West Running Brook Corridor Study

Derry, New Hampshire

August 2022

Prepared for:
Town of Derry Planning Department

HOYLE TANNER

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1 INTRODUCTION

In 2020, the Town of Derry created the West Running Brook zoning district with a purpose to encourage economic growth and provide multifamily housing while preserving Derry's natural resources and working landscape. The new zoning district encourages mixed use development in the area including multi-family residential, small-scale retail, restaurants, hotel, professional offices, banks, performing arts spaces, medical offices, and movie theaters. Since the creation of the West Running Brook district, four conceptual plans have been presented to the planning board, and it is anticipated that other landowners within the district will likely submit proposals for developments within the near future. The goal of this study is to investigate the possible traffic impacts within the new district resulting from trips generated by these approved and potential developments and recommend possible mitigation measures. A 2-year (2024) and 20-year (2042) development horizon will be evaluated with respect to traffic impacts.

2 EXISTING CONDITIONS

2.1 West Running Brook District

The West Running Brook zoning district stretches north to south along NH 28/NH 28 Bypass from just south of the West Running Brook Middle School to the Robert Frost Farm historic site, encompassing 90 parcels and approximately 206 acres of land. The zone also includes parcels along NH 28 (Rockingham Road) west to Winter Hill Road and approximately 1,000 feet eastward along Island Pond Road. See Appendix A for a map of the zoning district. This area currently includes undeveloped land, eighteenth century farmhouses, single family homes, an abandoned auto salvage dealer, a self-storage facility, an auto repair shop, an auto dealership, a gas station, a shuttered flea market, restaurants, small-scale retail establishments, and manufactured home parks, among other land uses.

2.2 Adjacent Roadway Network

At the heart of the West Running Brook district is the intersection of NH 28 (Rockingham Road), NH 28 Bypass (South Main Street), and Island Pond Road; which is controlled by a traffic signal. The intersection is shown in Figure 1.

NH 28 (Rockingham Road) is a two-lane urban minor arterial that runs south from the study intersection towards NH 111 and west from the study intersection towards the center of Derry. The speed limit is 35 mph for all roads in the study area. The New Hampshire Department of Transportation (NHDOT) maintains NH 28 south of the intersection while The Town of Derry maintain NH 28 west of the intersection. Dedicated left-turn and right-turn lanes are provided at the northbound approach to the intersection. A dedicated right-turn slip lane is provided on the eastbound approach to the intersection. The entrance to the slip lane is located approximately 130 feet west of the main intersection. Eastbound right turning traffic merges with southbound traffic approximately 330 feet south of the intersection. Merging traffic is controlled with a yield sign. For eastbound vehicles approaching the main intersection, there is a single, shared lane for left-turning and straight-ahead traffic.

Island Pond Road travels east from the intersection towards Island Pond and meets up with NH 111. Island Pond Road is categorized as a major collector owned by NHDOT with winter maintenance by the Town of Derry. It is a two-lane road through a mostly rural-residential area. On the westbound approach to the intersection there is a shared left and through lane as well as a dedicated right hand turn lane.

Figure 1 – Intersection of NH 28 (Rockingham Road), NH 28 Bypass, and Island Pond Road

NH 28 Bypass (South Main Street) is a two-lane urban minor arterial that heads north from the study intersection, crosses NH 102 at the Danforth Traffic Circle, and continues north before becoming the Londonderry Turnpike at the Derry town line. NH 28 Bypass is maintained by NHDOT within the study area. The southbound approach to the intersection includes a dedicated left-turn only lane and a lane for ahead and right turning traffic.

There are no sidewalks in the study area, except for one small section at the corner outside the Clam Haven Restaurant. There is no pedestrian phase at the traffic signal and no dedicated bicycle facilities within the study area.

2.3 Traffic Volumes and Counts

Average Annual Daily Traffic Counts (AADT) collected in 2019 just south of the intersection in NH 28 indicate a volume of 10,980 vehicles per day (VPD), with 10,710 vpd utilizing NH 28 west of the intersection. Volumes on Island Pond Road collected in 2020 were significantly lower at 3,719 vpd. To evaluate the existing and future traffic operation of the study intersection, intersection turning movement counts (TMC) were conducted by Precision Data Industries on Thursday, March 24 from 7:00-9:00 AM and 2:00-6:00 PM. The traffic count data collected indicates that the morning peak hour is 7:00-8:00 AM and the afternoon peak hour is 3:00-4:00 PM. These peak hours were subsequently used in analysis of the study intersection function and level of service. A copy of the turning movement count data can be found in Appendix B.

2.4 Public Transportation

The Cooperative Alliance for Reginal Transportation (CART) provides "fixed route and curb-to-cub demand response transportation serving the New Hampshire Towns of Chester, Derry, Hampstead, and Salem; and is operated by the Manchester Transit Authority. Fixed routes are not provided within the West Running Brook Corridor, however, prescheduled rides can be taken anywhere within the CART towns noted above. No other public transportation options have been identified within the district.

2.5 Traffic Crashes

The Derry Police Department provided three years of crash data for the West Running Brook corridor. The crash data can be found in Appendix C. In the three-year period between June 1, 2019 and May 31, 2022, there were 38 crashes reported in the study area. One crash involved a pedestrian. The pedestrian was crossing South Main Street approximately 300 feet north of Island Pond Road at night. Of the crashes in the study area, 17 occurred at the intersection of NH 28/NH 28 B/Island Pond Road. Three additional crashes occurred at the merge south of the intersection.

Of the 17 crashes at the study intersection, 53% (9) were attributed to failure to yield to traffic or the traffic signal. A third of those crashes involved eastbound vehicles turning left onto South Main Street failing to yield to westbound vehicles. In the police reports of two of those crashes, the drivers stated that they thought they had the right of way because the light was green. There is currently no green arrow for the eastbound approach. A "Left Turn Yield on Green" sign may help mitigate these types of crashes. The next two most prevalent cause of crashes in the study area were of drivers following too closely (13%) and driver inattention (13%).

3 NO-BUILD TRAFFIC CONDITIONS

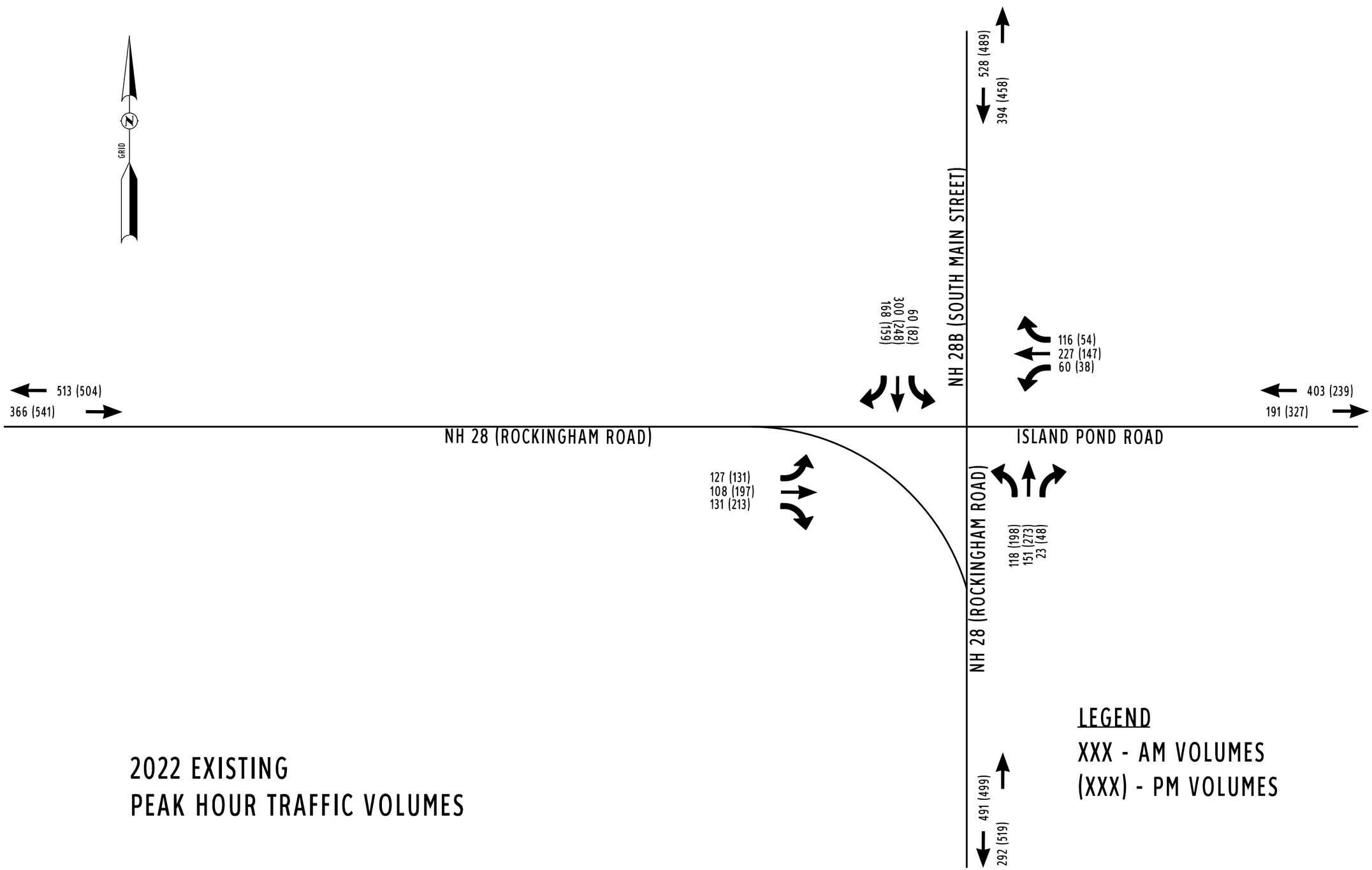
To analyze the current and future traffic conditions at the intersection, the weekday peak hour traffic volumes were adjusted for seasonal factors as well as annual growth to the 2024 and 2042 study years.

3.1 Adjustment Factors and Background Growth

The raw turning movement count data was adjusted to a peak month condition in order to analyze the capacity of the intersection. The TMC's were adjusted to the peak month using the NHDOT monthly adjustment factor for highway group four. The 2020 Existing Traffic Volumes are shown in Figure 2. An annual background growth rate of 1% was applied to project the traffic volumes to the future years of 2024 and 2042. A table of the current and future traffic volumes can be found in Appendix D.

3.2 COVID-19 Impacts on Traffic

The possible impact of COVID-19 on traffic volumes at the study intersection were also investigated using current NHDOT practices. An average of the weekday daily counts at the nearest permanent counting station on NH 28 at the intersection of Northland Road and Libbey Road (located just over the Windham town line) for March 21-25, 2022 was adjusted using the same seasonal adjustment factor to determine the average annual daily traffic. This was then compared to the 2019 AADT for the same station. The adjusted traffic count from the week of the TMC data collection was greater than the 2019 AADT, suggesting that COVID-19 is no longer affecting the daily traffic volumes at this location.



2022 EXISTING
PEAK HOUR TRAFFIC VOLUMES

FILENAME	V&A_Figs.dgn
DESIGNED	AMS
MODEL NAME	2022 No Build
DRAWN	NAE
SCALE	N/A
CHECKED	SBH
DATE	JULY, 2022

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2022 EXISTING PEAK HOUR TRAFFIC VOLUMES

PROJECT NO. 21.914701.00
FIGURE
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Therefore, adjustments for COVID-19 to the 2022 peak hour were not performed.

COVID-19 may however be affecting the time of the afternoon peak hour of traffic. The afternoon peak hour of traffic in 2019 was 5:00-6:00 PM while the afternoon peak hour in March 2022 was 3:00-4:00 PM. This is likely due to the number of people still working at home, who continue to make trips to and from school, go to afterschool activities, and run errands but are not leaving work in large numbers at 5:00 pm. It is unclear how working remotely will affect travel patterns in the future.

3.3 Planned Roadway Improvement Projects

The construction of the new I-93 Interchange (Exit 4A) will affect the background traffic at the study intersection after the interchange project is complete. The Exit 4A interchange project consists of three major projects. The first project is the construction of the Exit 4A interchange and the connector road to Folsom Road at the Derry/Londonderry town line. The anticipated completion date for the first project is October 2024. The second project includes widening and reconstructing about a mile of Folsom Road between the new connector and Pinkerton Street. This second project also includes implementation of a connected traffic signal system to improve capacity and operations on Folsom Road. The third project is improvements to Tsienneto Road and NH Route 102. The improvements include widening and rehabilitation of Tsienneto Road between Pinkerton Street and NH Route 102 and improvements at the Tsienneto Road and NH Route 102 intersection, including connected signals to improve traffic operations. This third and final project is anticipated to be completed in November of 2026.

Although the Exit 4A interchange will be operational in fall of 2024, the background traffic impacts at the study intersection will likely not be fully realized until the construction projects on Folsom Road and Tsienneto Road are finished, and the improvements are complete. The anticipated changes to background traffic were applied to the forecasted 2042 traffic volume only, as shown in Appendix D. The 4.4% increase in background traffic on South Main Street and NH 28 south of the intersection is based on Table 7 in Appendix C – Traffic Technical Report of the I-93 Exit 4A Final Environmental Impact Statement and Record of Decision, 2020.

4 PROPOSED CONDITIONS

4.1 Future Development

The purpose of this study is to determine what traffic impacts possible future development in the new West Running Brook zoning district may have on the surrounding network. To determine the number of new vehicle trips generated by the new developments, conceptual development plans were used to calculate trip generation based on proposed land uses. These plans have been shared with the Planning Board and copies of the plans were provided to Hoyle Tanner. As many of these plans are still in conceptual phases, the future land uses may change. In addition to developments that are known to the Planning Board, a potential development was imagined for the parcel at 2 Island Pond Road. There are no current development plans at the site, but it was important for the purpose of this study to incorporate some trip generation at the site to investigate the effects of development at the intersection.

The developments were also separated into two categories, the first group are developments that are likely to be built in the next two years and included in the 2024 Build scenario analysis. They include the following developments and their land uses:

74 Rockingham Road - Keystone Derry

- 16 Townhouse units
- 104 Apartment units in two four story buildings
- 10,800 SF Office Building
- 5,500 SF Community Center

109 Rockingham Road - Old Watts Auto

- 65 Apartment units
- 5,180 SF Retail space
- 9 Townhouse units

1-4 Humphrey Road - West Running Brook

- 72 Condominium units
- 22 Apartment units
- 18 Townhouse units
- 27,200 SF Retail space
- 16,800 SF Restaurant space

The second group of developments are estimated to be built by 2042. The exact land uses for these developments are less certain, but still provide valuable insight to possible number of trips generated by those parcels in the future.

45 & 49 South Main Street - Westbrook (Siragusa Farm)

- 94 Apartment units
- 14 Townhouse units
- 19,000 SF Retail space
- 16,000 SF Restaurant space
- 26,000 SF Office space
- 75 Room Hotel plus 7000 SF Event space

2 Island Pond Road (Former Flea Market)

- 30 Townhouse units
- 20,000 SF Restaurant space
- 40,000 SF Retail space

The details for the Westbrook (Siragusa Farm) development were based on their presentation to the Derry Planning Board on August 5, 2020, the Siragusa Group website, and information shared by the Town of Derry. The potential development at 2 Island Pond Road was created through a discussion between Hoyle Tanner and the Town of Derry, but is subject to change as it is not based on actual development proposals.

Note: The development land uses above were based on information shared by the Town of Derry in March 2022. Some of the proposed land uses have changed since that point and are likely to change in the future. The known changes to date do not have a significant impact on the overall recommendations of this study.

4.2 Trip Generation

Trip generation calculations for the expected developments were performed using ITE Trip Generation 11th Edition. A summary of the trip generation by land use is provided in Appendix E. The proposed and anticipated developments include several different land uses including residential, retail, restaurant, office space, hotel and event space. The exact tenants of the commercial areas are currently unknown, and they are likely to change over the twenty-year design horizon.

The residential units were broken down into three separate land uses depending on their characteristics. Trips generated from the apartments above the retail space on Humphrey Road were calculated using 220 – Multi-Family Housing (Low-Rise). The trips for the larger, four-story units such as the two developments on Rockingham Road were calculated using 221 – Multi-Family Housing. 215 – Single-Family Attached Housing was used to estimate the trips for the various town house development areas. As the constants in the trip generation fitted curve equations can give unrealistic trip figures when there are relatively small numbers of units, the generated trips were first calculated based on the total number of housing units within each specific land use, and then those trips were proportionally distributed to the separate development areas in that land use.

The trips generated from the Community Center on the Keystone Dairy property have been calculated using 495 – Recreational Community Center. The space at the development includes a weight room, a library, and meeting spaces. Although this land use often includes facilities with larger recreational spaces such as swimming pools and basketball courts, it also includes space for classes and meeting rooms and was the best fit of the available land uses designated in the ITE Trip Generation Manual.

The numbers of trips generated by the proposed office buildings on the Keystone Dairy and Siragusa Farm properties were calculated using 710 – General Office Building.

The tenant of the proposed retail space at the old Watts Auto salvage yard is currently unknown. The type of retail establishment and whether the retail space is generally intended for tenants of the building (such as a convenience store or laundromat) will impact the number of trips generated. In general, the nature of the retail spaces is unknown. The trips for these businesses were estimated using 822 – Strip Retail Plaza. The Strip Retail Plaza land use allows for flexibility in the mix of tenants that will ultimately occupy these units. The mix of tenants is also likely to change over the next twenty years. It should be noted that land use codes for Residential development with Ground Floor Commercial were considered for this use, but were dismissed due to the limited data available and dissimilar geographic setting (i.e. urban/suburban/rural), which were anticipated to provide misleading results.

The Westbrook development on the Siragusa Farm property includes a proposed hotel and event space. The number of trips generated was calculated using 310 – Hotel.

As proposed developments are mixed-use, consideration was also given to internal capture on site. The National Cooperative Highway Research Program (NCHRP) 684 Trip Capture Estimation Tool was used to estimate the overall internal capture rates. The internal capture rates would likely vary between uses, but the development-wide capture rates from the NCHRP Spreadsheet was used for simplicity. The NCHRP tool can be found in Appendix F.

4.3 Trip Distribution

Trip distribution was calculated using the directional distributions available in ITE Trip Generation 11th

Edition, for the land uses of the development. The development areas with relatively quick turnover, such as retail and restaurants, have entering and exiting distributions of nearly 50/50. The residential, office and hotel have more directional flow based on the time of day. During the AM peak 69-77% of trips attributable to the apartments are exiting the development, and during the PM peak, 57-61% are entering. Conversely, the office development areas have 88% of attributable trips entering the site during the AM Peak and 83% of trips exiting the site during the PM Peak. The directional distribution percentages and trips can be found in the Trip Generation tables in Appendix E.

A portion of the restaurant and retail trips generated by the anticipated developments are expected to be pass-by trips. These pass-by trips will be removed from the trip assignment at the study intersection are not new trips resulting from the development. Pass-by percentages were taken from Trip Generation 11th Edition when available. There are no average pass-by rates for 821 – Strip Retail, but ITE does provide an average pass-by rate of 40% for 822 – Shopping Plaza. Given that the proposed 31,500 sf of retail/dining space is close to the lower limit of 40,000 for the 822 – Shopping Plaza, this percentage was deemed reasonable and was utilized.

4.4 Trip Assignment

The 2010 Census Journey to Work Data was used to allocate work related trip assignments through the study area for residential developments. The data provides the number of people travelling for work between Derry and the city or town they work or live in. The majority of the origin and destination towns are in New Hampshire and northern Massachusetts. Some assumptions were made on the routes residents would take to reach their destination. The Journey of Work data used in the analysis is in Appendix G.

Overall, residents destined for cities and towns north of the study area would likely travel on NH 28 west towards I-93 and head north. Similarly, residents destined to jobs south of the study area such as Nashua and towns in Massachusetts would travel on NH 28 west to the interstate and drive south. Residents headed towards other southern destinations, such as Salem, would use NH 28 south. Residents would likely use NH 28 Bypass to reach Portsmouth. Residents would use Island Pond Road to drive to work destinations in towns immediately east of the study area, such as Hampstead. Similar assumptions were used to assign trips for those drivers working at the proposed developments. Trip assignments for residents working in Derry was based on the likely destination of work and the most convenient route. Trip assignments for Derry residents working at the anticipated developments were estimated based on current housing concentrations and the most convenient routes to the West Running Brook corridor.

For non-work related trips including the restaurants, retail and commercial units, a gravity model was used to assign trips. To develop the gravity model, populations for cities and towns within 15 miles of the proposed development were collected. The towns and cities with the ten largest weighted populations are shown in Table 2. The gravity model for the entire 15-mile radius can be found in Appendix H. The total number of people living within this area is approximately 505,000 people. These totals were then adjusted based on relative distances as shown in Table 1.

Table 1 – Population Weight based on Distance

Distance	Weight
Less than 2.5 miles	1.0
2.5 – 5 miles	0.5
5 – 10 miles	0.25

10 – 15 miles	0.125

The Town of Derry represents approximately 15% of the total weighted population within the 15-mile radius. These trips were assigned to the road network using similar route assumptions as the journey to work trips. As the exact location of proposed driveways to future developments was not necessarily known, assumptions for where these new trips would access the roadway network had to be made. In particular, the trips associated with the former Flea Market parcel (which was assumed would provide two access points) were split between accessing NH 28 Bypass and Island Pond Road based on their destination and the easiest turning maneuver at the signalized intersection. 2024 and 2042 Trip Assignment and Traffic Volumes are shown in Figures 3, 4, 5, & 6.

Table 2 – Gravity Model Population Totals for the 10 Largest Weighted Populations

City or Town within 15 Miles	State	Population	Weight	Weighted Population	Percentage
Derry	NH	33,109	1	33,109	15%
Manchester	NH	109,565	0.25	27,391	13%
Londonderry	NH	24,129	1	24,129	11%
Haverhill	MA	60,879	0.25	15,220	7%
Salem	NH	28,776	0.5	14,388	7%
Windham	NH	13,592	1	13,592	6%
Methuen	MA	47,255	0.25	11,814	5%
Nashua	NH	86,494	0.125	10,812	5%
Lawrence	MA	76,377	0.125	9,547	4%
Hudson	NH	24,467	0.25	6,117	3%

Data is from US Census Bureau – Subcounty Resident Population Estimates

5 ANALYSES

5.1 Intersection Capacity Analysis

Traffic operations are evaluated in terms of Level of Service (LOS), a qualitative measure that describes operations by a letter designation. LOS ranges from A (free flow traffic) to F (extreme delays), and for a signalized intersection is defined by Table 3.

Table 3 – Level of Service for Signalized Intersection

LOS	Delay Range
A	Less than or equal to 10 seconds
B	10 – 20 seconds
C	20 – 35 seconds
D	35 – 55 seconds
E	55 – 80 seconds
F	Greater than 80 seconds

NOTE :
1. 2024 Trip Assignment figure includes developments at Keystone Derry, Old Watts Auto and Humphrey Road sites only, which are anticipated to be developed by 2024.

GRID

KEYSTONE DERRY - 74 ROCKINGHAM RD

1-4 HUMPHREY ROAD

OLD WATTS AUTO - 109 ROCKINGHAM RD

NH28 (ROCKINGHAM ROAD)

ISLAND POND ROAD

NH 28B (SOUTH MAIN STREET)

NH 28 (ROCKINGHAM ROAD)

+112 (+86)
+88 (+105)

+36 (+41)
+36 (+37)

+83 (+66)
+78 (+79)

+74 (+56)
+8 (+5)
+4 (+3)

+24 (+30)
+29 (+26)

+89 (+53)
+79 (+77)

+5 (+4)
+4 (+3)
+0 (+0)

+3 (+7)
+6 (+7)

+18 (+41)
+37 (+31)

+69 (+68)
+2 (+4)
+7 (+7)

+5 (+7)
+7 (+6)
+0 (+0)

+15 (+12)
+12 (+13)

2024 SITE-GENERATED TRIP ASSIGNMENTS

LEGEND
XXX - AM VOLUMES
(XXX) - PM VOLUMES

FILENAME V&A_Figs.dgn
DESIGNED AMS
DRAWN NAE
CHECKED SBH
MODEL NAME 2024 Trip
SCALE N/A
DATE JULY, 2022

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2024 SITE-GENERATED TRIP ASSIGNMENTS

PROJECT NO. 21.914701.00
FIGURE
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NOTE

1. Peak Hour Volumes shown are for the NH 28/NH 28B intersection and traffic entering/exiting the network only. Existing and future volumes at site driveways have not been determined.

