d$ base percent time-spent-following in the analysis direction

c base capacity (pc/h/ln, Chapter 12); capacity of the combined movements (veh/h, Chapter 30); intermediate calculation variable (Chapter 30)

C cycle length (s, Chapter 19); parameter for the undersaturated model (Chapter 25)

C' cycle length (steps)

c_{75} managed lane capacity for a free-flow speed of 75 mi/h (pc/h/ln);

c_a available capacity for a lane group served by an actuated phase (veh/h)

c_A average capacity (veh/h)

$c_{a,l,e}$ available capacity of an exclusive-lane lane group with permitted left-turn operation (veh/h)

$c_{a,l,e,p}$ available capacity of an exclusive-lane lane group with protected left-turn operation (veh/h)

$c_{a,l,e,pp}$ available capacity of an exclusive-lane lane group with protected–permitted left-turn operation (veh/h)

$c_{a,r,e,pp}$ available capacity of an exclusive-lane lane group with protected–permitted right-turn operation (veh/h)

$c_{a,sl}$ available capacity of a shared-lane lane group with permitted left-turn operation (veh/h)

$c_{a,sl,pp}$ available capacity of a shared-lane lane group with protected–permitted left-turn operation (veh/h)

c_{adj} adjusted segment capacity (pc/h/ln)

CAF capacity adjustment factor (unitless)

CAF_{ao} capacity adjustment factor for the automobile-only case (e.g., due to weather or incidents) (decimal)

CAF_{cal} capacity adjustment factor for calibration purposes (unitless)

$CAF_{g,mix}$ capacity adjustment factor for grade in mixed-flow conditions (decimal)

CAF_{mix} mixed-flow capacity adjustment factor for the basic freeway segment (decimal)

$CAF_{T,mix}$ capacity adjustment factor for the percentage of trucks in mixed-flow conditions (decimal)

CAF_{weave} capacity adjustment factor for a weaving segment (decimal)

CAF_{wz} capacity adjustment factor for a work zone (decimal)

C_{ao} base segment capacity (pc/h/ln)

$CapMFlanes(s)$ capacity per mixed-flow lane in section s (veh/h/ln)

$CapShldr(s)$ capacity per shoulder lane for section s (veh/h/ln)

c_b capacity of the bicycle lane (bicycles/h, Chapter 19); capacity during the blocked regime (veh/h, Chapter 23)

$c_{bypass,pce}$ capacity of the bypass lane, adjusted for heavy vehicles (pc/h)

$c_{d,j,k}$ capacity at the downstream intersection for movement j for subperiod k (veh/h)

c_{dATS} capacity in the analysis direction under prevailing conditions based on ATS (pc/h)

c_{dPTSF} capacity in the analysis direction under prevailing conditions based on PTSF (pc/h)

C_e equilibrium cycle length (s)

$c_{e,L,pce}$ capacity of the left entry lane, adjusted for heavy vehicles (pc/h)

$c_{e,pce}$ lane capacity, adjusted for heavy vehicles (pc/h)

$c_{e,R,pce}$ capacity of the right entry lane, adjusted for heavy vehicles (pc/h)

$CFAF_{int}$ crash frequency adjustment factor for an intersection

$CFAF_{rf}$ crash frequency adjustment factor for rainfall

$CFAF_{seg}$ crash frequency adjustment factor for a segment

$CFAF_{sf}$ crash frequency adjustment factor for snowfall

$CFAF_{sp}$ crash frequency adjustment factor for snow or ice on pavement (not snowing)

$CFAF_{wea}$ crash frequency adjustment factor for weather condition wea

$CFAF_{wp}$ crash frequency adjustment factor for wet pavement (not raining)

c_{GA} capacity during the gap acceptance regime (veh/h)

CG_{DS} common green time with demand starvation potential (s)

c_{GP} unadjusted capacity of the general purpose lanes (veh/h)

c_{GPA} adjusted capacity of the general purpose lanes (veh/h)

CG_{RD} common green time between the upstream ramp green and the downstream arterial through green (s)

CG_{UD} common green time between the upstream through green and downstream through green (s)

$CG_{U,D}$ common green time between upstream approach i and downstream through green (s)

ci set of critical phases on the critical path

c_i capacity of lane, lane group, or section i (veh/h); movement capacity during iteration i (veh/h, Chapter 30)

$c_{i,PCE}$ capacity for lane i (pc/h)

c_I movement capacity for the Stage I process (veh/h)

c_j intersection capacity (tpc/h/ln)

$CI_{1-\alpha}$ confidence interval for the true average value, with a level of confidence of $1 - \alpha$

CID central island diameter (ft)

c_{IFL} capacity of a basic freeway segment with the same free-flow speed as the weaving segment under equivalent ideal conditions, per lane (pc/h/ln)

c_{II} movement capacity for the Stage II process (veh/h)

c_{IW} capacity of all lanes in the weaving segment under ideal conditions (pc/h)

c_{IWL} capacity of the weaving segment under equivalent ideal conditions (pc/h/ln)

c_l capacity of a left-turn movement with permitted left-turn operation (veh/h)

CL indicator variable that is 1 when the trail has a centerline and 0 otherwise

$c_{l,e}$ capacity of an exclusive-lane lane group with permitted left-turn operation (veh/h)

$c_{l,e,p}$ capacity of an exclusive-lane lane group with protected left-turn operation (veh/h)

$c_{l,e,pp}$ capacity of an exclusive-lane lane group with protected–permitted left-turn operation (veh/h)

c_{L-TH} capacity of the through and left-turn movements (veh/h)

CM capacity of downstream section (veh/h)

$c_{m,j}$ capacity of movement j

$c_{m,x}$ capacity of movement x (veh/h)

$c_{m,y}$ movement capacity of the y movement in the subject shared lane (veh/h)

c_{md} unadjusted capacity of merge/diverge area (veh/h)

c_{mda} adjusted capacity of merge/diverge area (veh/h)

c_{mg} merge capacity (veh/h)

$C_{mix,j}$ mixed-flow capacity for segment j (veh/h/ln)

c_{ms} midsegment capacity (veh/h)

C_{NCF} capacity of Regime 3 with no conflicting flow rate (veh/h)

c_{nm} nonmerge capacity for the inside lane (veh/h)

CP change period (yellow change interval plus red clearance interval) (s)

$c_{p,x}$ potential capacity of movement x (veh/h)

c_{pce} lane capacity adjusted for heavy vehicles (pc/h)

$c_{q|r}$ shared lane capacity for upstream right-turn traffic movement (veh/h)

c_R actual capacity of the flared lane (veh/h)

CR crash rate per 100 million vehicle miles traveled

$c_{r,e,pp}$ capacity of an exclusive-lane lane group with protected–permitted right-turn operation (veh/h)

$c_{r,x}$ capacity of movement x assuming random flow during the unblocked period (veh/h)

CRF capacity reduction factor (decimal)

c_s saturated capacity (veh/h)

c_{sep} sum of the capacity of the right-turning traffic operating as a separate lane and the capacity of the other traffic in the right lane (upstream of the flare) operating in a separate lane (veh/h)

c_{SH} capacity of the shared lane (veh/h)

c_{sl} capacity of a shared-lane lane group with permitted left-turn operation (veh/h)

$c_{sl,pp}$ capacity of a shared-lane lane group with protected–permitted left-turn operation (veh/h)

c_{sum} intersection capacity (tpc/h/ln)

c_T total capacity for the subject movement

c_{th} through-movement capacity (veh/h)

c_{thru} capacity for the exiting through movement (veh/h)

c_{total} total capacity of a work zone (pc/h)

c_{turn} capacity for the exiting turn movement (veh/h)

$c_{u,i,k}$ capacity at the upstream intersection for movement i for subperiod k (veh/h)

c_w unadjusted capacity of weaving area (veh/h)

CW cross-weave demand flow rate (pc/h)

c_{wa} adjusted capacity of weaving area (veh/h)

c_{wz} work zone capacity (prebreakdown flow rate) (pc/h/ln)

c_{YCT} combined capacity of the YIELD-controlled turn (veh/h)

d demand flow rate (veh/h, Chapter 10) (pc/h, Chapter 12); control delay (s/veh, Chapters 19 and 20); grade length (mi, Chapter 25)

D proportion of peak-hour traffic in the peak direction (decimal, Chapter 3); density (pc/mi/ln, Chapter 12); distance between the two intersections of the interchange (ft, Chapter 22); distance from the ramp movement stop bar to the conflict point (ft) measured along the centerline of the off-ramp approach (Chapter 23); intermediate calculation result (Chapter 24); parameter for the undersaturated model (Chapter 25)

d_1 uniform delay (s/veh, Chapter 19); conditional delay to first through vehicle (s/veh, Chapter 30)

$d_{1,agg,i,j,all}$ aggregated uniform delay for lane group j at intersection i for all subperiods (s/veh)

$d_{1,i}$ average uniform delay in direction i (s/pc)

$D_{1,i}$ total directional uniform control delay per cycle (s)

d_{1b} baseline uniform delay (s/veh)

d_2 incremental delay (s/veh, Chapter 19); conditional delay to Vehicle 2 (s/veh, Chapter 30)

$d_{2,d}$ average deterministic delay per vehicle (s/veh)

d_3 initial queue delay (s/veh)

d_A control delay on the approach (s/veh)

d_a acceleration/deceleration delay (s)

D_a access point density on segment (points/mi)

$D_{a,j}$ adjusted volume for destination j (veh/h)

$d_{A,j}$ approach control delay for approach j (s/veh)

$D_{A,j,k}$ adjusted volume for destination j for subperiod k (veh/h)

$d_{A,x}$ control delay on approach x (s/veh)

d_{ad} transit vehicle acceleration/deceleration delay due to a transit stop (s/veh)

DAF_{cal} demand adjustment factor for calibration purposes

$DAF_s(tp, seg)$ demand adjustment factor for scenario s, period tp, and segment seg

$d_{ap,i}$ delay due to left and right turns from the street into access point intersection i (s/veh)

$d_{ap,l}$ through vehicle delay due to left turns (s/veh)

$d_{ap,r}$ through vehicle delay due to right turns (s/veh)

d_b bicycle delay (s/bicycle)

d_{bypass} control delay for the right-turn bypass lane (s/veh)

D_c density at capacity (pc/mi/ln, Chapter 12); distance to nearest signal-controlled crossing (ft, Chapter 18)

$d_{control}$ through control delay (s/veh)

DC_s demand combination associated with scenario s

D_d diversion distance (ft)

$dd_{d,m}$ duration of drying time for rain event occurring on day d of month m (h/event)

$DDHV$ directional design-hour volume (veh/h)

$DEF(i, t, p)$ deficit: unmet demand from a previous time interval p that flows past node i during time step t

D_f distance from the U-turn crossover to the main junction (ft)

D_F average density for the facility (pc/mi/ln)

d_g average pedestrian gap delay (s)

d_{gd} average gap delay for pedestrians who incur nonzero delay

d_{geom} geometric delay (s/veh)

$D_{GP,vert}$ delay incurred by vehicles originating from the general purpose lanes waiting in the vertical queue for one 15-min analysis period (h)

d_i vehicle demand on segment i (veh, Chapter 2); control delay for lane i (s/veh, Chapter 19); conditional delay to vehicle i ($i = 3, 4, \ldots,$) (s/veh, Chapter 30)

di incident duration (h)

$\overline{di}$ average incident duration (h)

D_i person-hours of delay on segment i (Chapter 2); density for segment i (pc/mi/ln, Chapter 10)

d_I intersection control delay (s/veh)

$d_{i,t}$ demand on section i in analysis period t (pc/mi)

$D_{i,t}$ density on section i in analysis period t (pc/mi)

$d'_{i,t-1}$ carryover demand on section i at analysis period t

$d_{intersection}$ control delay for the entire intersection (s/veh)

d_j control delay for movement j (s/veh, Chapter 23); length of segment j (mi, Chapter 25)

