

**TIM
MILLER
ASSOCIATES, INC.**

10 North Street, Cold Spring, NY 10516

(845) 265-4400

265-4418 fax

August 1, 2016

President David H. Stolman, AICP, PP
Frederick P. Clark Associates, Inc.
350 Theodore Fremd Avenue
Rye NY, 10580

RE: Transportation Study for a Multi-Family Development
Project: Parth Knolls, LLC
Location: 87 Hawkes Avenue,
Ossining, NY 10562
Section: 80.20, Block 1, Lot 15

Dear Mr. Stolman:

This letter responds to the your request to study the NYS Route 9A and Croton Dam Road (NYS Route 134) intersection in relation to the proposed Parth Knolls, LLC project.

Summary

As previously noted (Feb. 26, 2016 letter) using New York State Department of Transportation data, average daily traffic on both NYS Route 9A and NYS Route 134 has for the decade following 2003 declined by over one percent per year.

The NYS Route corridor south of US Route 9 overlap is recognized as an issue and the New York State Department of Transportation has included the corridor in long range plans (*A Shared Vision for a Sustainable Region*, September 4, 2013) and has initiated work on some locations in Westchester County south of Ossining. At the intersection of NYS Route 9A and NYS Route 134, protected left turn movements from NYS Route 9A were provided by the State. Such protected signal phase improvements tend to improve safety at the cost of capacity.

Both of the above speak to the corridor being a known and long standing regional issue that probably will continue for decades. The NYS Route 9A corridor is one of several corridors providing major north-south access for residents of multiple counties.

The River Knolls traffic study once again confirmed what is already known and been stated, that the intersection of NYS Route 9A and Croton Dam Road NYS Route 134

is congested. Based on New York Department of Transportation historical data and the delays in Table 1 the congested condition has likely existed for at least a decade. Table 1 indicates there is no change in level of service as a result of the Parth Knolls Project.

The traffic analysis indicated trip generation peak of 46 trips less than half the 100 vehicle trips to be considered a substantial increase under SEQRA. Thus the volume itself is not significant and thus does not warrant the delay of the approval of this project. The project is anticipated to add to the NYS Route 9A and Croton Dam Road intersection 13 trips to the projected 3823 trips in the a.m. peak hour and 24 trips to the 4034 projected in the p.m. peak hour. The projected trips at the subject intersection is less than one quarter of 100 trips.

Analysis

This analysis utilizes the River Knolls traffic study to form the basis of the traffic as there is only four months between the counts. To the extent possible, the Existing Conditions are nearly the same in the River Knolls Build Condition taken as the No Build Condition herein. Onto the River Knolls Build Condition, the Parth Knolls project traffic added to form the Parth Knolls Build Condition. We note that the background growth used in the River Knolls project at two percent per year is conservatively high given that historically traffic is declining on both roads.

Attachment A contains the traffic volumes for all conditions.

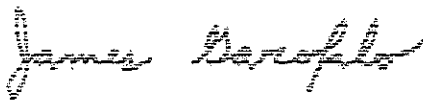
Attachment B contains the level of service analysis for the Existing, No Build, and Build Conditions. Since the River Knolls project is considered part of the No Build Condition, their a.m. peak hour mitigation timing is included in the a.m. peak hour No Build and Build Conditions. Attachment C has the level of service criteria.

As typically done in traffic analysis, the peak hour factors are unchanged and no traffic is rerouted based on the congested condition. In actually both of these may reduce the future peak flows more than the added project traffic to the intersection in the future.

| Table 1 Level of Service Summary All Conditions NYS Route 9A and Croton Dam Road NYS Route 134 | | | | | | | |
|--|---|---|----------------|----------------|----------------------|----------------|----------------|
| Intersection Road | Lane Group Approach Direction - Movement | Levels of Service (Delay in seconds per vehicle) Volume to Capacity Ratio | | | | | |
| | | Weekday A.M. Peak Hour | | | Weekday PM Peak Hour | | |
| | | Existing | No Build | Build | Existing | No Build | Build |
| NYS Route 9A and Croton Dam Road (NYS Route 134) signalized | | | | | | | |
| NYS Route 9A | EB - L | E (72.0) 0.85 | E (74.3) 0.86 | E (74.3) 0.86 | F (83.5) 0.86 | F (85.4) 0.87 | F (85.4) 0.87 |
| | EB - T | C (21.8) 0.86 | C (33.5) 0.95 | C (33.5) 0.95 | B (10.8) 0.41 | B (11.2) 0.43 | B (11.2) 0.43 |
| | EB - R | A (8.7) 0.09 | B (11.0) 0.10 | B (11.1) 0.10 | A (8.6) 0.14 | A (9.0) 0.18 | A (9.0) 0.18 |
| NYS Route 9A | WB - L | F (213.7) 0.98 | F (222.1) 1.04 | F (222.1) 1.04 | F (113.1) 0.82 | F (104.3) 0.80 | F (104.3) 0.80 |
| | WB - T, R* | B (18.2) 0.48 | C (22.8) 0.53 | C (22.8) 0.53 | F (58.7) 1.01 | F (72.1) 1.05 | F (74.5) 1.05 |
| Croton Dam Rd | NB - L, T, R | E (74.6) 0.89 | F (104.4) 1.02 | F (111.7) 1.04 | F (181.1) 1.18 | F (314.0) 1.50 | F (324.5) 1.52 |
| Croton Dam Rd | SB - L, T, R | E (77.6) 0.91 | E (61.4) 0.81 | E (61.6) 0.81 | F (104.7) 0.98 | F (125.4) 1.05 | F (125.9) 1.05 |
| | Overall | C (31.5) | D (41.0) | D (41.8) | E (56.2) | E (73.8) | E (76.1) |
| NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound. L = left, R = right, T = through, (e.g. WB-L = Westbound left). | | | | | | | |
| *Through-Right lane data shown. | | | | | | | |

If there are any question regarding why this project should not proceed based on the limited project volumes at the intersection please contact me.

Sincerely,



James A. Garofalo, AICP CTP
Director of Transportation Division
TIM MILLER ASSOCIATES, INC.

ATTACHMENT A

Figures

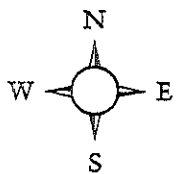
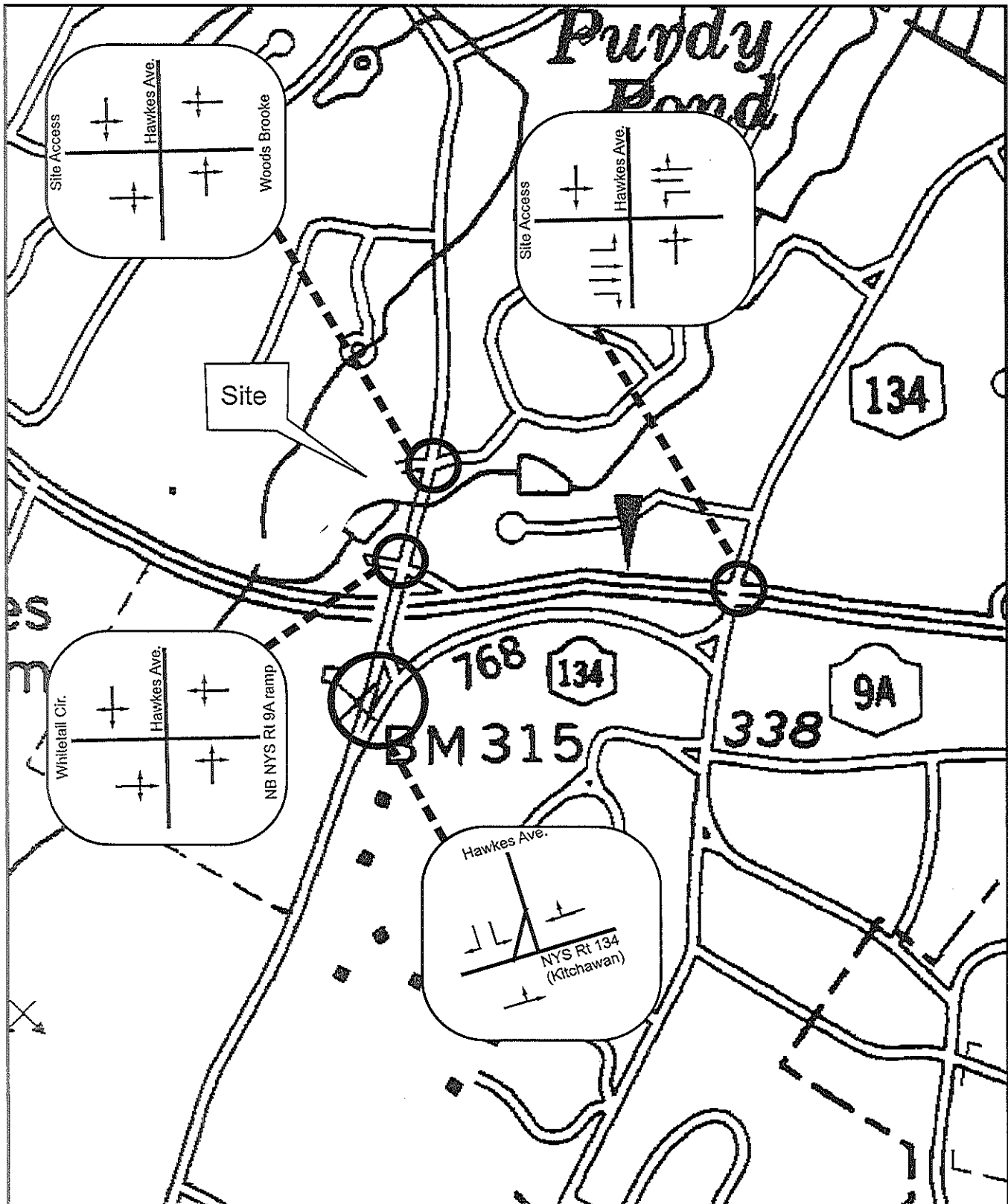


Figure 1: Site Location
 Parth Knolls LLC. 87 Hawk's Avenue
 Town of Ossining, Westchester County, New York
 Base Map: New York State Department of Transportation
 Ossining Quadangle
 Approx. Scale: 1 inch = 600 feet

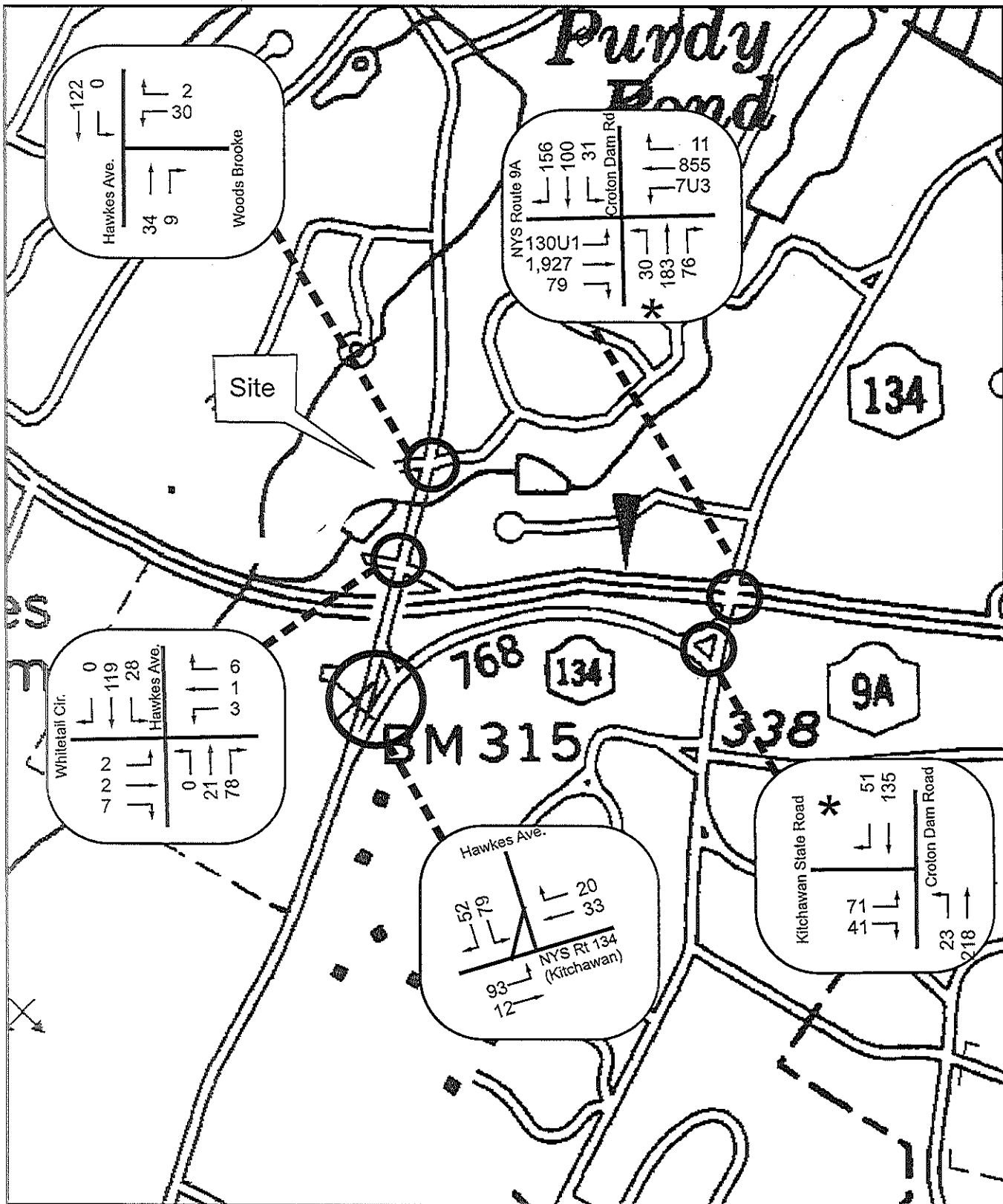
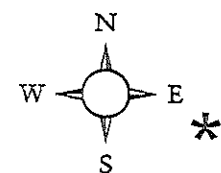
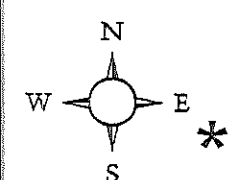


Figure 2: Existing AM Peak Hour Traffic
 Parth Knolls LLC, 87 Hawkes Avenue
 Town of Ossining, Westchester County, New York
 Base Map: New York State Department of Transportation
 Ossining Quadangle
 Approx. Scale: 1 inch = 600 feet



File 15015 07/21/16
 W:\Hawkes\Figure 2.cdr

source: JMC, River Knoll Traffic Study, Armonk, NY, Nov. 2015.
 U3 is u-turn volume of 3
 Tim Miller Associates, Inc., 10 North Street, Cold Spring, New York 10516 (845) 265-4400 Fax (845) 265-4418



source: JMC, River Knoll Traffic Study, Armonk, NY, Nov. 2015.
U2 is u-turn volume of 2