GRID

KEYSTONE DERRY -
74 ROCKINGHAM RD

1-4 HUMPHREY ROAD

OLD WATTS AUTO -
109 ROCKINGHAM RD

NH28B (SOUTH MAIN STREET)

NH28 (ROCKINGHAM ROAD)

ISLAND POND ROAD

NH28 (ROCKINGHAM ROAD)

656 (625)
485 (684)

636 (578)
498 (555)

65 (87)
314 (258)
245 (218)

123 (59)
236 (153)
61 (39)

420 (251)
200 (341)

199 (202)
112 (205)
141 (224)

125 (209)
161 (284)
23 (49)

516 (521)
309 (542)

2024 BUILD PEAK HOUR TRAFFIC VOLUMES

LEGEND

XXX - AM VOLUMES
(XXX) - PM VOLUMES

FILENAME	DESIGNED
V&A_Figs.dgn	AMS
MODEL NAME	DRAWN
2024 Build	NAE
SCALE	CHECKED
N/A	SBH
DATE	
JULY, 2022	

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WEST RUNNING BROOK CORRIDOR STUDY

2024 BUILD PEAK HOUR
TRAFFIC VOLUMES

PROJECT NO. 21.914701.00

FIGURE

4

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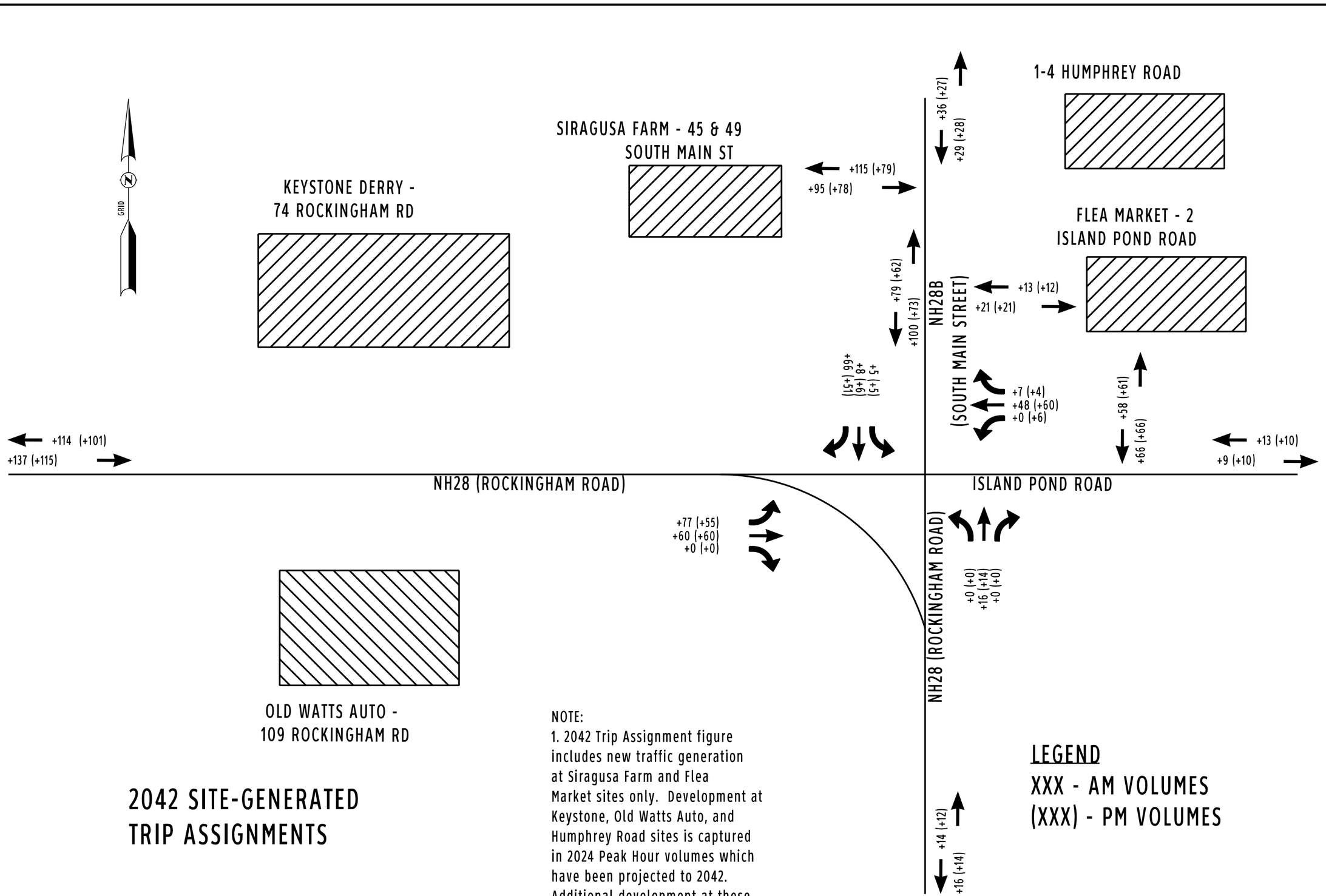

2042 SITE-GENERATED TRIP ASSIGNMENTS

NOTE:
1. 2042 Trip Assignment figure includes new traffic generation at Siragusa Farm and Flea Market sites only. Development at Keystone, Old Watts Auto, and Humphrey Road sites is captured in 2024 Peak Hour volumes which have been projected to 2042. Additional development at these sites is not anticipated.

LEGEND

XXX - AM VOLUMES
(XXX) - PM VOLUMES

FILENAME	V&A_Figs.dgn
DESIGNED	AMS
DRAWN	NAE
CHECKED	SBH
MODEL NAME	2042 Trip
SCALE	N/A
DATE	JULY, 2022

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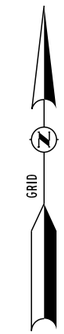
2042 SITE-GENERATED TRIP ASSIGNMENTS

PROJECT NO. 21.914701.00
FIGURE
5



SIRAGUSA FARM - 45 & 49
SOUTH MAIN ST

KEYSTONE DERRY -
74 ROCKINGHAM RD

1-4 HUMPHREY ROAD

FLEA MARKET - 2
ISLAND POND ROAD

885 (791)
727 (773)

NH28B (SOUTH MAIN STREET)

85 (112)
398 (327)
354 (310)

160 (77)
329 (232)
73 (52)

882 (882)
702 (702)

568 (367)
311 (480)

NH 28 (ROCKINGHAM ROAD)

ISLAND POND ROAD

308 (290)
194 (304)
167 (267)

NH28 (ROCKINGHAM ROAD)

149 (249)
215 (368)
28 (59)

OLD WATTS AUTO -
109 ROCKINGHAM RD

638 (646)
392 (676)

2042 BUILD PEAK HOUR TRAFFIC VOLUMES

NOTE:
1 Peak Hour Volumes Shown are for NH 28/NH 28 B intersection and traffic entering/exiting the network only. Existing and future traffic volumes at driveway sites have not been determined.

LEGEND

XXX - AM VOLUMES
(XXX) - PM VOLUMES

FILENAME V&A_Figs.dgn
DESIGNED AMS
DRAWN NAE
CHECKED SBH
MODEL NAME 2042 Build
SCALE N/A
DATE JULY, 2022

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2042 BUILD PEAK HOUR
TRAFFIC VOLUMES

PROJECT NO. 21.914701.00

FIGURE
6

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Trafficware's Synchro 10 software was used for analysis of the study intersection, the results of which are provided in Appendix I. Table 4 below summarizes the comparison of 2022 existing conditions, the 2024 Build conditions and the 2042 Build conditions.

Table 4 – Level of Service Summary

	2022 Existing		2024 Build		2042 Build	
Intersection Approaches	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Overall LOS (HCM2000)	E (60)	D (41)	D (49)	D (37)	F (160)	F (132)
Volume to Capacity Ratio	0.99	0.80	0.97	0.93	1.42	1.34
Eastbound Through and Left	F (164)	F (118)	E (72)	D (54)	F (260)	F (194)
Westbound Through and Left	D (37)	C (30)	C (23)	C (21)	C (30)	C (26)
Westbound Right	B (18)	B (18)	B (15)	B (15)	B (18)	B (17)
Northbound Left	B (17)	B (12)	C (24)	D (42)	F (169)	F (207)
Northbound Through	B (17)	B (16)	C (21)	C (22)	D (38)	D (41)
Northbound Right	B (15)	B (13)	B (18)	B (17)	C (32)	C (30)
Southbound Left	B (13)	B (14)	B (18)	B (19)	C (31)	C (32)
Southbound Through and Right	E (65)	C (29)	E (77)	D (46)	F (244)	F (184)

1. *Level of Service Letter Grade (Control Delay in Seconds)*
2. *The 2024 analysis includes optimized timing of the signal*

The 2022 Existing year traffic operations were analyzed utilizing the existing timing and phasing for the signalized intersection as provided by NHDOT. The eastbound approach for left turning and through traffic is currently operating over capacity in the peak period. Signal optimization could reduce the delay on the eastbound approach. The 2024 Build condition includes optimization of the existing signalized intersection (as noted above), which could improve LOS (particularly for the AM Peak period) over the current operations.

With the significant increase in traffic due to developments in the West Running Brook Corridor, the existing intersection is expected to operate at a LOS F on three of the approaches by 2042, with Volume to Capacity ratios well in excess of 1.0. The approaches that are capacity constrained are the eastbound left and through, the northbound left and the southbound through and right. The delays on two of the approaches exceed four minutes.

6 POTENTIAL MITIGATION ALTERNATIVES

To mitigate the effects of increased traffic at the intersection, three different intersection improvement alternatives were evaluated to see what was most effective in handling the increased traffic.

6.1 Traffic Signal Improvements

The first option evaluated was to maintain the existing traffic signal and add lanes and improve signal operations. This results in LOS D during the 2042 Design year with a 39 second delay during AM Peak and a 35.8 second delay during the PM Peak. The volume to capacity ratio in the AM Peak is 0.86 and 0.94 in the afternoon. To provide this level of service however will require construction of a second northbound through receiving lane, a second southbound through lane and receiving lane, a dedicated

southbound right turn lane, and an eastbound left turn lane.

6.2 Single Lane Roundabout

The second option evaluated was a single lane roundabout. Intersection capacity analysis for the roundabouts was analyzed using SIDRA Intersection 9.0 and are provided in Appendix J. For the 2042 design year, a single lane roundabout (which would require minimal or no roadway approach widening would result in LOS F with an 89.3 second delay in the AM Peak and a 96.6 second delay in the PM Peak. Adding an eastbound right turn slip lane reduces delay to an 81.4 second delay in the AM Peak and a 73.9 second delay in the PM Peak but still results in LOS of F. For this reason, a single lane roundabout was determined to not be an appropriate long-term mitigation.

6.3 Two Lane Roundabout

A two-lane roundabout could provide an acceptable LOS out to the design year, resulting in LOS C with about 15 to 20 seconds of average delay during the 2042 design year. This could be accomplished either through a traditional two-lane roundabout with two lanes on each approach or a hybrid with two lane approaches northbound and southbound and single lane approaches eastbound and westbound. For the latter configuration to provide an LOS C in the design year, a right turn slip lane for eastbound right turns would be required. The right turn slip lane construction could potentially be held off until volume thresholds are met, as long as sufficient space for its implementation was reserved. Without the slip lane, the LOS in 2042 is D (26.4 seconds) in the AM Peak and E (41.4 seconds) in the PM Peak.

7 PREFERRED MITIGATION

After preliminary discussion of the three potential mitigation measures with the Town of Derry, the traffic signal improvement alternative was chosen for further development of a conceptual drawings and cost estimate. The traffic signal improvements involve changes to the configuration of lanes as well as changes to the traffic signal operations. Conceptual design drawings can be found in Appendix K.

7.1 Lane Configurations and Traffic Signal Operation

As proposed, the existing northbound right lane would be converted to a northbound through and right lane while the existing northbound left lane and northbound through lane would remain unchanged. This would require construction of a second receiving lane on the north approach on South Main Street (by Heavenly Donuts). The existing combined southbound through and right lane would be converted to a southbound through lane, and a second southbound through lane and a southbound right lane. The existing southbound left lane would remain unchanged. This requires the construction of a second receiving lane on the south approach (in the area of the existing slip lane). On the eastbound approach, a dedicated left turn lane would be added. The existing eastbound through and left lane would also be maintained. This configuration would allow for dedicated eastbound left turn phasing, which would help reduce the left turn failure to yield crashes noted in the latest crash reports. The eastbound right turn slip lane would be removed and replaced with an eastbound right turn lane. The westbound approaches on Island Pond Road would remain unchanged. Because of the proposed eastbound dual left turn lanes, the eastbound and westbound phases would need to be split. Synchro traffic signal analysis for the proposed intersection can be found in Appendix M.

As part of the analysis, an alternate configuration of the southbound approach including a left lane, a through lane, and a shared through and right lane was investigated. As this resulted in significantly longer southbound queues than providing two dedicated through lanes, this alternative was not advanced.

7.2 Potential Right-of-Way and Environmental Impacts

Tax map level right-of-way and property lines from the Town's website have been depicted on the conceptual improvements plan. Although the existing space within the Town & State's right-of-way has been utilized as much as feasible, property impacts are anticipated along the northwest corner of the intersection at the Automart and along the southern side of Rockingham Road adjacent to Brady Avenue to facilitate the required widening. Coordination with these property owners during Preliminary Design would be required to ensure that the necessary easements and takings are secured, and owners are compensated.

The presence of natural resources and other environmental concerns within the project area were identified using the New Hampshire Department of Environmental Services (NHDES) OneStop database. An unnamed stream runs north south along the west side of NH 28, beneath the eastbound right turn slip lane, and is carried underneath the eastbound approach of Rockingham Road in 4'x5' concrete box culvert; before continuing on to West Running Brook. To avoid impacts to this stream, its associated wetlands, and the box culvert; the position of the existing guardrail on the north side of Rockingham Road in this area have been maintained. A small retaining wall may be required in this area to further limit impacts to the stream and the Automart. Impacts to West Running Brook itself are not anticipated. There are several hazardous waste generating sites (Automart, Affordable Auto, & Hawk Quality Products) and remediation sites (Peaceful Acres Mobile Home Park) identified within the immediate vicinity of the intersection. Coordination with NHDES during Preliminary design will be required to avoid or permit/mitigate impacts to these sites. Significant impacts to historic or potentially historic parcels are not anticipated. The Clam Haven restaurant is greater than 50 years old and could be considered potentially historic. Review of the impacts to this parcel may be required if Federal Funds are used for the project.

7.3 Opinion of Probable Cost

The conceptual opinion of probable cost for the proposed signalized intersection improvements is approximately $1.75 million. This estimate includes not only the hard construction costs, but also cost for potential right-of-way easements and acquisitions, design and construction engineering, and 3% inflation to the construction year. For the purposes of this estimate, a 2030 construction year has been assumed. the details of the opinion of cost can be found in Appendix M.

8 CONCLUSIONS AND RECOMMENDATIONS

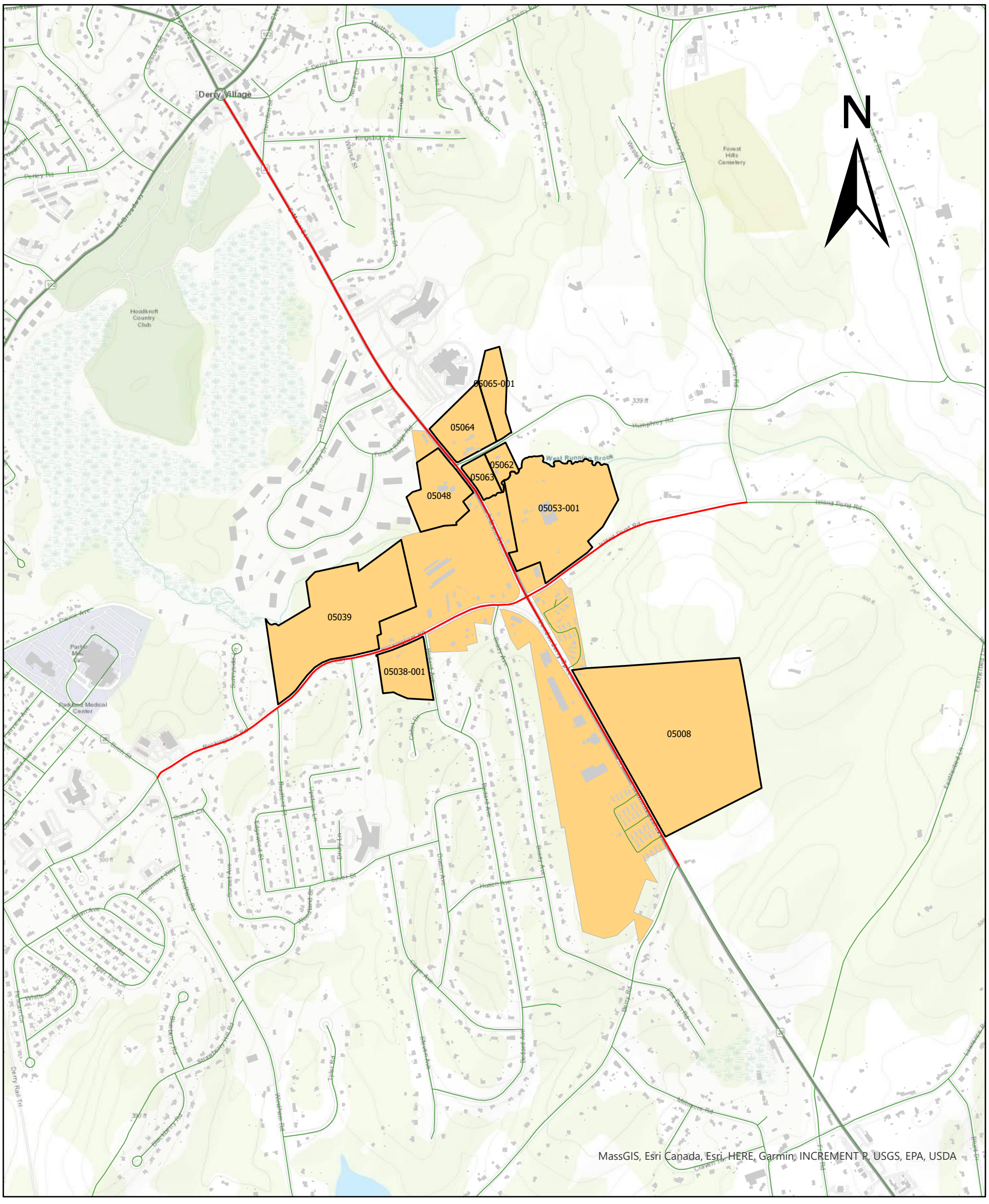
The creation of the West Running Brook zoning district has encouraged development near the intersection of NH 28, NH 28 Bypass and Island Pond Road in the Town of Derry. The purpose of this study is to identify the traffic impact on the surrounding road network from proposed and potential future developments in this new zone. Although it is difficult to forecast the exact impacts of these developments, in part because of impacts of the future I-93 Exit 4A interchange and changes in travel patterns due to COVID-19, it is clear that the trips generated by the new developments in the West Running Brook zoning district will reduce the capacity of the NH 28/NH 28 Bypass/Island Pond Road intersection. The intersection is currently operating at a Level of Service (LOS) E in the morning peak period. Although timing and phasing optimization may allow the traffic signal to operate at an acceptable LOS through 2024, by 2042, the intersection is expected to operate at a LOS F during the morning peak period with delays on some approaches over two minutes and a volume to capacity ratio of 1.34. Prior to this time, intersection improvements will be required to mitigate the anticipated growth in traffic from the developments within the West Running Brook district and within the region.

The Town of Derry has indicated that their preferred improvement alternative would be reconfiguring the intersection with additional turn lanes and reconfigured through lanes on three of the approaches to improve the LOS to a level D with a volume to capacity ratio under 1.0.

At a meeting of the Derry Planning Board, a methodology was determined for calculating fair mitigation fees for developments in the district. The Planning Board will require each development to submit a site-specific traffic study to determine the development's incremental impact on the Webster Corner intersection. The Planning Board has developed a formula using the development's increase in traffic as a percent against overall intersection capacity multiplied by the total estimated cost of improving the intersection. For example, if a development was determined to increase the volume at the intersection by two percent, then they developer would be responsible for $35,000 in fees ($1,750,000 multiplied by 2%). These mitigation fees could be used towards future improvements at the intersection, purchase of right-of-way, etc. Coordination with NHDOT (a recommended next step) will also be required to confirm what improvements can be proposed and who is responsible for implementing them.

APPENDIX A – WEST RUNNING BROOK ZONING DISTRICT MAP

Town of Derry - West Running Brook Corridor
Study Area



WRB Corridor

Proposed Project Sites

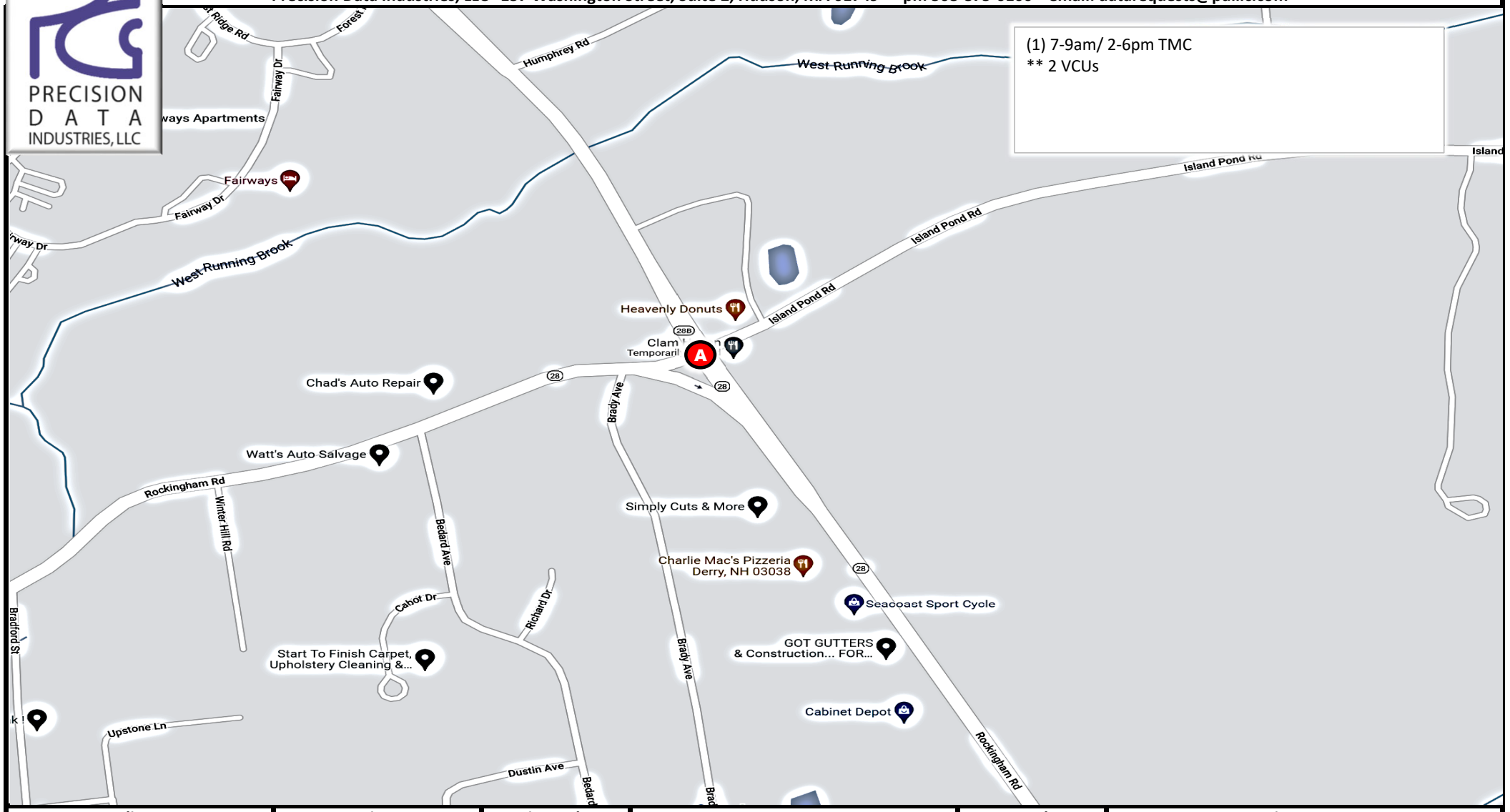
West Running Brook District

Derry
NEW HAMPSHIRE

APPENDIX B – TURNING MOVEMENT COUNT (TMC) DATA

Location Map: 228489 Derry, NH

Precision Data Industries, LLC 157 Washington Street, Suite 2, Hudson, MA 01749 ph: 508-875-0100 email: datarequests@pdillc.com



Client:	Engineer:	Site Code:	Date:	PDI Job #	City, State:
Hoyle Tanner	S. Haas	TBA	Thursday 3/24/22	228489	Derry, NH

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **7:00 AM**
End Time: **9:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Cars and Heavy Vehicles (Combined)

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	44	45	8	0	97	21	46	9	0	76	4	35	28	0	67	22	27	44	0	93	333
7:15 AM	61	89	21	0	171	39	46	15	0	100	5	32	25	0	62	24	23	33	0	80	413
7:30 AM	25	68	11	0	104	21	52	11	0	84	7	38	21	0	66	31	28	21	0	80	334
7:45 AM	16	59	12	0	87	20	53	17	0	90	4	26	29	0	59	37	16	12	0	65	301
Total	146	261	52	0	459	101	197	52	0	350	20	131	103	0	254	114	94	110	0	318	1381
8:00 AM	28	50	3	0	81	9	38	11	0	58	8	34	24	0	66	32	35	17	0	84	289
8:15 AM	25	46	6	0	77	22	50	5	0	77	5	50	23	0	78	37	23	18	0	78	310
8:30 AM	21	50	11	0	82	13	41	10	0	64	3	46	27	0	76	42	29	22	0	93	315
8:45 AM	26	47	12	0	85	14	43	10	0	67	11	41	29	0	81	38	27	15	0	80	313
Total	100	193	32	0	325	58	172	36	0	266	27	171	103	0	301	149	114	72	0	335	1227
Grand Total	246	454	84	0	784	159	369	88	0	616	47	302	206	0	555	263	208	182	0	653	2608
Approach %	31.4	57.9	10.7	0.0		25.8	59.9	14.3	0.0		8.5	54.4	37.1	0.0		40.3	31.9	27.9	0.0		
Total %	9.4	17.4	3.2	0.0	30.1	6.1	14.1	3.4	0.0	23.6	1.8	11.6	7.9	0.0	21.3	10.1	8.0	7.0	0.0	25.0	
Exiting Leg Total					643					339					805					821	2608
Cars	238	438	80	0	756	150	357	83	0	590	43	287	197	0	527	252	200	168	0	620	2493
% Cars	96.7	96.5	95.2	0.0	96.4	94.3	96.7	94.3	0.0	95.8	91.5	95.0	95.6	0.0	95.0	95.8	96.2	92.3	0.0	94.9	95.6
Exiting Leg Total					605					323					773					792	2493
Heavy Vehicles	8	16	4	0	28	9	12	5	0	26	4	15	9	0	28	11	8	14	0	33	115
% Heavy Vehicles	3.3	3.5	4.8	0.0	3.6	5.7	3.3	5.7	0.0	4.2	8.5	5.0	4.4	0.0	5.0	4.2	3.8	7.7	0.0	5.1	4.4
Exiting Leg Total					38					16					32					29	115

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

7:00 AM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	44	45	8	0	97	21	46	9	0	76	4	35	28	0	67	22	27	44	0	93	333
7:15 AM	61	89	21	0	171	39	46	15	0	100	5	32	25	0	62	24	23	33	0	80	413
7:30 AM	25	68	11	0	104	21	52	11	0	84	7	38	21	0	66	31	28	21	0	80	334
7:45 AM	16	59	12	0	87	20	53	17	0	90	4	26	29	0	59	37	16	12	0	65	301
Total Volume	146	261	52	0	459	101	197	52	0	350	20	131	103	0	254	114	94	110	0	318	1381
% Approach Total	31.8	56.9	11.3	0.0		28.9	56.3	14.9	0.0		7.9	51.6	40.6	0.0		35.8	29.6	34.6	0.0		
PHF	0.598	0.733	0.619	0.000	0.671	0.647	0.929	0.765	0.000	0.875	0.714	0.862	0.888	0.000	0.948	0.770	0.839	0.625	0.000	0.855	0.836
Cars	142	250	49	0	441	95	193	48	0	336	19	127	98	0	244	109	92	107	0	308	1329
Cars %	97.3	95.8	94.2	0.0	96.1	94.1	98.0	92.3	0.0	96.0	95.0	96.9	95.1	0.0	96.1	95.6	97.9	97.3	0.0	96.9	96.2
Heavy Vehicles	4	11	3	0	18	6	4	4	0	14	1	4	5	0	10	5	2	3	0	10	52
Heavy Vehicles %	2.7	4.2	5.8	0.0	3.9	5.9	2.0	7.7	0.0	4.0	5.0	3.1	4.9	0.0	3.9	4.4	2.1	2.7	0.0	3.1	3.8
Cars Enter Leg	142	250	49	0	441	95	193	48	0	336	19	127	98	0	244	109	92	107	0	308	1329
Heavy Enter Leg	4	11	3	0	18	6	4	4	0	14	1	4	5	0	10	5	2	3	0	10	52
Total Entering Leg	146	261	52	0	459	101	197	52	0	350	20	131	103	0	254	114	94	110	0	318	1381
Cars Exiting Leg					329					160					407					433	1329
Heavy Exiting Leg					13					6					20					13	52
Total Exiting Leg					342					166					427					446	1381