D_j volume for destination j (veh/h)

d_l	control delay for the left-turn movement (s/veh)
d_{LL}	control delay in left lane (s/veh)
$d_{M,LT}$	delay to major-street left-turning vehicles (s/veh)
$DM(s)$	demand multiplier associated with scenario s
$DM(Seed)$	demand multiplier associated with the seed file
D_{MD}	density in the major diverge influence area (which includes all approaching freeway lanes) (pc/mi/ln)
d_{mg}	merge delay (s/veh)
d_{mile}	average delay per mile (s/veh)
$\overline{DM}_j$	weighted average demand multiplier for all days in month j relative to seed value
$D_{ML,vert}$	delay incurred by vehicles originating from the managed lanes waiting in the vertical queue for one 15-min analysis period (h)
d_{nm}	nonmerge delay for the inside lane (s/veh)
d_{ot}	overall distance, the summation of all the segment grade lengths on the composite grade (mi)
$do_{d,m}$	duration of pavement runoff for rain event occurring on day d of month m (h/event)
d_{other}	delay due to other sources along the segment (s/veh)
D_p	phase duration (s)
d_p	average pedestrian delay (s)
DP	delayed passings factor
$D_{p,a}$	phase duration for phase a, which occurs just before phase b (s)
$D_{p,b}$	phase duration for phase b, which occurs just after phase a (s)
$d_{p,A}$	pedestrian delay in traversing Crosswalk D (s/p)
$D_{p,l}$	phase duration for left-turn phase l (s)
$D_{p,mi}$	duration of the phase serving the minor-street through movement (s)
$D_{p,t}$	phase duration for coordinated phase t (s)
d_{pc}	pedestrian delay in crossing the segment at a signalized intersection (s/p)
d_{pd}	pedestrian diversion delay (s/p)
D_{ped}	pedestrian density (p/ft²)
DP_m	delayed passings per minute
d_{pp}	pedestrian delay incurred in walking parallel to the segment (s/p)
d_{ps}	transit vehicle delay due to serving passengers (s)
d_{pw}	pedestrian waiting delay (s/p)
d_{px}	crossing delay (s/p)
DQ_A	distance to the downstream queue at the beginning of the upstream arterial green (ft)
DQ_i	distance to the downstream queue at the beginning of the upstream green for approach i (ft)
DQ_R	distance to the downstream queue at the beginning of the upstream ramp green (ft)
D_R	density in the ramp influence area (pc/mi/ln)
d_r	control delay for the right-turn movement (s/veh)
d_{Rank1}	delay to Rank 1 vehicles (s/veh)
$dr_{d,m}$	rainfall duration for the rain event occurring on day d of month m (h/event)
d_{re}	transit vehicle reentry delay (s/veh)
d_{RL}	control delay in right lane (s/veh)
D_S	speed index for off-ramps
d_s	saturated uniform delay (s/veh)
d_{sep}	control delay for the movement considered as a separate lane
d_{signal}	average delay per signal (s/veh)
d_{sl}	delay in shared left-turn and through lane group (s/veh)
D_{SP}	duration of study period (h)

d_{sr} delay in shared right-turn and through lane group (s/veh)

DSV daily service volume (veh/day)

D_{sv} distance between stored vehicles (ft)

DSV_i daily service volume for level-of-service i (veh/day)

d_t control delay for the through movement (s/veh, Chapters 18 and 20); time step duration (s/step, Chapters 23 and 30)

D_t distance traveled along the loop ramp or diverted movement (ft, Chapter 23); distance from the main junction to the U-turn crossover (ft, Chapter 23)

$d_{t,1}$ average delay to through vehicles in the inside lane (s/veh)

$d_{t|r}$ through vehicle delay per right-turn maneuver (s/veh)

d_{th} delay in exclusive through-lane group (s/veh)

d_{trip} average delay per trip (s/veh)

d_{ts} delay due to a transit vehicle stop

D_{up} unbalanced phase duration (s)

$D_{up,i}$ unbalanced phase duration for phase i (s)

d_{vq} time-in-queue per vehicle (s/veh)

$dv_{seg(i),n}$ directional volume for the direction of travel served by NEMA phase n on segment i (veh/h)

$dv_{u,i,k}$ maximum discharge rate for upstream movement i for subperiod k (veh/h)

$dw_{d,m}$ duration of wet pavement for rain event occurring on day d of month m (h/event)

dx_j length of discrete segment j (mi)

e ridership elasticity with respect to changes in the travel time rate (Chapter 18); extension of effective green time (s, Chapter 19)

E weighted events per minute (Chapter 24); parameter for the undersaturated model (Chapter 25)

$E[n_w, j]$ expected frequency of weather event w in month j, rounded to the nearest integer

$E_{15min}[D_w]$ expected duration of weather event w, rounded to the nearest 15-min increment

$ED(i, p)$ expected demand (veh/h) that would arrive at segment i on the basis of upstream conditions over time interval p

$EDTT$ extra distance travel time (s)

E_{HV} equivalency factor for heavy vehicles

E_L equivalent number of through cars for a protected left-turning vehicle

$E_{L,m}$ modified through-car equivalent for a protected left-turning vehicle

E_{L1} equivalent number of through cars for a permitted left-turning vehicle

$E_{L1,m}$ modified through-car equivalent for a permitted left-turning vehicle

E_{L2} equivalent number of through cars for a permitted left-turning vehicle when opposed by a queue on a single-lane approach

$E_{L2,m}$ modified through-car equivalent for a permitted left-turning vehicle when opposed by a queue on a single-lane approach

E_{LT} equivalency factor for left turns

$E_{LT,pm}$ equivalency factor for permitted left-turn operation

$E_{LT,pt}$ equivalency factor for protected left-turn operation

E_{LU} equivalency factor for lane utilization

E_{other} equivalency factor for other conditions

e_p permitted extension of effective green (s)

E_p equivalency factor for parking activity

E_{PHF} equivalency factor for peaking characteristics

E_R passenger car equivalent for recreational vehicles (Chapter 15); equivalent number of through cars for a protected right-turning vehicle (Chapter 19)

$E_{R,ap}$ equivalent number of through cars for a protected right-turning vehicle at an access point

$E_{R,m}$ modified through-car equivalent for a protected right-turning vehicle

E_{RT} equivalency factor for right turns

E_T passenger car equivalent of one heavy vehicle in the traffic stream

E_{TC} passenger car equivalent for trucks operating at crawl speed

ETT experienced travel time (s/veh)

ETT_A approach experienced travel time (s/veh)

ETT_{DLT} weighted average experienced travel time for the DLT intersection (s/veh)

ETT_I intersection experienced travel time (s/veh)

F total events on the path (events/h, Chapter 24); smoothing factor (Chapter 30)

$F(x)$ cumulative probability of a normal distribution of speeds with mean μ and standard deviation σ

f_{12} capacity adjustment factor for Rank 2 minor-street right-turn Movement 12

f_{1U} capacity adjustment factor for Rank 2 major-street U-turn Movement 1

f_{4U} capacity adjustment factor for Rank 2 major-street U-turn Movement 4

f_9 capacity adjustment factor for Rank 2 minor-street right-turn Movement 9

f_a adjustment factor for area type

f_A adjustment for access point density (mi/h)

f_{ad} proportion of transit vehicle stop acceleration/deceleration delay not due to traffic control

f_{ap} access point volume adjustment factor

f_{AT} indicator variable for area type that is 1 for rural areas and 0 otherwise

f_b buffer area coefficient

$f_{B\%}$ percentile back-of-queue factor

f_{bb} adjustment factor for blocking effect of local buses that stop within intersection area

f_{Br} indicator variable for barrier type that is 1 for cone, plastic drum, or other soft barrier separation and 0 otherwise

F_c unsignalized conflicts factor

$f_{c,dry}$ hourly crash frequency for dry pavement

$f_{c,wea}$ hourly crash frequency for weather condition *wea*

F_{cd} roadway crossing difficulty factor

f_{CS} adjustment for cross section (mi/h)

$Fc_{str(i)}$ expected crash frequency for street location *i* of type *str* (crashes/year)

$Fc_{str(i),dry}$ equivalent crash frequency when every day is dry for street location *i* of type *str*

$Fc_{str(i),wea}$ equivalent crash frequency when every day has weather condition *wea*

f_{DDI} adjustment for DDI crossover

F_{delay} pedestrian delay adjustment factor

f_{DN} indicator variable for daylight or night that is 1 for night and 0 for daylight

$f_{dow,d}$ day-of-week adjustment factor based on day *d*

$f_{dow,input}$ day-of-week adjustment factor for day associated with v_{input}

f_{dt} proportion of dwell time occurring during effective green

FFS free-flow speed (mi/h)

FFS_{adj} adjusted free-flow speed (mi/h)

FFS_{mix} mixed-flow free-flow speed (mi/h)

FFS_{wz} work zone free-flow speed (mi/h)

$f_{g,ATS}$ grade adjustment factor for ATS determination

$f_{g,PTSF}$ grade adjustment factor for PTSF determination

F_h headway factor

$f_{hod,h,d}$ hour-of-day adjustment factor based on hour *h* and day *d*

$f_{hod,input}$ hour-of-day adjustment factor for hour and day associated with v_{input}

f_{HV} heavy vehicle adjustment factor

$f_{HV,ATS}$ heavy vehicle adjustment factor for average travel speed

$f_{HV,e}$ heavy vehicle adjustment factor for the entry lane

$f_{HV,i}$ heavy vehicle adjustment factor for movement *i*

$f_{HV,PTSF}$ heavy vehicle adjustment factor for PTSF determination

f_{HVg} adjustment factor for heavy vehicles and grade

F_i frequency with which mode i will block two lanes

$f_{ic,int(i),n,m,ap,d}$ saturation flow adjustment factor for incident presence for movement m on leg associated with NEMA phase n at intersection i during analysis period ap and day d

$f_{int(i),j,h,d}$ adjustment factor used to estimate the standard deviation of demand flow rate for movement j at intersection i during hour h and day d

$fi_{str(i),wea(h,d),h,d}$ expected hourly incident frequency for street location i of type str and weather condition $wea(h, d)$ during hour h and day d (incidents/h)

$Fi_{str(i),wea(h,d)}$ expected incident frequency for street location i of type str and weather condition $wea(h, d)$ during hour h and day d (incidents/year)

f_j capacity adjustment factor for Movements 9 and 12

f_{jU} capacity adjustment factor for Movements 1U and 4U

f_k capacity adjustment factor for all Rank 3 movements

f_l capacity adjustment factor for all Rank 4 movements

f_L signal spacing (boundary intersection) adjustment factor

F_l passenger load factor (passengers/seat)

f_{LAT} lateral distance from the edge of travel lane adjacent to the work zone to the barrier, barricades, or cones (ft)

f_{LC} adjustment for lateral clearance (mi/h)

f_{Lpb} pedestrian adjustment factor for left-turn groups

f_{LS} adjustment for lane and shoulder width (mi/h)

f_{LT} adjustment factor for left-turn vehicle presence in a lane group

f_{LU} adjustment factor for lane utilization

f_{LW} adjustment for lane width (mi/h)

f_M adjustment for median type (mi/h)

F_m number of meeting events (events/h)

$f_{moy,d}$ month-of-year adjustment factor based on day d

$f_{moy,input}$ month-of-year adjustment factor for day associated with v_{input}

f_{ms} adjustment factor for downstream lane blockage

$f_{np,ATS}$ adjustment factor for ATS determination for the percentage of no-passing zones in the analysis direction

$f_{np,PTSF}$ adjustment to PTSF for the percentage of no-passing zones in the analysis segment

FO_4 force-off point for Phase 4 (s)

f_p adjustment factor for existence of a parking lane and parking activity adjacent to lane group

F_p number of passing events (events/h)

F_p pavement condition adjustment factor

$f_{p,j}$ capacity adjustment factor for the Rank 4 minor-street left-turn movement

f_{pb} pedestrian blockage factor for the proportion of time that one lane on an approach is blocked during 1 h

f_{ped} entry capacity adjustment factor for pedestrians

f_{pk} adjustment for on-street parking (mi/h)

$f_{pl,ATS}$ adjustment factor for the effect of passing lane on average travel speed

$f_{pl,PTSF}$ adjustment factor for the impact of a passing lane on percent time-spent-following

f_R adjustment factor for the effects of travel path radius

f_{reduce} adjustment factor for reducing lanes during work zone presence

f_{RLC} adjustment for right-side lateral clearance

f_{Rpb} pedestrian–bicycle adjustment factor for right-turn groups

$f_{rs,ap,d}$ saturation flow adjustment factor for rainfall or snowfall during analysis period ap and day d

f_{RT} adjustment for right-turning vehicle presence in the lane group

F_s motorized vehicle speed adjustment factor

$f_{s,rs,ap,d}$ free-flow speed adjustment factor for rainfall or snowfall during analysis period ap and day d

f_{sp} adjustment factor for sustained spillback

$f_{sp,i,k,l}$ adjustment factor for spillback for upstream movement i for iteration l in subperiod k

$f_{speed,i}$ ATS adjustment for direction i (decimal)

f_{Sr} speed ratio (decimal); the ratio of non–work zone speed limit (before the work zone was established) to work zone speed limit

f_{sw} sidewalk width coefficient

f_{tg} traffic growth factor

f_{TISi} time-interval scale factor for time period i

f_{TLC} adjustment for total lateral clearance

F_{tt} perceived travel time factor

f_v adjustment factor for traffic pressure or proximity

F_v motorized vehicle volume adjustment factor

f_w adjustment factor for lane width

F_w cross-section adjustment factor

f_{wa} adjustment factor for approach width

f_{wz} adjustment factor for work zone presence at the intersection

f_x control-type adjustment factor

$fx_{i,2,k}$ volume adjustment factor for origin i for subperiod k

g effective green time (s)