5. Ossining Quadangle
Approx. Scale: 1 inch = 600 feet

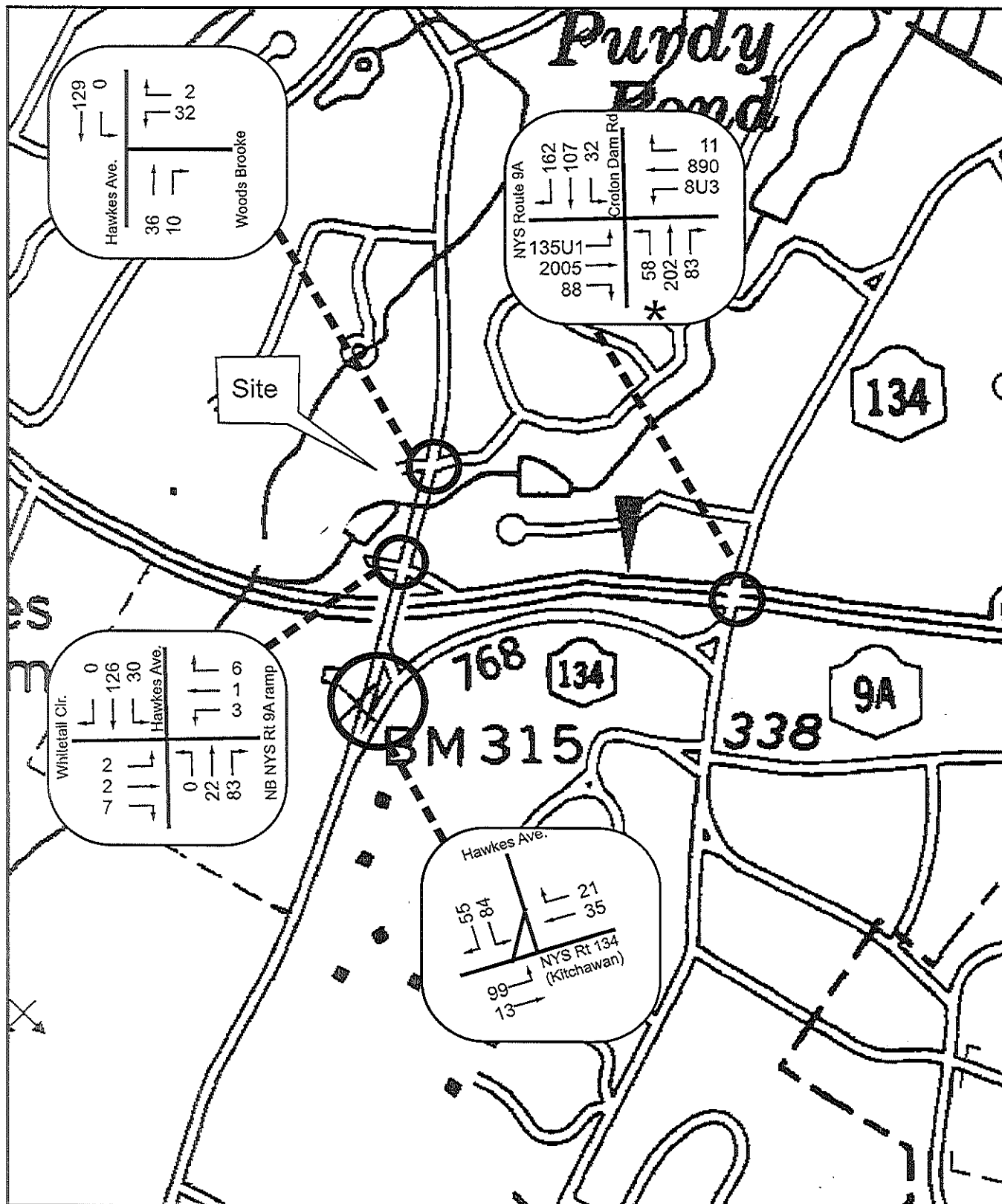


Figure 4: No Build AM Peak Hour Traffic

Parth Knolls LLC, 87 Hawk's Avenue

Town of Ossining, Westchester County, New York

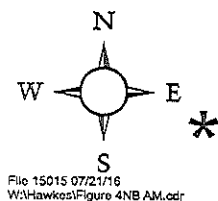
Base Map: New York State Department of Transportation

Ossining Quadangle

Approx. Scale: 1 inch = 600 feet

source: JMC, River Knoll Traffic Study, Armonk, NY, Nov. 2015.

+U is u-turn volume



File 15015 07/21/16
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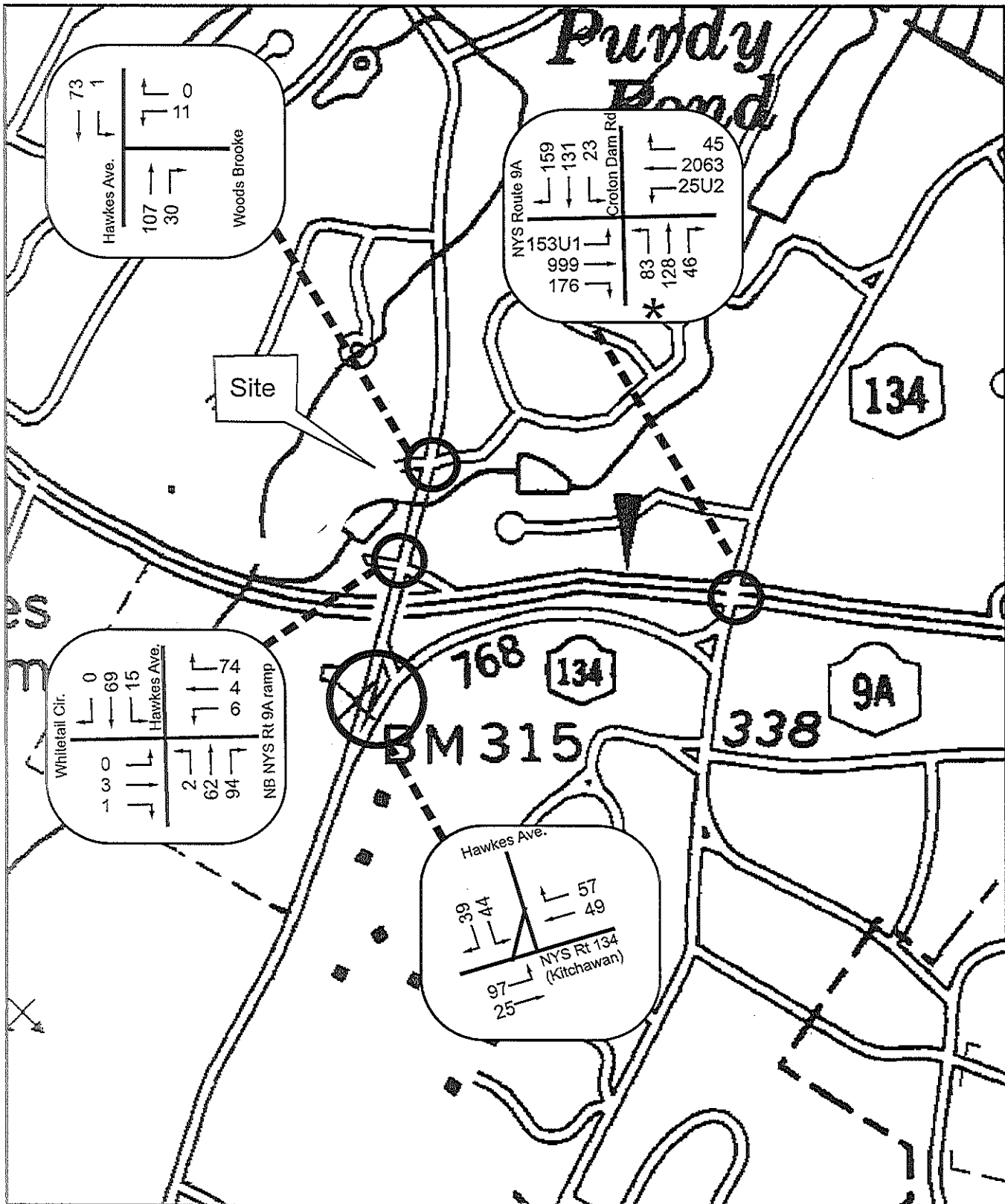
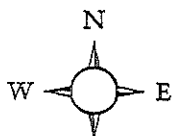


Figure 5: No Build PM Peak Hour Traffic
 Parth Knolls LLC, 87 Hawk's Avenue
 Town of Ossining, Westchester County, New York
 Base Map: New York State Department of Transportation
 Ossining Quadangle
 Approx. Scale: 1 inch = 600 feet



source: JMC, River Knoll Traffic Study, Armonk, NY, Nov. 2015.
 +U is u-turn volume

File 15015 07/26/16
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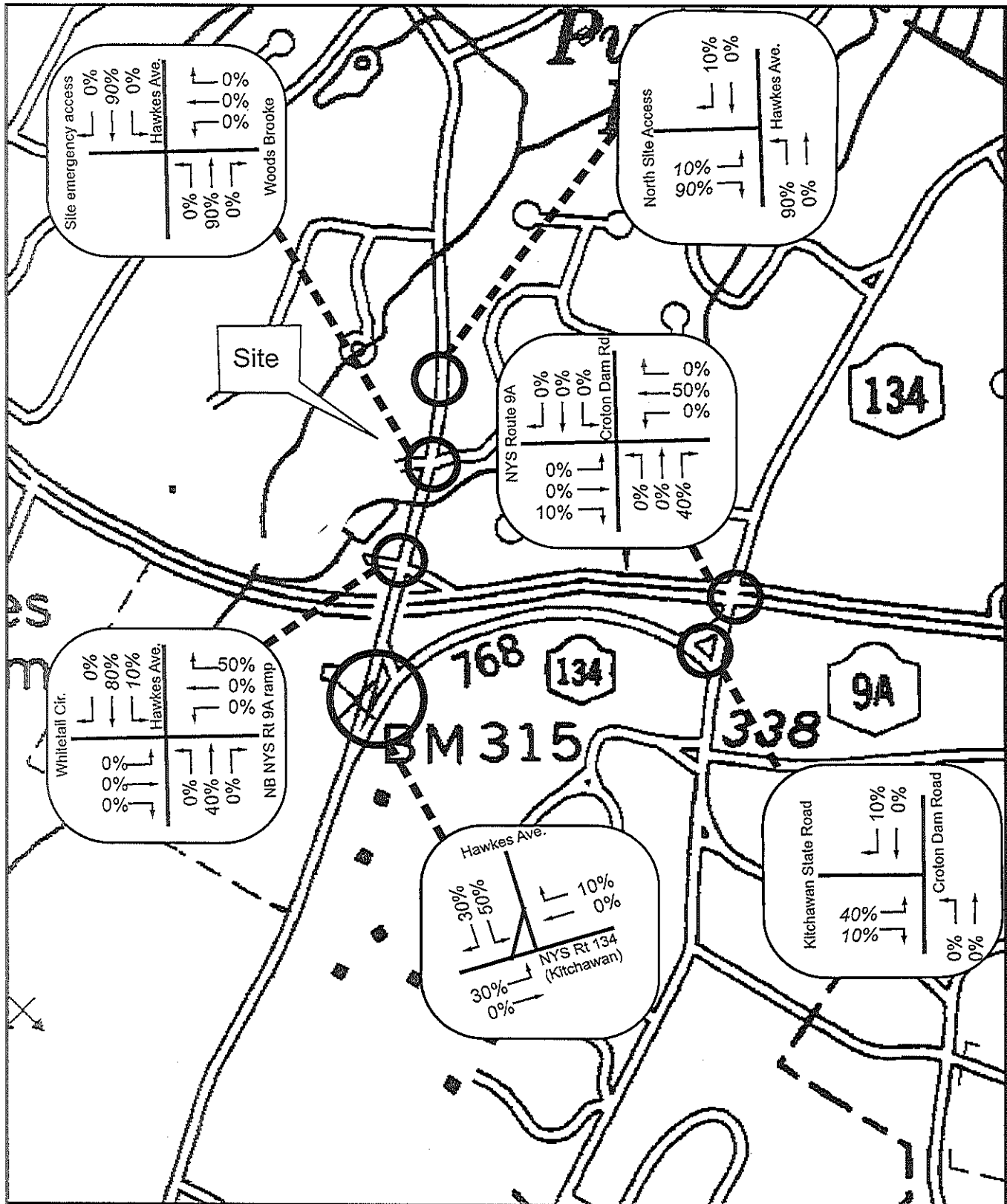


Figure 6: Site Distribution AM Peak Hour Traffic

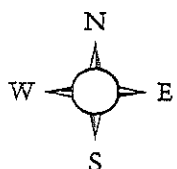
Parth Knolls LLC, 87 Hawkes Avenue

Town of Ossining, Westchester County, New York

Base Map: New York State Department of Transportation

Ossining Quadangle

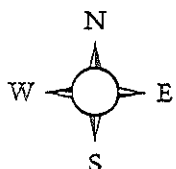
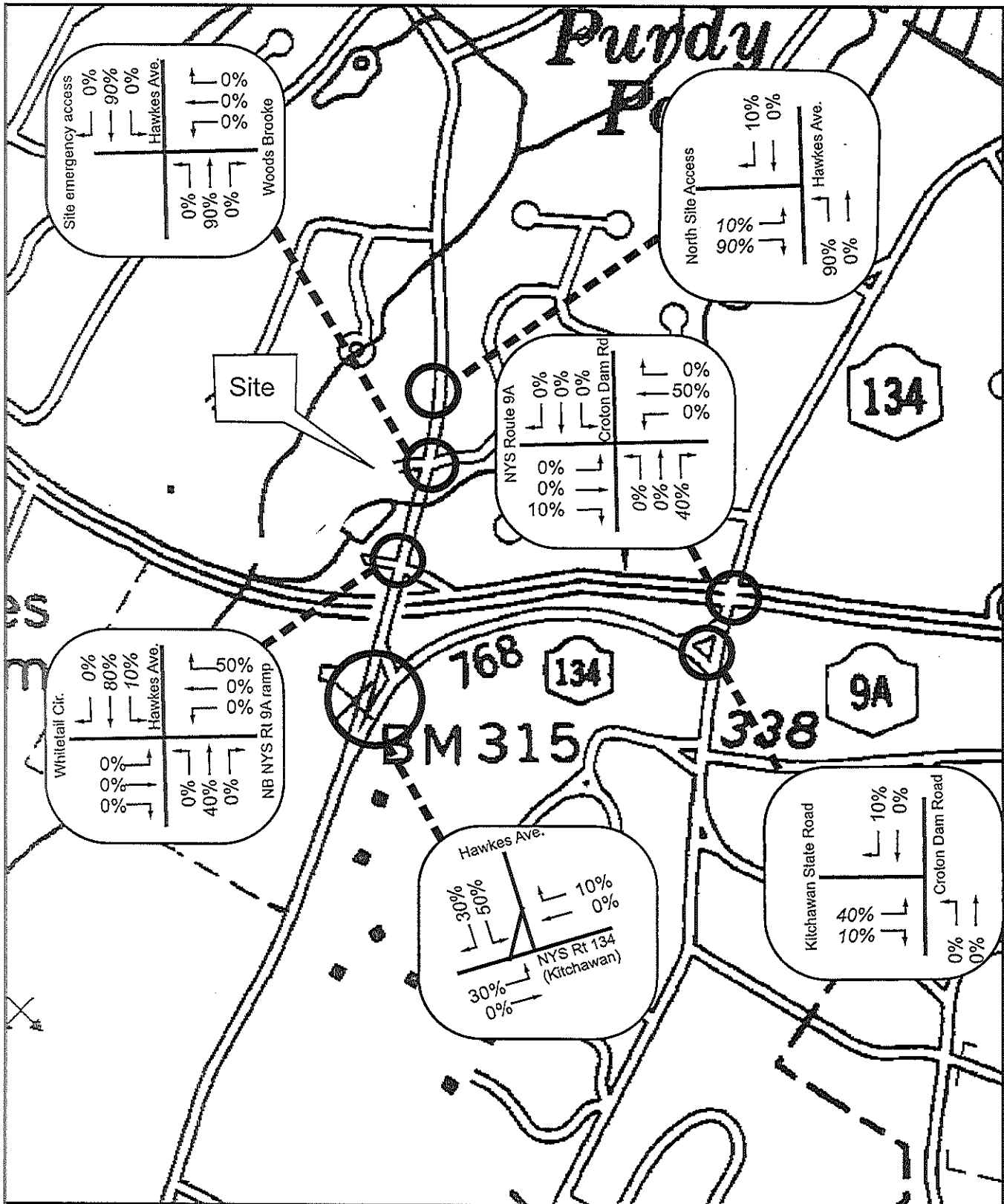
Approx. Scale: 1 inch = 600 feet



xx% outbound traffic
xx% inbound traffic

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xx% outbound traffic
xx% inbound traffic