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **7:00 AM**
End Time: **9:00 AM**

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Class: **Cars**

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	42	43	8	0	93	17	45	9	0	71	3	35	28	0	66	20	27	43	0	90	320
7:15 AM	60	89	21	0	170	38	45	12	0	95	5	31	24	0	60	23	22	33	0	78	403
7:30 AM	24	67	11	0	102	20	50	11	0	81	7	36	20	0	63	30	28	19	0	77	323
7:45 AM	16	51	9	0	76	20	53	16	0	89	4	25	26	0	55	36	15	12	0	63	283
Total	142	250	49	0	441	95	193	48	0	336	19	127	98	0	244	109	92	107	0	308	1329
8:00 AM	26	50	3	0	79	9	34	10	0	53	8	32	24	0	64	31	31	15	0	77	273
8:15 AM	25	44	6	0	75	22	48	5	0	75	4	46	23	0	73	34	21	17	0	72	295
8:30 AM	21	48	10	0	79	12	40	10	0	62	3	42	25	0	70	41	29	17	0	87	298
8:45 AM	24	46	12	0	82	12	42	10	0	64	9	40	27	0	76	37	27	12	0	76	298
Total	96	188	31	0	315	55	164	35	0	254	24	160	99	0	283	143	108	61	0	312	1164
Grand Total	238	438	80	0	756	150	357	83	0	590	43	287	197	0	527	252	200	168	0	620	2493
Approach %	31.5	57.9	10.6	0.0		25.4	60.5	14.1	0.0		8.2	54.5	37.4	0.0		40.6	32.3	27.1	0.0		
Total %	9.5	17.6	3.2	0.0	30.3	6.0	14.3	3.3	0.0	23.7	1.7	11.5	7.9	0.0	21.1	10.1	8.0	6.7	0.0	24.9	
Exiting Leg Total					605					323					773					792	2493

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

7:00 AM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	42	43	8	0	93	17	45	9	0	71	3	35	28	0	66	20	27	43	0	90	320
7:15 AM	60	89	21	0	170	38	45	12	0	95	5	31	24	0	60	23	22	33	0	78	403
7:30 AM	24	67	11	0	102	20	50	11	0	81	7	36	20	0	63	30	28	19	0	77	323
7:45 AM	16	51	9	0	76	20	53	16	0	89	4	25	26	0	55	36	15	12	0	63	283
Total Volume	142	250	49	0	441	95	193	48	0	336	19	127	98	0	244	109	92	107	0	308	1329
% Approach Total	32.2	56.7	11.1	0.0		28.3	57.4	14.3	0.0		7.8	52.0	40.2	0.0		35.4	29.9	34.7	0.0		
PHF	0.592	0.702	0.583	0.000	0.649	0.625	0.910	0.750	0.000	0.884	0.679	0.882	0.875	0.000	0.924	0.757	0.821	0.622	0.000	0.856	0.824
Entering Leg	142	250	49	0	441	95	193	48	0	336	19	127	98	0	244	109	92	107	0	308	1329
Exiting Leg					329					160					407					433	1329
Total					770					496					651					741	2658

PDI File #: **228489 A**
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City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **7:00 AM**
End Time: **9:00 AM**

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	2	2	0	0	4	4	1	0	0	5	1	0	0	0	1	2	0	1	0	3	13
7:15 AM	1	0	0	0	1	1	1	3	0	5	0	1	1	0	2	1	1	0	0	2	10
7:30 AM	1	1	0	0	2	1	2	0	0	3	0	2	1	0	3	1	0	2	0	3	11
7:45 AM	0	8	3	0	11	0	0	1	0	1	0	1	3	0	4	1	1	0	0	2	18
Total	4	11	3	0	18	6	4	4	0	14	1	4	5	0	10	5	2	3	0	10	52
8:00 AM	2	0	0	0	2	0	4	1	0	5	0	2	0	0	2	1	4	2	0	7	16
8:15 AM	0	2	0	0	2	0	2	0	0	2	1	4	0	0	5	3	2	1	0	6	15
8:30 AM	0	2	1	0	3	1	1	0	0	2	0	4	2	0	6	1	0	5	0	6	17
8:45 AM	2	1	0	0	3	2	1	0	0	3	2	1	2	0	5	1	0	3	0	4	15
Total	4	5	1	0	10	3	8	1	0	12	3	11	4	0	18	6	6	11	0	23	63
Grand Total	8	16	4	0	28	9	12	5	0	26	4	15	9	0	28	11	8	14	0	33	115
Approach %	28.6	57.1	14.3	0.0		34.6	46.2	19.2	0.0		14.3	53.6	32.1	0.0		33.3	24.2	42.4	0.0		
Total %	7.0	13.9	3.5	0.0	24.3	7.8	10.4	4.3	0.0	22.6	3.5	13.0	7.8	0.0	24.3	9.6	7.0	12.2	0.0	28.7	
Exiting Leg Total					38					16					32					29	115
Buses	5	3	3	0	11	5	1	0	0	6	0	3	0	0	3	0	1	8	0	9	29
% Buses	62.5	18.8	75.0	0.0	39.3	55.6	8.3	0.0	0.0	23.1	0.0	20.0	0.0	0.0	10.7	0.0	12.5	57.1	0.0	27.3	25.2
Exiting Leg Total					16					4					3					6	29
Single-Unit Trucks	3	12	1	0	16	4	11	5	0	20	3	10	9	0	22	11	7	6	0	24	82
% Single-Unit	37.5	75.0	25.0	0.0	57.1	44.4	91.7	100.0	0.0	76.9	75.0	66.7	100.0	0.0	78.6	100.0	87.5	42.9	0.0	72.7	71.3
Exiting Leg Total					20					11					28					23	82
Articulated Trucks	0	1	0	0	1	0	0	0	0	0	1	2	0	0	3	0	0	0	0	0	4
% Articulated	0.0	6.3	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	25.0	13.3	0.0	0.0	10.7	0.0	0.0	0.0	0.0	0.0	3.5
Exiting Leg Total					2					1					1					0	4

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

7:45 AM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:45 AM	0	8	3	0	11	0	0	1	0	1	0	1	3	0	4	1	1	0	0	2	18
8:00 AM	2	0	0	0	2	0	4	1	0	5	0	2	0	0	2	1	4	2	0	7	16
8:15 AM	0	2	0	0	2	0	2	0	0	2	1	4	0	0	5	3	2	1	0	6	15
8:30 AM	0	2	1	0	3	1	1	0	0	2	0	4	2	0	6	1	0	5	0	6	17
Total Volume	2	12	4	0	18	1	7	2	0	10	1	11	5	0	17	6	7	8	0	21	66
% Approach Total	11.1	66.7	22.2	0.0		10.0	70.0	20.0	0.0		5.9	64.7	29.4	0.0		28.6	33.3	38.1	0.0		
PHF	0.250	0.375	0.333	0.000	0.409	0.250	0.438	0.500	0.000	0.500	0.250	0.688	0.417	0.000	0.708	0.500	0.438	0.400	0.000	0.750	0.917
Buses	2	2	3	0	7	0	1	0	0	1	0	2	0	0	2	0	1	6	0	7	17
Buses %	100.0	16.7	75.0	0.0	38.9	0.0	14.3	0.0	0.0	10.0	0.0	18.2	0.0	0.0	11.8	0.0	14.3	75.0	0.0	33.3	25.8
Single-Unit Trucks	0	10	1	0	11	1	6	2	0	9	1	7	5	0	13	6	6	2	0	14	47
Single-Unit %	0.0	83.3	25.0	0.0	61.1	100.0	85.7	100.0	0.0	90.0	100.0	63.6	100.0	0.0	76.5	100.0	85.7	25.0	0.0	66.7	71.2
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.2	0.0	0.0	11.8	0.0	0.0	0.0	0.0	0.0	3.0
Buses	2	2	3	0	7	0	1	0	0	1	0	2	0	0	2	0	1	6	0	7	17
Single-Unit Trucks	0	10	1	0	11	1	6	2	0	9	1	7	5	0	13	6	6	2	0	14	47
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
Total Entering Leg	2	12	4	0	18	1	7	2	0	10	1	11	5	0	17	6	7	8	0	21	66
Buses					8					4					2					3	17
Single-Unit Trucks					10					8					18					11	47
Articulated Trucks					2					0					0					0	2
Total Exiting Leg					20					12					20					14	66

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **7:00 AM**
End Time: **9:00 AM**

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Class: **Buses**

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	0	1	0	0	1	3	0	0	0	3	0	0	0	0	0	0	0	1	0	1	5
7:15 AM	1	0	0	0	1	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	3
7:30 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:45 AM	0	2	3	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Total	2	3	3	0	8	4	0	0	0	4	0	1	0	0	1	0	0	1	0	1	14
8:00 AM	2	0	0	0	2	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	5
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	1	0	1	3
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	4
8:45 AM	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	1	3
Total	3	0	0	0	3	1	1	0	0	2	0	2	0	0	2	0	1	7	0	8	15
Grand Total	5	3	3	0	11	5	1	0	0	6	0	3	0	0	3	0	1	8	0	9	29
Approach %	45.5	27.3	27.3	0.0		83.3	16.7	0.0	0.0		0.0	100.0	0.0	0.0		0.0	11.1	88.9	0.0		
Total %	17.2	10.3	10.3	0.0	37.9	17.2	3.4	0.0	0.0	20.7	0.0	10.3	0.0	0.0	10.3	0.0	3.4	27.6	0.0	31.0	
Exiting Leg Total					16					4					3					6	29

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

7:45 AM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:45 AM	0	2	3	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
8:00 AM	2	0	0	0	2	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	5
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	1	0	1	3
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	4
Total Volume	2	2	3	0	7	0	1	0	0	1	0	2	0	0	2	0	1	6	0	7	17
% Approach Total	28.6	28.6	42.9	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	14.3	85.7	0.0		
PHF	0.250	0.250	0.250	0.000	0.350	0.000	0.250	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.250	0.000	0.250	0.375	0.000	0.438	0.850
Entering Leg	2	2	3	0	7	0	1	0	0	1	0	2	0	0	2	0	1	6	0	7	17
Exiting Leg					8					4					2					3	17
Total					15					5					4					10	34

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **7:00 AM**
End Time: **9:00 AM**

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Class: **Single-Unit Trucks**

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	2	0	0	0	2	1	1	0	0	2	1	0	0	0	1	2	0	0	0	2	7
7:15 AM	0	0	0	0	0	0	1	3	0	4	0	0	1	0	1	1	1	0	0	2	7
7:30 AM	0	1	0	0	1	1	2	0	0	3	0	2	1	0	3	1	0	2	0	3	10
7:45 AM	0	6	0	0	6	0	0	1	0	1	0	1	3	0	4	1	1	0	0	2	13
Total	2	7	0	0	9	2	4	4	0	10	1	3	5	0	9	5	2	2	0	9	37
8:00 AM	0	0	0	0	0	0	3	1	0	4	0	2	0	0	2	1	3	1	0	5	11
8:15 AM	0	2	0	0	2	0	2	0	0	2	1	1	0	0	2	3	2	0	0	5	11
8:30 AM	0	2	1	0	3	1	1	0	0	2	0	3	2	0	5	1	0	1	0	2	12
8:45 AM	1	1	0	0	2	1	1	0	0	2	1	1	2	0	4	1	0	2	0	3	11
Total	1	5	1	0	7	2	7	1	0	10	2	7	4	0	13	6	5	4	0	15	45
Grand Total	3	12	1	0	16	4	11	5	0	20	3	10	9	0	22	11	7	6	0	24	82
Approach %	18.8	75.0	6.3	0.0		20.0	55.0	25.0	0.0		13.6	45.5	40.9	0.0		45.8	29.2	25.0	0.0		
Total %	3.7	14.6	1.2	0.0	19.5	4.9	13.4	6.1	0.0	24.4	3.7	12.2	11.0	0.0	26.8	13.4	8.5	7.3	0.0	29.3	
Exiting Leg Total					20					11					28					23	82

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

7:45 AM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:45 AM	0	6	0	0	6	0	0	1	0	1	0	1	3	0	4	1	1	0	0	2	13
8:00 AM	0	0	0	0	0	0	3	1	0	4	0	2	0	0	2	1	3	1	0	5	11
8:15 AM	0	2	0	0	2	0	2	0	0	2	1	1	0	0	2	3	2	0	0	5	11
8:30 AM	0	2	1	0	3	1	1	0	0	2	0	3	2	0	5	1	0	1	0	2	12
Total Volume	0	10	1	0	11	1	6	2	0	9	1	7	5	0	13	6	6	2	0	14	47
% Approach Total	0.0	90.9	9.1	0.0		11.1	66.7	22.2	0.0		7.7	53.8	38.5	0.0		42.9	42.9	14.3	0.0		
PHF	0.000	0.417	0.250	0.000	0.458	0.250	0.500	0.500	0.000	0.563	0.250	0.583	0.417	0.000	0.650	0.500	0.500	0.500	0.000	0.700	0.904
Entering Leg	0	10	1	0	11	1	6	2	0	9	1	7	5	0	13	6	6	2	0	14	47
Exiting Leg					10					8					18					11	47
Total					21					17					31					25	94

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **7:00 AM**
End Time: **9:00 AM**

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Class: **Articulated Trucks**

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3	0	0	0	0	0	3
Grand Total	0	1	0	0	1	0	0	0	0	0	1	2	0	0	3	0	0	0	0	0	4
Approach %	0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		33.3	66.7	0.0	0.0		0.0	0.0	0.0	0.0		
Total %	0.0	25.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	25.0	50.0	0.0	0.0	75.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total					2					1					1					0	4

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

8:00 AM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3	0	0	0	0	0	3
% Approach Total	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		33.3	66.7	0.0	0.0		0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.500	0.000	0.000	0.750	0.000	0.000	0.000	0.000	0.000	0.750
Entering Leg	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3	0	0	0	0	0	3
Exiting Leg					2					1					0					0	3
Total					2					1					3					0	6

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **7:00 AM**
End Time: **9:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Bicycles (on Roadway and Crosswalks)

	South Main Street (Rte 28 Bypass)							Island Pond Road							Rockingham Road (Route 28)							Rockingham Road (Route 28)							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total							0							0							0							0	0

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

7:00 AM	South Main Street (Rte 28 Bypass)							Island Pond Road							Rockingham Road (Route 28)							Rockingham Road (Route 28)							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg							0							0							0							0	0
Total							0							0							0							0	0

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **7:00 AM**
End Time: **9:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Pedestrians

	South Main Street (Rte 28 Bypass)							Island Pond Road							Rockingham Road (Route 28)							Rockingham Road (Route 28)							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0		0	0	0	0	0	0		0	0	0	0	0	0		0	0	0	0	0	0		
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Exiting Leg Total							0							0							0							0	0

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

7:00 AM	South Main Street (Rte 28 Bypass)							Island Pond Road							Rockingham Road (Route 28)							Rockingham Road (Route 28)							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg							0							0							0							0	0
Total							0							0							0							0	0

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Cars and Heavy Vehicles (Combined)

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	26	50	17	0	93	8	26	7	0	41	8	51	40	0	99	29	38	19	0	86	319
2:15 PM	22	48	11	0	81	10	31	3	0	44	6	43	25	0	74	34	29	31	0	94	293
2:30 PM	40	48	19	0	107	19	42	1	0	62	11	53	37	0	101	41	37	24	0	102	372
2:45 PM	28	48	9	0	85	27	31	9	0	67	12	52	41	0	105	54	33	19	0	106	363
Total	116	194	56	0	366	64	130	20	0	214	37	199	143	0	379	158	137	93	0	388	1347
3:00 PM	36	65	22	0	123	17	37	11	0	65	12	63	44	0	119	46	29	37	0	112	419
3:15 PM	38	47	22	0	107	9	35	8	0	52	7	64	47	0	118	43	43	30	0	116	393
3:30 PM	26	56	14	0	96	6	26	4	0	36	14	57	36	0	107	46	63	18	0	127	366
3:45 PM	38	48	13	0	99	15	30	10	0	55	9	53	45	0	107	50	36	29	0	115	376
Total	138	216	71	0	425	47	128	33	0	208	42	237	172	0	451	185	171	114	0	470	1554
4:00 PM	25	40	6	0	71	8	33	7	0	48	10	67	52	0	129	38	43	28	0	109	357
4:15 PM	14	51	15	0	80	18	28	7	0	53	13	63	34	0	110	43	51	19	0	113	356
4:30 PM	27	58	19	0	104	14	36	3	0	53	13	53	33	0	99	48	55	27	0	130	386
4:45 PM	25	46	11	0	82	13	37	4	0	54	19	54	40	0	113	39	55	22	0	116	365
Total	91	195	51	0	337	53	134	21	0	208	55	237	159	0	451	168	204	96	0	468	1464
5:00 PM	20	36	20	0	76	9	39	7	0	55	10	73	46	0	129	57	53	31	0	141	401
5:15 PM	18	54	13	0	85	11	28	6	0	45	21	68	41	0	130	41	61	16	0	118	378
5:30 PM	16	40	15	0	71	16	37	4	0	57	12	72	35	0	119	48	45	14	0	107	354
5:45 PM	19	43	15	0	77	7	27	9	0	43	7	50	40	0	97	42	44	30	0	116	333
Total	73	173	63	0	309	43	131	26	0	200	50	263	162	0	475	188	203	91	0	482	1466
Grand Total	418	778	241	0	1437	207	523	100	0	830	184	936	636	0	1756	699	715	394	0	1808	5831
Approach %	29.1	54.1	16.8	0.0		24.9	63.0	12.0	0.0		10.5	53.3	36.2	0.0		38.7	39.5	21.8	0.0		
Total %	7.2	13.3	4.1	0.0	24.6	3.5	9.0	1.7	0.0	14.2	3.2	16.1	10.9	0.0	30.1	12.0	12.3	6.8	0.0	31.0	
Exiting Leg Total					1537					1140					1577					1577	5831
Cars	410	761	228	0	1399	197	510	96	0	803	178	907	622	0	1707	685	704	381	0	1770	5679
% Cars	98.1	97.8	94.6	0.0	97.4	95.2	97.5	96.0	0.0	96.7	96.7	96.9	97.8	0.0	97.2	98.0	98.5	96.7	0.0	97.9	97.4
Exiting Leg Total					1485					1110					1542					1542	5679
Heavy Vehicles	8	17	13	0	38	10	13	4	0	27	6	29	14	0	49	14	11	13	0	38	152
% Heavy Vehicles	1.9	2.2	5.4	0.0	2.6	4.8	2.5	4.0	0.0	3.3	3.3	3.1	2.2	0.0	2.8	2.0	1.5	3.3	0.0	2.1	2.6
Exiting Leg Total					52					30					35					35	152

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

3:00 PM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
3:00 PM	36	65	22	0	123	17	37	11	0	65	12	63	44	0	119	46	29	37	0	112	419
3:15 PM	38	47	22	0	107	9	35	8	0	52	7	64	47	0	118	43	43	30	0	116	393
3:30 PM	26	56	14	0	96	6	26	4	0	36	14	57	36	0	107	46	63	18	0	127	366
3:45 PM	38	48	13	0	99	15	30	10	0	55	9	53	45	0	107	50	36	29	0	115	376
Total Volume	138	216	71	0	425	47	128	33	0	208	42	237	172	0	451	185	171	114	0	470	1554
% Approach Total	32.5	50.8	16.7	0.0		22.6	61.5	15.9	0.0		9.3	52.5	38.1	0.0		39.4	36.4	24.3	0.0		
PHF	0.908	0.831	0.807	0.000	0.864	0.691	0.865	0.750	0.000	0.800	0.750	0.926	0.915	0.000	0.947	0.925	0.679	0.770	0.000	0.925	0.927
Cars	134	211	67	0	412	43	123	31	0	197	41	227	165	0	433	184	167	107	0	458	1500
Cars %	97.1	97.7	94.4	0.0	96.9	91.5	96.1	93.9	0.0	94.7	97.6	95.8	95.9	0.0	96.0	99.5	97.7	93.9	0.0	97.4	96.5
Heavy Vehicles	4	5	4	0	13	4	5	2	0	11	1	10	7	0	18	1	4	7	0	12	54
Heavy Vehicles %	2.9	2.3	5.6	0.0	3.1	8.5	3.9	6.1	0.0	5.3	2.4	4.2	4.1	0.0	4.0	0.5	2.3	6.1	0.0	2.6	3.5
Cars Enter Leg	134	211	67	0	412	43	123	31	0	197	41	227	165	0	433	184	167	107	0	458	1500
Heavy Enter Leg	4	5	4	0	13	4	5	2	0	11	1	10	7	0	18	1	4	7	0	12	54
Total Entering Leg	138	216	71	0	425	47	128	33	0	208	42	237	172	0	451	185	171	114	0	470	1554
Cars Exiting Leg					377					275					426					422	1500
Heavy Exiting Leg					21					9					8					16	54
Total Exiting Leg					398					284					434					438	1554

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **2:00 PM**
End Time: **6:00 PM**

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Class: **Cars**

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	25	49	14	0	88	8	24	7	0	39	8	48	40	0	96	25	37	18	0	80	303
2:15 PM	21	46	11	0	78	10	30	3	0	43	6	41	24	0	71	31	28	29	0	88	280
2:30 PM	39	46	17	0	102	17	41	1	0	59	10	49	35	0	94	41	35	24	0	100	355
2:45 PM	28	48	8	0	84	26	30	8	0	64	11	51	41	0	103	52	33	19	0	104	355
Total	113	189	50	0	352	61	125	19	0	205	35	189	140	0	364	149	133	90	0	372	1293
3:00 PM	34	62	20	0	116	15	36	11	0	62	12	62	40	0	114	46	29	37	0	112	404
3:15 PM	37	47	22	0	106	9	33	6	0	48	7	62	46	0	115	42	42	26	0	110	379
3:30 PM	26	56	14	0	96	5	26	4	0	35	13	52	36	0	101	46	61	17	0	124	356
3:45 PM	37	46	11	0	94	14	28	10	0	52	9	51	43	0	103	50	35	27	0	112	361
Total	134	211	67	0	412	43	123	31	0	197	41	227	165	0	433	184	167	107	0	458	1500
4:00 PM	25	39	6	0	70	7	33	7	0	47	10	66	50	0	126	38	43	27	0	108	351
4:15 PM	14	51	15	0	80	17	27	7	0	51	12	62	34	0	108	42	51	17	0	110	349
4:30 PM	27	56	19	0	102	14	35	3	0	52	12	53	32	0	97	46	55	27	0	128	379
4:45 PM	25	46	9	0	80	12	36	4	0	52	18	52	40	0	110	39	54	22	0	115	357
Total	91	192	49	0	332	50	131	21	0	202	52	233	156	0	441	165	203	93	0	461	1436
5:00 PM	19	36	20	0	75	9	39	7	0	55	10	71	46	0	127	57	51	31	0	139	396
5:15 PM	18	52	12	0	82	11	28	6	0	45	21	66	41	0	128	40	61	16	0	117	372
5:30 PM	16	39	15	0	70	16	37	4	0	57	12	71	35	0	118	48	45	14	0	107	352
5:45 PM	19	42	15	0	76	7	27	8	0	42	7	50	39	0	96	42	44	30	0	116	330
Total	72	169	62	0	303	43	131	25	0	199	50	258	161	0	469	187	201	91	0	479	1450
Grand Total	410	761	228	0	1399	197	510	96	0	803	178	907	622	0	1707	685	704	381	0	1770	5679
Approach %	29.3	54.4	16.3	0.0		24.5	63.5	12.0	0.0		10.4	53.1	36.4	0.0		38.7	39.8	21.5	0.0		
Total %	7.2	13.4	4.0	0.0	24.6	3.5	9.0	1.7	0.0	14.1	3.1	16.0	11.0	0.0	30.1	12.1	12.4	6.7	0.0	31.2	
Exiting Leg Total					1485					1110					1542					1542	5679

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:30 PM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
4:30 PM	27	56	19	0	102	14	35	3	0	52	12	53	32	0	97	46	55	27	0	128	379
4:45 PM	25	46	9	0	80	12	36	4	0	52	18	52	40	0	110	39	54	22	0	115	357
5:00 PM	19	36	20	0	75	9	39	7	0	55	10	71	46	0	127	57	51	31	0	139	396
5:15 PM	18	52	12	0	82	11	28	6	0	45	21	66	41	0	128	40	61	16	0	117	372
Total Volume	89	190	60	0	339	46	138	20	0	204	61	242	159	0	462	182	221	96	0	499	1504
% Approach Total	26.3	56.0	17.7	0.0		22.5	67.6	9.8	0.0		13.2	52.4	34.4	0.0		36.5	44.3	19.2	0.0		
PHF	0.824	0.848	0.750	0.000	0.831	0.821	0.885	0.714	0.000	0.927	0.726	0.852	0.864	0.000	0.902	0.798	0.906	0.774	0.000	0.897	0.949
Entering Leg	89	190	60	0	339	46	138	20	0	204	61	242	159	0	462	182	221	96	0	499	1504
Exiting Leg					384					342					392					386	1504
Total					723					546					854					885	3008

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **2:00 PM**
End Time: **6:00 PM**