$\mathcal{G}_i$ set of incidents of severity type i

G percentage grade (Chapter 20); green interval duration (s, Chapter 19)

$\mathbb{G}(i)$ distribution function for incident with severity type i

$G_{1ped,call}$ average green interval given that the phase is called by a pedestrian detection (s)

$G_{1veh,call}$ average green interval given that the phase is called by a vehicle detection (s)

g' effective green time adjusted for the presence of a downstream queue or for demand starvation (s)

G_3 green interval duration for Phase 3 (s)

g_a available effective green time (s)

G_A green interval for the external arterial approach (s)

g_b effective green time for the bicycle lane (s)

$g_{c,i}$ effective green time for critical lane group i (s)

G_D green interval for the downstream arterial through movement (s)

g_{diff} supplemental service time for shared single-lane approaches (s)

g_e green extension time (s)

g_f time before the first left-turning vehicle arrives and blocks the shared lane (s)

$g_{f,max}$ maximum time before the first left-turning vehicle arrives and within which there are sufficient through vehicles to depart at saturation (s)

g_i effective green time for lane group i (s)

G_i effective green time for direction i (s)

$G_{i,min}$ minimum effective green time for direction i (s)

g_j grade of segment j (decimal)

g_l effective green time for left-turn phase (s)

$g_{lt,pm}$ effective green time for permitted left-turn operation during the through phase (s)

$g_{lt,pt}$ effective green time for the protected left-turn phase (s)

G_{max} maximum green setting (s)

$G_{max,r}$ maximum green setting for the phase serving the subject right-turn movement during its permitted period (s)

G_{min} minimum green setting (s)

G_{opt} optimal effective green time for one direction (s)

g_p effective green time for permitted left-turn operation (s)

G_p displayed green interval corresponding to g_p (s)

$G_{p,min}$ minimum green interval duration based on pedestrian crossing time (s)

g_{ped} pedestrian service time (s)

g_{ps} queue service time during permitted left-turn operation (s)

g_q opposing queue service time (s)

G_q displayed green interval corresponding to g_q (s)

G_R green interval for the left-turning ramp movement (s)

g_s queue service time (s)

g_{tot} total effective green time in the cycle (s)

g_u duration of permitted left-turn green time that is not blocked by an opposing queue (s)

G_u unbalanced green interval duration for a phase (s)

G_U displayed green interval corresponding to g_u (s)

g_u^* adjusted duration of permitted left-turn green time that is not blocked by an opposing queue (s)

G_{U_i} green interval for the upstream approach i (s)

$g_{Walk,mi}$ effective walk time for the phase serving the minor-street movement (s)

h saturation headway (s, Chapter 4); full stop rate (stops/veh, Chapter 18); average headway for each through lane (s, Chapter 20); average call headway for all calls with headways less than MAH^* (s, Chapter 31)

$h_{|\Delta<h<H_I}$ average headway of those headways between Δ and H_I (s/veh)

h_0 base saturation headway (s/pc)

h_1 deterministic stop rate (stops/veh)

H_1 maximum headway that the first through vehicle can have and still incur delay (s/veh)

h_{adj} headway adjustment (s)

h_{base} base saturation headway (s)

h_d departure headway or average time between departures of successive vehicles on a given approach (s)

H_f spatial stop rate for the facility (stops/mi)

$h_{HV,adj}$ headway adjustment for heavy vehicles (s)

$\hat{h}_i$ adjusted time headway for direction i (s)

h_I saturation headway for the internal through approach (s)

h_{is} saturation headway or time between departures of successive vehicles on a given approach for degree-of-conflict case i (s)

$h_{LT,adj}$ headway adjustment for left turns (s)

h_{other} full stop rate due to other sources (stops/veh)

$h_{RT,adj}$ headway adjustment for right turns (s)

h_{s1} saturation headway if no vehicle is waiting on the conflicting approach

h_{s2} saturation headway if the conflicting approach is occupied

H_{seg} spatial stop rate for the segment (stops/mi)

h_{si} saturation headway

h_T total stop rate (stops/veh)

HV percentage of heavy vehicles (decimal)

i crossing event index

I adjustment factor for type, intensity, and proximity of work activity (pc/h/ln, Chapter 10); upstream filtering adjustment factor (Chapter 19)

$I_{a,seg}$ automobile traveler perception score for the segment

$I_{b,f}$ bicycle LOS score for the facility

$I_{b,int}$ bicycle LOS score for the intersection

$I_{b,link}$ bicycle LOS score for the link

$I_{b,seg}$	bicycle LOS score for the segment
I_c	indicator variable that is 0 when the density in the adjacent general purpose lane is less than or equal to 35 pc/mi/ln or the segment type is Buffer 2, Barrier 1, or Barrier 2; and 1 otherwise
ICD	inscribed circle diameter (ft)
ICR	incident-to-crash ratio
ID	interchange density; the number of interchanges within ±3 mi of the center of the subject weaving segment divided by 6 (int/mi)
IDR	incident delay rate (h/mi)
$I_{fi,int(i),n,ap,d}$	indicator variable that is 1 for fatal-or-injury crash on leg associated with NEMA phase n at intersection i during analysis period ap and day d, and 0 otherwise
I_{LC}	lane-changing intensity (lc/ft)
I_{lt}	indicator variable that is 1 when there is no left-turn bay on the major street at the access point and 0 otherwise
Inc_{Dur}	incident duration (min)
Inc_{Type}	incident severity type (1–5)
I_{night}	indicator variable for night that is 0 if rain starts between 6:00 a.m. and 6:00 p.m. and 1 otherwise
Intercept	model intercept
$I_{other,int(i),n,ap,d}$	indicator variable that is 1 for noncrash incident on leg associated with NEMA phase n at intersection i during analysis period ap and day d, and 0 otherwise
$I_{p,F}$	pedestrian LOS score for the facility
$I_{p,int}$	pedestrian LOS score for the intersection
$I_{p,link}$	pedestrian LOS score for the link
$I_{p,seg}$	pedestrian LOS score for the segment
$I_{pdo,int(i),n,ap,d}$	indicator variable that is 1 for property-damage-only crash on leg associated with NEMA phase n at intersection i during analysis period ap and day d, and 0 otherwise
I_{pk}	indicator variable for on-street parking occupancy that is 1 with no occupied on-street parking and 0 otherwise
IR_j	incident rate per 100 million vehicle miles traveled in month j
I_{rt}	indicator variable that is 1 when there is no right-turn bay on the major street at the access point and 0 otherwise
I_s	interval between vehicle-in-queue counts (s)
I_t	indicator variable that is 1.0 when equations are used to evaluate delay due to left turns and 0.00001 when equations are used to evaluate delay due to right turns
$I_{t,F}$	transit LOS score for the facility
$I_{t,seg}$	transit LOS score for the segment
j	time step associated with platoon arrival time t'
k	incremental delay factor (Chapter 19); proportion of AADT occurring in the peak hour (decimal, Chapter 25)
K	proportion of AADT occurring in the peak hour (decimal)
$K(i, p)$	average traffic density (veh/mi/ln) of segment i over time interval p
$K(NS, p)$	average vehicle density over the entire facility during time interval p
$K(NS, P)$	average vehicle density over the entire facility during the entire analysis period P
$KB(i, p)$	background density: segment i density (veh/mi/ln) over time interval p assuming there is no queuing on the segment
KC	ideal density at capacity (veh/mi/ln)
K_c^f	density at capacity, with the frictional effect of the adjacent general purpose lane (pc/mi/ln)
K_c^{nf}	density at capacity, without the frictional effect of the adjacent general purpose lane (pc/mi/ln)
K_{GP}	density of the adjacent general purpose lane (pc/mi/ln)
k_i	density of users of mode i (users/mi)
K_l	internal link density for arterial through movements (veh/mi)

KJ facilitywide jam density (veh/mi/ln)

k_{jam} jam density (veh/mi)

k_{min} minimum incremental delay factor

$k_{o,i}$ density of users of mode i in the opposing direction (users/mi)

$K_p(NS)$ average facility density in time interval p

$KQ(i, t, p)$ queue density: vehicle density (veh/mi/ln) in the queue on segment i during time step t in time interval p

$k_{s,i}$ density of users of mode i in the subject direction (users/mi)

l work zone length (ft)

L segment length (ft, Chapter 18); cycle lost time (s, Chapter 19); crosswalk length (ft, Chapter 20); design vehicle length (ft, Chapter 23); length of path segment (mi, Chapter 24); distance from midpoints of the upstream segment and the subject segment (ft, Chapter 25)

$L(d)$ length represented by detector station d (mi)

l_1 start-up lost time (s)

$l_{1,p}$ permitted start-up lost time (s)

l_2 clearance lost time (s)

L_a available queue storage distance (ft/ln)

L_A length of acceleration lane (ft)

$L_{a,lt}$ available queue storage distance for the left-turn movement (ft/ln)

$L_{a,thru}$ available queue storage distance for the through movement (ft/ln)

$L_{a,turn}$ available queue storage distance for the turn movement (ft/ln)

L_{A1} length of Acceleration Lane 1 (ft)

L_{A2} length of Acceleration Lane 2 (ft)

L_{Aeff} effective length of both acceleration lanes (ft)

LAG_{DLT} time duration between the reference point and the start of the displaced left-turn phase (s)

LAG_{TH} time duration between the reference point and the start of the major-street through phase (s)

L_B base length of the weaving segment, measured from the points at which the edges of the travel lanes of the merging and diverging roadways converge (ft)

LC_{ALL} total rate of lane changing of all vehicles within the weaving segment (lc/h)

L_{cc} curb-to-curb crossing distance (ft)

LC_{FR} minimum number of lane changes that a freeway-to-ramp weaving vehicle must make to complete the freeway-to-ramp movement successfully (lc)

LC_L left-side lateral clearance (ft)

LC_{MIN} minimum rate of lane changing that must exist for all weaving vehicles to complete their weaving maneuvers successfully (lc/h)

LC_{NW} total rate of lane changing by nonweaving vehicles within the weaving segment (lc/h)

LC_R right-side lateral clearance (ft)

LC_{RF} minimum number of lane changes that a ramp-to-freeway weaving vehicle must make to complete the ramp-to-freeway movement successfully (lc)

LC_{RR} minimum number of lane changes that must be made by one ramp-to-ramp vehicle to complete a weaving maneuver

$LCSI$ lane closure severity index

LC_W total rate of lane changing by weaving vehicles within the weaving segment (lc/h)

$L_{ccc-max}$ distance from the gore to the end of the ML access segment (ft)

$L_{ccc-min}$ distance between the on-ramp gore area and the beginning of the ML access segment (ft)

L_d length downstream of the passing lane beyond its effective length (mi, Chapter 15); length of Crosswalk D (ft, Chapter 19)

L_D length of deceleration lane (ft)

L_{D-A} lost time on the external arterial approach due to the presence of downstream queue (s)

L_{D-U_i} lost time on upstream approach i due to presence of a downstream queue (s)

L_{D1} length of Deceleration Lane 1 (ft)

L_{D2} length of Deceleration Lane 2 (ft)

L_{de} length downstream of the passing lane within its effective length (mi)

L_{Deff} effective length of both deceleration lanes (ft)

L'_{de} length downstream of the passing lane within the analysis segment (mi)

L_{DOWN} distance between the subject ramp junction and the adjacent downstream ramp junction (ft)

L_{D-R} lost time on the external ramp approach due to the presence of downstream queue (s)

L_{DS} additional lost time due to demand starvation (s)

L_{ds} length of the stop line detection zone (ft)

$L_{ds,lt}$ length of the stop line detection zone in the left-turn lanes (ft)

$L_{ds,rt}$ length of the stop line detection zone in the right-turn lanes (ft)

$L_{ds,th}$ length of the stop line detection zone in the through lanes (ft)

L_{D-Ui} lost time on the upstream approach i due to the presence of a downstream queue (s)

L_{EQ} equilibrium separation distance (ft)

L_h average vehicle spacing in stationary queue (ft/veh)

L_h^* effective average vehicle spacing in stationary queue (ft/veh)

$L_{h,k}^*$ effective average vehicle spacing in stationary queue during subperiod k (ft/veh)

L_{HV} stored heavy vehicle lane length (ft)

L_i length of segment or directional segment i (mi)

Location   segment in which the incident occurs

L_{OL-DDI} lost time on signalized external ramp approach at a DDI due to overlap phasing (s)

L_{pc} stored passenger car lane length (ft)

L_{pl} length of the passing lane (mi)

L_{pt} average passenger trip length (mi)

L_s distance between adjacent signalized intersections (ft, Chapter 18); weaving segment length (ft, Chapter 25)