Figure 7: Site Distribution PM Peak Hour Traffic

Parth Knolls LLC, 87 Hawkes Avenue

Town of Ossining, Westchester County, New York

Base Map: New York State Department of Transportation

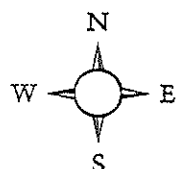
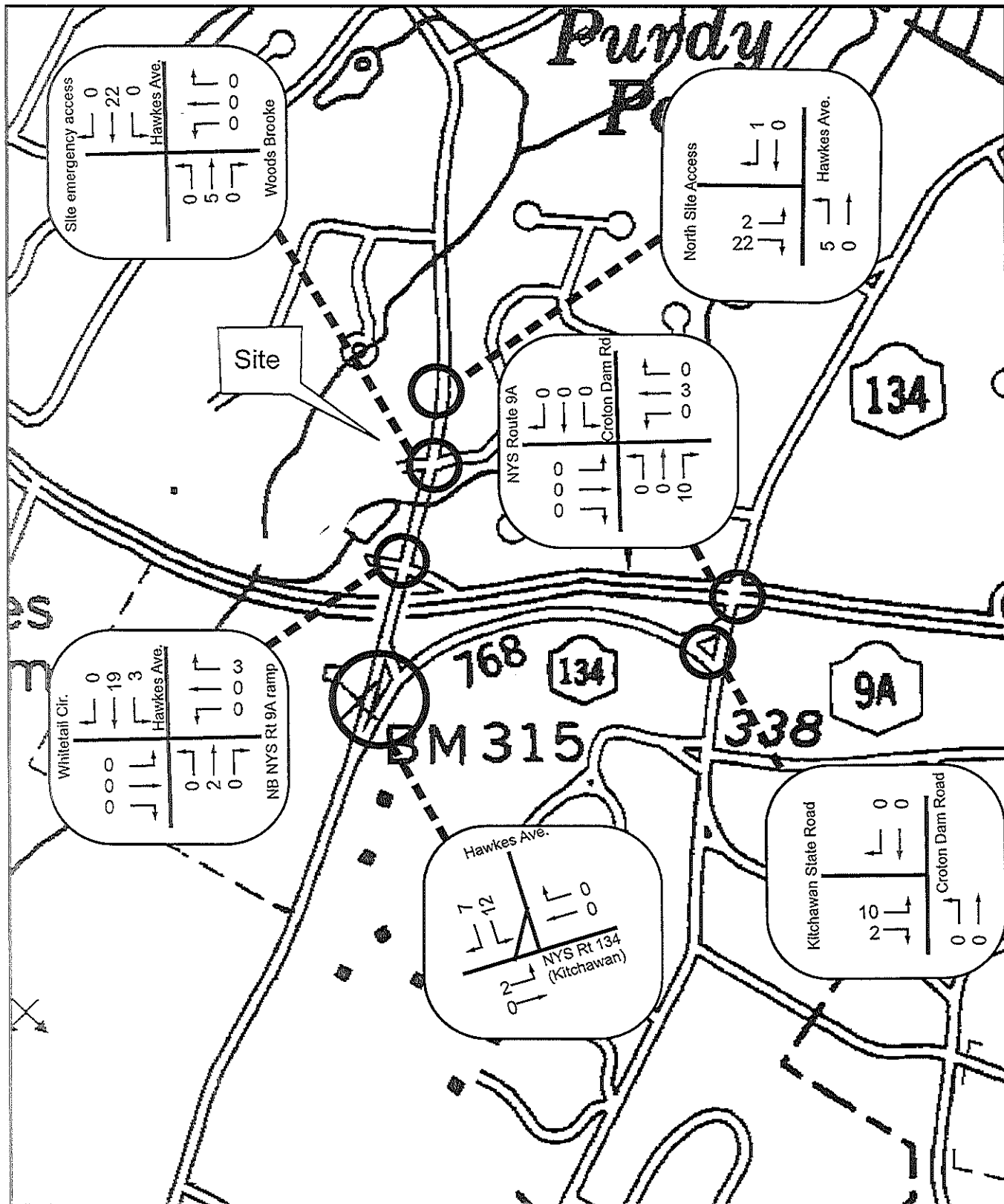
Ossining Quadangle

Approx. Scale: 1 inch = 600 feet

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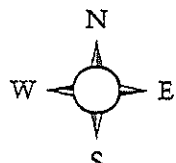
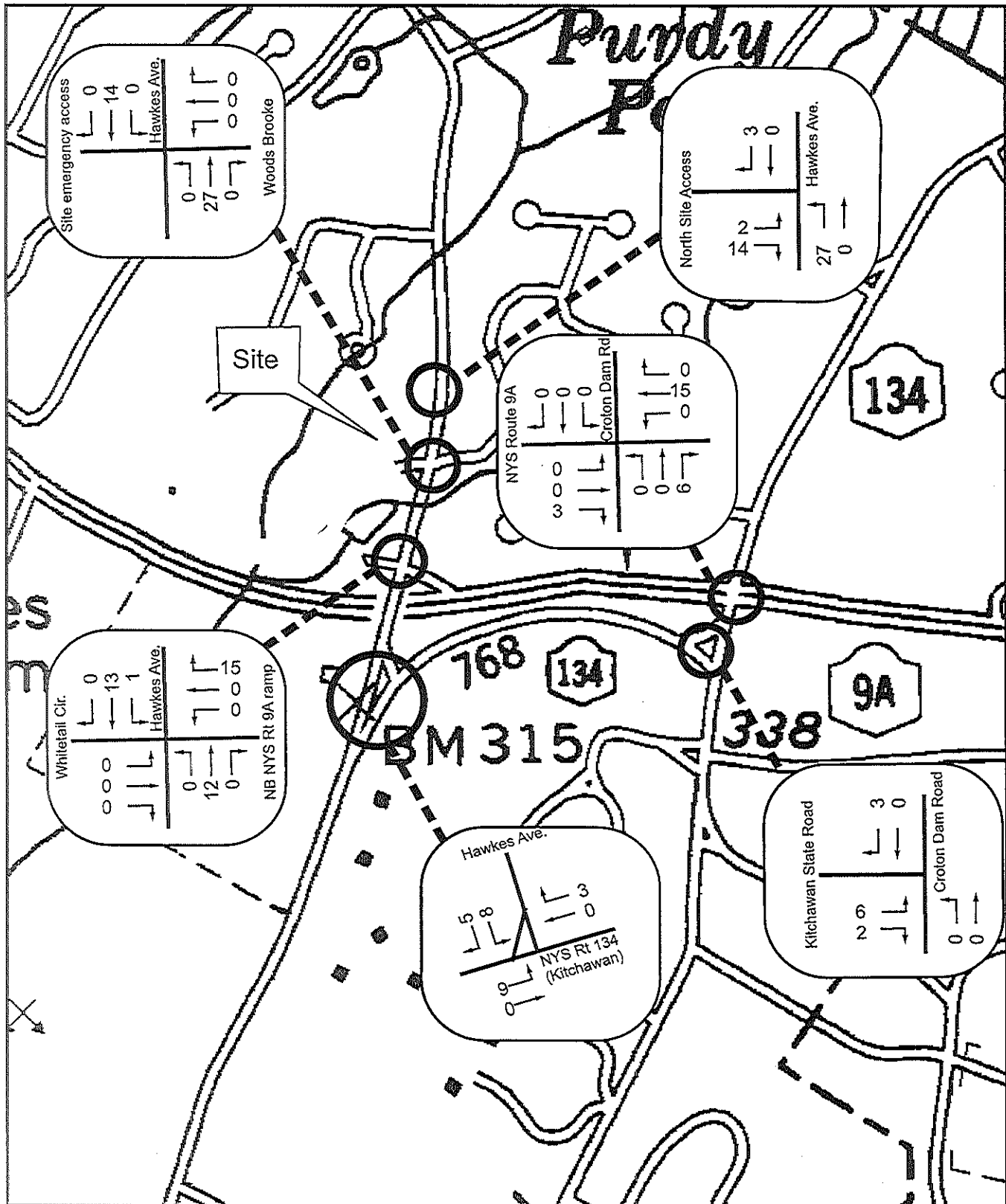
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Figure 8: Site Generated AM Peak Hour Traffic
 Parth Knolls LLC, 87 Hawkes Avenue
 Town of Ossining, Westchester County, New York
 Base Map: New York State Department of Transportation
 Ossining Quadangle
 Approx. Scale: 1 inch = 600 feet



File 15015 07/21/16
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Figure 9: Site Generated PM Peak Hour Traffic
Parth Knolls LLC, 87 Hawkes Avenue
Town of Ossining, Westchester County, New York
Base Map: New York State Department of Transportation
Ossining Quadangle
Approx. Scale: 1 inch = 600 feet

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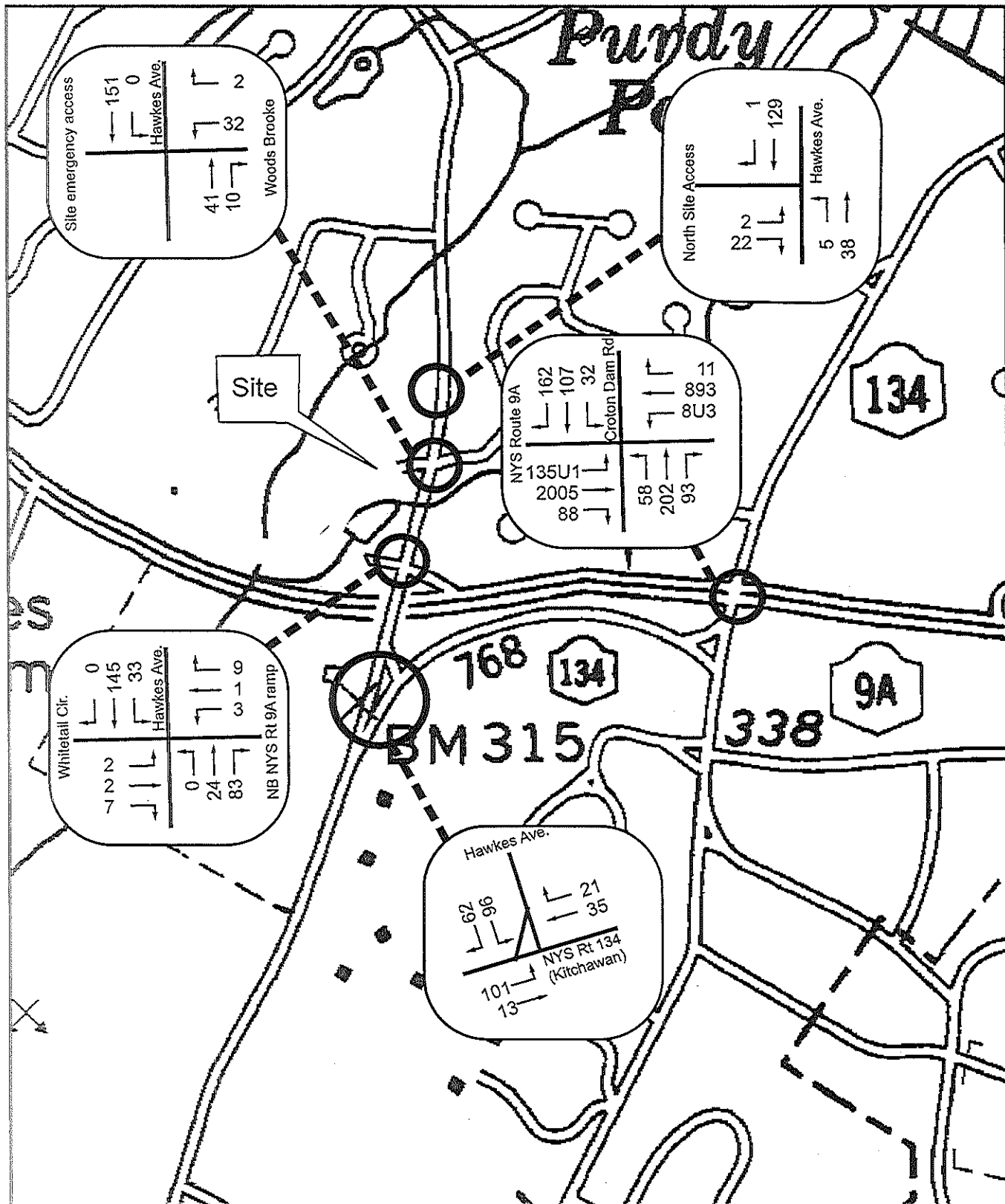
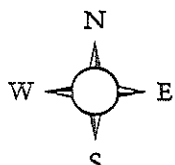


Figure 10: Build AM Peak Hour Traffic
 Parth Knolls LLC. 87 Hawkes Avenue
 Town of Ossining, Westchester County, New York
 Base Map: New York State Department of Transportation
 Ossining Quadangle
 Approx. Scale: 1 inch = 600 feet



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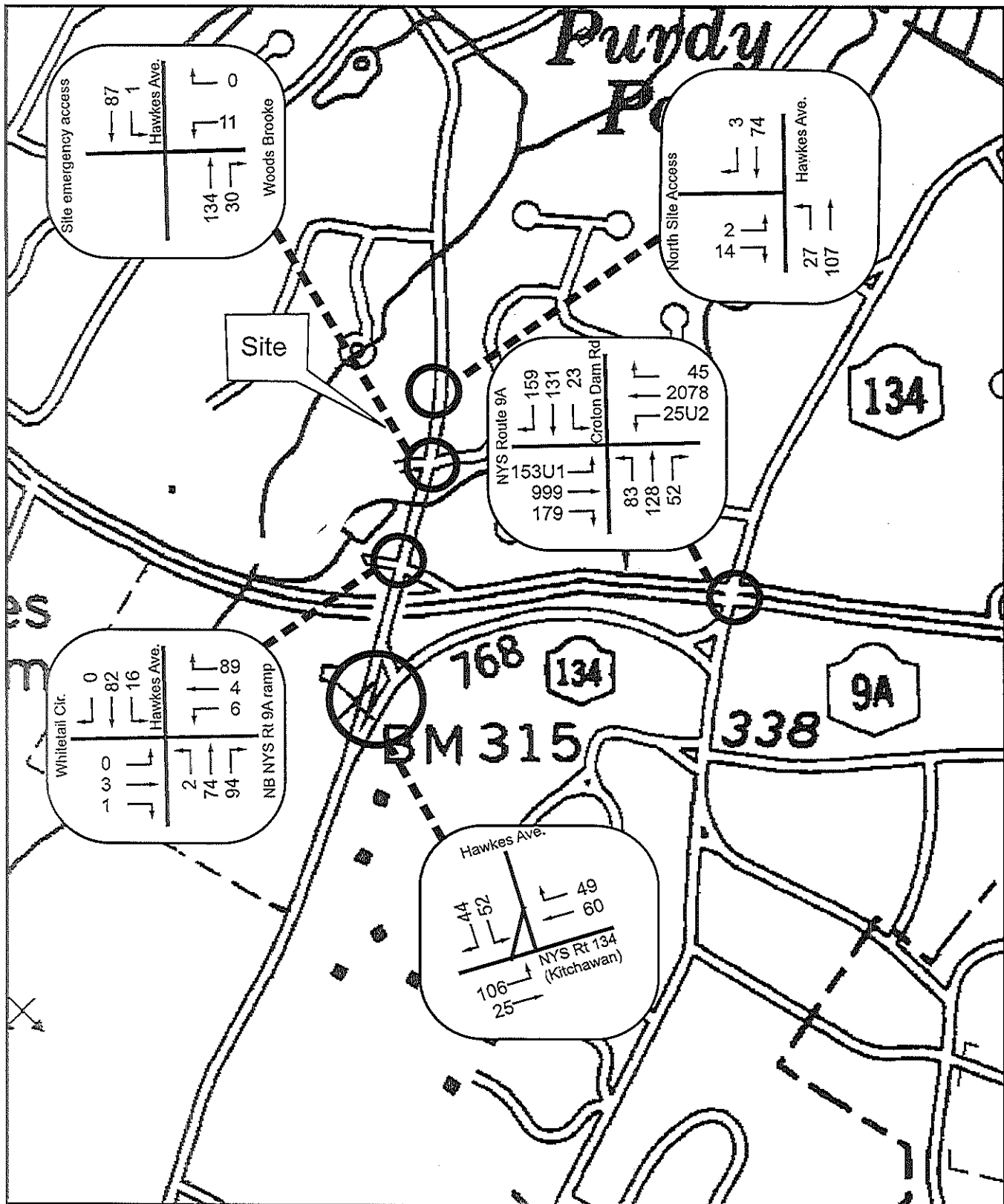
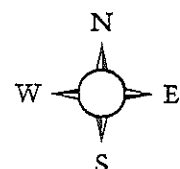


Figure 11: Build PM Peak Hour Traffic
 Parth Knolls LLC, 87 Hawkes Avenue
 Town of Ossining, Westchester County, New York
 Base Map: New York State Department of Transportation
 Ossining Quadangle
 Approx. Scale: 1 inch = 600 feet





