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	1	1	3	0	5	0	2	0	0	2	0	3	0	0	3	4	1	1	0	6	16
2:15 PM	1	2	0	0	3	0	1	0	0	1	0	2	1	0	3	3	1	2	0	6	13
2:30 PM	1	2	2	0	5	2	1	0	0	3	1	4	2	0	7	0	2	0	0	2	17
2:45 PM	0	0	1	0	1	1	1	1	0	3	1	1	0	0	2	2	0	0	0	2	8
Total	3	5	6	0	14	3	5	1	0	9	2	10	3	0	15	9	4	3	0	16	54
3:00 PM	2	3	2	0	7	2	1	0	0	3	0	1	4	0	5	0	0	0	0	0	15
3:15 PM	1	0	0	0	1	0	2	2	0	4	0	2	1	0	3	1	1	4	0	6	14
3:30 PM	0	0	0	0	0	1	0	0	0	1	1	5	0	0	6	0	2	1	0	3	10
3:45 PM	1	2	2	0	5	1	2	0	0	3	0	2	2	0	4	0	1	2	0	3	15
Total	4	5	4	0	13	4	5	2	0	11	1	10	7	0	18	1	4	7	0	12	54
4:00 PM	0	1	0	0	1	1	0	0	0	1	0	1	2	0	3	0	0	1	0	1	6
4:15 PM	0	0	0	0	0	1	1	0	0	2	1	1	0	0	2	1	0	2	0	3	7
4:30 PM	0	2	0	0	2	0	1	0	0	1	1	0	1	0	2	2	0	0	0	2	7
4:45 PM	0	0	2	0	2	1	1	0	0	2	1	2	0	0	3	0	1	0	0	1	8
Total	0	3	2	0	5	3	3	0	0	6	3	4	3	0	10	3	1	3	0	7	28
5:00 PM	1	0	0	0	1	0	0	0	0	0	0	2	0	0	2	0	2	0	0	2	5
5:15 PM	0	2	1	0	3	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	6
5:30 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
5:45 PM	0	1	0	0	1	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	3
Total	1	4	1	0	6	0	0	1	0	1	0	5	1	0	6	1	2	0	0	3	16
Grand Total	8	17	13	0	38	10	13	4	0	27	6	29	14	0	49	14	11	13	0	38	152
Approach %	21.1	44.7	34.2	0.0		37.0	48.1	14.8	0.0		12.2	59.2	28.6	0.0		36.8	28.9	34.2	0.0		
Total %	5.3	11.2	8.6	0.0	25.0	6.6	8.6	2.6	0.0	17.8	3.9	19.1	9.2	0.0	32.2	9.2	7.2	8.6	0.0	25.0	
Exiting Leg Total					52					30					35					35	152
Buses	2	2	5	0	9	3	4	0	0	7	0	8	1	0	9	2	2	9	0	13	38
% Buses	25.0	11.8	38.5	0.0	23.7	30.0	30.8	0.0	0.0	25.9	0.0	27.6	7.1	0.0	18.4	14.3	18.2	69.2	0.0	34.2	25.0
Exiting Leg Total					20					7					4					7	38
Single-Unit Trucks	6	12	7	0	25	7	7	3	0	17	6	20	10	0	36	10	7	4	0	21	99
% Single-Unit	75.0	70.6	53.8	0.0	65.8	70.0	53.8	75.0	0.0	63.0	100.0	69.0	71.4	0.0	73.5	71.4	63.6	30.8	0.0	55.3	65.1
Exiting Leg Total					31					20					25					23	99
Articulated Trucks	0	3	1	0	4	0	2	1	0	3	0	1	3	0	4	2	2	0	0	4	15
% Articulated	0.0	17.6	7.7	0.0	10.5	0.0	15.4	25.0	0.0	11.1	0.0	3.4	21.4	0.0	8.2	14.3	18.2	0.0	0.0	10.5	9.9
Exiting Leg Total					1					3					6					5	15

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	1	1	3	0	5	0	2	0	0	2	0	3	0	0	3	4	1	1	0	6	16
2:15 PM	1	2	0	0	3	0	1	0	0	1	0	2	1	0	3	3	1	2	0	6	13
2:30 PM	1	2	2	0	5	2	1	0	0	3	1	4	2	0	7	0	2	0	0	2	17
2:45 PM	0	0	1	0	1	1	1	1	0	3	1	1	0	0	2	2	0	0	0	2	8
Total Volume	3	5	6	0	14	3	5	1	0	9	2	10	3	0	15	9	4	3	0	16	54
% Approach Total	21.4	35.7	42.9	0.0		33.3	55.6	11.1	0.0		13.3	66.7	20.0	0.0		56.3	25.0	18.8	0.0		
PHF	0.750	0.625	0.500	0.000	0.700	0.375	0.625	0.250	0.000	0.750	0.500	0.625	0.375	0.000	0.536	0.563	0.500	0.375	0.000	0.667	0.794
Buses	0	1	4	0	5	2	3	0	0	5	0	2	0	0	2	2	0	3	0	5	17
Buses %	0.0	20.0	66.7	0.0	35.7	66.7	60.0	0.0	0.0	55.6	0.0	20.0	0.0	0.0	13.3	22.2	0.0	100.0	0.0	31.3	31.5
Single-Unit Trucks	3	4	2	0	9	1	2	1	0	4	2	8	2	0	12	5	3	0	0	8	33
Single-Unit %	100.0	80.0	33.3	0.0	64.3	33.3	40.0	100.0	0.0	44.4	100.0	80.0	66.7	0.0	80.0	55.6	75.0	0.0	0.0	50.0	61.1
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	1	0	0	3	4
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	6.7	22.2	25.0	0.0	0.0	18.8	7.4
Buses	0	1	4	0	5	2	3	0	0	5	0	2	0	0	2	2	0	3	0	5	17
Single-Unit Trucks	3	4	2	0	9	1	2	1	0	4	2	8	2	0	12	5	3	0	0	8	33
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	1	0	0	3	4
Total Entering Leg	3	5	6	0	14	3	5	1	0	9	2	10	3	0	15	9	4	3	0	16	54
Buses					7					4					3					3	17

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **2:00 PM**
End Time: **6:00 PM**

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
Single-Unit Trucks					9					7					10					7	33
Articulated Trucks					0					1					2					1	4
Total Exiting Leg					16					12					15					11	54

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Buses

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	1	3	0	4	0	2	0	0	2	0	0	0	0	0	1	0	1	0	2	8
2:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	2	0	3	4
2:30 PM	0	0	0	0	0	2	0	0	0	2	0	2	0	0	2	0	0	0	0	0	4
2:45 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	4	0	5	2	3	0	0	5	0	2	0	0	2	2	0	3	0	5	17
3:00 PM	1	1	1	0	3	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	5
3:15 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	4
3:30 PM	0	0	0	0	0	1	0	0	0	1	0	4	0	0	4	0	2	0	0	2	7
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	0	2	3
Total	2	1	1	0	4	1	1	0	0	2	0	5	1	0	6	0	2	5	0	7	19
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Grand Total	2	2	5	0	9	3	4	0	0	7	0	8	1	0	9	2	2	9	0	13	38
Approach %	22.2	22.2	55.6	0.0		42.9	57.1	0.0	0.0		0.0	88.9	11.1	0.0		15.4	15.4	69.2	0.0		
Total %	5.3	5.3	13.2	0.0	23.7	7.9	10.5	0.0	0.0	18.4	0.0	21.1	2.6	0.0	23.7	5.3	5.3	23.7	0.0	34.2	
Exiting Leg Total					20					7					4					7	38

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

3:00 PM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
3:00 PM	1	1	1	0	3	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	5
3:15 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	4
3:30 PM	0	0	0	0	0	1	0	0	0	1	0	4	0	0	4	0	2	0	0	2	7
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	0	2	3
Total Volume	2	1	1	0	4	1	1	0	0	2	0	5	1	0	6	0	2	5	0	7	19
% Approach Total	50.0	25.0	25.0	0.0		50.0	50.0	0.0	0.0		0.0	83.3	16.7	0.0		0.0	28.6	71.4	0.0		
PHF	0.500	0.250	0.250	0.000	0.333	0.250	0.250	0.000	0.000	0.500	0.000	0.313	0.250	0.000	0.375	0.000	0.250	0.417	0.000	0.583	0.679
Entering Leg	2	1	1	0	4	1	1	0	0	2	0	5	1	0	6	0	2	5	0	7	19
Exiting Leg					11					3					1					4	19
Total					15					5					7					11	38

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **2:00 PM**
End Time: **6:00 PM**

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Class:

Single-Unit Trucks

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	1	0	0	0	1	0	0	0	0	0	0	3	0	0	3	2	1	0	0	3	7
2:15 PM	1	2	0	0	3	0	0	0	0	0	0	2	1	0	3	2	1	0	0	3	9
2:30 PM	1	2	2	0	5	0	1	0	0	1	1	2	1	0	4	0	1	0	0	1	11
2:45 PM	0	0	0	0	0	1	1	1	0	3	1	1	0	0	2	1	0	0	0	1	6
Total	3	4	2	0	9	1	2	1	0	4	2	8	2	0	12	5	3	0	0	8	33
3:00 PM	1	2	1	0	4	2	0	0	0	2	0	1	3	0	4	0	0	0	0	0	10
3:15 PM	0	0	0	0	0	0	1	1	0	2	0	1	1	0	2	1	0	1	0	2	6
3:30 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	1	0	1	3
3:45 PM	1	2	2	0	5	1	1	0	0	2	0	1	1	0	2	0	1	0	0	1	10
Total	2	4	3	0	9	3	2	1	0	6	1	4	5	0	10	1	1	2	0	4	29
4:00 PM	0	1	0	0	1	1	0	0	0	1	0	1	1	0	2	0	0	0	0	0	4
4:15 PM	0	0	0	0	0	1	1	0	0	2	1	1	0	0	2	1	0	2	0	3	7
4:30 PM	0	1	0	0	1	0	1	0	0	1	1	0	1	0	2	2	0	0	0	2	6
4:45 PM	0	0	2	0	2	1	1	0	0	2	1	2	0	0	3	0	1	0	0	1	8
Total	0	2	2	0	4	3	3	0	0	6	3	4	2	0	9	3	1	2	0	6	25
5:00 PM	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	2	0	0	2	4
5:15 PM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	4
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
5:45 PM	0	1	0	0	1	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	3
Total	1	2	0	0	3	0	0	1	0	1	0	4	1	0	5	1	2	0	0	3	12
Grand Total	6	12	7	0	25	7	7	3	0	17	6	20	10	0	36	10	7	4	0	21	99
Approach %	24.0	48.0	28.0	0.0		41.2	41.2	17.6	0.0		16.7	55.6	27.8	0.0		47.6	33.3	19.0	0.0		
Total %	6.1	12.1	7.1	0.0	25.3	7.1	7.1	3.0	0.0	17.2	6.1	20.2	10.1	0.0	36.4	10.1	7.1	4.0	0.0	21.2	
Exiting Leg Total					31					20					25					23	99

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:15 PM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:15 PM	1	2	0	0	3	0	0	0	0	0	0	2	1	0	3	2	1	0	0	3	9
2:30 PM	1	2	2	0	5	0	1	0	0	1	1	2	1	0	4	0	1	0	0	1	11
2:45 PM	0	0	0	0	0	1	1	1	0	3	1	1	0	0	2	1	0	0	0	1	6
3:00 PM	1	2	1	0	4	2	0	0	0	2	0	1	3	0	4	0	0	0	0	0	10
Total Volume	3	6	3	0	12	3	2	1	0	6	2	6	5	0	13	3	2	0	0	5	36
% Approach Total	25.0	50.0	25.0	0.0		50.0	33.3	16.7	0.0		15.4	46.2	38.5	0.0		60.0	40.0	0.0	0.0		
PHF	0.750	0.750	0.375	0.000	0.600	0.375	0.500	0.250	0.000	0.500	0.500	0.750	0.417	0.000	0.813	0.375	0.500	0.000	0.000	0.417	0.818
Entering Leg	3	6	3	0	12	3	2	1	0	6	2	6	5	0	13	3	2	0	0	5	36
Exiting Leg					9					7					10					10	36
Total					21					13					23					15	72

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **2:00 PM**
End Time: **6:00 PM**

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Class: **Articulated Trucks**

	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	2
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	1	0	0	3	4
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	1	1	0	2	0	1	0	0	1	0	1	0	0	1	4
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	2
Total	0	0	0	0	0	0	2	1	0	3	0	1	1	0	2	0	1	0	0	1	6
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Grand Total	0	3	1	0	4	0	2	1	0	3	0	1	3	0	4	2	2	0	0	4	15
Approach %	0.0	75.0	25.0	0.0		0.0	66.7	33.3	0.0		0.0	25.0	75.0	0.0		50.0	50.0	0.0	0.0		
Total %	0.0	20.0	6.7	0.0	26.7	0.0	13.3	6.7	0.0	20.0	0.0	6.7	20.0	0.0	26.7	13.3	13.3	0.0	0.0	26.7	
Exiting Leg Total					1					3					6					5	15

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:30 PM	South Main Street (Rte 28 Bypass)					Island Pond Road					Rockingham Road (Route 28)					Rockingham Road (Route 28)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	2
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	1	1	0	2	0	1	0	0	1	0	1	0	0	1	4
Total Volume	0	0	0	0	0	0	1	1	0	2	0	1	1	0	2	1	2	0	0	3	7
% Approach Total	0.0	0.0	0.0	0.0		0.0	50.0	50.0	0.0		0.0	50.0	50.0	0.0		33.3	66.7	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.250	0.000	0.250	0.000	0.250	0.250	0.000	0.500	0.250	0.500	0.000	0.000	0.750	0.438
Entering Leg	0	0	0	0	0	0	1	1	0	2	0	1	1	0	2	1	2	0	0	3	7
Exiting Leg					1					2					2					2	7
Total					1					4					4					5	14

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Bicycles (on Roadway and Crosswalks)

	South Main Street (Rte 28 Bypass)							Island Pond Road							Rockingham Road (Route 28)							Rockingham Road (Route 28)							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total							0							0							0							0	0

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	South Main Street (Rte 28 Bypass)							Island Pond Road							Rockingham Road (Route 28)							Rockingham Road (Route 28)							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg							0							0							0							0	0
Total							0							0							0							0	0

PDI File #: **228489 A**
Location: **N: South Main Street (Rte 28 Bypass) S: Rockingham Road (Route 28)**
Location: **E: Island Pond Road W: Rockingham Road (Route 28)**
City, State: **Derry, NH**
Client: **Hoyle-Tanner/S. Haas**
Site Code: **TBA**
Count Date: **Thursday, March 24, 2022**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
157 Washington Street, Suite 2
Hudson, MA 01749
Office: 508-875-0100 Fax: 508-875-0118

Pedestrians

	South Main Street (Rte 28 Bypass)							Island Pond Road							Rockingham Road (Route 28)							Rockingham Road (Route 28)							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Approach %	0	0	0	0	100	0		0	0	0	0	0	0		0	0	0	0	0	0		0	0	0	0	0	0		
Total %	0	0	0	0	100	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Exiting Leg Total							1							0							0							0	1

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	South Main Street (Rte 28 Bypass)							Island Pond Road							Rockingham Road (Route 28)							Rockingham Road (Route 28)							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Approach Total	0.0	0.0	0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250
Entering Leg	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Exiting Leg							1							0							0							0	1
Total							2							0							0							0	2

APPENDIX C – CRASH DATA FROM 2019 THROUGH 2021

Crashes in the Study Area between June 1, 2019 and May 31, 2022
Derry Police Department

Crash Number	Date	Time	Location	Detailed Location	Cause
19-409-AC	7/13/2019	2:22 PM	*Clam Haven/94 Rockingham Road @ S Main St	5ft north of 94 Rockingham Road and S Main St	Following Too Closely
19-416-AC	7/16/2019	3:09 PM	*Clam Haven/94 Rockingham Road @ S Main St	94 Rockingham Rd & Island Pond Rd Intersection	Fail to Yield Right of Way
19-427-AC	7/21/2019	1:04 PM	Rockingham Rd @ Bedard Ave	75ft East of Rockingham Rd and Bedard Ave	Following Too Closely
19-433-AC	7/26/2019	1:52 PM	*Clam Haven/Island Pond Rd @ Rockingham Rd	10ft East of Island Pond Rd & Rockingham Rd/Street & Parking lot	Improper Backing/Parking lot to street
19-422-AC	7/31/2019	8:00 AM	82 Rockingham Rd (Area)		Living Animal (Deer) Crossing Road
19-550-AC	9/25/2019	2:18 PM	*Clam Haven/94 Rockingham Road @ Island Pond Rd	94 Rockingham Rd & Island Pond Rd Intersection	Following Too Closely
19-735-AC	12/14/2019	12:17 AM	100 Rockingham Road (Into Trailer at Trailer Park)		Unsafe Backing
20-29-AC	1/16/2020	2:39 PM	100 Rockingham Road (within the Trailer Park)		Limitations on Backing
20-54-AC	1/28/2020	11:35 AM	Clam Haven/94 Rockingham Road @ S Main St	25ft S of 94 Rockingham Road & S Main St / Pillars at Rest	Tried to push through pillars because in a hurry
20-94-AC	2/14/2020	9:09 AM	Hawk Products/Rt 28 @ Island Pond Road	300 Ft South of Rt 28 and Island Pond Road	Fail to Yield Right of Way
10-140-AC	3/18/2020	1:22 PM	*Rt 28 @ Island Pond Road Intersection		Fail to Yield While making left-hand turn
20-193-AC	5/23/2020	7:30 PM	Rt 28 @ Island Pond Rd (at Merge)		Fail to Yield at Merge
20-235-AC	6/19/2020	4:11 PM	*Rockingham Rd @ Island Pond Rd (Merge to Clam Haven)		Fail to Yield plus improper turn
20-247-AC	6/28/2020	11:45 AM	2 Island Pond Road @ Island Pond Road	5ft E of 2 Island Pond Rd	Fail to Yield to Traffic on the Right
20-313-AC	8/8/2020	4:47 PM	Rt 28 @ Island Pond Road Intersection	50 Ft N of Rt 28 and Island Pond Road	Driver Inattention

Crashes in the Study Area between June 1, 2019 and May 31, 2022
Derry Police Department

20-352-AC	8/31/2020	3:19 PM	*Rockingham Rd @ Island Pond Rd	10 ft S of Rt 28/Rockingham Road & Island Pond Rd	Fail to Maintain Safe Distance/Inattention/Distraction
20-423-AC	10/9/2020	2:40 PM	B&H Oil/Island Pond Road @ South Main Street		Fail to Yield to Oncoming Traffic
20-447-AC	10/29/2020	1:59 PM	*S Main St @ Island Pond Road (Intersection)		Disobey Traffic Control Device/Rain/Distraction
20-543-AC	12/17/2020	8:35 AM	*Island Pont Rd @ Rockingham Rd (Intersection)		Speed-Too Fast for Snowy Conditions
21-53-AC	2/1/2021	11:49 AM	Clam Haven/S Main St @ Island Pond Rd	75 ft N of S Main St and Island Pond Rd	Crossing Center Line
21-169-AC	4/4/2021	3:22 PM	*Rockingham Rd @ Island Pond Rd (Intersection)		Fail to Yield to Oncoming Traffic
21-271-AC	6/5/2021	10:17 AM	88 Rockingham Rd @ Rockingham Rd	10 Ft E of 88 Rockingham Rd & Rockingham Rd	Unsafe Backing/Fail to Yield
21-280-AC	6/9/2021	5:04 PM	*S Main St @ Island Pond Road	1 ft N of S Main St and Island Pond Rd	Fail to Yield Right-of-Way to Oncoming Traffic
21-293-AC	6/13/2021	3:24 PM	*Clam Haven/Rd 28 @ Island Pond Rd	1 Ft S of Rt 28 and Island Pond Rd	Negligent Driving - Speed & Fail to Stop
21-303-AC	6/18/2021	9:59 PM	S Main St @ 36 Main St (at B&H Oil Driveway)		Fail to Yield Right of Way while attempting LH turn into parking lot
21-328-AC	7/10/2021	12:43 PM	*Rt 28 @ Island Pond Road Intersection		Driver Inattention
21-414-AC	8/28/2021	9:41 AM	B&H Oil/36 S Main St @ Island Pond Rd (Intersection)		Following Too Closely
21-475-AC	9/30/2021	3:50 PM	*Rockingham Rd @ Island Pond Rd (Intersection)		Fail to Yield Right-of-Way
21-487-AC	10/6/2021	1:43 PM	Clam Haven/94 Rockingham Rd @ S Main St	500 Ft S of 94 Rockingham Rd and S Main Street (Merge and S/B)	Driver Inattention
21-622-AC	12/18/2021	12:57 PM	Rt 28 @ Island Pond Rd	20 Ft S of Rt 28 and Island Pond Rd	Negligent Driving on Wet Road (looking for dog)
21-625-AC	12/18/2021	7:07 PM	1 Island Pond Road @ S Main Street	200 Ft E of 1 Island Pond Rr and S Main St	Driving too fast for existing conditions - Heavy Snow
21-637-AC	12/21/2021	3:03 PM	Rt 28 @ Rockingham Rd (At Merge)		Failure to Yield
21-649-AC	12/27/2021	4:50 PM	*S Main St @ Island Pond Rd (Intersection)		Failure to Yield

Crashes in the Study Area between June 1, 2019 and May 31, 2022
Derry Police Department

22-40-AC	1/27/2022	12:48 PM	B&H Oil/S Main St @ Island Pond Rd (Intersection)		Mechanical Issue with Vehicle
22-94-AC	2/14/2022	5:06 PM	*Webster's Corner/Rockingham Rd @ Island Pond Rd		Failure to Yield - Traffic Control Violation
22-118-AC	2/25/2022	2:32 PM	Rockingham Rd @ Brady Ave	Rockingham Rd Near Brady Ave	Too fast for existing conditions - Snow
22-166-AC	3/25/2022	3:22 PM	*Rt 28 @ Island Pond Rd (Intersection)		Failure to Yield While Taking Left Turn
22-172-AC	3/30/2022	8:26 PM	S Main St @ Island Pond Rd (Intersection)	300 Ft N of S Main St and Island Pond Rd	Pedestrian Walk W/Traffic, No reflective, Poorly Lit Area

**Crashes occurring at the study intersection*

Failure to Yield Crashes Located at the Study Intersection

Crash Number	Date	Time	Direction of Vehicle 1	Direction of Vehicle 2	Description of Crash
19-416-AC	7/16/2019	15:09	Turning left from Rockingham to South Main Street	Westbound from Island Pond Road.	Eastbound vehicle making left hand turn northbound onto Rt 28 failed to yield to westbound traffic.
10-140-AC	3/18/2020	13:22	Turning left from Island Pond Road onto Rt 28.	Eastbound from Rockingham Road	Westbound vehicle making a left hand turn southbound onto Rt 28 failed to yield to eastbound vehicle.
20-235-AC	6/19/2020	16:11	Southbound on Rt 28	Turning left across merge into Clam Haven	A vehicle making an illegal left turn from the right turn merge, across southbound lane, into Clam Haven. Southbound motorcycle swerved and lost control.
21-169-AC	4/4/2021	15:27	Turning left from Rockingham to South Main Street	Westbound from Island Pond Road.	Eastbound vehicle making left hand turn northbound onto Rt 28 failed to yield to westbound traffic.
21-280-AC	6/9/2021	17:04	Northbound on Rt 28	Turning left into gas station.	Southbound vehicle turning left into gas station just north of the intersection hit by northbound vehicle.
21-475-AC	9/30/2021	15:50	Turning left from Rockingham to South Main Street	Westbound from Island Pond Road.	Eastbound vehicle making left hand turn northbound onto Rt 28 failed to yield to westbound traffic.
21-649-AC	12/27/2021	16:50	Turning left from northbound Rt 28 onto Rockingham Road.	Southbound	Northbound vehicle turning left onto Rockingham Road failed to yield to southbound vehicle.
22-94-AC	2/14/2021	17:06	Turning left from northbound Rt 28 onto Rockingham Road.	Westbound from Island Pond Road.	Westbound vehicle failed to yield to red light.
22-166-AC	3/25/2022	15:22	Turning left from southbound South Main Street to Island Pond Road	Northbound on Rt 28	Southbound vehicle turning left from South Main Street to Island Pond Road failed to yield to Northbound vehicle.

APPENDIX D – CURRENT AND FORECASTED TRAFFIC VOLUMES

Traffic Volume Calculation Sheet

Average Annual AM Peak Hour
NH 28 / NH 28 Business / Island Pond Road - Derry, New Hampshire

	Raw Count	Approach % Trucks	Movement PHF	Approach PHF	Weekday Adj. Factor	Monthly Adj. Factor*	Base Year	Background Growth Rate	Planned Development Trips	Build Year	Future Build Year Site Generated Trips	Exit 4A Adjustment Factor **	Future Build Year Build
NH 28 / NH 28 Business / Island Pond Road	*March 24, 2022 (7:00 - 8:00 AM)*	*AM*	*AM*	*AM*		*Highway Group: 4*	*2022 AM*		*Includes approved projects assumed to built by 2024*	*2024 AM*	*Included projects not yet approved or fully conceptualized*		*2042 AM*
NB Left - NH 28 (Rockingham Road)	103	3.90%	0.89	0.90	1.000	1.15	118	1.00%	5	125	0		149
NB Thru - NH 28 (Rockingham Road)	131		0.86		1.000	1.15	151	1.00%	7	161	16	+4.40%	215
NB Right - NH 28 (Rockingham Road)	20		0.71		1.000	1.15	23	1.00%	0	23	0		28
SB Left - NH 28 B (S Main Street)	52	3.90%	0.62	0.67	1.000	1.15	60	1.00%	4	65	5	+4.40%	85
SB Thru - NH 28 B (S Main Street)	261		0.73		1.000	1.15	300	1.00%	8	314	8	+4.40%	398
SB Right - NH 28 B (S Main Street)	146		0.60		1.000	1.15	168	1.00%	74	245	66	+4.40%	354
WB Left - Island Pond Road	52	4.00%	0.77	0.88	1.000	1.15	60	1.00%	0	61	0		73
WB Thru - Island Pond Road	197		0.93		1.000	1.15	227	1.00%	4	236	48		329
WB Right - Island Pond Road	101		0.65		1.000	1.15	116	1.00%	5	123	7	+4.40%	160
EB Left - NH 28 (Rockingham Road)	110	3.10%	0.63	0.86	1.000	1.15	127	1.00%	69	199	77	+4.40%	308
EB Thru - NH 28 (Rockingham Road)	94		0.84		1.000	1.15	108	1.00%	2	112	60		194
EB Right - NH 28 (Rockingham Road)	114		0.77		1.000	1.15	131	1.00%	7	141	0		167

* The monthly adjustment factor is taken from NHDOT's 2019 seasonal adjustment data Group 4 Average for month of March
** The Exit 4A Adjustment Factor is taken from Table 7 of the I-93 Exit 4A FEIS, Volume III, Appendix C Part 1. Alternative A, currently in design, shows a 4.4% increase in AADWT compared to No-Build in 2040 at location # 9 (NH 28 Bypass south of Thornton Road (S)

Traffic Volume Calculation Sheet

Average Annual PM Peak Hour
NH 28 / NH 28 Business / Island Pond Road - Derry, New Hampshire

		Raw Count	Approach % Trucks	Movement PHF	Approach PHF	Weekday Adj. Factor	Monthly Adj. Factor	Base Year	Background Growth Rate	Build Year Site Generated Trips	Build Year Build	Design Year Site Generated Trips	Exit 4A Adjustment Factor **	Design Year Build
NH 28 / NH 28 Business / Island Pond Road		*March 24, 2022 (3:00 - 4:00 PM)*	*PM*	*PM*	*PM*		*Highway Group: 4*	*2022 PM*		*Includes approved projects assumed to built by 2024*	*2024 AM*	*Included projects not yet approved or fully conceptualized*		*2042 AM*
NB Left - NH 28 (Rockingham Road)		172	4.00%	0.92	0.95	1.000	1.15	198	1.00%	7	209	0		249
NB Thru - NH 28 (Rockingham Road)		237		0.93		1.000	1.15	273	1.00%	6	284	14	+4.40%	368
NB Right - NH 28 (Rockingham Road)		42		0.75		1.000	1.15	48	1.00%	0	49	0		59
SB Left - NH 28 B (S Main Street)		71	3.10%	0.81	0.86	1.000	1.15	82	1.00%	3	87	5	+4.40%	112
SB Thru - NH 28 B (S Main Street)		216		0.83		1.000	1.15	248	1.00%	5	258	6	+4.40%	327
SB Right - NH 28 B (S Main Street)		138		0.90		1.000	1.15	159	1.00%	56	218	51	+4.40%	310
WB Left - Island Pond Road		33	5.30%	0.75	0.80	1.000	1.15	38	1.00%	0	39	6		52
WB Thru - Island Pond Road		128		0.87		1.000	1.15	147	1.00%	3	153	50		232
WB Right - Island Pond Road		47		0.69		1.000	1.15	54	1.00%	4	59	4	+4.40%	77
EB Left - NH 28 (Rockingham Road)		114	2.60%	0.77	0.93	1.000	1.15	131	1.00%	68	202	55	+4.40%	290
EB Thru - NH 28 (Rockingham Road)		171		0.68		1.000	1.15	197	1.00%	4	205	60		304
EB Right - NH 28 (Rockingham Road)		185		0.90		1.000	1.15	213	1.00%	7	224	0		267