L_S short length of the weaving segment, defined as the distance over which lane changing is not prohibited or dissuaded by markings (Chapter 13, ft); start-up lost time (s, Chapter 26)

$L_{seg(i)}$ length of segment i (ft)

l_t phase lost time (s)

L_t total length of the analysis segment (mi)

LTC   left-turn flow rate per cycle (veh/cycle)

LTDR   left-turn demand ratio (decimal)

L_u length upstream of the passing lane (mi)

L_{UP} distance between the subject ramp junction and the adjacent upstream ramp junction (ft)

L_v detected length of the vehicle (ft)

$lv_{int(i),n}$ leg volume (two-way total) for leg associated with NEMA phase n at intersection i (veh/h)

LW   lane width (ft)

L_{WI} influence area of the weaving segment (ft)

L_{wMAX} maximum length of a weaving segment (ft)

m number of segments on the facility (Chapter 16); move-up time (s, Chapter 21); number of lane groups served during the phase (Chapter 31)

M pedestrian space (ft²/p)

M_1 meetings per minute of users already on path segment

$M_{2,i}$ expected meetings per minute of users of mode i located beyond the end of the path segment at the time the average bicycle enters the segment

MAH maximum allowable headway (s/veh)

MAH^* equivalent maximum allowable headway for the phase (s/veh)

MAH_c maximum allowable headway for the concurrent phase that also ends at the barrier (s/veh)

$MAH_{lt,e}$ maximum allowable headway for permitted left-turning vehicles in exclusive lane (s/veh)

$MAH_{lt,e,p}$ maximum allowable headway for protected left-turning vehicles in exclusive lane (s/veh)

$MAH_{lt,s}$ maximum allowable headway for permitted left-turning vehicles in shared lane (s/veh)

$MAH_{lt,s,p}$ maximum allowable headway for protected left-turning vehicles in shared lane (s/veh)

$MAH_{rt,e,p}$ maximum allowable headway for protected right-turning vehicles in exclusive lane (s/veh)

$MAH_{rt,s}$ maximum allowable headway for permitted right-turning vehicles in shared lane (s/veh)

MAH_{th} maximum allowable headway for through vehicles (s/veh)

$MaxProportion$ maximum proportion of work zone capacity available for mainline flow at the weave area (decimal)

M_{corner} corner circulation area per pedestrian (ft²/p)

M_{cw} crosswalk circulation area per pedestrian (ft²/p)

m_d set of all automobile movements that cross Crosswalk D

$MF(i, t, p)$ actual mainline flow rate that can cross node i during time step t in time interval p

$MFlanes(s)$ number of mixed-flow lanes in section s (integer)

m_i average speed of mode i (mi/h)

$MI(i, t, p)$ maximum mainline input: maximum flow desiring to enter node i during time step t in time interval p

$MinRate$ minimum ramp-metering rate (veh/h/ln)

$MaxRate$ maximum ramp-metering rate (veh/h/ln)

m_j number of lane groups on approach j

$MO1(i, t, p)$ maximum Mainline Output 1: maximum allowable mainline flow rate across node i during time step t in time interval p, limited by the flow from an on-ramp at node i

$MO2(i, t, p)$ maximum Mainline Output 2: maximum allowable mainline flow rate across node i during time step t in time interval p, limited by available storage on segment i due to a downstream queue

$MO3(i, t, p)$ maximum Mainline Output 3: maximum allowable mainline flow rate across node i during time step t in time interval p, limited by the presence of queued vehicles at the upstream end of segment i while the queue clears from the downstream end of segment i

M_s speed index for on-ramps (merge areas)

MSF_i maximum service flow rate for LOS i (pc/h/ln)

M_T total number of expected meetings per minute during the peak 15 min

M_y motorist yield rate (decimal)

n number of segments in the defined facility (Chapter 10); average number of crossing events before an adequate gap is available (Chapter 20); number of lanes in the lane group (Chapter 23); number of extensions before the green interval reaches its maximum limit (Chapter 31)

N number of lanes in one direction (Chapter 11); number of lanes in analysis direction (Chapter 12); number of lanes required for a target LOS (Chapter 12); number of replications (Chapter 17); number of lanes in lane group (Chapter 19)

n_{15} count of vehicles during the peak 15-min period (veh)

$n_{15,mj}$ count of vehicles traveling on the major street during a 15-min period (veh/ln)

n_{60} count of vehicles during a 1-h period (veh)

N_A number of arterial lanes feeding the subject queue

N_{ap} number of analysis periods in 1 day (i.e., study period) (Chapter 17); number of influential access point approaches along the segment (Chapter 18, points)

$N_{ap,o}$ number of access point approaches on the right side in the opposing direction of travel (points)

$N_{ap,s}$ number of access point approaches on the right side in the subject direction of travel (points)

$N_{Arterial}$ number of lanes for the upstream arterial through movement

N_b bus stopping rate on the subject approach (buses/h)

N_c total number of pedestrians in the crossing platoon (p, Chapter 20); number of circulating lanes (Chapter 30)

N_{comb} number of lanes for the combined movement (ln)

n_{cp} number of critical phases

N_d number of days in the reliability reporting period (Chapter 17); number of traffic lanes crossed in traversing Crosswalk D (ln, Chapter 19)

$n_{Day,k}$ number of days in the reliability reporting period associated with demand combination k

N_{DC} number of demand combinations

$\bar{N}_{DC,WZ}$ adjusted number of replications of a demand combination for which the work zone is active

N_{di} number of pedestrians arriving at the corner each cycle having crossed the major street (p)

Nd_m number of days in month m (d)

N_{do} number of pedestrians arriving at the corner each cycle to cross the major street (p)

Ndp_m number of days with precipitation of 0.01 in. or more in month m (d)

N_e number of exclusive lanes in movement group (ln)

N_f number of fully stopped vehicles (veh/ln)

$N_{f,sl}$ number of fully stopped vehicles in shared left-turn and through-lane group (veh/ln)

$N_{f,sr}$ number of fully stopped vehicles in shared right-turn and through-lane group (veh/ln)

$N_{f,t}$ number of fully stopped vehicles in exclusive through-lane group (veh/ln)

n_g arrival count during green (veh)

N_g number of lane groups for which t exceeds 0.0 h

N_{GP} number of general purpose lanes (ln)

$N_{GP,vert}$ average number of vehicles originating from the general purpose lanes that are waiting in the vertical queue in one analysis period (veh)

Nh_{dry} total number of hours in Ny years with dry conditions (h)

Nh_{rf} total number of hours in Ny years with rainfall conditions (h)

Nh_{sf} total number of hours in Ny years with snowfall conditions (h)

Nh_{sp} total number of hours in Ny years with snow or ice on pavement and not snowing (h)

Nh_{wp} total number of hours in Ny years with wet pavement and not raining (h)

n_i number of lanes serving phase movement i

N_i number of lanes in segment i (Chapter 10); number of lanes associated with lane group i, with de facto lanes taken into account (ln, Chapter 31)

$N_{ic,int(i),n,m,ap,d}$ number of lanes serving movement m blocked by the incident on leg associated with NEMA phase n at intersection i during analysis period ap and day d (ln)

n_{inc} number of incidents

$N_{inc,i}$ number of incidents associated with severity type i

n_j expected frequency of all incidents in the study period for month j, rounded to the nearest integer

n_L number of vehicles that can be stored in the left-turn pocket

N_l number of lanes in exclusive left-turn lane group (ln)

N_L number of through lanes crossed

N_{lr} number of lanes in shared left- and right-turn lane group (ln)

N_{lt} number of lanes in the left-turn bay (ln)

n_m number of vehicles that can be stored in the median

N_m parking maneuver rate adjacent to lane group (maneuvers/h)

n_{Max} length of the storage area such that the approach would operate as separate lanes (veh)

$N_{ML,vert}$ average number of vehicles originating from the managed lanes that are waiting in the vertical queue in one analysis period (veh)

$N_{n,int(i),n,m}$ number of lanes serving movement m under normal (i.e., nonincident) conditions on leg associated with NEMA phase n at intersection i (ln)

n_o number of left-turn and through lanes open during normal operation (ln)

N_o number of open lanes in the work zone (ln)

N_O number of outer lanes on the freeway (1 for a six-lane freeway; 2 for an eight-lane freeway)

N_p spatial distribution of pedestrians (p, Chapter 20); number of partial stops (Chapter 31)

n_{ped} number of conflicting pedestrians (p/h)

N_{ped} number of pedestrians crossing during an interval (p)

$N_{ped,do}$ number of pedestrians waiting at the corner to cross the major street (p)

n_q maximum number of opposing vehicles that could arrive after g_f and before g_u (veh)

N_{qa} available queue storage (veh)

N_{qx} maximum queue storage for the movement (veh)

$N_{qx,lt}$ maximum queue storage for the left-turn movement (veh)

$N_{qx,lt,n,k}$ maximum queue storage for left-turn movement group during subperiod k (veh)

$N_{qx,thru}$ maximum queue storage for the through movement (veh)

$N_{qx,thru,n,k}$ maximum queue storage for through movement group during subperiod k (veh)

$N_{qx,turn}$ maximum queue storage for a turn movement (veh)

n_R actual storage area for right-turning vehicles

N_r number of replications of a demand combination (Chapter 25); number of lanes in exclusive right-turn lane group (Chapter 31, ln)

N_R number of ramp lanes feeding the subject queue (ln)

NR number of metered lanes on ramp (ln)

N_{Ramp-L} number of lanes for the upstream ramp left-turning movement (ln)

$N_{rci,d}$ number of right-turn channelizing islands along Crosswalk D

n_s number of sneakers per cycle

n_s^* expected number of sneakers per cycle in a shared left-turn lane

N_s number of segments forming the facility (Chapter 15); number of signals within study section of facility (unitless, Chapter 17)

NS number of segments on the facility

N_{scen} number of scenarios in the analysis

$N_{scen,Inc}$ number of all incident events generated for all scenarios

$N_{scen,j}$ number of scenarios associated with month j of the reliability reporting period

N_{sl} number of lanes in shared left-turn and through lane group (ln)

N_{sr} number of lanes in shared right-turn and through lane group (ln)

N_t number of lanes in exclusive-through lane group (ln, Chapters 18, 30, and 31); total number of stops (Chapter 31)

$N_{t,i,j}$ number of lanes in exclusive-through lane group j at intersection i (ln)

N_{th} number of through lanes (shared or exclusive) (ln)

N_{tot} total number of circulating pedestrians arriving each cycle (p)

N_{ts} number of transit stops on the segment for the subject route (stops)

N_{turn} number of lanes in the turn bay (ln)

N_{tv} number of turning vehicles during the walk and pedestrian clear intervals (veh)

N_{unblk} number of open lanes when blockage is present (ln)

$NV(i, t, p)$ number of vehicles present on segment i at the end of time step t during time interval p

N_{WL}	number of lanes from which a weaving maneuver may be completed with one lane change or no lane changes (ln)
n_{wz}	number of left-turn and through lanes open during work zone presence (ln)
n_x	number of calls necessary to extend the green to max out
Ny	total number of years (years)
$O_{a,i}$	adjusted volume for origin i (veh/h)
OCC_{bicg}	average bicycle occupancy
OCC_{pedg}	pedestrian occupancy
OCC_{pedu}	pedestrian occupancy after the opposing queue clears
OCC_r	relevant conflict-zone occupancy
$OFRD(i, p)$	desired off-ramp demand flow exiting at off-ramp i during time interval p
$OFRF(i, t, p)$	actual flow that can exit at off-ramp i during time step t in time interval p
O_i	volume for origin i (veh/h)
O_{MAIN}	offset at the downstream main intersection (s)
$ONRC(i, p)$	geometric carrying capacity of on-ramp at node i roadway during time interval p
$ONRD(i, p)$	demand flow rate for on-ramp at node i in time interval p
$ONRF(i, t, p)$	actual ramp flow rate that can cross on-ramp node i during time step t in time interval p
$ONRI(i, t, p)$	input flow rate desiring to enter the merge point at on-ramp i during time step t in time interval p
$ONRO(i, t, p)$	maximum output flow rate that can enter the merge point from on-ramp i during time step t in time interval p
$ONRQ(i, t, p)$	unmet demand that is stored as a queue on the on-ramp roadway at node i during time step t in time interval p (veh)
OR	open ratio, the ratio of the number of open lanes during road work to the total (or normal) number of lanes (decimal)
O_{SUPP}	offset at the upstream supplemental intersection (s)
p	probability of a call headway being less than the maximum allowable headway
P	Federal Highway Administration 5-point pavement surface condition rating (Chapter 15); proportion of vehicles arriving during the green indication (Chapters 18, 19, and 23); number of (15-min) analysis periods in the study period (Chapter 25)
$P(a_i)$	probability of a_i
$P(C_i)$	probability of degree-of-conflict case i
$P(i)$	probability of each combination i
$P(precip)_m$	probability of precipitation in any given day of month m
$P(v_i)$	probability of passing user of mode i
$P(v_{O,i})$	probability of meeting opposing user of mode i
$P(Y_i)$	probability that motorists yield to pedestrian on crossing event i
$P\{s\}$	probability of scenario s
p'	adjustment to the major-street left, minor-street through impedance factor
$p'_{b,x}$	proportion of time blocked for isolated DDI analysis (decimal)
$P'(i)$	adjusted probability of each combination i
p''	intermediate calculation variable
$p_{0,j}$	probability of a queue-free state for the conflicting major-street left-turning traffic
$p^*_{0,j}$	probability that there will be no queue in the inside through lane (Chapters 16 and 18); proportion of Rank 1 vehicles not blocked (Chapter 20)
$p_{0,k}$	probability of a queue-free state for the conflicting minor-street crossing traffic
$p0_{str(i)}$	probability of no incident for street location i of type str
P_a	proportion of automobiles in the traffic stream
$p_{ap,ti}$	proportion of $N_{ap,o}$ that can be accessed by a left turn from the subject direction of travel
p_b	probability of a blocked lane (Chapter 20); proportion of time blocked (decimal, Chapter 30)