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ATTACHMENT B

Level of Service Analysis

Lanes, Volumes, Timings
1: Croton Dam Road & Route 9A

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
| Lane Configurations | |  |  |  | |  |  | | |  | | |
| Volume (vph) | 1 | 130 | 1927 | 79 | 3 | 7 | 855 | 11 | 30 | 183 | 76 | 31 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 13 | 13 | 13 | 11 |
| Grade (%) | | | -2% | | | | 1% | | | 0% | | |
| Storage Length (ft) | | 110 | | 190 | | 150 | | 0 | 0 | | 0 | 0 |
| Storage Lanes | | 1 | | 1 | | 1 | | 0 | 0 | | 0 | 0 |
| Taper Length (ft) | | 25 | | | | 25 | | | 25 | | | 25 |
| Lane Util. Factor | 0.95 | 1.00 | *1.00 | 1.00 | 0.95 | 1.00 | *1.00 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | | | 0.850 | | | 0.998 | | | 0.964 | | |
| Flt Protected | | 0.950 | | | | 0.950 | | | | 0.995 | | |
| Satd. Flow (prot) | 0 | 1538 | 3567 | 1460 | 0 | 1334 | 3408 | 0 | 0 | 1843 | 0 | 0 |
| Flt Permitted | | 0.950 | | | | 0.950 | | | | 0.791 | | |
| Satd. Flow (perm) | 0 | 1538 | 3567 | 1460 | 0 | 1334 | 3408 | 0 | 0 | 1465 | 0 | 0 |
| Right Turn on Red | | | | No | | | | Yes | | | No | |
| Satd. Flow (RTOR) | | | | | | | 1 | | | | | |
| Link Speed (mph) | | | 40 | | | | 40 | | | 30 | | |
| Link Distance (ft) | | | 1697 | | | | 1673 | | | 161 | | |
| Travel Time (s) | | | 28.9 | | | | 28.5 | | | 3.7 | | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 100% | 14% | 4% | 8% | 0% | 43% | 7% | 9% | 0% | 3% | 1% | 0% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | | 0% | | | | 0% | | | 0% | | |
| Adj. Flow (vph) | 1 | 138 | 2050 | 84 | 3 | 7 | 910 | 12 | 32 | 195 | 81 | 33 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 139 | 2050 | 84 | 0 | 10 | 922 | 0 | 0 | 308 | 0 | 0 |
| Turn Type | Prot | Prot | NA | Perm | Prot | Prot | NA | | Perm | NA | | Perm |
| Protected Phases | 5 | 5 | 2 | | 1 | 1 | 6 | | | 8 | | |
| Permitted Phases | | | | 2 | | | | | 8 | | | 4 |
| Detector Phase | 5 | 5 | 2 | 2 | 1 | 1 | 6 | | 8 | 8 | | 4 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 3.0 | 3.0 | 10.0 | 10.0 | 3.0 | 3.0 | 10.0 | | 5.0 | 5.0 | | 5.0 |
| Minimum Split (s) | 10.0 | 10.0 | 17.0 | 17.0 | 10.0 | 10.0 | 17.0 | | 11.0 | 11.0 | | 11.0 |
| Total Split (s) | 27.0 | 27.0 | 92.0 | 92.0 | 27.0 | 27.0 | 92.0 | | 31.0 | 31.0 | | 31.0 |
| Total Split (%) | 18.0% | 18.0% | 61.3% | 61.3% | 18.0% | 18.0% | 61.3% | | 20.7% | 20.7% | | 20.7% |
| Yellow Time (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 4.0 | 4.0 | | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 |
| Lost Time Adjust (s) | | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | | 0.0 | | |
| Total Lost Time (s) | | 7.0 | 7.0 | 7.0 | | 7.0 | 7.0 | | | 6.0 | | |
| Lead/Lag | Lead | Lead | Lag | Lag | Lead | Lead | Lag | | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | | | | | |
| Recall Mode | None | None | Min | Min | None | None | Min | | None | None | | None |
| Intersection Summary | | | | | | | | | | | | |

a.m. peak hour Existing Condition
TMA

Lanes, Volumes, Timings

1: Croton Dam Road & Route 9A



| Lane Group | SBT | SBR |
|-------------------------|-------|------|
| Lane Configurations | ↔ | |
| Volume (vph) | 100 | 156 |
| Ideal Flow (vphpl) | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 |
| Grade (%) | -4% | |
| Storage Length (ft) | | 0 |
| Storage Lanes | | 0 |
| Taper Length (ft) | | |
| Lane Util. Factor | 1.00 | 1.00 |
| Ped Bike Factor | 0.99 | |
| Frt | 0.927 | |
| Flt Protected | 0.995 | |
| Satd. Flow (prot) | 1700 | 0 |
| Flt Permitted | 0.776 | |
| Satd. Flow (perm) | 1326 | 0 |
| Right Turn on Red | | No |
| Satd. Flow (RTOR) | | |
| Link Speed (mph) | 30 | |
| Link Distance (ft) | 419 | |
| Travel Time (s) | 9.5 | |
| Confl. Peds. (#/hr) | | 1 |
| Confl. Bikes (#/hr) | | |
| Peak Hour Factor | 0.94 | 0.94 |
| Growth Factor | 100% | 100% |
| Heavy Vehicles (%) | 1% | 1% |
| Bus Blockages (#/hr) | 0 | 0 |
| Parking (#/hr) | | |
| Mid-Block Traffic (%) | 0% | |
| Adj. Flow (vph) | 106 | 166 |
| Shared Lane Traffic (%) | | |
| Lane Group Flow (vph) | 305 | 0 |
| Turn Type | NA | |
| Protected Phases | 4 | |
| Permitted Phases | | |
| Detector Phase | 4 | |
| Switch Phase | | |
| Minimum Initial (s) | 5.0 | |
| Minimum Split (s) | 11.0 | |
| Total Split (s) | 31.0 | |
| Total Split (%) | 20.7% | |
| Yellow Time (s) | 4.0 | |
| All-Red Time (s) | 2.0 | |
| Lost Time Adjust (s) | 0.0 | |
| Total Lost Time (s) | 6.0 | |
| Lead/Lag | | |
| Lead-Lag Optimize? | | |
| Recall Mode | None | |
| Intersection Summary | | |

a.m. peak hour Existing Condition
TMA

Lanes, Volumes, Timings 1: Croton Dam Road & Route 9A

Area Type: Other

Cycle Length: 150







Actuated Cycle Length: 126.1

Natural Cycle: 100

Control Type: Semi Act-Uncoord



















* User Entered Value

Splits and Phases: 1: Croton Dam Road & Route 9A

| | | |
|--|--|--|
|  p1 |  p2 |  p4 |
| 27 s | 92 s | 31 s |
|  p5 |  p6 |  p8 |
| 27 s | 92 s | 31 s |

HCM 2010 Signalized Intersection Summary

1: Croton Dam Road & Route 9A

| |  |  |  |  |  |  |  |  |  |  |  |  |
|--|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
| Lane Configurations | |  |  |  | |  |  | | |  | | |
| Volume (veh/h) | 1 | 130 | 1927 | 79 | 3 | 7 | 855 | 11 | 30 | 183 | 76 | 31 |
| Number | | 5 | 2 | 12 | | 1 | 6 | 16 | 3 | 8 | 18 | 7 |
| Initial Q (Qb), veh | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | | 1.00 | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | | 1674 | 1845 | 1777 | | 1453 | 1766 | 1890 | 1976 | 1934 | 1976 | 1938 |
| Adj Flow Rate, veh/h | | 138 | 2050 | 84 | | 7 | 910 | 12 | 32 | 195 | 81 | 33 |
| Adj No. of Lanes | | 1 | 2 | 1 | | 1 | 2 | 0 | 0 | 1 | 0 | 0 |
| Peak Hour Factor | | 0.94 | 0.94 | 0.94 | | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | | 14 | 4 | 8 | | 43 | 7 | 7 | 3 | 3 | 3 | 1 |
| Cap, veh/h | | 162 | 2370 | 970 | | 7 | 1899 | 25 | 52 | 211 | 83 | 53 |
| Arrive On Green | | 0.10 | 0.64 | 0.64 | | 0.01 | 0.55 | 0.55 | 0.20 | 0.20 | 0.20 | 0.20 |
| Sat Flow, veh/h | | 1595 | 3690 | 1510 | | 1384 | 3479 | 46 | 106 | 1075 | 421 | 111 |
| Grp Volume(v), veh/h | | 138 | 2050 | 84 | | 7 | 462 | 460 | 308 | 0 | 0 | 305 |
| Grp Sat Flow(s), veh/h/ln | | 1595 | 1845 | 1510 | | 1384 | 1766 | 1758 | 1602 | 0 | 0 | 1560 |
| Q Serve(g_s), s | | 10.9 | 57.1 | 2.7 | | 0.6 | 20.5 | 20.5 | 0.0 | 0.0 | 0.0 | 0.6 |
| Cycle Q Clear(g_c), s | | 10.9 | 57.1 | 2.7 | | 0.6 | 20.5 | 20.5 | 24.4 | 0.0 | 0.0 | 24.9 |
| Prop In Lane | | 1.00 | | 1.00 | | 1.00 | | 0.03 | 0.10 | | 0.26 | 0.11 |
| Lane Grp Cap(c), veh/h | | 162 | 2370 | 970 | | 7 | 964 | 960 | 345 | 0 | 0 | 337 |
| V/C Ratio(X) | | 0.85 | 0.86 | 0.09 | | 0.98 | 0.48 | 0.48 | 0.89 | 0.00 | 0.00 | 0.91 |
| Avail Cap(c_a), veh/h | | 250 | 2458 | 1006 | | 217 | 1176 | 1171 | 345 | 0 | 0 | 337 |
| HCM Platoon Ratio | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | | 56.4 | 18.4 | 8.6 | | 63.5 | 17.8 | 17.8 | 50.5 | 0.0 | 0.0 | 50.9 |
| Incr Delay (d2), s/veh | | 15.6 | 3.4 | 0.0 | | 150.2 | 0.4 | 0.4 | 24.1 | 0.0 | 0.0 | 26.8 |
| Initial Q Delay(d3),s/veh | | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(-26165%), veh/ln | | 5.5 | 29.9 | 1.1 | | 0.5 | 10.1 | 10.1 | 13.1 | 0.0 | 0.0 | 13.2 |
| LnGrp Delay(d),s/veh | | 72.0 | 21.8 | 8.7 | | 213.7 | 18.2 | 18.2 | 74.6 | 0.0 | 0.0 | 77.6 |
| LnGrp LOS | | E | C | A | | F | B | B | E | | | E |
| Approach Vol, veh/h | 2272 | | | | 929 | | | | 308 | | | |
| Approach Delay, s/veh | 24.3 | | | | 19.7 | | | | 74.6 | | | |
| Approach LOS | C | | | | B | | | | E | | | |
| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 7.7 | 89.0 | | 31.0 | 19.9 | 76.7 | | 31.0 | | | | |
| Change Period (Y+Rc), s | 7.0 | 7.0 | | 6.0 | 7.0 | 7.0 | | 6.0 | | | | |
| Max Green Setting (Gmax), s | 20.0 | 85.0 | | 25.0 | 20.0 | 85.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 2.6 | 59.1 | | 26.9 | 12.9 | 22.5 | | 26.4 | | | | |
| Green Ext Time (p_c), s | 0.0 | 22.8 | | 0.0 | 0.2 | 47.2 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | 31.5 | | | | | | | | | | | |
| HCM 2010 LOS | C | | | | | | | | | | | |
| Notes | | | | | | | | | | | | |
| User approved ignoring U-Turning movement. | | | | | | | | | | | | |

a.m. peak hour Existing Condition
TMA

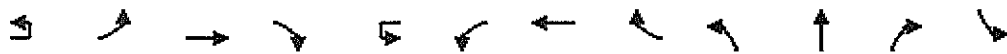
HCM 2010 Signalized Intersection Summary 1: Croton Dam Road & Route 9A



| Movement | SBT | SBR |
|-------------------------------|------|------|
| Lane Configurations | ↔ | |
| Volume (veh/h) | 100 | 156 |
| Number | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1921 | 1938 |
| Adj Flow Rate, veh/h | 106 | 166 |
| Adj No. of Lanes | 1 | 0 |
| Peak Hour Factor | 0.94 | 0.94 |
| Percent Heavy Veh, % | 1 | 1 |
| Cap, veh/h | 118 | 166 |
| Arrive On Green | 0.20 | 0.20 |
| Sat Flow, veh/h | 600 | 849 |
| Grp Volume(v), veh/h | 0 | 0 |
| Grp Sat Flow(s), veh/h/ln | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 |
| Prop In Lane | | 0.54 |
| Lane Grp Cap(c), veh/h | 0 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 |
| Upstream Filter(l) | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 |
| incr Delay (d2), s/veh | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 |
| %ile BackOfQ(-26.165%),veh/ln | 0.0 | 0.0 |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 |
| LnGrp LOS | | |
| Approach Vol, veh/h | 305 | |
| Approach Delay, s/veh | 77.6 | |
| Approach LOS | E | |
| Timer | | |

Lanes, Volumes, Timings

1: Croton Dam Road & Route 9A



| Lane Group | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|------|-------|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 1 | 147 | 960 | 143 | 2 | 20 | 1983 | 43 | 65 | 117 | 42 | 22 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 13 | 13 | 13 | 11 |
| Grade (%) | | | -2% | | | | 1% | | | 0% | | |
| Storage Length (ft) | | 110 | | 190 | | 150 | | 0 | 0 | | 0 | 0 |
| Storage Lanes | | 1 | | 1 | | 1 | | 0 | 0 | | 0 | 0 |
| Taper Length (ft) | | 25 | | | | 25 | | | 25 | | | 25 |
| Lane Util. Factor | 0.95 | 1.00 | *1.00 | 1.00 | 0.95 | 1.00 | *1.00 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | | | 0.850 | | | 0.997 | | | 0.975 | | |
| Flt Protected | | 0.950 | | | | 0.950 | | | | 0.986 | | |
| Satd. Flow (prot) | 0 | 1762 | 3602 | 1546 | 0 | 1660 | 3570 | 0 | 0 | 1838 | 0 | 0 |
| Flt Permitted | | 0.950 | | | | 0.950 | | | | 0.377 | | |
| Satd. Flow (perm) | 0 | 1762 | 3602 | 1546 | 0 | 1660 | 3570 | 0 | 0 | 703 | 0 | 0 |
| Right Turn on Red | | | | No | | | | Yes | | | No | |
| Satd. Flow (RTOR) | | | | | | | 2 | | | | | |
| Link Speed (mph) | | | 40 | | | | 40 | | | 30 | | |
| Link Distance (ft) | | | 1697 | | | | 1673 | | | 161 | | |
| Travel Time (s) | | | 28.9 | | | | 28.5 | | | 3.7 | | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 0% | 0% | 3% | 2% | 0% | 5% | 2% | 5% | 6% | 0% | 5% | 9% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | | 0% | | | | 0% | | | 0% | | |
| Adj. Flow (vph) | 1 | 158 | 1032 | 154 | 2 | 22 | 2132 | 46 | 70 | 126 | 45 | 24 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 159 | 1032 | 154 | 0 | 24 | 2178 | 0 | 0 | 241 | 0 | 0 |
| Turn Type | Prot | Prot | NA | Perm | Prot | Prot | NA | | Perm | NA | | Perm |
| Protected Phases | 5 | 5 | 2 | | 1 | 1 | 6 | | | 8 | | |
| Permitted Phases | | | | 2 | | | | | 8 | | | 4 |
| Detector Phase | 5 | 5 | 2 | 2 | 1 | 1 | 6 | | 8 | 8 | | 4 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 3.0 | 3.0 | 10.0 | 10.0 | 3.0 | 3.0 | 10.0 | | 5.0 | 5.0 | | 5.0 |
| Minimum Split (s) | 10.0 | 10.0 | 17.0 | 17.0 | 10.0 | 10.0 | 17.0 | | 11.0 | 11.0 | | 11.0 |
| Total Split (s) | 27.0 | 27.0 | 92.0 | 92.0 | 27.0 | 27.0 | 92.0 | | 31.0 | 31.0 | | 31.0 |
| Total Split (%) | 18.0% | 18.0% | 61.3% | 61.3% | 18.0% | 18.0% | 61.3% | | 20.7% | 20.7% | | 20.7% |
| Yellow Time (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 4.0 | 4.0 | | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 |
| Lost Time Adjust (s) | | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | | 0.0 | | |
| Total Lost Time (s) | | 7.0 | 7.0 | 7.0 | | 7.0 | 7.0 | | | 6.0 | | |
| Lead/Lag | Lead | Lead | Lag | Lag | Lead | Lead | Lag | | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | | | | | |
| Recall Mode | None | None | Min | Min | None | None | Min | | None | None | | None |
| Intersection Summary | | | | | | | | | | | | |