* The monthly adjustment factor is taken from NHDOT's 2019 seasonal adjustment data Group 4 Average for month of March
** The Exit 4A Adjustment Factor is taken from Table 7 of the I-93 Exit 4A FEIS, Volume III, Appendix C Part 1. Alternative A, currently in design, shows a 4.4% increase in AADWT compared to No-Build in 2040 at location # 9 (NH 28 Bypass south of Thornton Road (S)

APPENDIX E – TRIP GENERATION BY LAND USE

Trip Generation for Developments at 74 and 109 Rockingham Road

Trip Generation by Land Use

	221 - Multi-Family Housing (Mid-Rise)				220 - Multi-Family Housing (Low-Rise)			215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
		Total Residential Units	Keystone West Apartments	Keystone East Apartments		Total Residential Units	Old Watts Auto Apartments		Total Residential Units	Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
		(104 Units)	(48 Units)	(56 Units)		(65 Units)	(65 Units)		(25 Units)	(16 Units)	(9 Units)	(5,500 SF)		(10,800 SF)		(5,300 SF)		
	Rate (trips / unit)	Trips #	Trips #	Trips #	Rate (trips / unit)	Trips #	Trips #	Rate (trips / unit)	Trips #	Trips #	Trips #	Rate (trips / 1,000 sf)	Trips #	Rate (trips / 1,000 sf)	Trips #	Rate (trips / 1,000 sf)	Trips #	**Total**
Weekday Daily Trips	= 4.77(X) - 46.46	450	208	242	= 6.41(X) = 75.31	492	492	= 7.2(X)	180	115	65	=28.82(X)	159	= e^(0.87Ln(X) + 3.05)	167	=42.20(X)+229.68	453	1,901 vpd
Weekday AM Peak Hour	=0.44(X) - 11.61	34	16	18	= 0.31(X) + 22.85	43	43	=0.48(X)	12	8	4	=1.91(X)	11	= e^(0.86Ln(X) + 1.16)	25	= e^(0.66Ln(X) + 1.84)	19	144 vpd
Weekday PM Peak Hour	=0.39(X) + 0.34	41	19	22	= 0.43(X) + 20.55	49	49	=0.57(X)	14	9	5	=2.5(X)	14	= e^(0.83Ln(X) + 1.29)	26	= e^(0.71Ln(X) + 2.72)	50	194 vpd
Saturday Daily Trips	= e^(0.94Ln(X) + 1.84)	496	229	267	=4.55(X)	296	296	=8.76(X)	219	140	79	=9.10(X)	50	=2.21(X)	24	Calculated	457	1,542 vpd
Saturday Gen Peak Hour	=e^(1.00Ln(X) - 0.91)	42	19	23	=0.41(X)	27	27	=0.57(X)	14	9	5	=1.07(X)	6	=0.53(X)	6	= 6.57(X)	35	130 vpd

Trip Generation: Internal Capture

	221 - Multi-Family Housing (Mid-Rise)				220 - Multi-Family Housing (Low-Rise)			215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
		Total Residential Units	Keystone West Apartments	Keystone East Apartments		Total Residential Units	Old Watts Auto Apartments		Total Residential Units	Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
Weekday Daily Trips (10.2%)		-46	-21	-25		-50	-50		-18	-12	-7		-16		-17		-46	-193 vpd
Weekday AM Peak Hour (7.0%)	# of Trips Deducted for Internal Capture	-2	-1	-1	# of Trips Deducted for Internal Capture	-3	-3	# of Trips Deducted for Internal Capture	-1	-1	0	# of Trips Deducted for Internal Capture	-1	# of Trips Deducted for Internal Capture	-2	# of Trips Deducted for Internal Capture	-1	-10 vpd
Weekday PM Peak Hour (13.4%)		-5	-3	-3		-7	-7		-2	-1	-1		-2		-3		-7	-26 vpd
Saturday Daily Trips (10.2%)		-51	-23	-27		-30	-30		-22	-14	-8		-5		-2		-47	-157 vpd
Saturday Gen Peak Hour (13.4%)		-6	-3	-3		-4	-4		-2	-1	-1		-1		-1		-5	-19 vpd

Trip Generation: External Trips by Land Use

	221 - Multi-Family Housing (Mid-Rise)				220 - Multi-Family Housing (Low-Rise)			215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
		Total Residential Units	Keystone West Apartments	Keystone East Apartments		Total Residential Units	Old Watts Auto Apartments		Total Residential Units	Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
Weekday Daily Trips		404	187	217		442	442		162	103	58		143		150		407	1,708 vpd
Weekday AM Peak Hour	# of External Trips	32	15	17	# of External Trips	40	40	# of External Trips	11	7	4	# of External Trips	10	# of External Trips	23	# of External Trips	18	134 vpd
Weekday PM Peak Hour		36	16	19		42	42		12	8	4		12		23		43	168 vpd
Saturday Daily Trips		445	206	240		266	266		197	126	71		45		22		410	1,385 vpd
Saturday Gen Peak Hour		36	16	20		23	23		12	8	4		5		5		30	111 vpd

Trip Generation: Pass-By by Land Use

	221 - Multi-Family Housing (Mid-Rise)				220 - Multi-Family Housing (Low-Rise)			215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
		Total Residential Units	Keystone West Apartments	Keystone East Apartments		Total Residential Units	Old Watts Auto Apartments		Total Residential Units	Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
		0%	0%	0%		0%	0%		0%	0%	0%	0%		0%		40%		
Weekday Daily Trips		0	0	0		0	0		0	0	0		0		0		-163	-163 vpd
Weekday AM Peak Hour	# of Trips Deducted for Pass-By	0	0	0	# of Trips Deducted for Pass-By	0	0	# of Trips Deducted for Pass-By	0	0	0	# of Trips Deducted for Pass-By	0	# of Trips Deducted for Pass-By	0	# of Trips Deducted for Pass-By	-7	-7 vpd
Weekday PM Peak Hour		0	0	0		0	0		0	0	0		0		0		-17	-17 vpd
Saturday Daily Trips		0	0	0		0	0		0	0	0		0		0		-164	-164 vpd
Saturday Gen Peak Hour		0	0	0		0	0		0	0	0		0		0		-12	-12 vpd

Trip Generation: New External Trips by Land Use (Pass-By Trips Removed)

	221 - Multi-Family Housing (Mid-Rise)				220 - Multi-Family Housing (Low-Rise)			215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
		Total Residential Units	Keystone West Apartments	Keystone East Apartments		Total Residential Units	Old Watts Auto Apartments		Total Residential Units	Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
Weekday Daily Trips		404	187	217		442	442		162	103	58		143		150		244	1,545 vpd
Weekday AM Peak Hour	# of New External Trips	32	15	17	# of External Trips	40	40	# of External Trips	11	7	4	# of External Trips	10	# of External Trips	23	# of External Trips	11	127 vpd
Weekday PM Peak Hour		36	16	19		42	42		12	8	4		12		23		26	151 vpd
Saturday Daily Trips		445	206	240		266	266		197	126	71		45		22		246	1,221 vpd
Saturday Gen Peak Hour		36	16	20		23	23		12	8	4		5		5		18	99 vpd

Trip Generation for Developments at 74 and 109 Rockingham Road

Entering Trips by Land Use from Rockingham Road

	221 - Multi-Family Housing (Mid-Rise)				220 - Multi-Family Housing (Low-Rise)			215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
		Total Residential Units	Keystone West Apartments	Keystone East Apartments		Total Residential Units	Old Watts Auto Apartments		Total Residential Units	Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
	% Entering	Trips #	Trips #	Trips #	% Entering	Trips #	Trips #	% Entering	Trips #	Trips #	Trips #	% Entering	Trips #	% Entering	Trips #	% Entering	Trips #	**Total**
Weekday Daily Trips	50%	202	94	109	50%	221	221	50%	81	52	29	50%	72	50%	75	50%	122	773 vpd
Weekday AM Peak Hour	23%	7	3	4	24%	10	10	31%	3	2	1	66%	7	88%	20	60%	7	54 vpd
Weekday PM Peak Hour	61%	22	10	12	63%	26	26	57%	7	5	2	47%	6	17%	4	50%	13	78 vpd
Saturday Daily Trips	50%	223	103	120	50%	133	133	50%	99	63	36	50%	23	50%	11	50%	123	612 vpd
Saturday Gen Peak Hour	51%	18	8	10	50%	12	12	48%	6	4	2	54%	3	54%	3	51%	9	51 vpd

Exiting Trips by Land Use onto Rockingham Road

	221 - Multi-Family Housing (Mid-Rise)				220 - Multi-Family Housing (Low-Rise)			215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
		Total Residential Units	Keystone West Apartments	Keystone East Apartments		Total Residential Units	Old Watts Auto Apartments		Total Residential Units	Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
	% Exiting	Trips #	Trips #	Trips #	% Exiting	Trips #	Trips #	% Exiting	Trips #	Trips #	Trips #	% Exiting	Trips #	% Exiting	Trips #	% Exiting	Trips #	**Total**
Weekday Daily Trips	50%	202	94	109	50%	221	221	50%	81	52	29	50%	72	50%	75	50%	122	773 vpd
Weekday AM Peak Hour	77%	25	12	13	76%	30	30	69%	8	5	3	34%	3	12%	3	40%	4	73 vpd
Weekday PM Peak Hour	39%	14	6	7	37%	16	16	43%	5	3	2	53%	6	83%	19	50%	13	73 vpd
Saturday Daily Trips	50%	223	103	120	50%	133	133	50%	99	63	36	50%	23	50%	11	50%	123	612 vpd
Saturday Gen Peak Hour	49%	18	8	10	50%	12	12	52%	6	4	2	46%	2	46%	2	49%	9	49 vpd

Trip Generation Turning Movements at 74 and 109 Rockingham Road

Westbound (Exiting) at Rockingham Road by Land Use

	221 - Multi-Family Housing (Mid-Rise) / 220 - Multi-Family Housing (Low-Rise)					215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
			Keystone West Apartments	Keystone East Apartments	Old Watts Auto Apartments			Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
			71%	71%	71%			71%	71%	69%		46%		69%		**Total**
Weekday Daily Trips	# of Westbound Exiting Trips on Rockingham Road		66	77	156	# of Westbound Exiting Trips on Rockingham Road		37	20	# of Westbound Exiting Trips on Rockingham Road	50	# of Westbound Exiting Trips on Rockingham Road	34	# of Westbound Exiting Trips on Rockingham Road	84	524 vpd
Weekday AM Peak Hour			8	9	21			4	2		2		1		3	50 vph
Weekday PM Peak Hour			4	5	11			2	1		4		9		9	45 vph
Saturday Daily Trips			73	85	94			44	25		16		5		85	427 vpd
Saturday Gen Peak Hour			6	7	8			3	1		1		1		6	33 vph

Eastbound (Exiting) at Rockingham Road by Land Use

	221 - Multi-Family Housing (Mid-Rise) / 220 - Multi-Family Housing (Low-Rise)					215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
			Keystone West Apartments	Keystone East Apartments	Old Watts Auto Apartments			Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
			29%	29%	29%			29%	29%	31%		54%		31%		**Total**
Weekday Daily Trips	# of Eastbound Exiting Trips on Rockingham Road		28	32	65	# of EB Exiting Trips on Rockingham Road		15	9	# of Eastbound Exiting Trips on Rockingham Road	22	# of Eastbound Exiting Trips on Rockingham Road	41	# of Eastbound Exiting Trips on Rockingham Road	38	250 vpd
Weekday AM Peak Hour			4	4	9			1	1		1		2		1	23 vph
Weekday PM Peak Hour			2	2	5			1	1		2		10		4	27 vph
Saturday Daily Trips			30	35	39			19	11		7		6		38	185 vpd
Saturday Gen Peak Hour			2	3	4			1	1		1		1		3	16 vph

Trips Grouped by Assignment Model

Journey to Work (Rock to Work)	
Residential Based Trips	
Apartments and Townhouses	
Trips	
# of Westbound Exiting Trips on Rockingham Road	356
	44
	23
	321
	25

Journey to Work (Home to Rock)	
Work Based Trips	
Keystone Office Space	
Trips	
# of Westbound Exiting Trips on Rockingham Road	34
	1
	9
	5
	1

Gravity Model	
Retail/Recreation	
Keystone Community Center and Old Watts Auto Retail	
Trips	
# of Westbound Exiting Trips on Rockingham Road	134
	5
	13
	101
	7

	Via Rockingham Road NH 28	Via South Maine Street NH 28B	Island Pond Road	Via NH 28
Dev. to Work (Residence)	100%	60%	8%	32%
To Work @ Development	100%	62%	21%	17%
Gravity - (Retail, Dining, Child Care, etc.)	100%	51%	23%	26%

Weekday Daily Trips	# of Westbound Exiting Trips on Rockingham Road	524			
Weekday AM Peak Hour		50			
Weekday PM Peak Hour		45			
Saturday Daily Trips		427			
Saturday Gen Peak Hour		33			

Journey to Work (Rock to Work)	
Apartments and Townhouses	
Trips	
# of Eastbound Exiting Trips on Rockingham Road	149
	19
	11
	134
	11

Journey to Work (Home to Rock)	
Keystone Office Space	
Trips	
# of Eastbound Exiting Trips on Rockingham Road	41
	2
	10
	6
	1

Gravity Model	
Keystone Community Center and Old Watts Auto Retail	
Trips	
# of Eastbound Exiting Trips on Rockingham Road	60
	2
	6
	45
	4

Weekday Daily Trips	# of Eastbound Exiting Trips on Rockingham Road	146	34	70	
Weekday AM Peak Hour		14	2	7	
Weekday PM Peak Hour		16	4	7	
Saturday Daily Trips		108	22	55	
Saturday Gen Peak Hour		9	2	5	

Trip Generation Turning Movements at 74 and 109 Rockingham Road

Eastbound (Entering) from Rockingham Road by Land Use

	221 - Multi-Family Housing (Mid-Rise) / 220 - Multi-Family Housing (Low-Rise)					215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
			Keystone West Apartments	Keystone East Apartments	Old Watts Auto Apartments			Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
			71%	71%	71%			71%	71%	69%		46%		69%		**Total**
Weekday Daily Trips	# of EB Entering Trips from Rockingham Road		66	77	156	# of EB Entering Trips from Rockingham Road		37	20	# of EB Entering Trips from Rockingham Road	50	# of EB Entering Trips from Rockingham Road	34	# of EB Entering Trips from Rockingham Road	84	524 vpd
Weekday AM Peak Hour			2	3	7			1	1		5		9		5	33 vph
Weekday PM Peak Hour			7	8	18			4	1		4		2		9	53 vph
Saturday Daily Trips			73	85	94			44	25		16		5		85	427 vpd
Saturday Gen Peak Hour			6	7	8			3	1		2		1		6	34 vph

	Journey to Work (Rock to Work)		Journey to Work (Home to Rock)		Gravity Model	
	Apartments and Townhouses		Keystone Office Space		Keystone Community Center and Old Watts Auto Retail	
	Trips		Trips		Trips	
Weekday Daily Trips	# of EB Entering Trips from Rockingham Road	356	# of EB Entering Trips from Rockingham Road	34	# of EB Entering Trips from Rockingham Road	134
Weekday AM Peak Hour		14		9		10
Weekday PM Peak Hour		38		2		13
Saturday Daily Trips		321		5		101
Saturday Gen Peak Hour		25		1		8

Weekday Daily Trips	# of EB Entering Trips from Rockingham Road	524
Weekday AM Peak Hour		33
Weekday PM Peak Hour		53
Saturday Daily Trips		427
Saturday Gen Peak Hour		34

Westbound (Entering) from Rockingham Road by Land Use

	221 - Multi-Family Housing (Mid-Rise) / 220 - Multi-Family Housing (Low-Rise)					215 - Single-Family Attached Housing				495 - Recreational Community Center		710 - General Office Building		822 - Strip Retail Plaza		
			Keystone West Apartments	Keystone East Apartments	Old Watts Auto Apartments			Keystone Townhomes	Old Watts Auto Townhomes	Keystone Community Center		Keystone Office Building		Old Watts Auto Retail		
			29%	29%	29%			29%	29%	31%		54%		31%		**Total**
Weekday Daily Trips	# of WB Trips from Rockingham Road		28	32	65	# of WB Trips from Rockingham Road		15	9	# of WB Trips from Rockingham Road	22	# of WB Trips from Rockingham Road	41	# of WB Trips from Rockingham Road	38	250 vpd
Weekday AM Peak Hour			1	1	3			1	0		2		11		2	21 vph
Weekday PM Peak Hour			3	4	8			1	1		2		2		4	25 vph
Saturday Daily Trips			30	35	39			19	11		7		6		38	185 vpd
Saturday Gen Peak Hour			2	3	4			1	1		1		2		3	17 vph

	Journey to Work (Rock to Work)		Journey to Work (Home to Rock)		Gravity Model	
	Apartments and Townhouses		Keystone Office Space		Keystone Community Center and Old Watts Auto Retail	
	Trips		Trips		Trips	
Weekday Daily Trips	# of WB Trips from Rockingham Road	149	# of WB Trips from Rockingham Road	41	# of WB Trips from Rockingham Road	60
Weekday AM Peak Hour		6		11		4
Weekday PM Peak Hour		17		2		6
Saturday Daily Trips		134		6		45
Saturday Gen Peak Hour		11		2		4

Weekday Daily Trips	# of WB Trips from Rockingham Road	146	34	70
Weekday AM Peak Hour		12	4	5
Weekday PM Peak Hour		15	3	7
Saturday Daily Trips		108	22	55
Saturday Gen Peak Hour		10	2	5

Trip Generation for 1-4 Humphrey Road

Trip Generation by Land Use

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				822 - Strip Retail Plaza				
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses		Total Restaurant SF	Humphrey Road North Restaurant	Humphrey Road South		Total Retail SF	Humphrey Road North	Humphrey Road South	
		(22 Units)		(72 Units)		(18 Units)		(16,800 SF)	(5,600 SF)	(11,200 SF)		(27,200 SF)	(16,000 SF)	(11,200 SF)	
	Rate (trips / unit)	Trips #	Rate (trips / unit)	Trips #	Rate (trips / unit)	Trips #	Rate (trips / 1,000 sf)	Trips #	Trips #	Trips #	Rate (trips / 1,000 sf)	Trips #	Trips #	Trips #	**Total**
Weekday Daily Trips	= 6.41(X) + 75.31	216	= 4.77(X) - 46.46	297	= 7.2(X)	130	=107.2(X)	1801	600	1201	=42.20(X) + 229.68	1378	811	567	3,822 vpd
Weekday AM Peak Hour	=0.31(X) + 22.85	30	=0.44(X) - 11.61	20	=0.48(X)	9	=9.57(X)	161	54	107	=e^(0.66Ln(X) + 1.84)	56	33	23	276 vpd
Weekday PM Peak Hour	= 0.43(X) + 20.55	30	=0.39(X) + 0.34	28	=0.57(X)	10	=9.05(X)	152	51	101	= e^(0.71Ln(X) + 2.72)	158	93	65	378 vpd
Saturday Daily Trips	=4.55(X)	100	= e^(0.94Ln(X) + 1.84)	351	=8.76(X)	158	=122.4(X)	2056	685	1371	Calculated	2336	1374	962	5,001 vpd
Saturday Gen Peak Hour	=0.41(X)	9	=e^(1.00Ln(X) - 0.91)	29	=0.57(X)	10	=11.197(X)	188	63	125	=6.57(X)	179	105	74	415 vpd

Trip Generation: Internal Capture

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				822 - Strip Retail Plaza				
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses		Total Restaurant Trips	Humphrey Road North Restaurant	Humphrey Road South		Total Retail Trips	Humphrey Road North	Humphrey Road South	
Weekday Daily Trips (26.8%)	# of Trips Deducted for Internal Capture	-58	# of Trips Deducted for Internal Capture	-80	# of Trips Deducted for Internal Capture	-35	# of Trips Deducted for Internal Capture	-483	-161	-322	# of Trips Deducted for Internal Capture	-369	-217	-152	-1,025 vpd
Weekday AM Peak Hour (8.5%)		-3		-2		-1		-14	-5	-9		-5	-3	-2	-25 vpd
Weekday PM Peak Hour (45.1%)		-14		-13		-5		-69	-23	-46		-71	-42	-29	-172 vpd
Saturday Daily Trips (26.8%)		-27		-94		-42		-551	-184	-367		-626	-368	-258	-1,340 vpd
Saturday Gen Peak Hour (45.1%)		-4		-13		-5		-85	-28	-56		-81	-47	-33	-188 vpd

Trip Generation: External Trips by Land Use

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				822 - Strip Retail Plaza				
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses		Total Restaurant Trips	Humphrey Road North Restaurant	Humphrey Road South		Total Retail Trips	Humphrey Road North	Humphrey Road South	
Weekday Daily Trips	# of External Trips	158	# of External Trips	217	# of External Trips	95	# of External Trips	1318	439	879	# of External Trips	1009	594	415	2,797 vpd
Weekday AM Peak Hour		27		18		8		147	49	98		51	30	21	251 vpd
Weekday PM Peak Hour		16		15		5		83	28	55		87	51	36	206 vpd
Saturday Daily Trips		73		257		116		1505	501	1004		1710	1006	704	3,661 vpd
Saturday Gen Peak Hour		5		16		5		103	35	69		98	58	41	227 vpd

Trip Generation: Pass-By by Land Use

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				822 - Strip Retail Plaza				
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses		Total Restaurant Trips	Humphrey Road North Restaurant	Humphrey Road South		Total Retail Trips	Humphrey Road North	Humphrey Road South	
		0%		0%		0%		43%	43%	43%		40%	40%	40%	
Weekday Daily Trips	# of Trips Deducted for Pass-By	0	# of Trips Deducted for Pass-By	0	# of Trips Deducted for Pass-By	0	# of Trips Deducted for Pass-By	-567	-189	-378	# of Trips Deducted for Pass By	-404	-238	-166	-971 vpd
Weekday AM Peak Hour		0		0		0		-63	-21	-42		-20	-12	-8	-83 vpd
Weekday PM Peak Hour		0		0		0		-36	-12	-24		-35	-20	-14	-71 vpd
Saturday Daily Trips		0		0		0		-647	-215	-432		-684	-402	-282	-1,331 vpd
Saturday Gen Peak Hour		0		0		0		-44	-15	-30		-39	-23	-16	-83 vpd

Trip Generation: New External Trips by Land Use (Pass-By Trips Removed)

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				822 - Strip Retail Plaza				
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses		Total Restaurant Trips	Humphrey Road North Restaurant	Humphrey Road South		Total Retail Trips	Humphrey Road North	Humphrey Road South	
Weekday Daily Trips	# of New External Trips	158	# of External Trips	217	# of External Trips	95	# of External Trips	751	250	501	# of External Trips	605	356	249	1,826 vpd
Weekday AM Peak Hour		27		18		8		84	28	56		31	18	13	168 vpd
Weekday PM Peak Hour		16		15		5		47	16	31		52	31	22	135 vpd
Saturday Daily Trips		73		257		116		858	286	572		1026	604	422	2,330 vpd
Saturday Gen Peak Hour		5		16		5		59	20	39		59	35	25	144 vpd

Trip Generation for 1-4 Humphrey Road

Entering Trips by Land Use from South Main Street

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				822 - Strip Retail Plaza				
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses		Total Restaurant Trips	Humphrey Road North Restaurant	Humphrey Road South		Total Retail Trips	Humphrey Road North	Humphrey Road South	
	% Entering	Trips #	% Entering	Trips #	% Entering	Trips #	% Entering	Trips #	Trips #	Trips #	% Entering	Trips #	Trips #	Trips #	**Total**
Weekday Daily Trips	50%	79	50%	109	50%	48	50%	376	125	251	50%	303	178	125	915 vpd
Weekday AM Peak Hour	24%	6	23%	6	31%	2	55%	46	15	31	60%	19	11	8	79 vpd
Weekday PM Peak Hour	63%	10	61%	9	57%	3	61%	29	10	19	50%	26	16	11	77 vpd
Saturday Daily Trips	50%	37	50%	129	50%	58	50%	429	143	286	50%	513	302	211	1,166 vpd
Saturday Gen Peak Hour	50%	3	51%	8	48%	2	51%	30	10	20	51%	30	18	13	73 vpd

Exiting Trips by Land Use onto South Main Street

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				822 - Strip Retail Plaza				
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses		Total Restaurant Trips	Humphrey Road North Restaurant	Humphrey Road South		Total Retail Trips	Humphrey Road North	Humphrey Road South	
	% Exiting	Trips #	% Exiting	Trips #	% Exiting	Trips #	% Exiting	Trips #	Trips #	Trips #	% Exiting	Trips #	Trips #	Trips #	**Total**
Weekday Daily Trips	50%	79	50%	109	50%	48	50%	376	125	251	50%	303	178	125	915 vpd
Weekday AM Peak Hour	76%	21	77%	12	69%	6	45%	38	13	25	40%	12	7	5	89 vpd
Weekday PM Peak Hour	37%	6	39%	6	43%	2	39%	18	6	12	50%	26	16	11	58 vpd
Saturday Daily Trips	50%	37	50%	129	50%	58	50%	429	143	286	50%	513	302	211	1,166 vpd
Saturday Gen Peak Hour	50%	3	49%	8	52%	3	49%	29	10	19	49%	29	17	12	72 vpd

Trip Generation Turning Movements at 1-4 Humphrey Road

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant			822 - Strip Mall Plaza			
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses			Humphrey Road North Restaurant			Humphrey Road North	Humphrey Road South	
		18%		18%		18%			16%	16%		16%	16%	**Total**
Weekday Daily Trips		14		19		9			20	40		28	20	150 vpd
Weekday AM Peak Hour	# of Northbound	4	# of Northbound	2	# of Northbound	1	# of Northbound		2	4	# of Northbound	1	1	15 vph
Weekday PM Peak Hour	Exiting Trips on South	1	Exiting Trips on South	1	Exiting Trips on South	0	Exiting Trips on South		1	2	Exiting Trips on South	3	2	10 vph
Saturday Daily Trips	Main Street	7	Main Street	23	Main Street	10	Main Street		23	46	Main Street	48	34	191 vpd
Saturday Gen Peak Hour		1		1		1			2	3		3	2	13 vph

Journey to Work (DL to Work)	
Residential Based Trips	
Apartments and Townhouses	
Trips	
# of Northbound Exiting Trips on South Main Street	42
	7
	2
	40
	3

Gravity Model	
Retail, Dining	
Humphrey Road Retail and Dining	
Trips	
# of Northbound Exiting Trips on South Main Street	108
	8
	8
	151
	10