$p_{b,x}$ proportion of time that movement x is blocked by a platoon

P_{BCDEF} probability that an individual will respond with a score of B, C, D, E, or F

p_{be} proportion of stops on segment with benches (decimal)

P_{bo} probability of two blocked lanes in the opposing direction

P_{bs} probability of two blocked lanes in the subject direction

$p_{building}$ proportion of sidewalk length adjacent to a building face (decimal)

p_c probability that the subject phase is called

P_c pavement condition rating

PC pedestrian clear setting (s)

P_{CDEF} probability that an individual will respond with a score of C, D, E, or F

PC_{mt} pedestrian clear setting for the phase serving the minor-street through movement (s)

p_{curb} proportion of segment with curb on the right-hand side (decimal)

P_d probability of a delayed crossing

P_{DEF} probability that an individual will respond with a score of D, E, or F

P_{do} probability of delayed passing in opposing direction

P_{ds} probability of delayed passing in subject direction

P_{EF} probability that an individual will respond with a score of E or F

P_F probability that an individual will respond with a score of F

PF progression adjustment factor

PF^* simplified progression adjustment factor

P_{FD} proportion of diverging traffic remaining in Lanes 1 and 2 immediately upstream of the deceleration lane

p_{fence} proportion of sidewalk length adjacent to a fence or low wall (decimal)

$PFFS$ percentage of free-flow speed (decimal)

P_{FM} proportion of through freeway traffic remaining in Lanes 1 and 2 immediately upstream of the deceleration lane (decimal)

P_g approach grade (%)

$p_{GA,x}$ proportion of time of gap acceptance regime (decimal)

PHF peak hour factor (decimal)

P_{HV} percentage of heavy vehicles (%, Chapters 18 and 19); proportion of heavy vehicles (decimal, Chapters 20 and 21)

P_{HVa} adjusted percentage of heavy vehicles in the midsegment demand flow rate (%)

p_i path mode split for user group i (Chapter 24); distance required to pass mode i (mi, Chapter 24)

$p_{i,j}$ seed proportion of volume from origin i to destination j (decimal)

pi_{str} proportion of incidents for street location type str

P_L proportion of left-turning vehicles in the shared lane

P_{lc} probability of a lane change among the approach through lanes

$P_{LL,t}$ proportion of through-movement vehicles in the left lane (decimal)

P_{lt} proportion of left-turning vehicles on the subject approach (decimal)

P_{LT} proportion of left-turning vehicles in the lane

$P_{LTL,seg}$ proportion of intersections with left-turn lanes (or bay) on segment (decimal)

P_{lto} proportion of left-turning vehicles in the opposing traffic stream

P_{mds} probability of delayed passing for mode m

$P_{n,i}$ probability of passing section being blocked by mode i

$p_{NCF,x}$ proportion of time of no conflicting flow (decimal)

P_{no} probability of blocked lane in opposing direction

P_{ns} probability of blocked lane in subject direction

p_{ot} proportion of transit vehicles arriving on time (decimal)

p_{ov} probability of left-turn bay overflow (decimal)

p_p probability that the subject phase is called by a pedestrian detection

P_p	probability of a pedestrian pressing the detector button
$p_{p,j}$	probability that conflicting Rank 2 pedestrian movement j will operate in a queue-free state
$p_{p,x}$	pedestrian impedance factor for pedestrian movement x
p_{pk}	proportion of on-street parking occupied (decimal)
P_R	proportion of recreational vehicles in the traffic stream (Chapter 15); proportion of right-turning vehicles in the shared lane (Chapter 18)
$P_{R,i,j,k}$	proportion of right-turning vehicles in the shared lane group j at intersection i for subperiod k
$P_{RL,t}$	proportion of through-movement vehicles in the right lane (decimal)
p_{rm}	proportion of link length with restrictive median (decimal)
$Prop(off\text{-}ramp)$	off-ramp demand volume proportion
$Proportion$	proportion of work zone capacity available for mainline flow (decimal)
P_{rt}	proportion of right-turning vehicles on the subject approach (decimal)
P_{RT}	proportion of right-turning vehicles in the lane or lane group
p_{sh}	proportion of stops on segment with shelters (decimal)
P_{SUT}	proportion of single-unit trucks in the traffic stream (decimal)
$P_t\{w, j\}$	timewise probability of weather type w in month j
P_T	proportion of trucks or heavy vehicles in the traffic stream
PT	passage time setting (s)
PT_{45}	percentage of trips that occur at speeds less than 45 mi/h (decimal)
P_{TC}	proportion of trucks operating at crawl speed (decimal)
P_{Tds}	total probability of delayed passing
PTI	planning time index
PT_{lt}	passage time setting for phase serving left-turning vehicles (s)
PT_{rt}	passage time setting for phase serving right-turning vehicles (s)
$PTSF_d$	percent time-spent-following in the analysis direction (decimal)
$PTSF_f$	percent time-spent-following for the facility (decimal)
$PTSF_i$	percent time-spent-following for segment i (decimal)
$PTSF_{pl}$	percent time-spent-following for segment as affected by the presence of a passing lane (decimal)
P_{TT}	proportion of tractor trailers in the traffic stream (decimal)
PT_{th}	passage time setting for phase serving through vehicles (s)
P_{turn}	proportion of turning vehicles in the shared lane (decimal)
p_v	probability that the subject phase is called by a vehicle detection
$pv_{int(i),n}$	cumulative sum of volume proportions for leg associated with NEMA phase n at intersection i
$pv_{seg(i),n}$	volume proportion for the direction of travel served by NEMA phase n on segment i
$P_W(i, j)$	probability of encountering weather type i in month j
P_{window}	proportion of sidewalk length adjacent to a window display (decimal)
p_x	probability of phase termination by extension to the maximum green limit
q	arrival flow rate (veh/s)
Q	back-of-queue size (veh/ln)
$Q(i, t, p)$	total queue length on segment i at the end of time step t in time interval p (ft)
q^*	arrival flow rate for the phase (veh/s)
q_p^*	activating pedestrian call rate for the phase (p/s)
q_e^*	activating vehicular call rate for the phase (veh/s)
$q'_{a|u,j}$	arrival flow rate in time step j at a downstream intersection from upstream source u (veh/step)
$q'_{u,i}$	departure flow rate in time step i at upstream source u (veh/step)
$Q_\%$	percentile back-of-queue size (veh/ln)
Q_1	first-term back-of-queue size (veh/ln)

Q_2 second-term back-of-queue size (veh/ln)

$Q_{2,d}$ average queue size associated with the deterministic delay component

$Q_{2,sl}$ second-term back-of-queue size for shared left-turn and through lane group (veh/ln)

$Q_{2,sr}$ second-term back-of-queue size for shared right-turn and through lane group (veh/ln)

$Q_{2,t}$ second-term back-of-queue size for exclusive-through lane group (veh/ln)

Q_{2+3} back-of-queue size (veh/ln)

Q_3 third-term back-of-queue size (veh/ln)

$Q_{3,sl}$ third-term back-of-queue size for shared left-turn and through lane group (veh/ln)

$Q_{3,sr}$ third-term back-of-queue size for shared right-turn and through lane group (veh/ln)

$Q_{3,t}$ third-term back-of-queue size for exclusive-through lane group (veh/ln)

Q_{95} 95th percentile queue (veh)

Q_A estimated average per lane queue length for the through movement in the downstream (internal) link at the beginning of upstream arterial Phase A (ft)

Q_b initial queue at the start of the analysis period (veh)

$Q_{b,comb}$ initial queue for the combined movement (veh)

$Q_{b,thru}$ initial queue for the through movement (veh)

q_c conflicting flow rate (veh/h)

q_d arrival flow rate for downstream lane group (veh/s)

QDR_{wz} average 15-min queue discharge rate (pc/h/ln) at the work zone bottleneck

Q_e queue at the end of the analysis period (veh)

Q_{eo} queue at the end of the analysis period when $v \ge c_A$ and $Q_b = 0.0$ (veh)

Q_f queue size at the end of g_f (veh)

q_g arrival flow rate during the effective green time (veh/s)

q_i hourly directional path flow rate for user group i (modal users/h)

Q_i queue size at the end of interval i (veh)

$q_{i,t}$ demand flow rate on section i during analysis period t (pc/h)

$Q_{i,max}$ maximum queue length for direction i (pc)

$Q_{Initial}$ length of the queue stored at the internal approach at the beginning of the interval during which this approach has demand starvation potential

q_{it} outside lane flow rate (veh/s)

Q_{ob} bicycle demand in the opposing direction (bicycles/h)

Q_p queue size at the end of permitted service time (veh)

Q'_p queue size at the end of permitted service time, adjusted for sneakers (veh)

Q_q queue size at the start of g_u (veh)

q_r arrival flow rate during the effective red time (veh/s)

Q_r queue size at the end of effective red time (veh)

Q_R estimated average per lane queue length for the through movement in the downstream (internal) link at the beginning of upstream ramp Phase R (ft)

$QR(t-1)$ queue on ramp at end of previous analysis period $t-1$ (veh)

QRS queue storage capacity of ramp (veh)

Q_{sb} bicycle demand in the same direction (bicycles/h)

Q_{sep} average queue length for the movement considered as a separate lane (veh)

Q_T total hourly directional path demand (modal users/h)

Q_{tdo} total time spent by pedestrians waiting to cross the major street during one cycle (p-s)

r effective red time (s)

R red time (s, Chapter 19); radius of corner curb (ft, Chapter 19); intermediate calculation variable (Chapter 30); critical flow ratio for the exit-ramp movements (Chapter 34)

$R(t)$ ramp-metering rate for analysis period t (veh/h/ln)

R_I critical flow ratio for the exit-ramp movements for Intersection I

$R_{1,II}$	critical flow ratio for the exit-ramp movements for the interchange
R_{II}	critical flow ratio for the exit-ramp movements for Intersection II
r_a	acceleration rate (ft/s^2)
r_{at}	transit vehicle acceleration rate (ft/s^2)
R_c	red clearance interval (s)
$R_{c,mj}$	red clearance interval of the phase serving the minor-street through movement (s)
$r_{c,th}$	average radius of the circulating path of the through movement (ft)
r_d	deceleration rate (ft/s^2)
r_{DC}	ratio of weekday types with an active work zone in a given month to the total number of each weekday type occurring in a given month
RDR	recurring delay rate (h/mi)
$Rd_{str(i)}$	random number for incident duration for street location i of type str
r_{dt}	transit vehicle deceleration rate (ft/s^2)
$Rf_{ap,d}$	random number for flow rate for analysis period ap and day d
Rg_d	random number for temperature for day d
RIA_1	roundabout influence area for Subsegment 1 (ft)
$Ri_{str(i)}$	random number for incident for street location i of type str
$RM(i, p)$	maximum allowable rate of an on-ramp meter at the on-ramp at node i during time interval p (veh/h)
R_p	platoon ratio
$Rp_{d,m}$	random number for precipitation for day d of month m
R_Q	queue storage ratio
$R_{Q\%}$	percentile queue storage ratio
r_{qg}	queue growth rate (veh/h)
$R_{r,ap,d}$	rainfall rate during analysis period ap and day d (in./h)
Rr_d	random number for rainfall rate for day d
$rr_{d,m}$	rainfall rate for the rain event occurring on day d of month m (in./h)
$\overline{rr}_m$	precipitation rate in month m (in./h)
$R_{s,ap,d}$	precipitation rate when snow is falling during analysis period ap and day d (in./h)
$R_{s,d}$	random number for rain event start time for day d
Rt_d	random number for rainfall total for day d
$Rv_{int(i)}$	random number for leg volume for intersection i
$Rv_{seg(i)}$	random number for volume for segment i
RW	reciprocal of path width (ft)
s	saturation flow rate (veh/h, Chapter 4); mean service rate (veh/h, Chapter 4); standard deviation of the subject performance measure (Chapter 17); adjusted saturation flow rate (veh/h/ln, Chapter 18)
S	peak hour speed (mi/h, Chapter 11); mean speed of traffic stream under base conditions (mi/h, Chapter 12); number of computational time steps in an analysis period (integer, Chapter 25)
$S(t, d)$	arithmetic average speed of vehicles (mi/h) measured during time period t at lane detector station d
s_0	base saturation flow rate (pc/h/ln)
S_0	speed constant (mi/h)
S_{0i}	free-flow speed of segment i (mi/h)
s_1	saturation flow rate for the inside lane (veh/h/ln)
S_1	speed within the linear portion of the speed–flow curve (mi/h)
$S_{1,BP}$	speed at the breakpoint of the speed–flow curve
S_2	speed drop within the curvilinear portion of the speed–flow curve (mi/h)
S_3	additional speed drop (mi/h) within the curvilinear portion of the speed–flow curve when the density of the adjacent general purpose lane is more than 35 pc/mi/ln
$S_{85,mj}$	85th percentile speed at a midsegment location on the major street (mi/h)