p.m. peak hour Existing Condition
TMA

Lanes, Volumes, Timings
1: Croton Dam Road & Route 9A



| Lane Group | SBT | SBR |
|-------------------------|-------|------|
| Lane Configurations | ↕ | |
| Volume (vph) | 114 | 153 |
| Ideal Flow (vphpl) | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 |
| Grade (%) | -4% | |
| Storage Length (ft) | | 0 |
| Storage Lanes | | 0 |
| Taper Length (ft) | | |
| Lane Util. Factor | 1.00 | 1.00 |
| Ped Bike Factor | 0.99 | |
| Frt | 0.929 | |
| Flt Protected | 0.996 | |
| Satd. Flow (prot) | 1676 | 0 |
| Flt Permitted | 0.912 | |
| Satd. Flow (perm) | 1535 | 0 |
| Right Turn on Red | | No |
| Satd. Flow (RTOR) | | |
| Link Speed (mph) | 30 | |
| Link Distance (ft) | 419 | |
| Travel Time (s) | 9.5 | |
| Confl. Peds. (#/hr) | | 1 |
| Confl. Bikes (#/hr) | | |
| Peak Hour Factor | 0.93 | 0.93 |
| Growth Factor | 100% | 100% |
| Heavy Vehicles (%) | 1% | 3% |
| Bus Blockages (#/hr) | 0 | 0 |
| Parking (#/hr) | | |
| Mid-Block Traffic (%) | 0% | |
| Adj. Flow (vph) | 123 | 165 |
| Shared Lane Traffic (%) | | |
| Lane Group Flow (vph) | 312 | 0 |
| Turn Type | NA | |
| Protected Phases | 4 | |
| Permitted Phases | | |
| Detector Phase | 4 | |
| Switch Phase | | |
| Minimum Initial (s) | 5.0 | |
| Minimum Split (s) | 11.0 | |
| Total Split (s) | 31.0 | |
| Total Split (%) | 20.7% | |
| Yellow Time (s) | 4.0 | |
| All-Red Time (s) | 2.0 | |
| Lost Time Adjust (s) | 0.0 | |
| Total Lost Time (s) | 6.0 | |
| Lead/Lag | | |
| Lead-Lag Optimize? | | |
| Recall Mode | None | |
| Intersection Summary | | |

p.m. peak hour Existing Condition
TMA

Lanes, Volumes, Timings 1: Croton Dam Road & Route 9A

Area Type: Other

Cycle Length: 150







Actuated Cycle Length: 147.3

Natural Cycle: 150

Control Type: Semi Act-Uncoord



















* User Entered Value

Splits and Phases: 1: Croton Dam Road & Route 9A

| | | |
|--|--|--|
|  p1 |  p2 |  p4 |
| 27 s | 92 s | 31 s |
|  p5 |  p6 |  p8 |
| 27 s | 92 s | 31 s |

HCM 2010 Signalized Intersection Summary

1: Croton Dam Road & Route 9A

| |  |  |  |  |  |  |  |  |  |  |  |  |
|--|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
| Lane Configurations | |  |  |  | |  |  | | |  | | |
| Volume (veh/h) | 1 | 147 | 960 | 143 | 2 | 20 | 1983 | 43 | 65 | 117 | 42 | 22 |
| Number | | 5 | 2 | 12 | | 1 | 6 | 16 | 3 | 8 | 18 | 7 |
| Initial Q (Qb), veh | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | | 1.00 | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus Adj | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | | 1919 | 1863 | 1881 | | 1808 | 1852 | 1890 | 1976 | 1924 | 1976 | 1938 |
| Adj Flow Rate, veh/h | | 158 | 1032 | 154 | | 22 | 2132 | 46 | 70 | 126 | 45 | 24 |
| Adj No. of Lanes | | 1 | 2 | 1 | | 1 | 2 | 0 | 0 | 1 | 0 | 0 |
| Peak Hour Factor | | 0.93 | 0.93 | 0.93 | | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | | 0 | 3 | 2 | | 5 | 2 | 2 | 0 | 0 | 0 | 1 |
| Cap, veh/h | | 183 | 2507 | 1076 | | 27 | 2126 | 46 | 72 | 100 | 32 | 41 |
| Arrive On Green | | 0.10 | 0.67 | 0.67 | | 0.02 | 0.59 | 0.59 | 0.17 | 0.17 | 0.17 | 0.17 |
| Sat Flow, veh/h | | 1828 | 3726 | 1599 | | 1722 | 3613 | 78 | 227 | 580 | 185 | 83 |
| Grp Volume(v), veh/h | | 158 | 1032 | 154 | | 22 | 1089 | 1089 | 241 | 0 | 0 | 312 |
| Grp Sat Flow(s),veh/h/ln | | 1828 | 1863 | 1599 | | 1722 | 1852 | 1839 | 993 | 0 | 0 | 1688 |
| Q Serve(g_s), s | | 12.3 | 18.1 | 5.0 | | 1.8 | 84.8 | 85.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | | 12.3 | 18.1 | 5.0 | | 1.8 | 84.8 | 85.0 | 25.0 | 0.0 | 0.0 | 25.0 |
| Prop In Lane | | 1.00 | | 1.00 | | 1.00 | | 0.04 | 0.29 | | 0.19 | 0.08 |
| Lane Grp Cap(c), veh/h | | 183 | 2507 | 1076 | | 27 | 1090 | 1082 | 204 | 0 | 0 | 319 |
| V/C Ratio(X) | | 0.86 | 0.41 | 0.14 | | 0.82 | 1.00 | 1.01 | 1.18 | 0.00 | 0.00 | 0.98 |
| Avail Cap(c_a), veh/h | | 253 | 2507 | 1076 | | 238 | 1090 | 1082 | 204 | 0 | 0 | 319 |
| HCM Platoon Ratio | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | | 64.0 | 10.7 | 8.6 | | 70.9 | 29.7 | 29.7 | 60.7 | 0.0 | 0.0 | 60.4 |
| Incr Delay (d2), s/veh | | 19.5 | 0.1 | 0.1 | | 42.2 | 27.0 | 29.0 | 120.5 | 0.0 | 0.0 | 44.3 |
| Initial Q Delay(d3),s/veh | | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(-26165%),veh/ln | | 7.2 | 9.4 | 2.2 | | 1.2 | 51.1 | 51.7 | 14.9 | 0.0 | 0.0 | 16.3 |
| LnGrp Delay(d),s/veh | | 83.5 | 10.8 | 8.6 | | 113.1 | 56.7 | 58.7 | 181.1 | 0.0 | 0.0 | 104.7 |
| LnGrp LOS | | F | B | A | | F | E | F | F | F | F | F |
| Approach Vol, veh/h | | 1344 | | | | 2200 | | | | 241 | | |
| Approach Delay, s/veh | | 19.1 | | | | 58.3 | | | | 181.1 | | |
| Approach LOS | | B | | | | E | | | | F | | |
| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 9.3 | 104.2 | | 31.0 | 21.5 | 92.0 | | 31.0 | | | | |
| Change Period (Y+Rc), s | 7.0 | 7.0 | | 6.0 | 7.0 | 7.0 | | 6.0 | | | | |
| Max Green Setting (Gmax), s | 20.0 | 85.0 | | 25.0 | 20.0 | 85.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+1), s | 3.8 | 20.1 | | 27.0 | 14.3 | 87.0 | | 27.0 | | | | |
| Green Ext Time (p_c), s | 0.0 | 54.0 | | 0.0 | 0.2 | 0.0 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | 56.2 | | | | | | | | | | | |
| HCM 2010 LOS | E | | | | | | | | | | | |
| Notes | | | | | | | | | | | | |
| User approved ignoring U-Turning movement. | | | | | | | | | | | | |

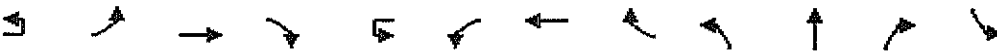
p.m. peak hour Existing Condition
TMA

HCM 2010 Signalized Intersection Summary 1: Croton Dam Road & Route 9A



| Movement | SBT | SBR |
|------------------------------|-------|------|
| Lane Configurations | ↕ | |
| Volume (veh/h) | 114 | 153 |
| Number | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1888 | 1938 |
| Adj Flow Rate, veh/h | 123 | 165 |
| Adj No. of Lanes | 1 | 0 |
| Peak Hour Factor | 0.93 | 0.93 |
| Percent Heavy Veh, % | 1 | 1 |
| Cap, veh/h | 123 | 155 |
| Arrive On Green | 0.17 | 0.17 |
| Sat Flow, veh/h | 712 | 893 |
| Grp Volume(v), veh/h | 0 | 0 |
| Grp Sat Flow(s), veh/h/ln | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 |
| Prop In Lane | | 0.53 |
| Lane Grp Cap(c), veh/h | 0 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 |
| %ile BackOfQ(-26165%),veh/ln | 0.0 | 0.0 |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 |
| LnGrp LOS | | |
| Approach Vol, veh/h | 312 | |
| Approach Delay, s/veh | 104.7 | |
| Approach LOS | F | |
| Timer | | |

Lanes, Volumes, Timings
1: Croton Dam Road & Route 9A

| |  | | | | | | | | | | | |
|-------------------------|--|-------|-------|-------|------|-------|-------|------|-------|-------|------|-------|
| Lane Group | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 1 | 135 | 2005 | 88 | 3 | 8 | 890 | 11 | 58 | 202 | 83 | 32 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 13 | 13 | 13 | 11 |
| Grade (%) | | | -2% | | | | 1% | | | 0% | | |
| Storage Length (ft) | | 110 | | 190 | | 150 | | 0 | 0 | | 0 | 0 |
| Storage Lanes | | 1 | | 1 | | 1 | | 0 | 0 | | 0 | 0 |
| Taper Length (ft) | | 25 | | | | 25 | | | 25 | | | 25 |
| Lane Util. Factor | 0.95 | 1.00 | *1.00 | 1.00 | 0.95 | 1.00 | *1.00 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | | | 0.850 | | | 0.998 | | | 0.967 | | |
| Flt Protected | | 0.950 | | | | 0.950 | | | | 0.992 | | |
| Satd. Flow (prot) | 0 | 1538 | 3567 | 1460 | 0 | 1313 | 3408 | 0 | 0 | 1846 | 0 | 0 |
| Flt Permitted | | 0.950 | | | | 0.950 | | | | 0.688 | | |
| Satd. Flow (perm) | 0 | 1538 | 3567 | 1460 | 0 | 1313 | 3408 | 0 | 0 | 1280 | 0 | 0 |
| Right Turn on Red | | | | No | | | | Yes | | | No | |
| Satd. Flow (RTOR) | | | | | | | 1 | | | | | |
| Link Speed (mph) | | | 40 | | | | 40 | | | 30 | | |
| Link Distance (ft) | | | 1697 | | | | 1673 | | | 161 | | |
| Travel Time (s) | | | 28.9 | | | | 28.5 | | | 3.7 | | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 100% | 14% | 4% | 8% | 0% | 43% | 7% | 9% | 0% | 3% | 1% | 0% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | | 0% | | | | 0% | | | 0% | | |
| Adj. Flow (vph) | 1 | 144 | 2133 | 94 | 3 | 9 | 947 | 12 | 62 | 215 | 88 | 34 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 145 | 2133 | 94 | 0 | 12 | 959 | 0 | 0 | 365 | 0 | 0 |
| Turn Type | Prot | Prot | NA | Perm | Prot | Prot | NA | | Perm | NA | | Perm |
| Protected Phases | 5 | 5 | 2 | | 1 | 1 | 6 | | | 8 | | |
| Permitted Phases | | | | 2 | | | | | 8 | | | 4 |
| Detector Phase | 5 | 5 | 2 | 2 | 1 | 1 | 6 | | 8 | 8 | | 4 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 3.0 | 3.0 | 10.0 | 10.0 | 3.0 | 3.0 | 10.0 | | 5.0 | 5.0 | | 5.0 |
| Minimum Split (s) | 10.0 | 10.0 | 17.0 | 17.0 | 10.0 | 10.0 | 17.0 | | 11.0 | 11.0 | | 11.0 |
| Total Split (s) | 30.0 | 30.0 | 92.0 | 92.0 | 10.0 | 10.0 | 72.0 | | 38.0 | 38.0 | | 38.0 |
| Total Split (%) | 21.4% | 21.4% | 65.7% | 65.7% | 7.1% | 7.1% | 51.4% | | 27.1% | 27.1% | | 27.1% |
| Yellow Time (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 4.0 | 4.0 | | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 |
| Lost Time Adjust (s) | | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | | 0.0 | | |
| Total Lost Time (s) | | 7.0 | 7.0 | 7.0 | | 7.0 | 7.0 | | | 6.0 | | |
| Lead/Lag | Lead | Lead | Lag | Lag | Lead | Lead | Lag | | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | | | | | |
| Recall Mode | None | None | Min | Min | None | None | Min | | None | None | | None |
| Intersection Summary | | | | | | | | | | | | |

a.m. peak hour No Build Condition
TMA

Lanes, Volumes, Timings
1: Croton Dam Road & Route 9A









| Lane Group | SBT | SBR |
|-------------------------|-------|------|
| Lane Configurations | ↔ | |
| Volume (vph) | 107 | 162 |
| Ideal Flow (vphpl) | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 |
| Grade (%) | -4% | |
| Storage Length (ft) | | 0 |
| Storage Lanes | | 0 |
| Taper Length (ft) | | |
| Lane Util. Factor | 1.00 | 1.00 |
| Ped Bike Factor | 0.99 | |
| Frt | 0.927 | |
| Flt Protected | 0.995 | |
| Satd. Flow (prot) | 1700 | 0 |
| Flt Permitted | 0.828 | |
| Satd. Flow (perm) | 1415 | 0 |
| Right Turn on Red | | No |
| Satd. Flow (RTOR) | | |
| Link Speed (mph) | 30 | |
| Link Distance (ft) | 419 | |
| Travel Time (s) | 9.5 | |
| Confl. Peds. (#/hr) | | 1 |
| Confl. Bikes (#/hr) | | |
| Peak Hour Factor | 0.94 | 0.94 |
| Growth Factor | 100% | 100% |
| Heavy Vehicles (%) | 1% | 1% |
| Bus Blockages (#/hr) | 0 | 0 |
| Parking (#/hr) | | |
| Mid-Block Traffic (%) | 0% | |
| Adj. Flow (vph) | 114 | 172 |
| Shared Lane Traffic (%) | | |
| Lane Group Flow (vph) | 320 | 0 |
| Turn Type | NA | |
| Protected Phases | 4 | |
| Permitted Phases | | |
| Detector Phase | 4 | |
| Switch Phase | | |
| Minimum Initial (s) | 5.0 | |
| Minimum Split (s) | 11.0 | |
| Total Split (s) | 38.0 | |
| Total Split (%) | 27.1% | |
| Yellow Time (s) | 4.0 | |
| All-Red Time (s) | 2.0 | |
| Lost Time Adjust (s) | 0.0 | |
| Total Lost Time (s) | 6.0 | |
| Lead/Lag | | |
| Lead-Lag Optimize? | | |
| Recall Mode | None | |
| Intersection Summary | | |

a.m. peak hour No Build Condition
TMA

Lanes, Volumes, Timings
1: Croton Dam Road & Route 9A



















Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 133.9
Natural Cycle: 150
Control Type: Semi Act-Uncoord
User Entered Value

Splits and Phases: 1: Croton Dam Road & Route 9A

| | | |
|--|--|--|
|  ø1 |  ø2 |  ø4 |
| 10 s | 92 s | 38 s |
|  ø5 |  ø6 |  ø8 |
| 30 s | 72 s | 38 s |