		Via Rockingham Road NH 28	Via South Maine Street NH 28B	Island Pond Road	Via NH 28
Dev. to Work (Residence)		86%	100%	3%	11%
Gravity - (Retail, Dining,		82%	100%	8%	10%
Weekday Daily Trips	# of Northbound Exiting Trips on South Main Street	150			
Weekday AM Peak Hour		15			
Weekday PM Peak Hour		10			
Saturday Daily Trips		191			
Saturday Gen Peak Hour		13			

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant			822 - Strip Mall Plaza			
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses			Humphrey Road North Restaurant	Humphrey Road South		Humphrey Road North	Humphrey Road South	
		82%		82%		82%			84%	84%		84%	84%	**Total**
Weekday Daily Trips		65		90		39			105	211		150	105	765 vpd
Weekday AM Peak Hour	# of Southbound	17	# of Southbound	10	# of Southbound	5	# of Southbound		11	21	# of Southbound	6	4	74 vph
Weekday PM Peak Hour	Exiting Trips on South	5	Exiting Trips on South	5	Exiting Trips on South	2	Exiting Trips on South		5	10	Exiting Trips on South	13	9	49 vph
Saturday Daily Trips	Main Street	30	Main Street	106	Main Street	48	Main Street		120	240	Main Street	254	177	975 vpd
Saturday Gen Peak Hour		2		7		2			8	16		14	10	59 vph

Journey to Work (DL to Work)	
Apartments and Townhouses	
Trips	
# of Southbound Exiting Trips on South Main Street	194
	32
	12
	184
	11

Gravity Model	
Humphrey Road Retail and Dining	
Trips	
# of Southbound Exiting Trips on South Main Street	571
	42
	37
	791
	48

Weekday Daily Trips	# of Southbound Exiting Trips on South Main Street	634	54	78
Weekday AM Peak Hour		62	4	8
Weekday PM Peak Hour		41	3	5
Saturday Daily Trips		805	72	98
Saturday Gen Peak Hour		49	4	6

Trip Generation Turning Movements at 1-4 Humphrey Road

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant			822 - Strip Mall Plaza			
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses		Humphrey Road North Restaurant	Humphrey Road South		Humphrey Road North	Humphrey Road South	
		18%		18%		18%		16%	16%		16%	16%	**Total**
Weekday Daily Trips		14		19		9		20	40		28	20	150 vpd
Weekday AM Peak Hour	# of Southbound	1	# of Southbound	1	# of Southbound	0	# of Southbound	2	5	# of Southbound	2	1	12 vph
Weekday PM Peak Hour	Entering Trips From	2	Entering Trips From	2	Entering Trips From	1	Entering Trips From	2	3	Entering Trips From	3	2	15 vph
Saturday Daily Trips	South Main Street	7	South Main Street	23	South Main Street	10	South Main Street	23	46	South Main Street	48	34	191 vpd
Saturday Gen Peak Hour		1		1		0		2	3		3	2	12 vph

Journey to Work (DL to Work)	
Apartments and Townhouses	
Trips	
# of Southbound Entering Trips From South Main Street	42
	2
	5
	40
	2

Gravity Model	
Humphrey Road Retail and Dining	
Trips	
# of Southbound Entering Trips From South Main Street	108
	10
	10
	151
	10

Weekday Daily Trips	# of Southbound Entering Trips From South Main Street	150
Weekday AM Peak Hour		12
Weekday PM Peak Hour		15
Saturday Daily Trips		191
Saturday Gen Peak Hour		12

	220 - Multi-Family Housing (Low-Rise)		221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant			822 - Strip Mall Plaza			
		Humphrey Road North Apartments		Humphrey Road North Condominiums		Humphrey Road North Townhouses		Humphrey Road North Restaurant	Humphrey Road South		Humphrey Road North	Humphrey Road South	
		82%		82%		82%		84%	84%		84%	84%	**Total**
Weekday Daily Trips		65		90		39		105	211		150	105	765 vpd
Weekday AM Peak Hour	# of Northbound	5	# of Northbound	5	# of Northbound	2	# of Northbound	13	26	# of Northbound	9	7	67 vph
Weekday PM Peak Hour	Entering Trips from	8	Entering Trips from	7	Entering Trips from	2	Entering Trips from	8	16	Entering Trips from	13	9	63 vph
Saturday Daily Trips	South Main Street	30	South Main Street	106	South Main Street	48	South Main Street	120	240	South Main Street	254	177	975 vpd
Saturday Gen Peak Hour		2		7		2		8	17		15	11	62 vph

Journey to Work (DL to Work)	
Apartments and Townhouses	
Trips	
# of Northbound Entering Trips from South Main Street	194
	12
	17
	184
	11

Gravity Model	
Humphrey Road Retail and Dining	
Trips	
# of Northbound Entering Trips from South Main Street	571
	55
	46
	791
	51

Weekday Daily Trips	# of Northbound Entering Trips from South Main Street	634	54	78
Weekday AM Peak Hour		55	5	7
Weekday PM Peak Hour		52	4	6
Saturday Daily Trips		805	72	98
Saturday Gen Peak Hour		51	5	6

Trip Generation by Land Use

	220 - Multi-Family Housing (Low-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes		Total Restaurant SF	Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
		(94 Units)		(14 Units)		(16,000 SF)	(6,800 SF)	(4,200 SF)	(5,000 SF)	(26,000 SF)		(75 Rooms)		(19,000 SF)		
	Rate (trips / unit)	Trips #	Rate (trips / unit)	Trips #	Rate (trips / 1,000 sf)	Trips #	Trips #	Trips #	Trips #	Rate (trips / 1,000 sf)	Trips #	Rate (trips / 1,000 sf)	Trips #	Rate (trips / 1,000 sf)	Trips #	**Total**
Weekday Daily Trips	= 6.41(X) + 75.31	678	= 7.2(X)	101	=107.2(X)	1715	729	450	536	= e^(0.87Ln(X) + 3.05)	359	= 10.84(X) - 423.51	389	=42.20(X) + 229.68	1031	4,273 vpd
Weekday AM Peak Hour	=0.31(X) + 22.85	52	=0.48(X)	7	=9.57(X)	153	65	40	48	= e^(0.86Ln(X) + 1.16)	53	= 0.50(X) - 7.45	30	=e^(0.66Ln(X) + 1.84)	44	339 vpd
Weekday PM Peak Hour	= 0.43(X) + 20.55	61	=0.57(X)	8	=9.05(X)	145	62	38	45	= e^(0.83Ln(X) + 1.29)	54	= 0.74(X) - 27.89	28	= e^(0.71Ln(X) + 2.72)	123	419 vpd
Saturday Daily Trips	=4.55(X)	428	=8.76(X)	123	=122.4(X)	1958	832	514	612	=2.21(X)	57	= 9.69(X) - 326.34	400	Calculated	1631	4,597 vpd
Saturday Gen Peak Hour	=0.41(X)	39	=0.57(X)	8	=11.197(X)	179	76	47	56	=0.53(X)	14	=0.69(X) + 5.95	58	=6.57(X)	125	423 vph

Trip Generation: Internal Capture

	220 - Multi-Family Housing (Low-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes		Total Restaurant SF	Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
Weekday Daily Trips (32.9%)	# of Trips Deducted for Internal Capture	-223	# of Trips Deducted for Internal Capture	-33	# of Trips Deducted for Internal Capture	-563	-239	-148	-176	# of Trips Deducted for Internal Capture	-118	# of Trips Deducted for Internal Capture	-128	# of Trips Deducted for Internal Capture	-339	-1,404 vpd
Weekday AM Peak Hour (16.9%)		-9		-1		-26	-11	-7	-8		-9		-5		-7	-57 vpd
Saturday Daily Trips (48.8%)		-30		-4		-71	-30	-19	-22		-26		-14		-60	-205 vpd
Saturday Daily Trips (32.9%)		-141		-40		-643	-273	-169	-201		-19		-131		-536	-1,510 vpd
Saturday Gen Peak Hour (48.8%)		-19		-4		-87	-37	-23	-27		-7		-28		-61	-206 vph

Trip Generation: External Trips by Land Use

	220 - Multi-Family Housing (Low-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes		Total Restaurant SF	Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
Weekday Daily Trips	# of External Trips	455	# of External Trips	68	# of External Trips	1152	490	302	360	# of External Trips	241	# of External Trips	261	# of External Trips	692	2,869 vpd
Weekday AM Peak Hour		43		6		127	54	33	40		44		25		37	282 vpd
Weekday PM Peak Hour		31		4		74	32	19	23		28		14		63	214 vpd
Saturday Daily Trips		287		83		1315	559	345	411		38		269		1095	3,087 vpd
Saturday Gen Peak Hour		20		4		92	39	24	29		7		30		64	217 vph

Trip Generation: Pass-By by Land Use

	220 - Multi-Family Housing (Low-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes		Total Restaurant SF	Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
		0%		0%		43%	43%	43%	43%	0%		0%		40%		
Weekday Daily Trips	# of Trips Deducted for Pass-By	0	# of Trips Deducted for Pass-By	0	# of Trips Deducted for Pass-By	-495	-211	-130	-155	# of Trips Deducted for Pass-By	0	# of Trips Deducted for Pass-By	0	# of Trips Deducted for Pass By	-277	-772 vpd
Weekday AM Peak Hour		0		0		-55	-23	-14	-17		0		0		-15	-70 vpd
Weekday PM Peak Hour		0		0		-32	-14	-8	-10		0		0		-25	-57 vpd
Saturday Daily Trips		0		0		-565	-240	-148	-177		0		0		-438	-1,003 vpd
Saturday Gen Peak Hour		0		0		-40	-17	-10	-12		0		0		-26	-66 vph

Trip Generation: New External Trips by Land Use (Pass-By Trips Removed)

	220 - Multi-Family Housing (Low-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes		Total Restaurant SF	Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
Weekday Daily Trips	# of New External Trips	455	# of External Trips	68	# of External Trips	657	279	172	205	# of External Trips	241	# of External Trips	261	# of External Trips	415	2,097 vpd
Weekday AM Peak Hour		43		6		72	31	19	23		44		25		22	212 vpd
Weekday PM Peak Hour		31		4		42	18	11	13		28		14		38	157 vpd
Saturday Daily Trips		287		83		750	319	197	234		38		269		657	2,084 vpd
Saturday Gen Peak Hour		20		4		52	22	14	17		7		30		38	151 vph

Entering Trips by Land Use from South Main Street

	220 - Multi-Family Housing (Low-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes		Total Restaurant SF	Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
	% Entering	Trips #	% Entering	Trips #	% Entering	Trips #	Trips #	Trips #	Trips #	% Entering	Trips #	% Entering	Trips #	% Entering	Trips #	**Total**
Weekday Daily Trips	50%	228	50%	34	50%	329	140	86	103	50%	121	50%	131	50%	208	1,051 vpd
Weekday AM Peak Hour	24%	10	31%	2	55%	40	17	10	13	88%	39	56%	14	60%	13	118 vpd
Weekday PM Peak Hour	63%	20	57%	2	61%	26	11	7	8	17%	5	51%	7	50%	19	79 vpd
Saturday Daily Trips	50%	144	50%	42	50%	375	160	99	117	50%	19	50%	135	50%	329	1,044 vpd
Saturday Gen Peak Hour	50%	10	48%	2	51%	27	11	7	9	54%	4	56%	17	51%	19	79 vpd

Exiting Trips by Land Use onto South Main Street

	220 - Multi-Family Housing (Low-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes		Total Restaurant SF	Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
	% Exiting	Trips #	% Exiting	Trips #	% Exiting	Trips #	Trips #	Trips #	Trips #	% Exiting	Trips #	% Exiting	Trips #	% Exiting	Trips #	**Total**
Weekday Daily Trips	50%	228	50%	34	50%	329	140	86	103	50%	121	50%	131	50%	208	1,051 vpd
Weekday AM Peak Hour	76%	33	69%	4	45%	32	14	9	10	12%	5	44%	11	40%	9	94 vpd
Weekday PM Peak Hour	37%	11	43%	2	39%	16	7	4	5	83%	23	49%	7	50%	19	78 vpd
Saturday Daily Trips	50%	144	50%	42	50%	375	160	99	117	50%	19	50%	135	50%	329	1,044 vpd
Saturday Gen Peak Hour	50%	10	52%	2	49%	25	11	7	8	46%	3	44%	13	49%	19	72 vpd

Trip Generation Turning Movements at 45 49 South Main Street (Siragusa Farm)

Northbound (Exiting) at South Main Stret by Land Use

	221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes		Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
		18%		18%		16%	16%	16%	28%		16%		16%		**Total**
Weekday Daily Trips		41		6		22	14	16		34		21		33	187 vpd
Weekday AM Peak Hour	# of Northbound	6	# of Northbound	1	# of Northbound	2	1	2	# of Northbound	1	# of Northbound	2	# of Northbound	1	16 vph
Weekday PM Peak Hour	Exiting Trips on South	2	Exiting Trips on South	0	Exiting Trips on South	1	1	1	Exiting Trips on South	7	Exiting Trips on South	1	Exiting Trips on South	3	16 vph
Saturday Daily Trips	Main Street	26	Main Street	7	Main Street	26	16	19	Main Street	5	Main Street	22	Main Street	52	173 vpd
Saturday Gen Peak Hour		2		0		2	1	1		1		2		3	12 vph

Southbound (Exiting) at Sound Main Street by Land Use

	221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes		Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
		82%		82%		84%	84%	84%	72%		84%		84%		**Total**
Weekday Daily Trips		187		28		118	72	87		87		110		175	864 vpd
Weekday AM Peak Hour	# of Southbound	27	# of Southbound	3	# of Southbound	12	8	8	# of Southbound	4	# of Southbound	9	# of Southbound	8	79 vph
Weekday PM Peak Hour	Exiting Trips on South	9	Exiting Trips on South	2	Exiting Trips on South	6	3	4	Exiting Trips on South	16	Exiting Trips on South	6	Exiting Trips on South	16	62 vph
Saturday Daily Trips	Main Street	118	Main Street	35	Main Street	134	83	98	Main Street	14	Main Street	113	Main Street	277	872 vpd
Saturday Gen Peak Hour		8		2		9	6	7		2		11		16	61 vph

Trips Grouped by Assignment Model

Journey to Work (DL to Work)		Journey to Work (Home to DL)		Gravity Model	
Residential Based Trips		Work Based Trips		Retail, Dining, Child Care Trips	
Apartments and Townhouses		Siragusa Office Space		Siragusa Retail, Dining and Hotel	
Trips		Trips		Trips	
# of Northbound Exiting Trips on South Main Street	47	# of Northbound Exiting Trips on South Main Street	34	# of Northbound Exiting Trips on South Main Street	106
	7		7		8
	2		1		7
	33		5		135
	2		1		9

Journey to Work (DL to Work)		Journey to Work (Home to DL)		Gravity Model	
Apartments and Townhouses		Siragusa Office Space		Siragusa Retail, Dining and Hotel	
Trips		Trips		Trips	
# of Southbound Exiting Trips on South Main Street	215	# of Southbound Exiting Trips on South Main Street	87	# of Southbound Exiting Trips on South Main Street	562
	30		4		45
	11		16		35
	153		14		705
	10		2		49

	Via Rockingham Road NH 28	Via South Maine Street NH 28B	Island Pond Road	Via NH 28
Dev. to Work (Residence)	86%	100%	3%	11%
To Work @ Development	82%	100%	8%	10%
Gravity - (Retail, Dining, Child Care, etc.)	82%	100%	8%	10%

Weekday Daily Trips	# of Northbound Exiting Trips on South Main Street	187		
Weekday AM Peak Hour		16		
Weekday PM Peak Hour		16		
Saturday Daily Trips		173		
Saturday Gen Peak Hour		12		

Weekday Daily Trips	# of Southbound Exiting Trips on South Main Street	716	61	88
Weekday AM Peak Hour		66	5	8
Weekday PM Peak Hour		51	5	6
Saturday Daily Trips		720	65	87
Saturday Gen Peak Hour		50	4	6

Trip Generation Turning Movements at 45 49 South Main Street (Siragusa Farm)

Southbound (Entering) from South Main Street by Land Use

	221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes			Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
		18%		18%			16%	16%	16%	28%		16%		16%		**Total**
Weekday Daily Trips		41		6			22	14	16		34		21		33	187 vpd
Weekday AM Peak Hour	# of Southbound	2	# of Southbound	0	# of Southbound		3	2	2	# of Southbound	11	# of Southbound	0	# of Southbound	2	22 vph
Weekday PM Peak Hour	Entering Trips From	4	Entering Trips From	0	Entering Trips From		2	1	1	Entering Trips From	1	Entering Trips From	1	Entering Trips From	3	13 vph
Saturday Daily Trips	South Main Street	26	South Main Street	7	South Main Street		26	16	19	South Main Street	5	South Main Street	22	South Main Street	52	173 vpd
Saturday Gen Peak Hour		2		0			2	1	1		1		3		3	13 vph

Journey to Work (DL to Work)		
Apartments and Townhouses		
Trips		
# of Southbound		47
Entering Trips From		4
South Main Street		33
		2

Journey to Work (Home to DL)		
Siragusa Office Space		
Trips		
# of Southbound		34
Entering Trips From		11
South Main Street		5
		1

Gravity Model		
Siragusa Retail, Dining and Hotel		
Trips		
# of Southbound		106
Entering Trips From		8
South Main Street		135
		10

Weekday Daily Trips		187
Weekday AM Peak Hour	# of Southbound Entering	22
Weekday PM Peak Hour	Trips From South Main	13
Saturday Daily Trips	Street	173
Saturday Gen Peak Hour		13

Northbound (Entering) from South Main Street by Land Use

	221 - Multi-Family Housing (Mid-Rise)		215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				710 - General Office Building		310 - Hotel		822 - Strip Mall Plaza		
		Siragusa Apartments		Siragusa Townhomes			Siragusa Restaurant #1	Siragusa Restaurant #2	Siragusa Brew Pub	Siragusa Office Buildings		Siragusa Hotel		Total Siragusa Retail		
		82%		82%			84%	84%	84%	72%		84%		84%		**Total**
Weekday Daily Trips		187		28			118	72	87		87		110		175	864 vpd
Weekday AM Peak Hour	# of Northbound	8	# of Northbound	2	# of Northbound		14	8	11	# of Northbound	28	# of Northbound	12	# of Northbound	11	94 vph
Weekday PM Peak Hour	Entering Trips from	16	Entering Trips from	2	Entering Trips from		9	6	7	Entering Trips from	4	Entering Trips from	6	Entering Trips from	16	66 vph
Saturday Daily Trips	South Main Street	118	South Main Street	35	South Main Street		134	83	98	South Main Street	14	South Main Street	113	South Main Street	277	872 vpd
Saturday Gen Peak Hour		8		2			9	6	8		3		14		16	66 vph

Journey to Work (DL to Work)		
Apartments and Townhouses		
Trips		
# of Northbound		215
Entering Trips from		18
South Main Street		153
		10

Journey to Work (Home to DL)		
Siragusa Office Space		
Trips		
# of Northbound		87
Entering Trips from		4
South Main Street		14
		3

Gravity Model		
Siragusa Retail, Dining and Hotel		
Trips		
# of Northbound		562
Entering Trips from		44
South Main Street		705
		53

Weekday Daily Trips		716	61	88
Weekday AM Peak Hour	# of Northbound Entering	77	7	9
Weekday PM Peak Hour	Trips from South Main	55	4	7
Saturday Daily Trips	Street	720	64	87
Saturday Gen Peak Hour		54	5	7

Trip Generation for 2 Island Pond Road (Old Flea Market)

Trip Generation by Land Use

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					822 - Strip Mall Plaza		
		Flea Market Townhouses		Total Restaurant SF	Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3		Flea Market Retail	
		(30 Units)		(20,000 SF)	(7,000 SF)	(8,000 SF)	(5,000 SF)		(40,000 SF)	
	Rate (trips / unit)	Trips #	Rate (trips / 1,000 sf)	Trips #	Trips #	Trips #	Trips #	Rate (trips / 1,000 sf)	Trips #	**Total**
Weekday Daily Trips	= 7.2(X)	216	=107.2(X)	2144	750	858	536	=42.20(X) + 229.68	1918	4,278 vpd
Weekday AM Peak Hour	=0.48(X)	14	=9.57(X)	191	67	76	48	=e^(0.66Ln(X) + 1.84)	72	277 vph
Weekday PM Peak Hour	=0.57(X)	17	=9.05(X)	181	63	72	45	= e^(0.71Ln(X) + 2.72)	208	406 vph
Saturday Daily Trips	=8.76(X)	263	=122.4(X)	2448	857	979	612	Calculated	3432	6,143 vpd
Saturday Gen Peak Hour	=0.57(X)	17	=11.197(X)	224	78	90	56	=6.57(X)	263	504 vph

Trip Generation: Internal Capture

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					822 - Strip Mall Plaza		
		Flea Market Townhouses		Total Restaurant SF	Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3		Flea Market Retail	
Weekday Daily Trips (20.3%)	# of Trips Deducted for Internal Capture	-44	# of Trips Deducted for Internal Capture	-435	-152	-174	-109	# of Trips Deducted for Internal Capture	-389	-868 vpd
Weekday AM Peak Hour (5.4%)		-1		-10	-4	-4	-3		-4	-15 vph
Weekday PM Peak Hour (35.2%)		-6		-64	-22	-25	-16		-73	-143 vph
Saturday Daily Trips (20.3%)		-53		-497	-174	-199	-124		-697	-1,247 vpd
Saturday Gen Peak Hour (35.2%)		-6		-79	-27	-32	-20		-93	-178 vph

Trip Generation: External Trips by Land Use

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					822 - Strip Mall Plaza		
		Humphrey Road North Townhouses		Total Restaurant SF	Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3		Flea Market Retail	
Weekday Daily Trips	# of External Trips	172	# of External Trips	1709	598	684	427	# of External Trips	1529	3,410 vpd
Weekday AM Peak Hour		13		181	63	72	45		68	262 vph
Weekday PM Peak Hour		11		117	41	47	29		135	263 vph
Saturday Daily Trips		210		1951	683	780	488		2735	4,896 vpd
Saturday Gen Peak Hour		11		145	51	58	36		170	326 vph

Trip Generation for 2 Island Pond Road (Old Flea Market)

Trip Generation: Pass-By by Land Use

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					822 - Strip Mall Plaza		
		Humphrey Road North Townhouses		Total Restaurant SF	Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3		Flea Market Retail	
		0%		43%	43%	43%	43%		40%	
Weekday Daily Trips	# of Trips Deducted for Pass-By	0	# of Trips Deducted for Pass-By	-735	-257	-294	-184	# of Trips Deducted for Pass-By	-612	-1,347 vpd
Weekday AM Peak Hour		0		-78	-27	-31	-19		-27	-105 vph
Weekday PM Peak Hour		0		-50	-18	-20	-12		-54	-104 vph
Saturday Daily Trips		0		-839	-294	-335	-210		-1094	-1,933 vpd
Saturday Gen Peak Hour		0		-62	-22	-25	-15		-68	-130 vph

Trip Generation: New External Trips by Land Use (Pass-By Trips Removed)

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					822 - Strip Mall Plaza		
		Humphrey Road North Townhouses		Total Restaurant SF	Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3		Flea Market Retail	
Weekday Daily Trips	# of New External Trips	172	# of New External Trips	974	341	390	243	# of New External Trips	917	2,063 vpd
Weekday AM Peak Hour		13		103	36	41	26		41	157 vph
Weekday PM Peak Hour		11		67	23	27	17		81	159 vph
Saturday Daily Trips		210		1112	389	445	278		1641	2,963 vpd
Saturday Gen Peak Hour		11		83	29	33	21		102	196 vph

Trip Generation for 2 Island Pond Road (Old Flea Market)

Entering Trips by Land Use from South Main Street

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					822 - Strip Mall Plaza		
		Humphrey Road North Townhouses		Total Restaurant SF	Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3		Flea Market Retail	
	% Entering	Trips #	% Entering	Trips #	Trips #	Trips #	Trips #	% Entering	Trips #	**Total**
Weekday Daily Trips	50%	86	50%	487	171	195	122	50%	459	1,032 vpd
Weekday AM Peak Hour	31%	4	55%	57	20	23	14	60%	25	86 vph
Weekday PM Peak Hour	57%	6	61%	41	14	16	10	50%	41	88 vph
Saturday Daily Trips	50%	105	50%	556	195	223	139	50%	821	1,482 vpd
Saturday Gen Peak Hour	48%	5	51%	42	15	17	11	51%	52	99 vph

Exiting Trips by Land Use onto South Main Street

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant					822 - Strip Mall Plaza		
		Humphrey Road North Townhouses		Total Restaurant SF	Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3		Flea Market Retail	
	% Exiting	Trips #	% Exiting	Trips #	Trips #	Trips #	Trips #	% Exiting	Trips #	**Total**
Weekday Daily Trips	50%	86	50%	487	171	195	122	50%	459	1,032 vpd
Weekday AM Peak Hour	69%	9	45%	46	16	18	12	40%	16	71 vph
Weekday PM Peak Hour	43%	5	39%	26	9	11	7	50%	41	72 vph
Saturday Daily Trips	50%	105	50%	556	195	223	139	50%	821	1,482 vpd
Saturday Gen Peak Hour	52%	6	49%	41	14	16	10	49%	50	97 vph

Trip Generation Turning Movements at 2 Island Pond Road (Old Flea Market)

Northbound (Exiting) at South Main Street by Land Use

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant			822 - Strip Mall Plaza		
		Flea Market Townhouses		Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3	Flea Market Retail	
		18%		16%	16%	16%	16%	**Total**
Weekday Daily Trips	# of Northbound Exiting Trips on South Main Street	15	# of Northbound Exiting Trips on South Main Street	27	31	19	73	165 vpd
Weekday AM Peak Hour		2		3	3	2	3	13 vph
Weekday PM Peak Hour		1		1	2	1	7	12 vph
Saturday Daily Trips		19		31	36	22	131	239 vpd
Saturday Gen Peak Hour		1		2	3	2	8	16 vph

Eastbound (Exiting) at Island Pond Road by Land Use

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant			822 - Strip Mall Plaza		
		Flea Market Townhouses		Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3	Flea Market Retail	
		2%		7%	7%	7%	7%	**Total**
Weekday Daily Trips	# of Southbound Exiting Trips on South Main Street	2	# of Southbound Exiting Trips on South Main Street	12	14	9	32	69 vpd
Weekday AM Peak Hour		0		1	1	1	1	4 vph
Weekday PM Peak Hour		0		1	1	0	3	5 vph
Saturday Daily Trips		2		14	16	10	58	100 vpd
Saturday Gen Peak Hour		0		1	1	1	4	7 vph

Westbound (Exiting) at Island Pond Road by Land Use

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant			822 - Strip Mall Plaza		
		Flea Market Townhouses		Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3	Flea Market Retail	
		80%		77%	77%	77%	77%	**Total**
Weekday Daily Trips	# of Northbound Exiting Trips on South Main Street	69	# of Northbound Exiting Trips on South Main Street	132	150	94	353	798 vpd
Weekday AM Peak Hour		7		12	14	9	12	54 vph
Weekday PM Peak Hour		4		7	8	5	32	56 vph
Saturday Daily Trips		84		150	172	107	632	1,145 vpd
Saturday Gen Peak Hour		5		11	12	8	38	74 vph