S_a average speed (mi/h, Chapter 30); average speed on the intersection approach (mi/h, Chapter 31)

SAF speed adjustment factor (decimal)

SAF_{cal} free-flow speed adjustment factor for calibration purposes

SAF_{mix} mixed-flow speed adjustment factor for the basic freeway segment (decimal)

SAF_{wz} free-flow speed adjustment factor for a work zone (decimal)

S_{ao} automobile-only speed for the given flow rate (mi/h)

s_b saturation flow rate of the bicycle lane (bicycles/h)

S_b bicycle running speed (mi/h, Chapter 18); mean bicycle speed on path (mi/h, Chapter 24)

S_c circulating speed (mi/h)

$SC(i, p)$ segment capacity: maximum number of vehicles (veh/h) that can pass through segment i in time interval p based strictly on traffic and geometric properties

S_{calib} base free-flow speed calibration factor (mi/h)

$S_{calib,90cap}$ mixed-flow speed at 90 percent of capacity (mi/h)

$S_{calib,cap}$ mixed-flow speed at capacity (mi/h)

$SD(i, p)$ segment demand: desired flow rate (veh/h) through segment i including on- and off-ramp demands in time interval p

s_{DDI} saturation flow rate for the DDI approach (veh/h)

S_f free-flow speed (mi/h)

SF service flow rate (veh/h)

$SF(i, t, p)$ segment flow (veh/h) out of segment i during time step t in time interval p

$S_{f,1,initial}$ initial free-flow speed for Subsegment 1 (mi/h)

$S_{f,DDI}$ free-flow speed between the DDI crossover stop bar and the yield conflict point (mi/h)

SF_i service flow rate for LOS i (veh/h)

SFI_i service flow rate under ideal conditions (pc/h)

S_{FM} mean speed of sample ($v > 200$ veh/h) (mi/h)

$S_{f,non-rbt}$ free-flow speed for nonroundabout segments (mi/h)

S_{fo} base free-flow speed (mi/h)

$S_{fo,F}$ base free-flow speed for the facility (mi/h)

$S_{fo,i}$ base free-flow speed for segment i (mi/h)

$S_{fo,seg,i,ap,d}$ base free-flow speed of through vehicles for segment i during analysis period ap and day d (mi/h)

$S^*_{fo,seg(i),n,ap,d}$ adjusted base free-flow speed for the direction of travel served by NEMA phase n on segment i during analysis period ap and day d (ft/s)

S_{FR} free-flow speed of the ramp (mi/h)

s_i saturation flow rate for lane group or phase movement i (veh/h/ln)

S_i average vehicle speed on segment i or in direction i (mi/h)

$S_{i,fps}$ average travel speed in direction i (ft/s)

$S_{i,t}$ average speed on section i in analysis period t (mi/h)

s_{i1} saturation flow rate for the major-street through movements (veh/h)

s_{i2} saturation flow rate for the major-street right-turn movements (veh/h)

s_l saturation flow rate in exclusive left-turn lane group with permitted operation (veh/h/ln)

s_{l1} saturation flow rate in the exclusive left-turn lane group during Period 1 (veh/h/ln)

s_{lc} maximum flow rate in which a lane change can occur (veh/h/ln)

s_{lr} saturation flow rate in shared left- and right-turn lane group (veh/h/ln)

s_{lt} saturation flow of an exclusive left-turn lane with protected operation (veh/h/ln)

SL_{wz} work zone speed limit (mi/h)

S_m speed for mode m (mi/h)

S_{MAX} maximum average speed of weaving vehicles expected in a weaving segment (mi/h)

S_{MIN} minimum average speed of weaving vehicles expected in a weaving segment (mi/h)

$S_{mix,i}$	space-based speed (mi/h)
$S_{mix,oa}$	overall mixed-flow speed (mi/h)
S_{ML}	space mean speed of the basic managed lane segment (mi/h)
$SMS(NS, p)$	average time interval facility speed: average space mean speed over the entire facility during time interval p
$SMS(NS, P)$	average analysis period facility speed: average space mean speed over the entire facility during the entire analysis period P
$SMS_p(NS)$	facility space mean speed in time interval p
S_{NW}	average speed of nonweaving vehicles within the weaving segment (mi/h)
s_o	base saturation flow rate (pc/h/ln)
S_O	average speed of vehicles in outer lanes of the freeway, adjacent to the 1,500-ft ramp influence area (mi/h)
$s_{o,local}$	local base saturation flow rate (pc/h/ln)
s_p	saturation flow rate of a permitted left-turn movement (veh/h/ln)
S_p	posted speed limit (mi/h, Chapter 15); pedestrian walking speed (ft/s, Chapters 18, 20, 24, and 31)
S_{ped}	pedestrian speed (ft/min)
S_{pf}	free-flow pedestrian walking speed (ft/s)
S_{pl}	posted speed limit (mi/h)
$S_{prevailing,i}$	prevailing saturation flow rate for lane group i (veh/h/ln)
$s_{q|r}$	shared lane discharge flow rate for upstream right-turn traffic movement (veh/h/ln)
s_r	saturation flow rate in exclusive right-turn lane group with permitted operation (veh/h/ln)
S_R	average speed in the ramp influence area (mi/h, Chapter 14); motorized vehicle running speed (mi/h, Chapter 18)
S_{Ra}	adjusted motorized vehicle running speed (mi/h)
$s_{rr,m}$	standard deviation of precipitation rate in month m (in./h)
s_{rt}	saturation flow rate of an exclusive right-turn lane with protected operation (veh/h/ln)
S_{Rt}	transit vehicle running speed (mi/h)
S_s	threshold speed defining a stopped vehicle (mi/h)
s_{sl}	saturation flow rate in shared left-turn and through lane group with permitted operation (veh/h/ln)
s_{sl2}	saturation flow rate in shared left-turn and through lane group during Period 2 (veh/h/ln)
S_{spot}	average spot speed (mi/h)
s_{sr}	saturation flow rate in shared right-turn and through lane group with permitted operation (veh/h/ln)
s_{str}	standard deviation of incident duration for street location type str
s_t	saturation flow rate in exclusive-through lane group (veh/h/ln)
s_T	standard deviation of daily mean temperature in a month ($^\circ$F)
S_t	effective speed factor
$S_{T,F}$	travel speed for the facility (mi/h)
$S_{T,seg}$	travel speed of through vehicles for the segment (mi/h)
$S_{T,seg,i,ap,d}$	travel speed of through vehicles for segment i during analysis period ap and day d (mi/h)
$StartTime$	analysis period in which the incident starts
$S_{Tb,F}$	travel speed of through bicycles for the facility (mi/h)
$S_{Tb,seg}$	travel speed of through bicycles along the segment (mi/h)
ST_{DLT}	system start time of the displaced left-turn phase (s)
s_{th}	saturation flow rate of an exclusive through lane (veh/h/ln)
$S_{Tp,F}$	travel speed of through pedestrians for the facility (ft/s)
$S_{Tp,seg}$	travel speed of through pedestrians for the segment (ft/s)
$S_{Tt,F}$	travel speed of transit vehicles for the facility (mi/h)

$S_{Tt,seg}$ travel speed of transit vehicles along the segment (mi/h)

ST_{TH} system start time of the major-street through phase (s)

SV_i service volume for LOS i (veh/h)

S_W average speed of weaving vehicles within the weaving segment (mi/h)

s_{w-r} transit wait–ride score

t duration of unmet demand in the analysis period (h, Chapter 19); path segment travel time for average bicycle (min, Chapter 24)

T analysis time period (h, Chapters 19 and 20); number of time steps in 1 h (integer, Chapter 25)

t' platoon arrival time (steps)

t'_p blocked period duration (steps)

t'_R segment running time (steps)

$t_{(1-\alpha),N-1}$ Student's t-statistic for the probability of a two-sided error of α, with $N-1$ degrees of freedom

T_0 time at which a vehicle would have arrived at the stop line if it had been traveling at the reference speed (s)

T_1 time at which a vehicle would have arrived at the stop line if it had been traveling at the running speed (s)

T_2 time at which a vehicle is discharged at the stop line (s)

$t_{3,LT}$ adjustment factor for intersection geometry

T_{10000} kinematic travel rate at 10,000 ft (s/mi)

t_a average duration of unmet demand in the analysis period (h)

t_A adjusted duration of unmet demand in the analysis period (h)

T_{at} amenity time rate (min/mi)

T_{btt} base travel time rate (min/mi)

T_c time until spillback (h)

t_c queue clearing time (h, Chapter 19); critical headway for a single pedestrian (s, Chapter 20)

$t_{c,base}$ base critical headway (s)

$t_{c,G}$ adjustment factor for grade (s, Chapter 20); group critical headway (s, Chapter 20)

$t_{c,HV}$ adjustment factor for heavy vehicles (s)

$t_{c,x}$ critical headway for movement x (s)

t_{cx} critical headway (s)

t_{cl} clearance time of the right-turn vehicle (s)

t_{clear} time for last queued vehicle to clear distance from stop bar to yield point (s)

t_{CQ} time to clear conflicting queue (s)

$t_{CQ,coord}$ time to clear conflicting queue for a coordinated interchange (s)

$t_{CQ,free}$ time to clear conflicting queue for an isolated interchange with random arrivals (s)

$T_{cs,k}$ controlling time until spillback for the subperiod k (h)

t_d dwell time (s)

$t_{d,i}$ duration of time interval i during which the arrival flow rate and saturation flow rate are constant (s)

$T_{d,m}$ average temperature for day d of month m (°F)

TD_{DLT} travel distance from upstream stop line to downstream stop line for the displaced left-turn roadway (ft)

t_{ex} excess wait time due to late arrivals (s)

T_{ex} excess wait time rate due to late arrivals (min/mi)

t_f follow-up headway (s, Chapter 22); service time for fully stopped vehicles (s, Chapter 31)

$t_{f,base}$ base follow-up headway (s)

$t_{f,HV}$ adjustment factor for heavy vehicles (s)

$t_{f,x}$ follow-up headway for movement x (s)

t_{fr} follow-up headway (s)

t_i lost time for *i*th vehicle in queue (s, Chapter 4); duration of unmet demand for lane group *i* in the analysis period (h, Chapter 19)

$T_{i,t}$ travel time on segment *i* in analysis period *t* (min/mi)

t_l transit vehicle running time loss (min/mi)

t_L lost time per phase (s)

t'_L adjusted lost time (s)

t''_L adjusted lost time for the internal approaches (s)

t_{late} threshold late time (min)

t_{lc} critical merge headway (s)

TLC total lateral clearance (ft)

$\overline{T}_m$ normal daily mean temperature in month *m* (°F)

T_{max} wave travel time (s)

$t_{mix,j}$ mixed-flow travel time for segment *j* (s)

$t_{mix,oa}$ overall mixed-flow travel time (s)

T_o analysis period duration for the first subperiod (h)

T_{occ} crosswalk occupancy time (p-s)

T_p analysis time period

tp_m total normal precipitation for month *m* (in.)

t_{pr} driver starting response time (s/veh, Chapter 30); pedestrian perception of signal indication and curb departure time (s, Chapter 31)

t_{ps} pedestrian service time (s)

$t_{ps,do}$ service time for pedestrians who arrive at the corner to cross the major street (s)

T_{ptt} perceived travel time rate (min/mi)

t_Q duration of queue (s)

t_R segment running time (s)