HCM 2010 Signalized Intersection Summary

1: Croton Dam Road & Route 9A

| | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> | | | | | | | | | | | |
|--|---|---|---|---|------|---|---|------|-------|---|------|------|
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
| Lane Configurations | |  |  |  | |  |  | | |  | | |
| Volume (veh/h) | 1 | 135 | 2005 | 88 | 3 | 8 | 890 | 11 | 58 | 202 | 83 | 32 |
| Number | | 5 | 2 | 12 | | 1 | 6 | 16 | 3 | 8 | 18 | 7 |
| Initial Q (Qb), veh | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | | 1.00 | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | | 1675 | 1845 | 1777 | | 1429 | 1766 | 1890 | 1976 | 1937 | 1976 | 1938 |
| Adj Flow Rate, veh/h | | 144 | 2133 | 94 | | 9 | 947 | 12 | 62 | 215 | 88 | 34 |
| Adj No. of Lanes | | 1 | 2 | 1 | | 1 | 2 | 0 | 0 | 1 | 0 | 0 |
| Peak Hour Factor | | 0.94 | 0.94 | 0.94 | | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | | 14 | 4 | 8 | | 43 | 7 | 7 | 3 | 3 | 3 | 1 |
| Cap, veh/h | | 167 | 2252 | 922 | | 9 | 1781 | 23 | 74 | 206 | 79 | 55 |
| Arrive On Green | | 0.10 | 0.61 | 0.61 | | 0.01 | 0.51 | 0.51 | 0.24 | 0.24 | 0.24 | 0.24 |
| Sat Flow, veh/h | | 1595 | 3690 | 1510 | | 1361 | 3481 | 44 | 183 | 873 | 336 | 108 |
| Grp Volume(v), veh/h | | 144 | 2133 | 94 | | 9 | 481 | 478 | 365 | 0 | 0 | 320 |
| Grp Sat Flow(s), veh/h/ln | | 1595 | 1845 | 1510 | | 1361 | 1766 | 1759 | 1392 | 0 | 0 | 1544 |
| Q Serve(g_s), s | | 12.0 | 72.4 | 3.5 | | 0.9 | 24.7 | 24.7 | 5.3 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | | 12.0 | 72.4 | 3.5 | | 0.9 | 24.7 | 24.7 | 32.0 | 0.0 | 0.0 | 26.7 |
| Prop In Lane | | 1.00 | | 1.00 | | 1.00 | | 0.03 | 0.17 | | 0.24 | 0.11 |
| Lane Grp Cap(c), veh/h | | 167 | 2252 | 922 | | 9 | 904 | 900 | 359 | 0 | 0 | 394 |
| V/C Ratio(X) | | 0.86 | 0.95 | 0.10 | | 1.04 | 0.53 | 0.53 | 1.02 | 0.00 | 0.00 | 0.81 |
| Avail Cap(c_a), veh/h | | 271 | 2313 | 947 | | 30 | 904 | 900 | 359 | 0 | 0 | 394 |
| HCM Platoon Ratio | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(l) | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | | 59.7 | 24.4 | 11.0 | | 67.4 | 22.2 | 22.2 | 52.9 | 0.0 | 0.0 | 49.2 |
| Incr Delay (d2), s/veh | | 14.5 | 9.1 | 0.0 | | 154.0 | 0.6 | 0.6 | 51.4 | 0.0 | 0.0 | 12.2 |
| Initial Q Delay(d3),s/veh | | 0.0 | 0.0 | 0.0 | | 0.7 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(-26165%),veh/ln | | 6.0 | 39.3 | 1.5 | | 0.7 | 12.2 | 12.1 | 18.5 | 0.0 | 0.0 | 12.9 |
| LnGrp Delay(d),s/veh | | 74.3 | 33.5 | 11.0 | | 222.1 | 22.8 | 22.8 | 104.4 | 0.0 | 0.0 | 61.4 |
| LnGrp LOS | | E | C | B | | F | C | C | F | | | E |
| Approach Vol, veh/h | 2371 | | | | 968 | | | | 365 | | | |
| Approach Delay, s/veh | 35.1 | | | | 24.7 | | | | 104.4 | | | |
| Approach LOS | D | | | | C | | | | F | | | |
| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 7.9 | 89.7 | | 38.0 | 21.2 | 76.4 | | 38.0 | | | | |
| Change Period (Y+Rc), s | 7.0 | 7.0 | | 6.0 | 7.0 | 7.0 | | 6.0 | | | | |
| Max Green Setting (Gmax), s | 3.0 | 85.0 | | 32.0 | 23.0 | 65.0 | | 32.0 | | | | |
| Max Q Clear Time (g_c+H1), s | 2.9 | 74.4 | | 28.7 | 14.0 | 26.7 | | 34.0 | | | | |
| Green Ext Time (p_c), s | 0.0 | 8.3 | | 1.4 | 0.2 | 32.9 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | 41.0 | | | | | | | | | | | |
| HCM 2010 LOS | D | | | | | | | | | | | |
| Notes | | | | | | | | | | | | |
| User approved ignoring U-Turning movement. | | | | | | | | | | | | |

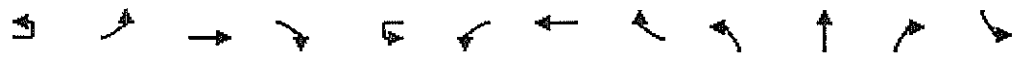
a.m. peak hour No Build Condition
TMA

HCM 2010 Signalized Intersection Summary 1: Croton Dam Road & Route 9A



| Movement | SBT | SBR |
|-------------------------------|------|------|
| Lane Configurations | ↕ | |
| Volume (veh/h) | 107 | 162 |
| Number | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1921 | 1938 |
| Adj Flow Rate, veh/h | 114 | 172 |
| Adj No. of Lanes | 1 | 0 |
| Peak Hour Factor | 0.94 | 0.94 |
| Percent Heavy Veh, % | 1 | 1 |
| Cap, veh/h | 143 | 196 |
| Arrive On Green | 0.24 | 0.24 |
| Sat Flow, veh/h | 607 | 830 |
| Grp Volume(v), veh/h | 0 | 0 |
| Grp Sat Flow(s), veh/h/ln | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 |
| Prop in Lane | | 0.54 |
| Lane Grp Cap(c), veh/h | 0 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 |
| Upstream Filter(l) | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 |
| %ile BackOfQ(-26165%), veh/ln | 0.0 | 0.0 |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 |
| LnGrp LOS | | |
| Approach Vol, veh/h | 320 | |
| Approach Delay, s/veh | 61.4 | |
| Approach LOS | E | |
| Timer | | |

Lanes, Volumes, Timings
1: Croton Dam Road & Route 9A

| |  | | | | | | | | | | | |
|-------------------------|--|-------|-------|-------|-------|-------|-------|------|-------|-------|------|-------|
| Lane Group | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
| Lane Configurations | | ↔ | ↑↑ | ↑ | | ↔ | ↑↑ | | | ↔ | | |
| Volume (vph) | 1 | 153 | 999 | 176 | 2 | 25 | 2063 | 45 | 83 | 128 | 46 | 23 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 13 | 13 | 13 | 11 |
| Grade (%) | | | -2% | | | | 1% | | | 0% | | |
| Storage Length (ft) | | 110 | | 190 | | 150 | | 0 | 0 | | 0 | 0 |
| Storage Lanes | | 1 | | 1 | | 1 | | 0 | 0 | | 0 | 0 |
| Taper Length (ft) | | 25 | | | | 25 | | | 25 | | | 25 |
| Lane Util. Factor | 0.95 | 1.00 | *1.00 | 1.00 | 0.95 | 1.00 | *1.00 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | | | 0.850 | | | 0.997 | | | 0.976 | | |
| Flt Protected | | 0.950 | | | | 0.950 | | | | 0.984 | | |
| Satd. Flow (prot) | 0 | 1762 | 3602 | 1546 | 0 | 1659 | 3570 | 0 | 0 | 1834 | 0 | 0 |
| Flt Permitted | | 0.950 | | | | 0.950 | | | | 0.306 | | |
| Satd. Flow (perm) | 0 | 1762 | 3602 | 1546 | 0 | 1659 | 3570 | 0 | 0 | 570 | 0 | 0 |
| Right Turn on Red | | | | No | | | | Yes | | | No | |
| Satd. Flow (RTOR) | | | | | | | 2 | | | | | |
| Link Speed (mph) | | | 40 | | | | 40 | | | 30 | | |
| Link Distance (ft) | | | 1697 | | | | 1673 | | | 161 | | |
| Travel Time (s) | | | 28.9 | | | | 28.5 | | | 3.7 | | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 0% | 0% | 3% | 2% | 0% | 5% | 2% | 5% | 6% | 0% | 5% | 9% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | | 0% | | | | 0% | | | 0% | | |
| Adj. Flow (vph) | 1 | 165 | 1074 | 189 | 2 | 27 | 2218 | 48 | 89 | 138 | 49 | 25 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 166 | 1074 | 189 | 0 | 29 | 2266 | 0 | 0 | 276 | 0 | 0 |
| Turn Type | Prot | Prot | NA | Perm | Prot | Prot | NA | | Perm | NA | | Perm |
| Protected Phases | 5 | 5 | 2 | | 1 | 1 | 6 | | | 8 | | |
| Permitted Phases | | | | 2 | | | | | 8 | | | 4 |
| Detector Phase | 5 | 5 | 2 | 2 | 1 | 1 | 6 | | 8 | 8 | | 4 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 3.0 | 3.0 | 10.0 | 10.0 | 3.0 | 3.0 | 10.0 | | 5.0 | 5.0 | | 5.0 |
| Minimum Split (s) | 10.0 | 10.0 | 17.0 | 17.0 | 10.0 | 10.0 | 17.0 | | 11.0 | 11.0 | | 11.0 |
| Total Split (s) | 27.0 | 27.0 | 92.0 | 92.0 | 27.0 | 27.0 | 92.0 | | 31.0 | 31.0 | | 31.0 |
| Total Split (%) | 18.0% | 18.0% | 61.3% | 61.3% | 18.0% | 18.0% | 61.3% | | 20.7% | 20.7% | | 20.7% |
| Yellow Time (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 4.0 | 4.0 | | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 |
| Lost Time Adjust (s) | | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | | 0.0 | | |
| Total Lost Time (s) | | 7.0 | 7.0 | 7.0 | | 7.0 | 7.0 | | | 6.0 | | |
| Lead/Lag | Lead | Lead | Lag | Lag | Lead | Lead | Lag | | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | | | | | |
| Recall Mode | None | None | Min | Min | None | None | Min | | None | None | | None |
| Intersection Summary | | | | | | | | | | | | |

p.m. peak hour No Build Condition
TMA

Lanes, Volumes, Timings
1: Croton Dam Road & Route 9A



| Lane Group | SBT | SBR |
|-------------------------|-------|------|
| Lane Configurations | ↕ | |
| Volume (vph) | 131 | 159 |
| Ideal Flow (vphpl) | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 |
| Grade (%) | -4% | |
| Storage Length (ft) | | 0 |
| Storage Lanes | | 0 |
| Taper Length (ft) | | |
| Lane Util. Factor | 1.00 | 1.00 |
| Ped Bike Factor | 0.99 | |
| Frt | 0.931 | |
| Flt Protected | 0.996 | |
| Satd. Flow (prot) | 1681 | 0 |
| Flt Permitted | 0.908 | |
| Satd. Flow (perm) | 1533 | 0 |
| Right Turn on Red | | No |
| Satd. Flow (RTOR) | | |
| Link Speed (mph) | 30 | |
| Link Distance (ft) | 419 | |
| Travel Time (s) | 9.5 | |
| Confl. Peds. (#/hr) | | 1 |
| Confl. Bikes (#/hr) | | |
| Peak Hour Factor | 0.93 | 0.93 |
| Growth Factor | 100% | 100% |
| Heavy Vehicles (%) | 1% | 3% |
| Bus Blockages (#/hr) | 0 | 0 |
| Parking (#/hr) | | |
| Mid-Block Traffic (%) | 0% | |
| Adj. Flow (vph) | 141 | 171 |
| Shared Lane Traffic (%) | | |
| Lane Group Flow (vph) | 337 | 0 |
| Turn Type | NA | |
| Protected Phases | 4 | |
| Permitted Phases | | |
| Detector Phase | 4 | |
| Switch Phase | | |
| Minimum Initial (s) | 5.0 | |
| Minimum Split (s) | 11.0 | |
| Total Split (s) | 31.0 | |
| Total Split (%) | 20.7% | |
| Yellow Time (s) | 4.0 | |
| All-Red Time (s) | 2.0 | |
| Lost Time Adjust (s) | 0.0 | |
| Total Lost Time (s) | 6.0 | |
| Lead/Lag | | |
| Lead-Lag Optimize? | | |
| Recall Mode | None | |
| Intersection Summary | | |

Lanes, Volumes, Timings 1: Croton Dam Road & Route 9A

Area Type: Other

Cycle Length: 150







Actuated Cycle Length: 147.7

Natural Cycle: 150

Control Type: Semi Act-Uncoord




















* User Entered Value

Splits and Phases: 1: Croton Dam Road & Route 9A

| | | |
|--|--|--|
|  Ø1 |  Ø2 |  Ø4 |
| 27 s | 92 s | 31 s |
|  Ø5 |  Ø6 |  Ø8 |
| 27 s | 92 s | 31 s |

HCM 2010 Signalized Intersection Summary

1: Croton Dam Road & Route 9A

| |  |  |  |  |  |  |  |  |  |  |  |  |
|--|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
| Lane Configurations | |  |  |  | |  |  |  | |  | | |
| Volume (veh/h) | 1 | 153 | 999 | 176 | 2 | 25 | 2063 | 45 | 83 | 128 | 46 | 23 |
| Number | | 5 | 2 | 12 | | 1 | 6 | 16 | 3 | 8 | 18 | 7 |
| Initial Q (Qb), veh | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | | 1.00 | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | | 1919 | 1863 | 1881 | | 1806 | 1852 | 1890 | 1976 | 1922 | 1976 | 1938 |
| Adj Flow Rate, veh/h | | 165 | 1074 | 189 | | 27 | 2218 | 48 | 89 | 138 | 49 | 25 |
| Adj No. of Lanes | | 1 | 2 | 1 | | 1 | 2 | 0 | 0 | 1 | 0 | 0 |
| Peak Hour Factor | | 0.93 | 0.93 | 0.93 | | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | | 0 | 3 | 2 | | 5 | 2 | 2 | 0 | 0 | 0 | 1 |
| Cap, veh/h | | 190 | 2497 | 1072 | | 34 | 2117 | 46 | 75 | 82 | 27 | 41 |
| Arrive On Green | | 0.10 | 0.67 | 0.67 | | 0.02 | 0.59 | 0.59 | 0.17 | 0.17 | 0.17 | 0.17 |
| Sat Flow, veh/h | | 1828 | 3726 | 1599 | | 1720 | 3613 | 78 | 242 | 478 | 155 | 83 |
| Grp Volume(v), veh/h | | 165 | 1074 | 189 | | 27 | 1133 | 1133 | 276 | 0 | 0 | 337 |
| Grp Sat Flow(s),veh/h/ln | | 1828 | 1863 | 1599 | | 1720 | 1852 | 1839 | 875 | 0 | 0 | 1705 |
| Q Serve(g_s), s | | 12.9 | 19.4 | 6.4 | | 2.3 | 85.0 | 85.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | | 12.9 | 19.4 | 6.4 | | 2.3 | 85.0 | 85.0 | 25.0 | 0.0 | 0.0 | 25.0 |
| Prop In Lane | | 1.00 | | 1.00 | | 1.00 | | 0.04 | 0.32 | | 0.18 | 0.07 |
| Lane Grp Cap(c), veh/h | | 190 | 2497 | 1072 | | 34 | 1085 | 1077 | 184 | 0 | 0 | 320 |
| V/C Ratio(X) | | 0.87 | 0.43 | 0.18 | | 0.80 | 1.04 | 1.05 | 1.50 | 0.00 | 0.00 | 1.05 |
| Avail Cap(c_a), veh/h | | 252 | 2497 | 1072 | | 237 | 1085 | 1077 | 184 | 0 | 0 | 320 |
| HCM Platoon Ratio | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | | 64.0 | 11.1 | 8.9 | | 70.8 | 30.0 | 30.0 | 61.5 | 0.0 | 0.0 | 61.0 |
| Incr Delay (d2), s/veh | | 21.3 | 0.1 | 0.1 | | 33.5 | 39.5 | 42.1 | 252.5 | 0.0 | 0.0 | 64.4 |
| Initial Q Delay(d3),s/veh | | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(-26165%),veh/ln | | 7.6 | 9.9 | 2.9 | | 1.4 | 55.0 | 55.4 | 20.2 | 0.0 | 0.0 | 18.6 |
| LnGrp Delay(d),s/veh | | 85.4 | 11.2 | 9.0 | | 104.3 | 69.5 | 72.1 | 314.0 | 0.0 | 0.0 | 125.4 |
| LnGrp LOS | | F | B | A | | F | F | F | F | F | F | F |
| Approach Vol, veh/h | 1428 | | | | 2293 | | | | 276 | | | |
| Approach Delay, s/veh | 19.5 | | | | 71.2 | | | | 314.0 | | | |
| Approach LOS | B | | | | E | | | | F | | | |
| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 9.8 | 104.2 | | 31.0 | 22.1 | 92.0 | | 31.0 | | | | |
| Change Period (Y+Rc), s | 7.0 | 7.0 | | 6.0 | 7.0 | 7.0 | | 6.0 | | | | |
| Max Green Setting (Gmax), s | 20.0 | 85.0 | | 25.0 | 20.0 | 85.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+1), s | 4.3 | 21.4 | | 27.0 | 14.9 | 87.0 | | 27.0 | | | | |
| Green Ext Time (p_c), s | 0.0 | 55.4 | | 0.0 | 0.2 | 0.0 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | 73.8 | | | | | | | | | | | |
| HCM 2010 LOS | E | | | | | | | | | | | |
| Notes | | | | | | | | | | | | |
| User approved ignoring U-Turning movement. | | | | | | | | | | | | |

p.m. peak hour No Build Condition
TMA

HCM 2010 Signalized Intersection Summary 1: Croton Dam Road & Route 9A

| | | |
|------------------------------|-------|------|
| Movement | SBT | SBR |
| Lane Configurations | ↕ | |
| Volume (veh/h) | 131 | 159 |
| Number | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1889 | 1938 |
| Adj Flow Rate, veh/h | 141 | 171 |
| Adj No. of Lanes | 1 | 0 |
| Peak Hour Factor | 0.93 | 0.93 |
| Percent Heavy Veh, % | 1 | 1 |
| Cap, veh/h | 130 | 149 |
| Arrive On Green | 0.17 | 0.17 |
| Sat Flow, veh/h | 757 | 865 |
| Grp Volume(v), veh/h | 0 | 0 |
| Grp Sat Flow(s), veh/h/ln | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 |
| Prop In Lane | | 0.51 |
| Lane Grp Cap(c), veh/h | 0 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 |
| Upstream Filter(l) | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 |
| %ile BackOfQ(-26165%),veh/ln | 0.0 | 0.0 |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 |
| LnGrp LOS | | |
| Approach Vol, veh/h | 337 | |
| Approach Delay, s/veh | 125.4 | |
| Approach LOS | F | |
| Timer | | |