Trips Grouped by Assignment Model

Journey to Work (DL to Work)	
Residential Based Trips	
Townhouses	
Trips	
# of Northbound Exiting Trips on South Main Street	15
	2
	1
	19
	1

Gravity Model	
Retail, Dining	
Retail and Restaurants	
Trips	
# of Northbound Exiting Trips on South Main Street	150
	11
	11
	220
	15

Weekday Daily Trips	# of Northbound Exiting Trips on South Main Street	165
Weekday AM Peak Hour		13
Weekday PM Peak Hour		12
Saturday Daily Trips		239
Saturday Gen Peak Hour		16

Journey to Work (DL to Work)	
Townhouses	
Trips	
# of Southbound Exiting Trips on South Main Street	2
	0
	0
	2
	0

Gravity Model	
Retail and Restaurants	
Trips	
# of Southbound Exiting Trips on South Main Street	67
	4
	5
	98
	7

Weekday Daily Trips	# of Southbound Exiting Trips on South Main Street	69
Weekday AM Peak Hour		4
Weekday PM Peak Hour		5
Saturday Daily Trips		100
Saturday Gen Peak Hour		7

Journey to Work (DL to Work)	
Residential Based Trips	
Townhouses	
Trips	
# of Northbound Exiting Trips on South Main Street	69
	7
	4
	84
	5

Gravity Model	
Retail, Dining, Child Care Trips	
Retail and Restaurants	
Trips	
# of Northbound Exiting Trips on South Main Street	729
	47
	52
	1061
	69

Weekday Daily Trips	# of Northbound Exiting Trips on South Main Street	712	86
Weekday AM Peak Hour		48	6
Weekday PM Peak Hour		50	6
Saturday Daily Trips		1022	123
Saturday Gen Peak Hour		66	8

	Via Rockingham Road NH 28	Via South Maine Street NH 28B	Island Pond Road	Via NH 28
Dev. to Work (Residence)	88%	100%	100%	12%
Gravity - (Retail, Dining,	89%	100%	100%	11%

	Via Rockingham Road NH 28	Via South Maine Street NH 28B	Island Pond Road	Via NH 28
Dev. to Work (Residence)	100%	66%	100%	34%
Gravity - (Retail, Dining, Child Care, etc.)	100%	66%	100%	34%

Trip Generation Turning Movements at 2 Island Pond Road (Old Flea Market)

Southbound (Entering) from South Main Street by Land Use

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				822 - Strip Mall Plaza		
		Flea Market Townhouses			Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3	Flea Market Retail	
		27%			24%	24%	24%	24%	**Total**
Weekday Daily Trips		23			41	47	29	111	251 vpd
Weekday AM Peak Hour	# of Southbound	1	# of Southbound		5	6	3	6	21 vph
Weekday PM Peak Hour	Entering Trips From	2	Entering Trips From		3	4	2	10	21 vph
Saturday Daily Trips	South Main Street	28	South Main Street		47	54	34	198	361 vpd
Saturday Gen Peak Hour		1			4	4	3	13	25 vph

Journey to Work (DL to Work)	
Townhouses	
Trips	
# of Southbound Entering Trips From South Main Street	23
	1
	2
	28
	1

Gravity Model	
Retail and Restaurants	
Trips	
# of Southbound Entering Trips From South Main Street	228
	20
	19
	333
	24

Weekday Daily Trips	# of Southbound Entering Trips From South Main Street	166	85
Weekday AM Peak Hour		14	7
Weekday PM Peak Hour		14	7
Saturday Daily Trips		238	123
Saturday Gen Peak Hour		17	8

Westbound (Entering) at Island Pond Road by Land Use

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				822 - Strip Mall Plaza		
		Flea Market Townhouses			Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3	Flea Market Retail	
		2%			7%	7%	7%	7%	**Total**
Weekday Daily Trips		2			12	14	9	32	69 vpd
Weekday AM Peak Hour	# of Northbound	0	# of Northbound		1	2	1	2	6 vph
Weekday PM Peak Hour	Entering Trips from	0	Entering Trips from		1	1	1	3	6 vph
Saturday Daily Trips	South Main Street	2	South Main Street		14	16	10	58	100 vpd
Saturday Gen Peak Hour		0			1	1	1	4	7 vph

Journey to Work (DL to Work)	
Townhouses	
Trips	
# of Northbound Entering Trips from South Main Street	2
	0
	0
	2
	0

Gravity Model	
Retail and Restaurants	
Trips	
# of Northbound Entering Trips from South Main Street	67
	6
	6
	98
	7

Weekday Daily Trips	# of Northbound Entering Trips from South Main Street	69
Weekday AM Peak Hour		6
Weekday PM Peak Hour		6
Saturday Daily Trips		100
Saturday Gen Peak Hour		7

Eastbound (Entering) at Island Pond Road by Land Use

	215 - Single-Family Attached Housing		932 - High Turnover (Sit-Down) Restaurant				822 - Strip Mall Plaza		
		Flea Market Townhouses			Flea Market Restaurant #1	Flea Market Restaurant #2	Flea Market Restaurant #3	Flea Market Retail	
		71%			69%	69%	69%	69%	**Total**
Weekday Daily Trips		61			118	134	84	316	713 vpd
Weekday AM Peak Hour	# of Northbound	3	# of Northbound		14	16	10	17	60 vph
Weekday PM Peak Hour	Entering Trips from	4	Entering Trips from		10	11	7	28	60 vph
Saturday Daily Trips	South Main Street	74	South Main Street		134	153	96	565	1,022 vpd
Saturday Gen Peak Hour		4			10	12	8	36	70 vph

Journey to Work (DL to Work)	
Townhouses	
Trips	
# of Northbound Entering Trips from South Main Street	61
	3
	4
	74
	4

Gravity Model	
Retail and Restaurants	
Trips	
# of Northbound Entering Trips from South Main Street	652
	57
	56
	948
	66

Weekday Daily Trips	# of Northbound Entering Trips from South Main Street	713
Weekday AM Peak Hour		60
Weekday PM Peak Hour		60
Saturday Daily Trips		1022
Saturday Gen Peak Hour		70

APPENDIX F – NCHRP 684 TRIP CAPTURE ESTIMATION TOOL

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Derry West Running Brook Corridor Study	**Organization:**	Hoyle Tanner Associates
Project Location:	Rockingham Road, Derry NH	**Performed By:**	Alyssa Smith
Scenario Description:	Keystone and Watts Auto Developments	**Date:**	5/24/2024
Analysis Year:	2024	**Checked By:**	Jacob Sparkowich
Analysis Period:	**AM Street Peak Hour**	**Date:**	6/21/2022

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	1	10800	25	22	3
Retail	822	1	5300	19	11	8
Restaurant		-	0	0	0	0
Cinema/Entertainment		-	0	0	0	0
Residential	215, 220, 221	5	194	89	22	67
Hotel		-		0	0	0
All Other Land Uses[2]	495	1	5500	11	7	4
				144	62	82

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office	1.06			1.06		
Retail	1.17			1.16		
Restaurant						
Cinema/Entertainment						
Residential	1.13			1.09		
Hotel						
All Other Land Uses[2]	1.00			1.00		

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		1	0	0	0	0
Retail	1		0	0	1	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	1	1	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	157	68	89
Internal Capture Percentage	6%	7%	6%
External Vehicle-Trips[5]	134	57	77
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	9%	33%
Retail	15%	22%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	4%	3%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Derry West Running Brook Corridor Study	**Organization:**	Hoyle Tanner Associates
Project Location:	Rockingham Road, Derry NH	**Performed By:**	Alyssa Smith
Scenario Description:	Keystone and Watts Auto Developments	**Date:**	5/24/2024
Analysis Year:	2024	**Checked By:**	Jacob Sparkowich
Analysis Period:	**PM Street Peak Hour**	**Date:**	6/21/2022

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	1	10800	26	4	22
Retail	822	1	5300	50	25	25
Restaurant		-	0	0		
Cinema/Entertainment		-	0	0		
Residential	215, 220, 221	5	194	104	64	40
Hotel		-		0		
All Other Land Uses[2]	495	1	5500	14	7	7
				194	100	94

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office	1.11			1.07		
Retail	1.21			1.28		
Restaurant						
Cinema/Entertainment						
Residential	1.15			1.21		
Hotel						
All Other Land Uses[2]	1.00			1.00		

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		2	0	0	0	0
Retail	1		0	0	8	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	3	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	226	115	111
Internal Capture Percentage	14%	14%	14%
External Vehicle-Trips[5]	168	86	82
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	75%	8%
Retail	17%	28%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	11%	10%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

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NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Derry West Running Brook Corridor Study	**Organization:**	Hoyle Tanner Associates
Project Location:	Rockingham Road, Derry NH	**Performed By:**	Alyssa Smith
Scenario Description:	Humphrey Road	**Date:**	5/31/2024
Analysis Year:	2024	**Checked By:**	Jacob Sparkowich
Analysis Period:	**AM Street Peak Hour**	**Date:**	6/21/2022

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office		-		0	0	0
Retail	822	2	27200	56	34	22
Restaurant	932	2	16800	161	89	72
Cinema/Entertainment		-	0	0	0	0
Residential	215, 220, 221	3	112	59	16	43
Hotel		-		0	0	0
All Other Land Uses[2]		-		0	0	0
				276	139	137

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office						
Retail	1.17			1.16		
Restaurant	1.52			1.52		
Cinema/Entertainment						
Residential	1.13			1.09		
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		3	0	0	0
Restaurant	0	3		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	9	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	375	193	182
Internal Capture Percentage	9%	8%	9%
External Vehicle-Trips[5]	252	128	124
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	8%	12%
Restaurant	9%	4%
Cinema/Entertainment	N/A	N/A
Residential	6%	19%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

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NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Derry West Running Brook Corridor Study	**Organization:**	Hoyle Tanner Associates
Project Location:	Rockingham Road, Derry NH	**Performed By:**	Alyssa Smith
Scenario Description:	Humphrey Road	**Date:**	5/31/2024
Analysis Year:	2024	**Checked By:**	Jacob Sparkowich
Analysis Period:	**PM Street Peak Hour**	**Date:**	6/21/2022

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office		-		0		
Retail	822	2	27200	158	79	79
Restaurant	932	2	16800	152	93	59
Cinema/Entertainment		-	0	0		
Residential	215, 220, 221	3	112	68	41	27
Hotel		-		0		
All Other Land Uses[2]		-		0		
				378	213	165

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office						
Retail	1.21			1.28		
Restaurant	1.52			1.52		
Cinema/Entertainment						
Residential	1.15			1.21		
Hotel						
All Other Land Uses[2]						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		29	0	22	0
Restaurant	0	37		0	8	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	10	7	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	508	284	224
Internal Capture Percentage	44%	40%	50%
External Vehicle-Trips[5]	206	124	82
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	49%	50%
Restaurant	26%	50%
Cinema/Entertainment	N/A	N/A
Residential	64%	52%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Derry West Running Brook Corridor Study	**Organization:**	Hoyle Tanner Associates
Project Location:	Rockingham Road, Derry NH	**Performed By:**	Alyssa Smith
Scenario Description:	Siragusa Farm	**Date:**	5/31/2022
Analysis Year:	2042	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	1	26,000	0	47	6
Retail	822	1	19,000	44	26	18
Restaurant	932	3	16,000	153	84	69
Cinema/Entertainment		-	0	0	0	0
Residential	215, 220	2	108	59	14	45
Hotel	310	1	75	30	26	4
All Other Land Uses[2]		-		0	0	0
				286	197	142

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office	1.06			1.06		
Retail	1.17			1.16		
Restaurant	1.52			1.52		
Cinema/Entertainment						
Residential	1.13			1.09		
Hotel	1.00			1.00		
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		2	3	0	0	0
Retail	2		3	0	0	0
Restaurant	7	2		0	1	1
Cinema/Entertainment	0	0	0		0	0
Residential	1	0	10	0		0
Hotel	2	1	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	435	250	185
Internal Capture Percentage	16%	14%	19%
External Vehicle-Trips[5]	282	169	113
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	24%	83%
Retail	17%	24%
Restaurant	13%	10%
Cinema/Entertainment	N/A	N/A
Residential	6%	22%
Hotel	4%	75%

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Derry West Running Brook Corridor Study	**Organization:**	Hoyle Tanner Associates
Project Location:	Rockingham Road, Derry NH	**Performed By:**	Alyssa Smith
Scenario Description:	Siragusa Farm	**Date:**	6/1/2022
Analysis Year:	2042	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office	710	1	26,000	54	9	45
Retail	822	1	19,000	124	62	62
Restaurant	932	3	16,000	145	88	57
Cinema/Entertainment		-	0	0		
Residential	215, 220	2	108	69	43	26
Hotel	310	1	75	28	5	23
All Other Land Uses[2]		-		0		
				420	207	213

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office	1.11			1.07		
Retail	1.21			1.28		
Restaurant	1.52			1.52		
Cinema/Entertainment						
Residential	1.15			1.21		
Hotel	1.00			1.00		
All Other Land Uses[2]						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	2	0	1	0
Retail	2		23	0	21	1
Restaurant	3	36		0	8	3
Cinema/Entertainment	0	0	0		0	0
Residential	1	8	7	0		0
Hotel	0	2	7	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	541	273	268
Internal Capture Percentage	48%	48%	49%
External Vehicle-Trips[5]	215	104	111
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	60%	19%
Retail	69%	59%
Restaurant	29%	57%
Cinema/Entertainment	N/A	N/A
Residential	61%	52%
Hotel	80%	39%

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

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NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Derry West Running Brook Corridor Study	**Organization:**	Hoyle Tanner Associates
Project Location:	Rockingham Road, Derry NH	**Performed By:**	Alyssa Smith
Scenario Description:	Flea Market Parcel	**Date:**	6/6/2022
Analysis Year:	2042	**Checked By:**	Jacob Sparkowich
Analysis Period:	**AM Street Peak Hour**	**Date:**	6/21/2022

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office		-		0		
Retail	822	1	40,000	72	43	29
Restaurant	932	3	20,000	191	105	86
Cinema/Entertainment		-	0	0		
Residential	215	1	30	14	4	10
Hotel				0		
All Other Land Uses[2]		-		0		
				277	152	125

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office						
Retail	1.17			1.16		
Restaurant	1.52			1.52		
Cinema/Entertainment						
Residential	1.13			1.09		
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		4	0	0	0
Restaurant	0	4		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	2	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	391	215	176
Internal Capture Percentage	5%	5%	6%
External Vehicle-Trips[5]	262	144	118
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	8%	12%
Restaurant	4%	3%
Cinema/Entertainment	N/A	N/A
Residential	0%	18%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Derry West Running Brook Corridor Study	**Organization:**	Hoyle Tanner Associates
Project Location:	Rockingham Road, Derry NH	**Performed By:**	Alyssa Smith
Scenario Description:	Flea Market Parcel	**Date:**	6/6/2022
Analysis Year:	2042	**Checked By:**	Jacob Sparkowich
Analysis Period:	**PM Street Peak Hour**	**Date:**	6/21/2022

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips[3]		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office		-		0		
Retail	822	1	40,000	208	104	104
Restaurant	932	3	20,000	181	110	71
Cinema/Entertainment		-	0	0		
Residential	215	1	30	17	10	7
Hotel				0		
All Other Land Uses[2]		-		0		
				406	224	182

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.[4]	% Transit	% Non-Motorized	Veh. Occ.[4]	% Transit	% Non-Motorized
Office						
Retail	1.21			1.28		
Restaurant	1.52			1.52		
Cinema/Entertainment						
Residential	1.15			1.21		
Hotel						
All Other Land Uses[2]						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		39	0	6	0
Restaurant	0	44		0	2	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	3	2	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	554	305	249
Internal Capture Percentage	35%	31%	39%
External Vehicle-Trips[5]	263	151	112
External Transit-Trips[6]	0	0	0
External Non-Motorized Trips[6]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	37%	34%
Restaurant	25%	43%
Cinema/Entertainment	N/A	N/A
Residential	67%	63%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

[2]Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

[3]Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

[4]Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made

[5]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.

[6]Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

APPENDIX G – JOURNEY TO WORK CENSUS DATA

Journey to Work Data

From West Running Brook Residential Developments to Work

Workplace State/U.S. Island Area/Foreign Country	Workplace County	Workplace MCD	Number of Workers
New Hampshire	Rockingham County	**Derry town**	3,957
New Hampshire	Hillsborough County	Manchester city	1,617
New Hampshire	Rockingham County	Londonderry town	1,457
New Hampshire	Rockingham County	Salem town	1,360
New Hampshire	Hillsborough County	Nashua city	668
Massachusetts	Suffolk County	Boston city	650
Massachusetts	Essex County	Lawrence city	456
Massachusetts	Essex County	Haverhill city	441
Massachusetts	Essex County	Andover town	433
New Hampshire	Hillsborough County	Hudson town	366
Massachusetts	Essex County	Methuen Town city	330
Massachusetts	Middlesex County	Woburn city	292
New Hampshire	Rockingham County	Windham town	289
New Hampshire	Hillsborough County	Bedford town	276
New Hampshire	Merrimack County	Hooksett town	265
New Hampshire	Rockingham County	Portsmouth city	265
Massachusetts	Middlesex County	Lowell city	216
Massachusetts	Middlesex County	Wilmington town	202
Massachusetts	Middlesex County	Chelmsford town	200
New Hampshire	Rockingham County	Exeter town	187
Massachusetts	Essex County	North Andover town	184
New Hampshire	Hillsborough County	Merrimack town	178
New Hampshire	Merrimack County	Concord city	166
Massachusetts	Middlesex County	Cambridge city	162
New Hampshire	Hillsborough County	Pelham town	145
Massachusetts	Middlesex County	Tewksbury town	139
New Hampshire	Rockingham County	Hampstead town	123
Massachusetts	Middlesex County	Dracut town	108
Massachusetts	Middlesex County	Waltham city	104
Massachusetts	Middlesex County	Billerica town	103
Massachusetts	Essex County	Peabody city	88
Massachusetts	Middlesex County	Burlington town	88
New Hampshire	Rockingham County	Auburn town	87
Massachusetts	Middlesex County	Everett city	74
Massachusetts	Essex County	Gloucester city	72
Massachusetts	Essex County	Danvers town	69
New Hampshire	Rockingham County	Plaistow town	67
Massachusetts	Middlesex County	Westford town	65
New Hampshire	Rockingham County	Candia town	64
Massachusetts	Middlesex County	Marlborough city	60
Massachusetts	Middlesex County	Reading town	60
Massachusetts	Essex County	Salem city	53
New Hampshire	Hillsborough County	Amherst town	53
New Hampshire	Rockingham County	Chester town	51

Journey to Work Data

From West Running Brook Residential Developments to Work

Workplace State/U.S. Island Area/Foreign Country	Workplace County	Workplace MCD	Number of Workers
New Hampshire	Rockingham County	Atkinson town	50
Massachusetts	Middlesex County	Framingham town	49
Massachusetts	Essex County	Beverly city	48
New Hampshire	Rockingham County	Raymond town	47
Massachusetts	Middlesex County	North Reading town	46
Massachusetts	Middlesex County	Weston town	46
New Hampshire	Rockingham County	Kingston town	46
New Hampshire	Belknap County	Tilton town	41
New Hampshire	Rockingham County	South Hampton town	39
New Hampshire	Rockingham County	Hampton Falls town	37
Massachusetts	Middlesex County	Bedford town	35
Massachusetts	Middlesex County	Medford city	33
Massachusetts	Middlesex County	Newton city	33
New Hampshire	Rockingham County	North Hampton town	33
Massachusetts	Middlesex County	Lexington town	32
New Hampshire	Cheshire County	Keene city	31
New Hampshire	Rockingham County	Seabrook town	31
New Hampshire	Merrimack County	Andover town	30
New Hampshire	Rockingham County	Hampton town	29
Massachusetts	Middlesex County	Wakefield town	28
Massachusetts	Essex County	Amesbury Town city	27
Massachusetts	Middlesex County	Sudbury town	26
Massachusetts	Norfolk County	Norwood town	26
New Hampshire	Strafford County	Durham town	26
New Hampshire	Hillsborough County	Goffstown town	25
New Hampshire	Rockingham County	Brentwood town	25
New Hampshire	Rockingham County	Danville town	24
Massachusetts	Middlesex County	Winchester town	23
New Hampshire	Rockingham County	Newington town	22
Massachusetts	Middlesex County	Hopkinton town	21
Massachusetts	Essex County	Rowley town	20
Massachusetts	Middlesex County	Malden city	20
Massachusetts	Norfolk County	Wellesley town	20
Massachusetts	Middlesex County	Hudson town	19
Massachusetts	Middlesex County	Somerville city	18
Massachusetts	Worcester County	Clinton town	18
New Hampshire	Merrimack County	Danbury town	17
Massachusetts	Essex County	Lynnfield town	16
New Hampshire	Belknap County	Gilford town	16
New Hampshire	Hillsborough County	Milford town	16
Vermont	Chittenden County	Burlington city	16
Maine	York County	Kittery town	15
Massachusetts	Worcester County	Hopedale town	15
New Hampshire	Merrimack County	Hopkinton town	14

Journey to Work Data

From West Running Brook Residential Developments to Work

Workplace State/U.S. Island Area/Foreign Country	Workplace County	Workplace MCD	Number of Workers
Massachusetts	Dukes County	Chilmark town	13
Massachusetts	Essex County	Marblehead town	13
Massachusetts	Middlesex County	Arlington town	13
Massachusetts	Middlesex County	Ayer town	13
Massachusetts	Norfolk County	Weymouth Town city	13
New Hampshire	Merrimack County	Franklin city	13
Connecticut	Fairfield County	Wilton town	12
Massachusetts	Essex County	Ipswich town	12
Massachusetts	Essex County	Lynn city	12
New Hampshire	Merrimack County	Epsom town	12
New Hampshire	Rockingham County	Fremont town	12
New Hampshire	Rockingham County	Greenland town	12
Massachusetts	Essex County	Topsfield town	11
Massachusetts	Norfolk County	Braintree Town city	11
New Hampshire	Hillsborough County	Litchfield town	11
Massachusetts	Essex County	Newburyport city	10
Massachusetts	Suffolk County	Winthrop Town city	10
New Hampshire	Hillsborough County	Hollis town	10
Massachusetts	Essex County	Middleton town	9
Massachusetts	Plymouth County	Kingston town	9
Maine	Cumberland County	South Portland city	8
New Hampshire	Strafford County	Lee town	8
TOTAL			**17,786**

Journey to Work Data

Commuting to West Running Brook Developments for Work

Number	Residence State	Residence County	Residence MCD	Number
9	New Hampshire	Merrimack County	Allenstown town	9
10	Massachusetts	Essex County	Amesbury Town city	10
62	New Hampshire	Hillsborough County	Amherst town	62
7	New Hampshire	Merrimack County	Andover town	7
14	New Hampshire	Hillsborough County	Antrim town	14
38	New Hampshire	Grafton County	Ashland town	38
59	New Hampshire	Rockingham County	Atkinson town	59
114	New Hampshire	Rockingham County	Auburn town	114
8	New Hampshire	Strafford County	Barrington town	8
121	New Hampshire	Hillsborough County	Bedford town	121
22	New Hampshire	Merrimack County	Bow town	22
12	New Hampshire	Rockingham County	Brentwood town	12
66	New Hampshire	Rockingham County	Candia town	66
12	Massachusetts	Middlesex County	Chelmsford town	12
205	New Hampshire	Rockingham County	Chester town	205
4	New Hampshire	Merrimack County	Chichester town	4
40	New Hampshire	Merrimack County	Concord city	40
10	Massachusetts	Middlesex County	Concord town	10
34	New Hampshire	Rockingham County	Deerfield town	34
3,957	New Hampshire	Rockingham County	**Derry town**	3,957
45	New Hampshire	Strafford County	Dover city	45
17	Massachusetts	Middlesex County	Dracut town	17
7	New Hampshire	Merrimack County	Dunbarton town	7
10	Maine	Androscoggin County	Durham town	10
41	New Hampshire	Strafford County	Durham town	41
21	New Hampshire	Rockingham County	East Kingston town	21
10	New Hampshire	Rockingham County	Epping town	10
38	New Hampshire	Rockingham County	Exeter town	38
67	New Hampshire	Rockingham County	Fremont town	67
19	Massachusetts	Essex County	Georgetown town	19
36	New Hampshire	Belknap County	Gilford town	36
106	New Hampshire	Hillsborough County	Goffstown town	106
5	New Hampshire	Grafton County	Groton town	5
145	New Hampshire	Rockingham County	Hampstead town	145
28	New Hampshire	Rockingham County	Hampton town	28
26	Massachusetts	Essex County	Haverhill city	26
13	New Hampshire	Merrimack County	Henniker town	13
10	New Hampshire	Hillsborough County	Hillsborough town	10
164	New Hampshire	Merrimack County	Hooksett town	164
19	New Hampshire	Merrimack County	Hopkinton town	19
107	New Hampshire	Hillsborough County	Hudson town	107
14	New Hampshire	Cheshire County	Keene city	14
24	New Hampshire	Rockingham County	Kingston town	24
86	Massachusetts	Essex County	Lawrence city	86

Journey to Work Data

Commuting to West Running Brook Developments for Work

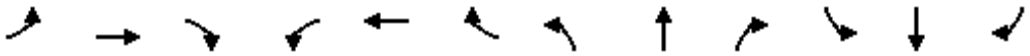
Number	Residence State	Residence County	Residence MCD	Number
10	Massachusetts	Middlesex County	Lexington town	10
473	New Hampshire	Rockingham County	Londonderry town	473
8	New Hampshire	Merrimack County	Loudon town	8
58	Massachusetts	Middlesex County	Lowell city	58
17	New Hampshire	Strafford County	Madbury town	17
996	New Hampshire	Hillsborough County	Manchester city	996
31	New Hampshire	Hillsborough County	Merrimack town	31
76	Massachusetts	Essex County	Methuen Town city	76
3	New Hampshire	Strafford County	Middleton town	3
37	New Hampshire	Hillsborough County	Milford town	37
120	New Hampshire	Hillsborough County	Nashua city	120
12	New Hampshire	Hillsborough County	New Boston town	12
5	New Hampshire	Strafford County	New Durham town	5
11	New Hampshire	Merrimack County	New London town	11
10	New Hampshire	Rockingham County	Newfields town	10
10	New Hampshire	Rockingham County	Newmarket town	10
7	New Hampshire	Rockingham County	Newton town	7
10	Massachusetts	Berkshire County	North Adams city	10
23	Massachusetts	Essex County	North Andover town	23
9	New Hampshire	Rockingham County	Northwood town	9
28	New Hampshire	Rockingham County	Nottingham town	28
65	New Hampshire	Hillsborough County	Pelham town	65
9	Massachusetts	Middlesex County	Pepperell town	9
27	New Hampshire	Rockingham County	Plaistow town	27
27	New Hampshire	Rockingham County	Portsmouth city	27
84	New Hampshire	Rockingham County	Raymond town	84
31	New Hampshire	Strafford County	Rochester city	31
73	New Hampshire	Rockingham County	Rye town	73
304	New Hampshire	Rockingham County	Salem town	304
56	Massachusetts	Essex County	Salisbury town	56
4	New Hampshire	Merrimack County	Salisbury town	4
82	New Hampshire	Rockingham County	Sandown town	82
11	Maine	Cumberland County	Scarborough town	11
10	Rhode Island	Providence County	Smithfield town	10
31	Maine	Cumberland County	South Portland city	31
10	New Hampshire	Rockingham County	Stratham town	10
19	Massachusetts	Middlesex County	Tewksbury town	19
6	New Hampshire	Grafton County	Thornton town	6
15	Massachusetts	Middlesex County	Tyngsborough town	15
12	Massachusetts	Norfolk County	Walpole town	12
3	New Hampshire	Merrimack County	Webster town	3
126	New Hampshire	Rockingham County	Windham town	126
	Total			**8,821**