$t_{R,agg,m,all}$ aggregated segment running time for site *m* for all *n* subperiods (s)

$t_{R,m}$ segment running time for site *m* (s)

t_{Rb} segment running time of through bicycles (s)

TRD total ramp density (ramps/mi)

$tr_{d,m}$ total rainfall for the rain event occurring on day *d* of month *m* (in./event)

TR_{FFS} travel rate under free-flow conditions (min/mi)

$TR_{i,t}$ travel rate on segment *i* in analysis period *t* (min/mi)

$\overline{tr}_m$ average total rainfall per event in month *m* (in./event)

t_{Rt} segment transit vehicle running time (s)

t_s pedestrian start-up time and end clearance time (s, Chapter 20); service time (s, Chapter 21)

TS_c time-space available for circulating pedestrians (ft²-s)

TS_{corner} available corner time-space (ft²-s)

TS_{cw} available crosswalk time-space (ft²-s)

TS^*_{cw} effective available crosswalk time-space (ft²-s)

$ts_{d,m}$ start of rain event on day *d* of month *m* (h)

TS_{tv} time-space occupied by turning vehicles (ft²-s)

T_T travel time (s)

$t_{t,i}$ duration of trapezoid or triangle in interval *i* (s)

TT_{DLT} left-turn travel time (s)

$\overline{TT}_F$ average travel time for through trips on the facility during the reliability reporting period (s)

$\overline{TT}_{fo,F}$ average travel time for through trips at the base free-flow speed on the facility during the reliability reporting period (s)

TT_i total travel time of all vehicles in segment *i* (veh-h)

TTI travel time index (unitless)

TT_{i15} total travel time consumed by all vehicles traversing directional segment i during the 15-min analysis period (veh-h)

TTI_{50} 50th percentile travel time index (unitless)

TTI_{95} 95th percentile travel time index or planning time index (unitless)

TTI_{mean} average annual mean travel time index (unitless)

TTI_{policy} policy travel time index, based on the agency's policy (or target) travel time for the facility (unitless)

TTI_{pp} percentile travel time index (unitless)

TTI_t travel time index for the facility during time period t (unitless)

$\overline{TT}_p$ agency's maximum acceptable travel time for through trips on the facility during the reliability reporting period (s)

$T_{total,k}$ total analysis time for subperiods 0 to k (h)

$tv_{int(i)}$ total volume entering intersection i (veh/h)

U speed of average bicyclist (mi/h)

$U(i, p)$ average space mean speed over the length of segment i during time interval p (mi/h)

u_m minimum speed of the first through vehicle given that it is delayed (ft/s)

u_{rt} right-turn speed (ft/s)

$UV(i, t, p)$ unserved vehicles: the additional number of vehicles stored on segment i at the end of time step t in time interval p due to a downstream bottleneck

v mean arrival rate (veh/h, Chapter 4); base demand volume (veh/h, Chapter 10); demand flow rate (pc/h, Chapter 12); total demand flow rate in the weaving segment (pc/h, Chapter 13); conflicting vehicular flow rate (veh/s, Chapter 20)

V demand volume under prevailing conditions (veh/h, Chapter 12); movement volume (veh/h, Chapter 31)

$V(t, d)$ sum of lane volumes (veh) measured at detector station d during time period t

v_1 flow rate for the inside lane (veh/h/ln)

v_{12} demand flow rate in Lanes 1 and 2 of the freeway immediately upstream of the ramp influence area (pc/h)

v_{12a} adjusted flow rate in Lanes 1 and 2 immediately upstream of the ramp influence area (pc/h)

v_{15} pedestrian flow rate during the peak 15 min (p/h)

V_{15} volume during the peak 15 min of the analysis hour (veh/15 min)

v_2 flow rate in the adjacent through lane (veh/h/ln)

v_3 flow rate in Lane 3 of the freeway (pc/h/ln)

v_5 estimated approaching freeway flow in Lane 5 (pc/h)

v_A arterial flow feeding subject queue (veh/h)

V_q average speed of moving queue (ft/s)

$v_{a,1}$ adjusted arrival volume in the shared lane (veh/h)

$v_{a,b}$ flow rate of pedestrians traveling through the corner from Sidewalk A to Sidewalk B, or vice versa (p/h)

$v_{a,thru}$ adjusted arrival volume for the subject through movement (veh/h)

$v_{a,turn}$ adjusted arrival volume for the subject turn movement (veh/h)

$v_{A,x}$ volume or flow rate on approach x (veh/h)

v_{adj} adjusted demand input volume (veh/h, Chapter 10); equivalent through movement flow rate expressed in through passenger cars per hour (tpc/h, Chapter 31)

$v_{adj,i}$ equivalent through movement flow rate for lane group i (tpc/h)

v_{app} approach flow rate (veh/h, Chapter 23); average demand flow rate per through lane (upstream of any turn bays on the approach) (veh/h/ln, Chapter 30)

$v_{app,g}$ arrival flow rate during green (veh/h)

$v_{app,r}$ arrival flow rate during red (veh/h)

$v_{Arterial}$ upstream arterial through flow (veh/h)

v_{av34} flow rate in outer lanes (pc/h/ln)

v_{bic} bicycle flow rate (bicycles/h)

v_{bicg}	bicycle flow rate during the green indication (bicycles/h)
v_{bypass}	volume in the bypass lane (veh/h)
v_c	conflicting or circulating flow rate (veh/h)
V_c	sum of the critical-lane flow rates (tpc/h/ln)
$v_{c,i}$	lane flow rate for critical lane group i (tpc/h/ln)
$v_{c,min}$	minimum platooned flow rate (veh/h)
$v_{c,pce}$	conflicting flow rate (pc/h)
$V_{c,perm,1}$	critical-lane flow rate for permitted left-turn operation on the east–west approaches (tpc/h/ln)
$V_{c,perm,2}$	critical-lane flow rate for permitted left-turn operation on the north–south approaches (tpc/h/ln)
$V_{c,prot,1}$	critical-lane flow rate for protected left-turn operation on the east–west approaches (tpc/h/ln)
$V_{c,prot,2}$	critical-lane flow rate for protected left-turn operation on the north–south approaches (tpc/h/ln)
$V_{c,split,1}$	critical-lane flow rate for split phasing on the east–west approaches (tpc/h/ln)
$V_{c,split,2}$	critical-lane flow rate for split phasing on the north–south approaches (tpc/h/ln)
$v_{c,u,x}$	conflicting flow for movement x during the unblocked period (veh/h)
$v_{c,x}$	conflicting flow rate for movement x (veh/h)
v_{ci}	flow rate of pedestrians arriving at the corner after crossing the minor street (p/h)
v_{co}	flow rate of pedestrians arriving at the corner to cross the minor street (p/h)
v_D	flow rate on the adjacent downstream ramp (pc/h, Chapter 14); design speed of the loop ramp or diverted movement (mi/h, Chapter 23)
$v_{d,ATS}$	demand flow rate for ATS estimation (pc/h)
$v_{d,PTSF}$	demand flow rate in the analysis direction for estimation of PTSF (pc/h)
v_{di}	flow rate of pedestrians arriving at the corner after crossing the major street (p/h)
v_{do}	flow rate of pedestrians arriving at the corner to cross the major street (p/h)
$V_{dOFF15ij}$	adjusted 15-min exit demand for time period i and exiting location j (veh)
v_e	entry flow rate
v_{ex}	exiting flow rate
$v_{ex,pce}$	conflicting exiting flow rate (pc/h)
v_F	flow rate on freeway immediately upstream of the ramp influence area under study (pc/h)
v_{F4eff}	effective approaching freeway flow in four lanes (pc/h)
v_{FF}	freeway-to-freeway demand flow rate in the weaving segment (pc/h)
v_{FO}	flow rate on the freeway immediately downstream of the merge or diverge area (pc/h)
v_{FR}	freeway-to-ramp demand flow rate in the weaving segment (pc/h)
v_g	demand flow rate for movement group (veh/h)
v_{g1}	demand flow rate in the single exclusive lane with the highest flow rate of all exclusive lanes in movement group (veh/h/ln)
v_h	pedestrian demand during the analysis hour (p/h)
$VHT(t, d)$	vehicle hours traveled during time period t measured at lane detector station d
$VHTFF_t$	facility vehicle hours traveled during time period t if travel was at free-flow speed
VHT_t	facility vehicle hours traveled during time period t
$VHT_{t,d}$	vehicle hours traveled during time period t measured at lane detector station d
v_i	demand flow rate for movement i (pc/h, Chapters 13, 19, and 20); actual or projected demand flow rate for lane group i (veh/h, Chapter 23); speed of a given path user of mode i (mi/h, Chapter 24); flow rate for lane i (veh/h/ln, Chapter 30)
V_i	demand volume for movement i (veh/h)
v_i'	demand flow rate (veh/cycle/ln)
$v_{i,1}$	major-street through vehicles in shared lane (veh/h)
$v_{i,2}$	major-street turning vehicles in shared lane (veh/h)

$v_{i,ATS}$ demand flow rate i for ATS estimation (pc/h)

$v_{i,j}$ volume entering from origin i and exiting at destination j (veh/h)

$v_{i,pce}$ demand flow rate for movement i (pc/h)

$v_{i,PTSF}$ demand flow rate i for determination of PTSF (pc/h)

$V_{i,t}$ demand flow rate on section i during analysis period t (veh/h)

v_{i1} major-street through-movement flow rate (veh/h)

v_{i2} major-street right-turn flow rate (veh/h)

$v_{input,int(i),j}$ movement j volume at intersection i (from dataset) (veh/h)

$v_{int(i),j,h,d}$ adjusted hourly flow rate for movement j at intersection i during hour h and day d (veh/h)

$v^*_{int(i),j,ap,d}$ randomized hourly flow rate for movement j at intersection i during analysis period ap and day d (veh/h)

V_{iq} vehicle-in-queue count (veh)

v_j demand flow rate of movement j (veh/h)

v_l left-turn flow rate using a given entry (veh/h, Chapter 22); demand flow rate in exclusive left-turn lane group (veh/h/ln, Chapter 31)

v_L major left-turn or U-turn flow rate (veh/h, Chapter 20); O-D demand flow rate traveling through the first intersection and turning left at the second (Chapter 23)

v_{L+TH} through and left-turn movement combined flow rate (veh/h)

v_{LL} demand flow rate in left lane (veh/h)

v_{lr} demand flow rate in shared left- and right-turn lane group (veh/h)

v_{lt} left-turn demand flow rate (veh/h, Chapter 19); lane flow rate for the left-turn lane group (tpc/h/ln, Chapter 31)

$v_{lt,perm}$ permitted left-turn demand flow rate (veh/h)

$v_{lt,pt}$ lane flow rate for the left-turn lane group during the protected left-turn phase (tpc/h/ln)

v_m midsegment demand flow rate (veh/h, Chapter 18); flow rate for mode m (SUT/h, TT/h, or pc/h; Chapter 26)

$VM(t)$ volume on upstream section for analysis period t (veh/h)

v_{ma} adjusted midsegment demand flow rate (veh/h)

V_{max} maximum achievable segment speed (mi/h)

v_{mg} merge flow rate (veh/h/ln)

v_{mix} flow rate of mixed traffic (veh/h/ln)

$VMT(t, d)$ vehicle miles traveled during time period t measured at lane detector station d

VMT_i vehicle miles traveled for segment i (veh-mi)

VMT_{i15} total vehicle miles traveled by all vehicles in directional segment i during the 15-min analysis period (veh-mi)

VMT_j average vehicle miles traveled for scenarios in month j

VMT_{Seed} vehicle miles of travel in the seed file

$VMT_{seg,u}$ vehicle miles traveled on segment seg during analysis period u in the seed file

VMT_t facility vehicle miles traveled during time period t

$VMT_{t,d}$ vehicle miles traveled during time period t measured at lane detector station d

v_n flow rate for the outside lane (veh/h/ln)

v_{NW} nonweaving demand flow rate in the weaving segment (pc/h)

v_o opposing demand flow rate (veh/h)

$v_{o,ATS}$ demand flow rate for ATS determination in the opposing direction (pc/h)

$v_{o,PTSF}$ demand flow rate in the opposing direction for estimation of PTSF (pc/h)

v_{OA} average per lane demand flow in outer lanes adjacent to the ramp influence area (not including flow in Lanes 1 and 2) (pc/h/ln)

v_{OD} O-D demand volumes (veh/h)

$v_{od,i,j,k}$ volume entering from origin i and exiting at destination j for subperiod k (veh/h)

$V_{OFF15,ij}$ 15-min exit count for time period i and exiting location j (veh)

v_{OL} directional demand flow rate in the outside lane (veh/h)