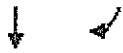
Lanes, Volumes, Timings

1: Croton Dam Road & Route 9A



| Lane Group | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
|-------------------------|-------|-------|-------|-------|------|-------|-------|------|-------|-------|------|-------|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 1 | 135 | 2005 | 88 | 3 | 8 | 893 | 11 | 58 | 202 | 93 | 32 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 13 | 13 | 13 | 11 |
| Grade (%) | | | -2% | | | | 1% | | | 0% | | |
| Storage Length (ft) | | 110 | | 190 | | 150 | | 0 | 0 | | 0 | 0 |
| Storage Lanes | | 1 | | 1 | | 1 | | 0 | 0 | | 0 | 0 |
| Taper Length (ft) | | 25 | | | | 25 | | | 25 | | | 25 |
| Lane Util. Factor | 0.95 | 1.00 | *1.00 | 1.00 | 0.95 | 1.00 | *1.00 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | | | 0.850 | | | 0.998 | | | 0.964 | | |
| Flt Protected | | 0.950 | | | | 0.950 | | | | 0.992 | | |
| Satd. Flow (prot) | 0 | 1538 | 3567 | 1460 | 0 | 1313 | 3408 | 0 | 0 | 1841 | 0 | 0 |
| Flt Permitted | | 0.950 | | | | 0.950 | | | | 0.694 | | |
| Satd. Flow (perm) | 0 | 1538 | 3567 | 1460 | 0 | 1313 | 3408 | 0 | 0 | 1288 | 0 | 0 |
| Right Turn on Red | | | | No | | | | Yes | | | No | |
| Satd. Flow (RTOR) | | | | | | | 1 | | | | | |
| Link Speed (mph) | | | 40 | | | | 40 | | | 30 | | |
| Link Distance (ft) | | | 1697 | | | | 1673 | | | 161 | | |
| Travel Time (s) | | | 28.9 | | | | 28.5 | | | 3.7 | | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 100% | 14% | 4% | 8% | 0% | 43% | 7% | 9% | 0% | 3% | 1% | 0% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | | 0% | | | | 0% | | | 0% | | |
| Adj. Flow (vph) | 1 | 144 | 2133 | 94 | 3 | 9 | 950 | 12 | 62 | 215 | 99 | 34 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 145 | 2133 | 94 | 0 | 12 | 962 | 0 | 0 | 376 | 0 | 0 |
| Turn Type | Prot | Prot | NA | Perm | Prot | Prot | NA | | Perm | NA | | Perm |
| Protected Phases | 5 | 5 | 2 | | 1 | 1 | 6 | | | 8 | | |
| Permitted Phases | | | | 2 | | | | | 8 | | | 4 |
| Detector Phase | 5 | 5 | 2 | 2 | 1 | 1 | 6 | | 8 | 8 | | 4 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 3.0 | 3.0 | 10.0 | 10.0 | 3.0 | 3.0 | 10.0 | | 5.0 | 5.0 | | 5.0 |
| Minimum Split (s) | 10.0 | 10.0 | 17.0 | 17.0 | 10.0 | 10.0 | 17.0 | | 11.0 | 11.0 | | 11.0 |
| Total Split (s) | 30.0 | 30.0 | 92.0 | 92.0 | 10.0 | 10.0 | 72.0 | | 38.0 | 38.0 | | 38.0 |
| Total Split (%) | 21.4% | 21.4% | 65.7% | 65.7% | 7.1% | 7.1% | 51.4% | | 27.1% | 27.1% | | 27.1% |
| Yellow Time (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 4.0 | 4.0 | | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 |
| Lost Time Adjust (s) | | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | | 0.0 | | |
| Total Lost Time (s) | | 7.0 | 7.0 | 7.0 | | 7.0 | 7.0 | | | 6.0 | | |
| Lead/Lag | Lead | Lead | Lag | Lag | Lead | Lead | Lag | | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | | | | | |
| Recall Mode | None | None | Min | Min | None | None | Min | | None | None | | None |
| Intersection Summary | | | | | | | | | | | | |

Lanes, Volumes, Timings
1: Croton Dam Road & Route 9A



| Lane Group | SBT | SBR |
|-------------------------|-------|------|
| Lane Configurations | ↕ | |
| Volume (vph) | 107 | 162 |
| Ideal Flow (vphpl) | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 |
| Grade (%) | -4% | |
| Storage Length (ft) | | 0 |
| Storage Lanes | | 0 |
| Taper Length (ft) | | |
| Lane Util. Factor | 1.00 | 1.00 |
| Ped Bike Factor | 0.99 | |
| Frt | 0.927 | |
| Flt Protected | 0.995 | |
| Satd. Flow (prot) | 1700 | 0 |
| Flt Permitted | 0.820 | |
| Satd. Flow (perm) | 1401 | 0 |
| Right Turn on Red | | No |
| Satd. Flow (RTOR) | | |
| Link Speed (mph) | 30 | |
| Link Distance (ft) | 419 | |
| Travel Time (s) | 9.5 | |
| Confl. Peds. (#/hr) | | 1 |
| Confl. Bikes (#/hr) | | |
| Peak Hour Factor | 0.94 | 0.94 |
| Growth Factor | 100% | 100% |
| Heavy Vehicles (%) | 1% | 1% |
| Bus Blockages (#/hr) | 0 | 0 |
| Parking (#/hr) | | |
| Mid-Block Traffic (%) | 0% | |
| Adj. Flow (vph) | 114 | 172 |
| Shared Lane Traffic (%) | | |
| Lane Group Flow (vph) | 320 | 0 |
| Turn Type | NA | |
| Protected Phases | 4 | |
| Permitted Phases | | |
| Detector Phase | 4 | |
| Switch Phase | | |
| Minimum Initial (s) | 5.0 | |
| Minimum Split (s) | 11.0 | |
| Total Split (s) | 38.0 | |
| Total Split (%) | 27.1% | |
| Yellow Time (s) | 4.0 | |
| All-Red Time (s) | 2.0 | |
| Lost Time Adjust (s) | 0.0 | |
| Total Lost Time (s) | 6.0 | |
| Lead/Lag | | |
| Lead-Lag Optimize? | | |
| Recall Mode | None | |
| Intersection Summary | | |

a.m. peak hour Build Condition
TMA

Lanes, Volumes, Timings 1: Croton Dam Road & Route 9A

Area Type: Other

Cycle Length: 140







Actuated Cycle Length: 133.9

Natural Cycle: 150

Control Type: Semi Act-Uncoord



















* User Entered Value

Splits and Phases: 1: Croton Dam Road & Route 9A

| | | |
|---|---|---|
|  <p>ø1</p> |  <p>ø2</p> |  <p>ø4</p> |
| 10 s | 92 s | 38 s |
|  <p>ø5</p> |  <p>ø6</p> |  <p>ø8</p> |
| 30 s | 72 s | 38 s |

HCM 2010 Signalized Intersection Summary























1: Croton Dam Road & Route 9A

| |  |  |  |  |  |  |  |  |  |  |  |  |
|--|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
| Lane Configurations | |  |  |  | |  |  | | |  | | |
| Volume (veh/h) | 1 | 135 | 2005 | 88 | 3 | 8 | 893 | 11 | 58 | 202 | 93 | 32 |
| Number | | 5 | 2 | 12 | | 1 | 6 | 16 | 3 | 8 | 18 | 7 |
| Initial Q (Qb), veh | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | | 1.00 | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | | 1675 | 1845 | 1777 | | 1429 | 1766 | 1890 | 1976 | 1938 | 1976 | 1938 |
| Adj Flow Rate, veh/h | | 144 | 2133 | 94 | | 9 | 950 | 12 | 62 | 215 | 99 | 34 |
| Adj No. of Lanes | | 1 | 2 | 1 | | 1 | 2 | 0 | 0 | 1 | 0 | 0 |
| Peak Hour Factor | | 0.94 | 0.94 | 0.94 | | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | | 14 | 4 | 8 | | 43 | 7 | 7 | 3 | 3 | 3 | 1 |
| Cap, veh/h | | 167 | 2252 | 922 | | 9 | 1781 | 23 | 73 | 201 | 87 | 55 |
| Arrive On Green | | 0.10 | 0.61 | 0.61 | | 0.01 | 0.51 | 0.51 | 0.24 | 0.24 | 0.24 | 0.24 |
| Sat Flow, veh/h | | 1595 | 3690 | 1510 | | 1361 | 3481 | 44 | 179 | 851 | 368 | 107 |
| Grp Volume(v), veh/h | | 144 | 2133 | 94 | | 9 | 482 | 480 | 376 | 0 | 0 | 320 |
| Grp Sat Flow(s),veh/h/ln | | 1595 | 1845 | 1510 | | 1361 | 1766 | 1759 | 1398 | 0 | 0 | 1540 |
| Q Serve(g_s), s | | 12.0 | 72.4 | 3.5 | | 0.9 | 24.8 | 24.8 | 5.2 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | | 12.0 | 72.4 | 3.5 | | 0.9 | 24.8 | 24.8 | 32.0 | 0.0 | 0.0 | 26.8 |
| Prop In Lane | | 1.00 | | 1.00 | | 1.00 | | 0.03 | 0.16 | | 0.26 | 0.11 |
| Lane Grp Cap(c), veh/h | | 167 | 2252 | 922 | | 9 | 904 | 900 | 361 | 0 | 0 | 393 |
| V/C Ratio(X) | | 0.86 | 0.95 | 0.10 | | 1.04 | 0.53 | 0.53 | 1.04 | 0.00 | 0.00 | 0.81 |
| Avail Cap(c_a), veh/h | | 271 | 2313 | 947 | | 30 | 904 | 900 | 361 | 0 | 0 | 393 |
| HCM Platoon Ratio | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | | 59.7 | 24.4 | 11.0 | | 67.4 | 22.2 | 22.2 | 52.9 | 0.0 | 0.0 | 49.2 |
| Incr Delay (d2), s/veh | | 14.5 | 9.1 | 0.0 | | 154.0 | 0.6 | 0.6 | 58.8 | 0.0 | 0.0 | 12.4 |
| Initial Q Delay(d3),s/veh | | 0.0 | 0.0 | 0.0 | | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(-26165%),veh/ln | | 6.0 | 39.3 | 1.5 | | 0.7 | 12.2 | 12.2 | 19.3 | 0.0 | 0.0 | 12.9 |
| LnGrp Delay(d),s/veh | | 74.3 | 33.5 | 11.0 | | 222.1 | 22.8 | 22.8 | 111.7 | 0.0 | 0.0 | 61.6 |
| LnGrp LOS | | E | C | B | | F | C | C | F | | | E |
| Approach Vol, veh/h | 2371 | | | | 971 | | | | 376 | | | |
| Approach Delay, s/veh | 35.1 | | | | 24.7 | | | | 111.7 | | | |
| Approach LOS | D | | | | C | | | | F | | | |
| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 7.9 | 89.7 | | 38.0 | 21.2 | 76.4 | | 38.0 | | | | |
| Change Period (Y+Rc), s | 7.0 | 7.0 | | 6.0 | 7.0 | 7.0 | | 6.0 | | | | |
| Max Green Setting (Gmax), s | 3.0 | 85.0 | | 32.0 | 23.0 | 65.0 | | 32.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 2.9 | 74.4 | | 28.8 | 14.0 | 26.8 | | 34.0 | | | | |
| Green Ext Time (p_c), s | 0.0 | 8.3 | | 1.4 | 0.2 | 32.9 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | 41.8 | | | | | | | | | | | |
| HCM 2010 LOS | D | | | | | | | | | | | |
| Notes | | | | | | | | | | | | |
| User approved ignoring U-Turning movement. | | | | | | | | | | | | |

HCM 2010 Signalized Intersection Summary 1: Croton Dam Road & Route 9A

| | ↓ | ↙ |
|------------------------------|------|------|
| Movement | SBT | SBR |
| Lane Configurations | ↕ | |
| Volume (veh/h) | 107 | 162 |
| Number | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1921 | 1938 |
| Adj Flow Rate, veh/h | 114 | 172 |
| Adj No. of Lanes | 1 | 0 |
| Peak Hour Factor | 0.94 | 0.94 |
| Percent Heavy Veh, % | 1 | 1 |
| Cap, veh/h | 143 | 195 |
| Arrive On Green | 0.24 | 0.24 |
| Sat Flow, veh/h | 605 | 828 |
| Grp Volume(v), veh/h | 0 | 0 |
| Grp Sat Flow(s), veh/h/ln | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 |
| Prop In Lane | | 0.54 |
| Lane Grp Cap(c), veh/h | 0 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 |
| Upstream Filter(l) | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 |
| %ile BackOfQ(-26165%),veh/ln | 0.0 | 0.0 |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 |
| LnGrp LOS | | |
| Approach Vol, veh/h | 320 | |
| Approach Delay, s/veh | 61.6 | |
| Approach LOS | E | |
| Timer | | |

Lanes, Volumes, Timings
1: Croton Dam Road & Route 9A

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Lane Group | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
| Lane Configurations | |  |  |  | |  |  |  |  |  |  |  |
| Volume (vph) | 1 | 153 | 999 | 179 | 2 | 25 | 2078 | 45 | 83 | 128 | 52 | 23 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 13 | 13 | 13 | 11 |
| Grade (%) | | | -2% | | | | 1% | | | 0% | | |
| Storage Length (ft) | | 110 | | 190 | | 150 | | 0 | 0 | | 0 | 0 |
| Storage Lanes | | 1 | | 1 | | 1 | | 0 | 0 | | 0 | 0 |
| Taper Length (ft) | | 25 | | | | 25 | | | 25 | | | 25 |
| Lane Util. Factor | 0.95 | 1.00 | *1.00 | 1.00 | 0.95 | 1.00 | *1.00 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | | | 0.850 | | | 0.997 | | | 0.973 | | |
| Flt Protected | | 0.950 | | | | 0.950 | | | | 0.985 | | |
| Satd. Flow (prot) | 0 | 1762 | 3602 | 1546 | 0 | 1659 | 3570 | 0 | 0 | 1829 | 0 | 0 |
| Flt Permitted | | 0.950 | | | | 0.950 | | | | 0.312 | | |
| Satd. Flow (perm) | 0 | 1762 | 3602 | 1546 | 0 | 1659 | 3570 | 0 | 0 | 579 | 0 | 0 |
| Right Turn on Red | | | | No | | | Yes | | | | No | |
| Satd. Flow (RTOR) | | | | | | | 2 | | | | | |
| Link Speed (mph) | | | 40 | | | | 40 | | | 30 | | |
| Link Distance (ft) | | | 1697 | | | | 1673 | | | 161 | | |
| Travel Time (s) | | | 28.9 | | | | 28.5 | | | 3.7 | | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 0% | 0% | 3% | 2% | 0% | 5% | 2% | 5% | 6% | 0% | 5% | 9% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | | 0% | | | | 0% | | | 0% | | |
| Adj. Flow (vph) | 1 | 165 | 1074 | 192 | 2 | 27 | 2234 | 48 | 89 | 138 | 56 | 25 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 166 | 1074 | 192 | 0 | 29 | 2282 | 0 | 0 | 283 | 0 | 0 |
| Turn Type | Prot | Prot | NA | Perm | Prot | Prot | NA | | Perm | NA | | Perm |
| Protected Phases | 5 | 5 | 2 | | 1 | 1 | 6 | | | 8 | | |
| Permitted Phases | | | | 2 | | | | | 8 | | | 4 |
| Detector Phase | 5 | 5 | 2 | 2 | 1 | 1 | 6 | | 8 | 8 | | 4 |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 3.0 | 3.0 | 10.0 | 10.0 | 3.0 | 3.0 | 10.0 | | 5.0 | 5.0 | | 5.0 |
| Minimum Split (s) | 10.0 | 10.0 | 17.0 | 17.0 | 10.0 | 10.0 | 17.0 | | 11.0 | 11.0 | | 11.0 |
| Total Split (s) | 27.0 | 27.0 | 92.0 | 92.0 | 27.0 | 27.0 | 92.0 | | 31.0 | 31.0 | | 31.0 |
| Total Split (%) | 18.0% | 18.0% | 61.3% | 61.3% | 18.0% | 18.0% | 61.3% | | 20.7% | 20.7% | | 20.7% |
| Yellow Time (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 4.0 | 4.0 | | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 |
| Lost Time Adjust (s) | | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | | | 0.0 | | |
| Total Lost Time (s) | | 7.0 | 7.0 | 7.0 | | 7.0 | 7.0 | | | 6.0 | | |
| Lead/Lag | Lead | Lead | Lag | Lag | Lead | Lead | Lag | | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | | | | | |
| Recall Mode | None | None | Min | Min | None | None | Min | | None | None | | None |
| Intersection Summary | | | | | | | | | | | | |

p.m. peak hour Build Condition
TMA

Lanes, Volumes, Timings
1: Croton Dam Road & Route 9A



| Lane Group | SBT | SBR |
|-------------------------|-------|------|
| Lane Configurations | ↕ | |
| Volume (vph) | 131 | 159 |
| Ideal Flow (vphpl) | 1900 | 1900 |
| Lane Width (ft) | 11 | 11 |
| Grade (%) | -4% | |
| Storage Length (ft) | | 0 |
| Storage Lanes | | 0 |
| Taper Length (ft) | | |
| Lane Util. Factor | 1.00 | 1.00 |
| Ped Bike Factor | 0.99 | |
| Frt | 0.931 | |
| Flt Protected | 0.996 | |
| Satd. Flow (prot) | 1681 | 0 |
| Flt Permitted | 0.903 | |
| Satd. Flow (perm) | 1524 | 0 |
| Right Turn on Red | | No |
| Satd. Flow (RTOR) | | |
| Link Speed (mph) | 30 | |
| Link Distance (ft) | 419 | |
| Travel Time (s) | 9.5 | |
| Confl. Peds. (#/hr) | | 1 |
| Confl. Bikes (#/hr) | | |
| Peak Hour Factor | 0.93 | 0.93 |
| Growth Factor | 100% | 100% |
| Heavy Vehicles (%) | 1% | 3% |
| Bus Blockages (#/hr) | 0 | 0 |
| Parking (#/hr) | | |
| Mid-Block Traffic (%) | 0% | |
| Adj. Flow (vph) | 141 | 171 |
| Shared Lane Traffic (%) | | |
| Lane Group Flow (vph) | 337 | 0 |
| Turn Type | NA | |
| Protected Phases | 4 | |
| Permitted Phases | | |
| Detector Phase | 4 | |
| Switch Phase | | |
| Minimum Initial (s) | 5.0 | |
| Minimum Split (s) | 11.0 | |
| Total Split (s) | 31.0 | |
| Total Split (%) | 20.7% | |
| Yellow Time (s) | 4.0 | |
| All-Red Time (s) | 2.0 | |
| Lost Time Adjust (s) | 0.0 | |
| Total Lost Time (s) | 6.0 | |
| Lead/Lag | | |
| Lead-Lag Optimize? | | |
| Recall Mode | None | |
| Intersection Summary | | |

p.m. peak hour Build Condition
TMA

Lanes, Volumes, Timings

1: Croton Dam Road & Route 9A

Area Type: Other

Cycle Length: 150







Actuated Cycle Length: 147.7

Natural Cycle: 150

Control Type: Semi Act-Uncoord


* User Entered Value

Splits and Phases: 1: Croton Dam Road & Route 9A

| | | |
|--|--|--|
|  Ø1 |  Ø2 |  Ø4 |
| 27 s | 92 s | 31 s |
|  Ø5 |  Ø6 |  Ø8 |
| 27 s | 92 s | 31 s |

HCM 2010 Signalized Intersection Summary

1: Croton Dam Road & Route 9A

| |  | | | | | | | | | | | |
|--|--|-------|------|------|------|-------|------|------|-------|-------|------|-------|
| Movement | EBU | EBL | EBT | EBR | WBU | WBL | WBT | WBR | NBL | NBT | NBR | SBL |
| Lane Configurations | | ↔ | ↔ | ↔ | | ↔ | ↔ | ↔ | | ↔ | ↔ | ↔ |
| Volume (veh/h) | 1 | 153 | 999 | 179 | 2 | 25 | 2078 | 45 | 83 | 128 | 52 | 23 |
| Number | | 5 | 2 | 12 | | 1 | 6 | 16 | 3 | 8 | 18 | 7 |
| Initial Q (Qb), veh | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 | | 1.00 | | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 |
| Parking Bus, Adj | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | | 1919 | 1863 | 1881 | | 1806 | 1852 | 1890 | 1976 | 1921 | 1976 | 1938 |
| Adj Flow Rate, veh/h | | 165 | 1074 | 192 | | 27 | 2234 | 48 | 89 | 138 | 56 | 25 |
| Adj No. of Lanes | | 1 | 2 | 1 | | 1 | 2 | 0 | 0 | 1 | 0 | 0 |
| Peak Hour Factor | | 0.93 | 0.93 | 0.93 | | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | | 0 | 3 | 2 | | 5 | 2 | 2 | 0 | 0 | 0 | 1 |
| Cap, veh/h | | 190 | 2497 | 1072 | | 34 | 2117 | 45 | 74 | 81 | 30 | 41 |
| Arrive On Green | | 0.10 | 0.67 | 0.67 | | 0.02 | 0.59 | 0.59 | 0.17 | 0.17 | 0.17 | 0.17 |
| Sat Flow, veh/h | | 1828 | 3726 | 1599 | | 1720 | 3614 | 77 | 240 | 471 | 175 | 82 |
| Grp Volume(v), veh/h | | 165 | 1074 | 192 | | 27 | 1141 | 1141 | 283 | 0 | 0 | 337 |
| Grp Sat Flow(s), veh/h/ln | | 1828 | 1863 | 1599 | | 1720 | 1852 | 1839 | 885 | 0 | 0 | 1702 |
| Q Serve(g_s), s | | 12.9 | 19.4 | 6.5 | | 2.3 | 85.0 | 85.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | | 12.9 | 19.4 | 6.5 | | 2.3 | 85.0 | 85.0 | 25.0 | 0.0 | 0.0 | 25.0 |
| Prop In Lane | | 1.00 | | 1.00 | | 1.00 | | 0.04 | 0.31 | | 0.20 | 0.07 |
| Lane Grp Cap(c), veh/h | | 190 | 2497 | 1072 | | 34 | 1085 | 1077 | 185 | 0 | 0 | 320 |
| V/C Ratio(X) | | 0.87 | 0.43 | 0.18 | | 0.80 | 1.05 | 1.06 | 1.53 | 0.00 | 0.00 | 1.05 |
| Avail Cap(c_a), veh/h | | 252 | 2497 | 1072 | | 237 | 1085 | 1077 | 185 | 0 | 0 | 320 |
| HCM Platoon Ratio | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | | 64.0 | 11.1 | 9.0 | | 70.8 | 30.0 | 30.0 | 61.5 | 0.0 | 0.0 | 61.0 |
| Incr Delay (d2), s/veh | | 21.3 | 0.1 | 0.1 | | 33.5 | 41.8 | 44.5 | 263.0 | 0.0 | 0.0 | 64.9 |
| Initial Q Delay(d3), s/veh | | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(-26165%), veh/ln | | 7.6 | 9.9 | 2.9 | | 1.4 | 55.7 | 56.1 | 20.9 | 0.0 | 0.0 | 18.6 |
| LnGrp Delay(d), s/veh | | 85.4 | 11.2 | 9.0 | | 104.3 | 71.8 | 74.5 | 324.5 | 0.0 | 0.0 | 125.9 |
| LnGrp LOS | | F | B | A | | F | F | F | F | F | F | F |
| Approach Vol, veh/h | | 1431 | | | | 2309 | | | | 283 | | |
| Approach Delay, s/veh | | 19.5 | | | | 73.5 | | | | 324.5 | | |
| Approach LOS | | B | | | | E | | | | F | | |
| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 9.8 | 104.2 | | 31.0 | 22.1 | 92.0 | | 31.0 | | | | |
| Change Period (Y+Rc), s | 7.0 | 7.0 | | 6.0 | 7.0 | 7.0 | | 6.0 | | | | |
| Max Green Setting (Gmax), s | 20.0 | 85.0 | | 25.0 | 20.0 | 85.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+1), s | 4.3 | 21.4 | | 27.0 | 14.9 | 87.0 | | 27.0 | | | | |
| Green Ext Time (p_c), s | 0.0 | 55.7 | | 0.0 | 0.2 | 0.0 | | 0.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | | | 76.1 | | | | | | | | | |
| HCM 2010 LOS | | | E | | | | | | | | | |
| Notes | | | | | | | | | | | | |
| User approved ignoring U-Turning movement. | | | | | | | | | | | | |

HCM 2010 Signalized Intersection Summary 1: Croton Dam Road & Route 9A

| | ↓ | ↙ |
|------------------------------|-------|------|
| Movement | SBT | SBR |
| Lane Configurations | ↔ | |
| Volume (veh/h) | 131 | 159 |
| Number | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 |
| Ped-Bike Adj(A_pbT) | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1889 | 1938 |
| Adj Flow Rate, veh/h | 141 | 171 |
| Adj No. of Lanes | 1 | 0 |
| Peak Hour Factor | 0.93 | 0.93 |
| Percent Heavy Veh, % | 1 | 1 |
| Cap, veh/h | 130 | 149 |
| Arrive On Green | 0.17 | 0.17 |
| Sat Flow, veh/h | 756 | 864 |
| Grp Volume(v), veh/h | 0 | 0 |
| Grp Sat Flow(s), veh/h/ln | 0 | 0 |
| Q Serve(g_s), s | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 0.0 |
| Prop In Lane | | 0.51 |
| Lane Grp Cap(c), veh/h | 0 | 0 |
| V/C Ratio(X) | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 |
| %ile BackOfQ(-26165%),veh/ln | 0.0 | 0.0 |
| LnGrp Delay(d),s/veh | 0.0 | 0.0 |
| LnGrp LOS | | |
| Approach Vol, veh/h | 337 | |
| Approach Delay, s/veh | 125.9 | |
| Approach LOS | F | |
| Timer | | |

ATTACHMENT C

Level of Service Criteria

Traffic: Performance Measures

Introduction

The *Highway Capacity Manual*¹ and the *Synchro 8 Software*² procedures document the methodology used for modeling levels of service, average vehicle delay, and volume -to-capacity ratios at both signalized and unsignalized intersections. Level of service is a measure of the operational quality of an intersection; level of service A is the highest, most efficient level, and level of service F is the lowest level. The operational quality of an intersection for the automobile mode is based on the average amount of time vehicles are delayed. Levels of service are examined by 'lane group', the set of lanes allowing common movement(s) on an approach.

The *Synchro 8 Software* modeled results apply to peak hour periods only. During off peak periods, which is the majority of the time, drivers typically will find operations better than the modeled peak hour periods. During peak periods the experience of individual drivers can vary, because the model calculates average delay.

Level of Service Criteria Signalized Intersections

When analyzing activity at signalized intersections, an understanding of the definition of level of service for the Automobile mode is essential:

Automobile Mode

Level of service can be characterized for the entire intersection, each intersection approach, and each lane group. Control delay alone is used to characterize level of service for the entire intersection or an approach. Control delay and volume-to-capacity ratio are used to characterize level of service for a lane group. Delay quantifies the increase in travel time due to traffic signal control. It is also a surrogate measure to driver discomfort and fuel consumption. The volume-to-capacity ratio quantifies the degree to which a phase's capacity is utilized by a lane group. The following paragraphs describe each level of service.

Level of service A describes operations with a control delay of 10 seconds per vehicle or less and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If it is due to favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.

Level of service B describes operations with control delay between 10 and 20 seconds per vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with Level of service A.

Level of service C describes operations with control delay between 20 and 35 seconds per vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual cycle failures (i.e., one or more queued vehicles are not able to depart as a result of depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.

Level of service D describes operations with control delay between 35 and 55 seconds per vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned

¹ Transportation Research Board of the National Academies, *Highway Capacity Manual*, Washington D.C., 2010.

² *Synchro 8*, Computer software, Trafficware, Sugar Land, Texas, 2011.

when the volume-to-capacity ratio is higher and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.

Level of service E describes operations with control delay between 55 and 80 seconds per vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.

Level of service F describes operations with control delay exceeding 80 seconds per vehicle or a volume-to-capacity ratio greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

A lane group can incur a delay less than 80 seconds per vehicle when the volume-to-capacity ratio exceeds 1.0. This condition typically occurs when the cycle length is short, the signal progression is favorable, or both. As a result, both the delay and volume-to-capacity ratio are considered when lane group level of service is established. A ratio of 1.0 or more indicates that cycle capacity is fully utilized and represents failure from a capacity perspective (just as delay in excess of 80 seconds per vehicle represents failure from a delay perspective).

Exhibit 18-4 lists the level of service thresholds established for the automobile mode at a signalized intersection.³

| Signalized Intersections Level of Service Criteria Automobile Mode For Lane Groups | | |
|---|--|---|
| Average Control Delay (Seconds Per Vehicle) | Volume-to-capacity Ratio less than or equal to one Level of Service | Volume-to-capacity Ratio greater than one Level of Service |
| less than or equal to 10 | A | F |
| greater than 10 and less than or equal to 20 | B | F |
| greater than 20 and less than or equal to 35 | C | F |
| greater than 35 and less than or equal to 55 | D | F |
| greater than 55 and less than or equal to 80 | E | F |
| greater than 80 | F | F |
| ¹ From Transportation Research Board of the National Academies, <u>Highway Capacity Manual</u> , Washington D.C., Volume 3 page 18-6, Exhibit 18-4, 2010. Abbreviations and mathematical symbols have been replaced for reader clarity. Table limited to lane groups (lane or group of lanes sharing a common movement). | | |

The New York State Department of Transportation (NYS DOT) generally seeks in urban areas for a level of service D or better (delay of 55 seconds or less for a signalized intersection) for all lane groups however:

In some cases, it may be necessary to accept level of service E or F on individual lane groups due to unreasonable costs or impacts associated with improving the level of service.⁴

³ From Transportation Research Board of the National Academies, Highway Capacity Manual, Washington D.C., Volume 3 page 18-6, 2010. Abbreviations and mathematical symbols have been replaced for reader clarity.

⁴ From NYS DOT, Highway Design Manual, Revision 62, April 13, 2011, (page 5-103) with abbreviations replaced for reader clarity.