V_{ON15ij} 15-min entering count for time period i and entering location j (veh)

v_p demand flow rate under equivalent base conditions (pc/h/ln, Chapter 12); pedestrian flow per unit width (p/ft/min, Chapter 18); pedestrian flow rate (p/s, Chapter 20)

v_{ped} unit flow rate (p/min/ft, Chapter 4); pedestrian flow rate in the subject sidewalk (walking in both directions) (p/h, Chapter 18)

$v_{ped,i}$ pedestrian flow rate in the subject crossing for travel direction i (p/h)

v_{pdg} pedestrian flow rate during the pedestrian service time (p/h)

v_r demand flow rate in exclusive right-turn lane group (veh/h/ln)

v_R flow rate on the on-ramp or off-ramp (pc/h, Chapter 14); right-turn movement flow rate (veh/h, Chapter 20); right-turn flow rate using a given entry (veh/h, Chapter 22); O-D demand flow rate traveling through the first intersection and turning right at the second (Chapter 23); ramp flow feeding subject queue (veh/h, Chapter 23)

V_R ratio of weaving demand flow rate to total demand flow rate in the weaving segment (decimal)

VR volume ratio (decimal)

$VR(t)$ volume on ramp during analysis period t (veh/h)

$v_{R,e}$ nonbypass right-turn flow rate using a given entry (veh/h)

v_{R12} sum of the flow rates in Lanes 1 and 2 and the ramp flow rate (on-ramps only) (pc/h)

v_{Ramp-L} upstream ramp left-turning flow (veh/h)

v_{RF} ramp-to-freeway demand flow rate in the weaving segment (pc/h)

v_{RL} demand flow rate in right lane (veh/h)

v_{RR} ramp-to-ramp demand flow rate in the weaving segment (pc/h)

v_{rt} right-turn demand flow rate (veh/h)

v_{rtor} right-turn-on-red flow rate (veh/h)

v_s transit frequency for the segment (veh/h)

v_{sep} flow rate for the movement considered as a separate lane (veh/h)

v_{sl} demand flow rate in shared left-turn and through lane group (veh/h)

$v_{sl,i,j,k}$ demand flow rate in shared left-turn and through lane group j at intersection i for subperiod k (veh/h)

$v_{sl,lt}$ left-turn flow rate in shared lane group (veh/h/ln)

v_{sr} demand flow rate in shared right-turn and through lane group (veh/h)

$v_{sr,i,j,k}$ demand flow rate in shared right-turn and through lane group j at intersection i for subperiod k (veh/h)

$v_{sr,rt}$ right-turn flow rate in shared lane group (veh/h/ln)

v_t demand flow rate in exclusive-through lane group (veh/h/ln, Chapter 18); through flow rate using a given entry (veh/h, Chapter 22)

v_T right-turn flow rate using a given entry (veh/h, Chapter 22); O-D demand flow rate traveling through the first intersection and through the second (Chapter 23)

$v_{t,i,j,k}$ demand flow rate in exclusive-through lane group j at intersection i for subperiod k (veh/h/ln)

v_{th} through-demand flow rate (veh/h)

V_{tot} total number of vehicles arriving during the survey period (veh)

v_U flow rate on the adjacent upstream ramp (pc/h, Chapter 14); U-turn flow rate (veh/h, Chapter 22)

v_{vph} one-direction demand flow rate (veh/h)

v_W weaving demand flow rate in the weaving segment (pc/h)

$V_{W,start}$ starting shock wave speed for arterial through movements due to the downstream queue (ft/s)

$V_{W,stop}$ stopping shock wave speed for arterial through movements due to the downstream queue (ft/s)

v_x flow rate for movement x (veh/h, Chapter 20); number of groups of pedestrians, where x is Movement 13, 14, 15, or 16 (Chapter 20)

v_y flow rate of the y movement in the subject shared lane (veh/h)

w lane width of the lane that the minor movement is negotiating into (ft)

W weaving intensity factor (Chapter 13); width of the clear zone for the longest vehicle path, measured along the centerline of the outside lane (ft, Chapter 23); effective width of crosswalk (ft, Chapter 31)

W_a effective width of Sidewalk A (ft)

W_A available sidewalk width (ft)

W_{aA} adjusted available sidewalk width (ft)

Walk   pedestrian walk setting (s)

$Walk_{mi}$ pedestrian walk setting for the phase serving the minor-street through movement (s)

W_b effective width of Sidewalk B (ft)

W_{bl} width of the bicycle lane (ft)

W_{buf} buffer width between roadway and sidewalk (ft)

w_c average width of circulating lane(s) (ft)

W_c crosswalk width (ft)

W_{cd} curb-to-curb width of the cross street (ft)

W_d effective width of Crosswalk D (ft)

W_e effective width of the outside through lane (ft)

W_E effective sidewalk or walkway width (ft)

W_i width of signalized intersection as measured along the segment centerline (ft)

$w_{l,i,k}$ weighting factor for lane group j at intersection i for subperiod k (veh)

W_l total width of shoulder, bicycle lane, and parking lane (ft)

W_O sum of fixed-object effective widths and linear-feature shy distances at a given point along the walkway (ft)

$W_{O,i}$ adjusted fixed-object effective width on inside of sidewalk (ft)

$W_{O,o}$ adjusted fixed-object effective width on outside of sidewalk (ft)

W_{ol} width of the outside through lane (ft)

W_{OL} outside lane width (ft)

W_{os} width of paved outside shoulder (ft)

W_{os}^* adjusted width of paved outside shoulder (ft)

W_{pk} width of striped parking lane (ft)

w_q queue change rate (veh/s)

W_s paved shoulder width (ft)

$WS(i, p)$ wave speed: speed at which a front-clearing queue shock wave travels through segment i during time interval p (ft/s)

$W_{s,i}$ shy distance on inside of sidewalk (ft)

$W_{s,o}$ shy distance on outside of sidewalk (ft)

W_t total width of the outside through lane, bicycle lane, and paved shoulder (ft)

W_T total walkway width (ft)

$w_{thru,m,k}$ weighting factor for site m for subperiod k (veh)

WTT   wave travel time (time steps)

$WTT(i, p)$ wave travel time: time taken by the shock wave traveling at wave speed WS to travel from the downstream end of segment i to the upstream end of the segment during time interval p (time steps)

$WTT_{b,i}$ travel-time-weighted average bicycle LOS score for segment i

$WTT_{p,i}$ travel-time-weighted average pedestrian LOS score for segment i

W_v effective total width of outside through lane, bicycle lane, and shoulder as a function of traffic volume (ft)

x volume-to-capacity ratio of the link's rightmost lane on a roundabout approach (Chapter 18); degree of utilization (Chapter 21); volume-to-capacity ratio of the subject lane (Chapter 22); distance from average bicyclist to user (mi, Chapter 24)

X peak hour volume-to-capacity ratio (decimal, Chapter 11); volume-to-capacity ratio (Chapter 20); distance of user beyond end of path segment (mi, Chapter 24)

X_1 volume-to-capacity ratio in the shared lane

X_A average volume-to-capacity ratio

X_c critical intersection volume-to-capacity ratio

x_{CL} degree of utilization on the conflicting approach from the left

x_{clear} distance between the DDI crossover stop bar and the yield conflict point (ft)

x_{CR} degree of utilization on the conflicting approach from the right

X_i volume-to-capacity ratio for lane or lane group i

$x_{6,1+2}$ combined degree of saturation for the major-street through and right-turn movements

x_O degree of utilization on the opposing approach

X_u weighted volume-to-capacity ratio for all upstream movements contributing to the volume in the subject movement group

y flow ratio (Chapter 19); intermediate calculation variable (Chapter 20)

y^* flow ratio for the approach

Y yellow change interval (s, Chapter 19); yellow-plus-all-red change-and-clearance interval (s, Chapter 23)

y_3 effective flow ratio for concurrent (or transition) Phase 3

y_7 effective flow ratio for concurrent (or transition) Phase 7

Y_c sum of the critical flow ratios

$Y_{c,I}$ sum of the critical flow ratios for Intersection I

$Y_{c,II}$ sum of the critical flow ratios for Intersection II

$y_{c,i}$ critical flow ratio for phase i

$Y_{c,max}$ sum of the critical flow ratios for the interchange

Y_{mi} change interval of the phase serving the minor-street through movement (s)

YP_2 yield point for Phase 2 (s)

y_t effective flow ratio for the concurrent phase when dictated by travel time

z percentile parameter

α fraction of capacity drop in queue discharge conditions due to congestion on the facility

α_{wz} percentage drop in prebreakdown capacity at the work zone due to queuing conditions (%)

β shape parameter of the fitted Weibull distribution

β_1 model coefficient for 2-to-1 lane closures

β_2 model coefficient for 2-to-2 lane closures

β_3 model coefficient for 3-to-2 lane closures

β_4 model coefficient for 4-to-3 lane closures

β_5 model coefficient for volume ratio

β_6 model coefficient for auxiliary lane length

γ scale parameter of the fitted Weibull distribution

δ slope of the travel time–versus–distance curve (s/ft)

δ_1 adjustment parameter for incident frequency

δ_2 adjustment parameter for incident severity

δ_3 adjustment parameter for incident duration

δ_4 adjustment parameter for incident location

δ_5 adjustment parameter for incident start time

Δ headway of bunched vehicle stream (s/veh)

Δ^* equivalent headway of bunched vehicle stream served by the phase (s/veh)

Δ_i headway of bunched vehicle stream in lane group i (s/veh)

$\Delta_{RO_{i,t}}$ additional oversaturation delay rate for segment i at analysis period t (min/mi)

$\Delta_{RU_{i,t}}$ delay rate for segment i in time period t (min/mi)

$\Delta\tau_{TI}$ traffic interaction term (s/mi)

λ threshold breakdown rate (Chapter 26); flow rate parameter (veh/s) (Chapter 30)

λ^* flow rate parameter for the phase (veh/s)

λ_{A2} rate of change in A_2 per unit increase in free-flow speed (mi/h)

λ_{Bp} rate of increase in breakpoint per unit decrease in free-flow speed (pc/h/ln)

λ_c rate of change in capacity per unit change in free-flow speed (pc/h/ln)

$\lambda_{c,i}$ flow rate parameter for lane group i served in the concurrent phase that also ends at the barrier (veh/s)

λ_i flow rate parameter for lane group i

λ_l flow rate parameter for the exclusive left-turn lane group (veh/s)

λ_r flow rate parameter for the exclusive right-turn lane group (veh/s)

λ_{sl} flow rate parameter for shared left-turn and through lane group (veh/s)

λ_{sr} flow rate parameter for shared right-turn and through lane group (veh/s)

λ_t flow rate parameter for exclusive-through lane group (veh/s)

μ_i average speed of mode i (mi/h)

$\rho_{g,\text{mix}}$ coefficient for grade term in the mixed-flow CAF equation (decimal)

σ_{spot} standard deviation of spot speeds (mi/h)

τ_a automobile free-flow travel rate (s/mi)

$\tau_{f,a,j}$ end-of-grade spot travel time rate for automobiles (s/mi)

$\tau_{f,SUT,j}$ spot travel time rate for SUTs at the end of segment j (s/mi)

$\tau_{f,SUT,kin,j}$ spot kinematic travel time rate of SUTs at the end of segment j (s/mi)

$\tau_{f,TT,j}$ spot travel time rate for TTs at the end of segment j (s/mi)

$\tau_{f,TT,kin,j}$ spot kinematic travel time rate of TTs at the end of segment j (s/mi)

τ_{kin} kinematic space-based travel time rate (s/mi)

τ_m travel time rate for mode m (s/mi)

$\tau_{\text{mix},j}$ mixed-flow space-based travel time rate for segment j (s/mi)

$\tau_{S,a,j}$ automobile space-based travel time rate (s/mi)

$\tau_{S,SUT,j}$ space-based travel time rate for SUTs across segment j (s/mi)

$\tau_{S,SUT,kin,j}$ kinematic space-based travel time rate of SUTs (s/mi)

$\tau_{S,TT,j}$ space-based travel time rate for TTs across segment j (s/mi)

$\tau_{S,TT,kin,j}$ kinematic space-based travel time rate of TTs (s/mi)

τ_{SUT} SUT free-flow travel rate (s/mi)

$\tau_{SUT,10000}$ travel time rate for a SUT at a point 10,000 ft along the upgrade (s/mi)

$\tau_{SUT,kin}$ kinematic travel rate of SUTs (s/mi)

τ_{TT} TT free-flow travel rate (s/mi)

$\tau_{TT,10000}$ travel time rate for a TT at a point 10,000 ft along the upgrade (s/mi)

$\tau_{TT,kin}$ kinematic travel rate of TTs (s/mi)

φ^* combined proportion of free (unbunched) vehicles for the phase (decimal)

φ_i proportion of free (unbunched) vehicles in lane group i (decimal)

ϕ_{mix} exponent for the speed–flow curve (decimal)