APPENDIX H - GRAVITY MODEL

Gravity Model for West Running Brook Corridor Study

City or Town within 15 Miles	State	Population	Weight	Weighted Population	Percentage
Derry	NH	33,109	1	33,109	15%
Manchester	NH	109,565	0.25	27,391	13%
Londonderry	NH	24,129	1	24,129	11%
Haverhill	MA	60,879	0.25	15,220	7%
Salem	NH	28,776	0.5	14,388	7%
Windham	NH	13,592	1	13,592	6%
Methuen	MA	47,255	0.25	11,814	5%
Nashua	NH	86,494	0.125	10,812	5%
Lawrence	MA	76,377	0.125	9,547	4%
Hudson	NH	24,467	0.25	6,117	3%
Bedford	NH	21,203	0.25	5,301	2%
Hampstead	NH	8,523	0.5	4,262	2%
Dracut	MA	29,475	0.125	3,684	2%
Pelham	NH	12,897	0.25	3,224	1%
Sandown	NH	5,986	0.5	2,993	1%
Raymond	NH	10,138	0.25	2,535	1%
Auburn	NH	4,953	0.5	2,477	1%
Chester	NH	4,768	0.5	2,384	1%
Goffstown	NH	17,651	0.125	2,206	1%
Litchfield	NH	8,271	0.25	2,068	1%
Plaistow	NH	7,609	0.25	1,902	1%
Atkinson	NH	6,751	0.25	1,688	1%
Hookset	NH	13,451	0.125	1,681	1%
Kingston	NH	6,025	0.25	1,506	1%
Tyngsborough	MA	11,292	0.125	1,412	1%
Amherst	NH	11,201	0.125	1,400	1%
Danville	NH	4,387	0.25	1,097	1%
Fremont	NH	4,283	0.25	1,071	0%
Boxford	MA	7,965	0.125	996	0%
Candia	NH	3,909	0.25	977	0%
Hollis	NH	7,684	0.125	961	0%
Epping	NH	6,411	0.125	801	0%
Merrimac	MA	6,338	0.125	792	0%
Nottingham	NH	4,785	0.125	598	0%
Newton	NH	4,603	0.125	575	0%
Brentwood	NH	4,486	0.125	561	0%
Deerfield	NH	4,280	0.125	535	0%
Dunstable	MA	3,179	0.125	397	0%
South Hampton	NH	814	0.125	102	0%
Total				**216,304**	**100%**

APPENDIX I – SYNCHRO ANALYSIS

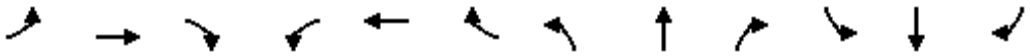


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	127	108	0	60	227	116	118	151	23	60	300	168
Future Volume (vph)	127	108	0	60	227	116	118	151	23	60	300	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00			1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected		0.97			0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1796			1808	1553	1736	1827	1553	1736	1729	
Flt Permitted		0.44			0.86	1.00	0.10	1.00	1.00	0.65	1.00	
Satd. Flow (perm)		813			1579	1553	190	1827	1553	1189	1729	
Peak-hour factor, PHF	0.86	0.86	0.86	0.88	0.88	0.88	0.90	0.90	0.90	0.67	0.67	0.67
Adj. Flow (vph)	148	126	0	68	258	132	131	168	26	90	448	251
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	15	0	16	0
Lane Group Flow (vph)	0	274	0	0	326	49	131	168	11	90	683	0
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm	NA		Perm	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		25.0			25.0	33.8	50.5	38.5	38.5	44.1	35.3	
Effective Green, g (s)		25.0			25.0	33.8	50.5	38.5	38.5	44.1	35.3	
Actuated g/C Ratio		0.28			0.28	0.37	0.56	0.43	0.43	0.49	0.39	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		4.0			4.0	4.0	4.0	5.0	5.0	4.0	5.0	
Lane Grp Cap (vph)		225			437	684	311	778	662	633	675	
v/s Ratio Prot						0.01	c0.06	0.09		0.01	c0.40	
v/s Ratio Perm		c0.34			0.21	0.02	c0.18		0.01	0.06		
v/c Ratio		1.22			0.75	0.07	0.42	0.22	0.02	0.14	1.01	
Uniform Delay, d1		32.6			29.8	18.2	15.9	16.4	15.0	12.5	27.5	
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		131.4			7.2	0.1	1.3	0.3	0.0	0.1	37.7	
Delay (s)		164.0			37.0	18.2	17.2	16.7	15.0	12.6	65.2	
Level of Service		F			D	B	B	B	B	B	E	
Approach Delay (s)		164.0			31.6			16.7			59.2	
Approach LOS		F			C			B			E	

Intersection Summary			
HCM 2000 Control Delay	60.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	90.3	Sum of lost time (s)	18.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	131	197	0	38	147	54	198	273	48	82	248	159
Future Volume (vph)	131	197	0	38	147	54	198	273	48	82	248	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00			1.00	0.85	1.00	1.00	0.85	1.00	0.94	
Flt Protected		0.98			0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1809			1791	1538	1736	1827	1553	1752	1736	
Flt Permitted		0.66			0.84	1.00	0.23	1.00	1.00	0.58	1.00	
Satd. Flow (perm)		1210			1512	1538	415	1827	1553	1077	1736	
Peak-hour factor, PHF	0.93	0.93	0.93	0.80	0.80	0.80	0.95	0.95	0.95	0.86	0.86	0.86
Adj. Flow (vph)	141	212	0	48	184	68	208	287	51	95	288	185
RTOR Reduction (vph)	0	0	0	0	0	45	0	0	28	0	19	0
Lane Group Flow (vph)	0	353	0	0	232	23	208	287	23	95	454	0
Heavy Vehicles (%)	3%	3%	3%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Perm	NA		Perm	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		21.9			21.9	28.8	50.2	37.3	37.3	36.8	29.9	
Effective Green, g (s)		21.9			21.9	28.8	50.2	37.3	37.3	36.8	29.9	
Actuated g/C Ratio		0.26			0.26	0.34	0.60	0.44	0.44	0.44	0.36	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		4.0			4.0	4.0	4.0	5.0	5.0	4.0	5.0	
Lane Grp Cap (vph)		315			393	636	472	810	688	526	617	
v/s Ratio Prot						0.00	c0.07	0.16		0.01	c0.26	
v/s Ratio Perm		c0.29			0.15	0.01	0.19		0.01	0.06		
v/c Ratio		1.12			0.59	0.04	0.44	0.35	0.03	0.18	0.74	
Uniform Delay, d1		31.1			27.2	18.4	10.6	15.4	13.2	14.1	23.6	
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		87.3			2.8	0.0	0.9	0.6	0.0	0.2	5.5	
Delay (s)		118.4			29.9	18.4	11.5	16.0	13.3	14.3	29.1	
Level of Service		F			C	B	B	B	B	B	C	
Approach Delay (s)		118.4			27.3			14.1			26.7	
Approach LOS		F			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	41.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	84.1	Sum of lost time (s)	18.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

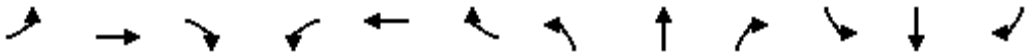


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	199	112	0	61	236	123	125	161	23	65	314	245
Future Volume (vph)	199	112	0	61	236	123	125	161	23	65	314	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00			1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected		0.97			0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1787			1808	1553	1736	1827	1553	1736	1707	
Flt Permitted		0.50			0.87	1.00	0.12	1.00	1.00	0.64	1.00	
Satd. Flow (perm)		929			1583	1553	221	1827	1553	1177	1707	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	221	124	0	68	262	137	139	179	26	72	349	272
RTOR Reduction (vph)	0	0	0	0	0	78	0	0	16	0	31	0
Lane Group Flow (vph)	0	345	0	0	330	59	139	179	10	72	590	0
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm	NA		Perm	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		34.0			34.0	39.0	41.0	33.0	33.0	35.0	30.0	
Effective Green, g (s)		34.0			34.0	39.0	41.0	33.0	33.0	35.0	30.0	
Actuated g/C Ratio		0.38			0.38	0.43	0.46	0.37	0.37	0.39	0.33	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		4.0			4.0	4.0	4.0	5.0	5.0	4.0	5.0	
Lane Grp Cap (vph)		350			598	776	235	669	569	488	569	
v/s Ratio Prot						0.00	c0.05	0.10		0.01	c0.35	
v/s Ratio Perm		c0.37			0.21	0.03	c0.22		0.01	0.05		
v/c Ratio		0.99			0.55	0.08	0.59	0.27	0.02	0.15	1.04	
Uniform Delay, d1		27.8			22.0	14.9	19.5	20.0	18.2	17.5	30.0	
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		44.0			1.4	0.1	4.6	0.5	0.0	0.2	47.4	
Delay (s)		71.7			23.4	15.0	24.1	20.5	18.2	17.7	77.4	
Level of Service		E			C	B	C	C	B	B	E	
Approach Delay (s)		71.7			20.9			21.7			71.2	
Approach LOS		E			C			C			E	

Intersection Summary			
HCM 2000 Control Delay	49.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	91.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

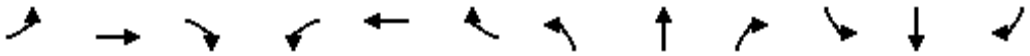
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	202	205	0	39	153	59	209	284	49	87	258	218
Future Volume (vph)	202	205	0	39	153	59	209	284	49	87	258	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00			1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected		0.98			0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1800			1791	1538	1736	1827	1553	1752	1718	
Flt Permitted		0.70			0.86	1.00	0.14	1.00	1.00	0.56	1.00	
Satd. Flow (perm)		1298			1559	1538	247	1827	1553	1028	1718	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	224	228	0	43	170	66	232	316	54	97	287	242
RTOR Reduction (vph)	0	0	0	0	0	39	0	0	33	0	33	0
Lane Group Flow (vph)	0	452	0	0	213	27	232	316	21	97	496	0
Heavy Vehicles (%)	3%	3%	3%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Perm	NA		Perm	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		32.9			32.9	36.8	42.8	33.8	33.8	32.6	28.7	
Effective Green, g (s)		32.9			32.9	36.8	42.8	33.8	33.8	32.6	28.7	
Actuated g/C Ratio		0.37			0.37	0.42	0.48	0.38	0.38	0.37	0.32	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		4.0			4.0	4.0	4.0	5.0	5.0	4.0	5.0	
Lane Grp Cap (vph)		481			578	742	270	696	592	410	556	
v/s Ratio Prot						0.00	c0.09	0.17		0.01	0.29	
v/s Ratio Perm		c0.35			0.14	0.02	c0.33		0.01	0.08		
v/c Ratio		0.94			0.37	0.04	0.86	0.45	0.03	0.24	0.89	
Uniform Delay, d1		26.9			20.3	15.4	18.1	20.5	17.2	18.7	28.5	
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		26.6			0.5	0.0	23.5	1.0	0.1	0.4	17.5	
Delay (s)		53.5			20.8	15.4	41.6	21.5	17.2	19.1	45.9	
Level of Service		D			C	B	D	C	B	B	D	
Approach Delay (s)		53.5			19.5			28.9			41.8	
Approach LOS		D			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	37.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	88.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	90.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	308	194	0	73	329	160	149	215	28	85	398	354
Future Volume (vph)	308	194	0	73	329	160	149	215	28	85	398	354
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00			1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected		0.97			0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1790			1811	1553	1736	1827	1553	1736	1698	
Flt Permitted		0.43			0.83	1.00	0.08	1.00	1.00	0.51	1.00	
Satd. Flow (perm)		785			1518	1553	141	1827	1553	940	1698	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	342	216	0	81	366	178	166	239	31	94	442	393
RTOR Reduction (vph)	0	0	0	0	0	61	0	0	20	0	21	0
Lane Group Flow (vph)	0	558	0	0	447	117	166	239	11	94	814	0
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Perm	NA		Perm	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		73.0			73.0	80.0	60.0	52.0	52.0	58.0	51.0	
Effective Green, g (s)		73.0			73.0	80.0	60.0	52.0	52.0	58.0	51.0	
Actuated g/C Ratio		0.49			0.49	0.53	0.40	0.35	0.35	0.39	0.34	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		4.0			4.0	4.0	4.0	5.0	5.0	4.0	5.0	
Lane Grp Cap (vph)		382			738	890	141	633	538	400	577	
v/s Ratio Prot						0.01	c0.06	0.13		0.01	c0.48	
v/s Ratio Perm		c0.71			0.29	0.07	0.41		0.01	0.08		
v/c Ratio		1.46			0.61	0.13	1.18	0.38	0.02	0.23	1.41	
Uniform Delay, d1		38.5			28.0	17.6	37.8	36.8	32.2	30.1	49.5	
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		221.3			1.6	0.1	131.3	0.8	0.0	0.4	194.9	
Delay (s)		259.8			29.7	17.7	169.1	37.6	32.3	30.5	244.4	
Level of Service		F			C	B	F	D	C	C	F	
Approach Delay (s)		259.8			26.2			87.3			222.8	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	159.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.42		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	119.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	290	304	0	52	232	77	249	368	59	112	327	310
Future Volume (vph)	290	304	0	52	232	77	249	368	59	112	327	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00			1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected		0.98			0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1801			1793	1538	1736	1827	1553	1752	1710	
Flt Permitted		0.59			0.82	1.00	0.08	1.00	1.00	0.34	1.00	
Satd. Flow (perm)		1081			1475	1538	149	1827	1553	618	1710	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	322	338	0	58	258	86	277	409	66	124	363	344
RTOR Reduction (vph)	0	0	0	0	0	41	0	0	43	0	25	0
Lane Group Flow (vph)	0	660	0	0	316	45	277	409	23	124	682	0
Heavy Vehicles (%)	3%	3%	3%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Perm	NA		Perm	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4			8	1	5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		65.0			65.0	73.0	62.0	49.0	49.0	52.0	44.0	
Effective Green, g (s)		65.0			65.0	73.0	62.0	49.0	49.0	52.0	44.0	
Actuated g/C Ratio		0.46			0.46	0.52	0.44	0.35	0.35	0.37	0.31	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		4.0			4.0	4.0	4.0	5.0	5.0	4.0	5.0	
Lane Grp Cap (vph)		501			684	867	213	639	543	294	537	
v/s Ratio Prot						0.00	c0.12	0.22		0.02	0.40	
v/s Ratio Perm		c0.61			0.21	0.03	c0.45		0.01	0.13		
v/c Ratio		1.32			0.46	0.05	1.30	0.64	0.04	0.42	1.27	
Uniform Delay, d1		37.5			25.6	16.5	42.3	38.1	30.0	30.8	48.0	
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		156.4			0.7	0.0	165.2	3.0	0.1	1.3	135.9	
Delay (s)		193.9			26.3	16.5	207.4	41.1	30.1	32.1	183.9	
Level of Service		F			C	B	F	D	C	C	F	
Approach Delay (s)		193.9			24.2			101.4			161.2	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	131.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.34		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	117.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.9	1.4	0.0	2.9	1.6
Total Del/Veh (s)	71.1	22.4	16.0	56.5	41.8
Stop Del/Veh (s)	68.4	18.2	13.8	45.4	35.7

6: NH 28/Rockingham Road Performance by approach

Approach	NB	SB	SE	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.1
Total Del/Veh (s)	0.4	3.4	6.4	2.8
Stop Del/Veh (s)	0.0	0.5	6.2	1.3

7: NH 28/Rockingham Road Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	6.9	0.0	2.8
Total Del/Veh (s)	44.0	1.1	18.9
Stop Del/Veh (s)	41.4	0.2	17.2

Total Network Performance

Denied Del/Veh (s)	3.1
Total Del/Veh (s)	50.6
Stop Del/Veh (s)	42.3

Intersection: 4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LT	LT	R	L	T	R	L	TR
Maximum Queue (ft)	251	312	173	138	145	51	299	1037
Average Queue (ft)	174	145	38	60	59	11	82	360
95th Queue (ft)	282	247	103	111	118	35	267	918
Link Distance (ft)	136	1010		269	269	269		1237
Upstream Blk Time (%)	46							4
Queuing Penalty (veh)	112							0
Storage Bay Dist (ft)			120				100	
Storage Blk Time (%)		16					0	34
Queuing Penalty (veh)		20					0	24

Intersection: 6: NH 28/Rockingham Road

Movement	SB	SE
Directions Served	T	R
Maximum Queue (ft)	123	351
Average Queue (ft)	14	52
95th Queue (ft)	68	248
Link Distance (ft)	269	349
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: NH 28/Rockingham Road

Movement	EB
Directions Served	TR
Maximum Queue (ft)	447
Average Queue (ft)	158
95th Queue (ft)	529
Link Distance (ft)	612
Upstream Blk Time (%)	9
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 156

4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	1.1	0.0	0.9	0.5
Total Del/Veh (s)	56.2	24.5	15.0	22.3	27.3
Stop Del/Veh (s)	52.3	20.8	12.4	16.9	23.4

6: NH 28/Rockingham Road Performance by approach

Approach	NB	SB	SE	All
Denied Del/Veh (s)	0.4	0.0	0.0	0.2
Total Del/Veh (s)	0.7	4.8	5.4	2.8
Stop Del/Veh (s)	0.0	1.5	4.8	1.4

7: NH 28/Rockingham Road Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	5.0	0.0	2.6
Total Del/Veh (s)	29.5	1.0	15.7
Stop Del/Veh (s)	24.3	0.2	12.7

Total Network Performance

Denied Del/Veh (s)	2.0
Total Del/Veh (s)	35.8
Stop Del/Veh (s)	28.4

Intersection: 4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LT	LT	R	L	T	R	L	TR
Maximum Queue (ft)	248	232	113	183	216	57	161	334
Average Queue (ft)	199	104	24	81	102	18	39	170
95th Queue (ft)	277	187	73	146	179	45	103	296
Link Distance (ft)	136	1010		269	269	269		1237
Upstream Blk Time (%)	50				0			
Queuing Penalty (veh)	168				0			
Storage Bay Dist (ft)			120				100	
Storage Blk Time (%)		8					0	22
Queuing Penalty (veh)		5					1	19

Intersection: 6: NH 28/Rockingham Road

Movement	SB	SE
Directions Served	T	R
Maximum Queue (ft)	159	453
Average Queue (ft)	26	100
95th Queue (ft)	98	373
Link Distance (ft)	269	349
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: NH 28/Rockingham Road

Movement	EB
Directions Served	TR
Maximum Queue (ft)	534
Average Queue (ft)	173
95th Queue (ft)	531
Link Distance (ft)	612
Upstream Blk Time (%)	6
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 192

4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.1	1.4	0.0	6.0	2.6
Total Del/Veh (s)	54.9	17.8	18.6	88.8	51.8
Stop Del/Veh (s)	52.0	14.0	16.3	75.4	44.8

6: NH 28/Rockingham Road Performance by approach

Approach	NB	SB	SE	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.1
Total Del/Veh (s)	0.4	3.9	5.4	2.9
Stop Del/Veh (s)	0.0	0.6	5.2	1.2

7: NH 28/Rockingham Road Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	10.4	0.0	4.5
Total Del/Veh (s)	25.8	1.1	11.9
Stop Del/Veh (s)	22.7	0.2	10.0

Total Network Performance

Denied Del/Veh (s)	5.1
Total Del/Veh (s)	56.5
Stop Del/Veh (s)	47.2

Intersection: 4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LT	LT	R	L	T	R	L	TR
Maximum Queue (ft)	259	248	180	140	147	46	300	970
Average Queue (ft)	191	125	40	65	67	10	133	544
95th Queue (ft)	277	207	107	114	124	36	348	1044
Link Distance (ft)	136	1010		269	269	269		1237
Upstream Blk Time (%)	45							6
Queuing Penalty (veh)	143							0
Storage Bay Dist (ft)			120				100	
Storage Blk Time (%)		11					1	59
Queuing Penalty (veh)		14					3	39

Intersection: 6: NH 28/Rockingham Road

Movement	SB	SE
Directions Served	T	R
Maximum Queue (ft)	164	414
Average Queue (ft)	20	66
95th Queue (ft)	92	290
Link Distance (ft)	269	349
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: NH 28/Rockingham Road

Movement	EB
Directions Served	TR
Maximum Queue (ft)	443
Average Queue (ft)	123
95th Queue (ft)	443
Link Distance (ft)	612
Upstream Blk Time (%)	5
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 199

4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	1.1	0.0	1.0	0.5
Total Del/Veh (s)	42.7	18.5	21.8	67.5	41.0
Stop Del/Veh (s)	38.7	15.4	18.8	56.7	35.2

6: NH 28/Rockingham Road Performance by approach

Approach	NB	SB	SE	All
Denied Del/Veh (s)	0.4	0.0	0.0	0.2
Total Del/Veh (s)	0.7	4.7	4.3	2.6
Stop Del/Veh (s)	0.0	1.0	3.8	1.1

7: NH 28/Rockingham Road Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	8.6	0.0	4.4
Total Del/Veh (s)	25.1	0.9	13.4
Stop Del/Veh (s)	19.8	0.2	10.3

Total Network Performance

Denied Del/Veh (s)	3.2
Total Del/Veh (s)	46.8
Stop Del/Veh (s)	37.6

Intersection: 4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LT	LT	R	L	T	R	L	TR
Maximum Queue (ft)	253	193	87	223	246	57	280	794
Average Queue (ft)	204	89	21	106	120	21	120	403
95th Queue (ft)	279	156	57	185	205	48	313	853
Link Distance (ft)	136	1010		269	269	269		1237
Upstream Blk Time (%)	45			0	0			0
Queuing Penalty (veh)	189			0	0			0
Storage Bay Dist (ft)			120				100	
Storage Blk Time (%)		5	0				1	52
Queuing Penalty (veh)		3	0				4	46

Intersection: 6: NH 28/Rockingham Road

Movement	SB	SE
Directions Served	T	R
Maximum Queue (ft)	142	452
Average Queue (ft)	24	62
95th Queue (ft)	90	264
Link Distance (ft)	269	349
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: NH 28/Rockingham Road

Movement	EB
Directions Served	TR
Maximum Queue (ft)	520
Average Queue (ft)	174
95th Queue (ft)	527
Link Distance (ft)	612
Upstream Blk Time (%)	8
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 243

4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	1.5	0.0	897.6	362.0
Total Del/Veh (s)	83.9	25.4	43.4	267.0	114.4
Stop Del/Veh (s)	81.4	19.8	40.0	238.5	102.8

6: NH 28/Rockingham Road Performance by approach

Approach	NB	SB	SE	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.2
Total Del/Veh (s)	0.7	3.4	7.9	2.8
Stop Del/Veh (s)	0.0	0.6	8.2	1.4

7: NH 28/Rockingham Road Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	883.0	0.0	464.1
Total Del/Veh (s)	163.7	1.0	69.8
Stop Del/Veh (s)	158.7	0.1	67.1

Total Network Performance

Denied Del/Veh (s)	558.3
Total Del/Veh (s)	146.7
Stop Del/Veh (s)	132.7

Intersection: 4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LT	LT	R	L	T	R	L	TR
Maximum Queue (ft)	263	454	220	244	337	49	300	1300
Average Queue (ft)	239	251	116	127	154	17	101	1262
95th Queue (ft)	250	418	273	219	255	47	296	1288
Link Distance (ft)	136	1010		269	269	269		1237
Upstream Blk Time (%)	84				1			84
Queuing Penalty (veh)	430				2			0
Storage Bay Dist (ft)			120				100	
Storage Blk Time (%)		30					4	70
Queuing Penalty (veh)		50					33	60

Intersection: 6: NH 28/Rockingham Road

Movement	SB	SE
Directions Served	T	R
Maximum Queue (ft)	97	451
Average Queue (ft)	14	100
95th Queue (ft)	52	400
Link Distance (ft)	269	349
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: NH 28/Rockingham Road

Movement	EB
Directions Served	TR
Maximum Queue (ft)	651
Average Queue (ft)	632
95th Queue (ft)	645
Link Distance (ft)	612
Upstream Blk Time (%)	91
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 575

4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	1.2	0.0	632.4	216.3
Total Del/Veh (s)	57.3	29.0	64.1	279.9	115.6
Stop Del/Veh (s)	52.8	24.5	59.2	255.3	105.4

6: NH 28/Rockingham Road Performance by approach

Approach	NB	SB	SE	All
Denied Del/Veh (s)	0.5	0.0	0.0	0.3
Total Del/Veh (s)	9.5	3.5	10.0	8.1
Stop Del/Veh (s)	6.1	0.7	9.5	5.3

7: NH 28/Rockingham Road Performance by approach

Approach	EB	WB	All
Denied Del/Veh (s)	755.8	0.1	425.1
Total Del/Veh (s)	111.3	1.1	52.9
Stop Del/Veh (s)	96.1	0.1	45.3

Total Network Performance

Denied Del/Veh (s)	424.8
Total Del/Veh (s)	136.6
Stop Del/Veh (s)	120.4

Intersection: 4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street

Movement	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	LT	LT	R	L	T	R	L	TR
Maximum Queue (ft)	276	542	220	393	416	49	300	1290
Average Queue (ft)	231	178	54	292	238	18	162	1261
95th Queue (ft)	257	391	171	455	422	42	377	1279
Link Distance (ft)	136	1010		269	269	269		1237
Upstream Blk Time (%)	72			42	7			87
Queuing Penalty (veh)	435			97	15			0
Storage Bay Dist (ft)			120				100	
Storage Blk Time (%)		18	0				3	73
Queuing Penalty (veh)		15	0				21	83

Intersection: 6: NH 28/Rockingham Road

Movement	NB	SB	SE
Directions Served	T	T	R
Maximum Queue (ft)	574	90	468
Average Queue (ft)	89	10	155
95th Queue (ft)	291	46	489
Link Distance (ft)	874	269	349
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: NH 28/Rockingham Road

Movement	EB
Directions Served	TR
Maximum Queue (ft)	664
Average Queue (ft)	632
95th Queue (ft)	649
Link Distance (ft)	612
Upstream Blk Time (%)	78
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 666

LANE LEVEL OF SERVICE

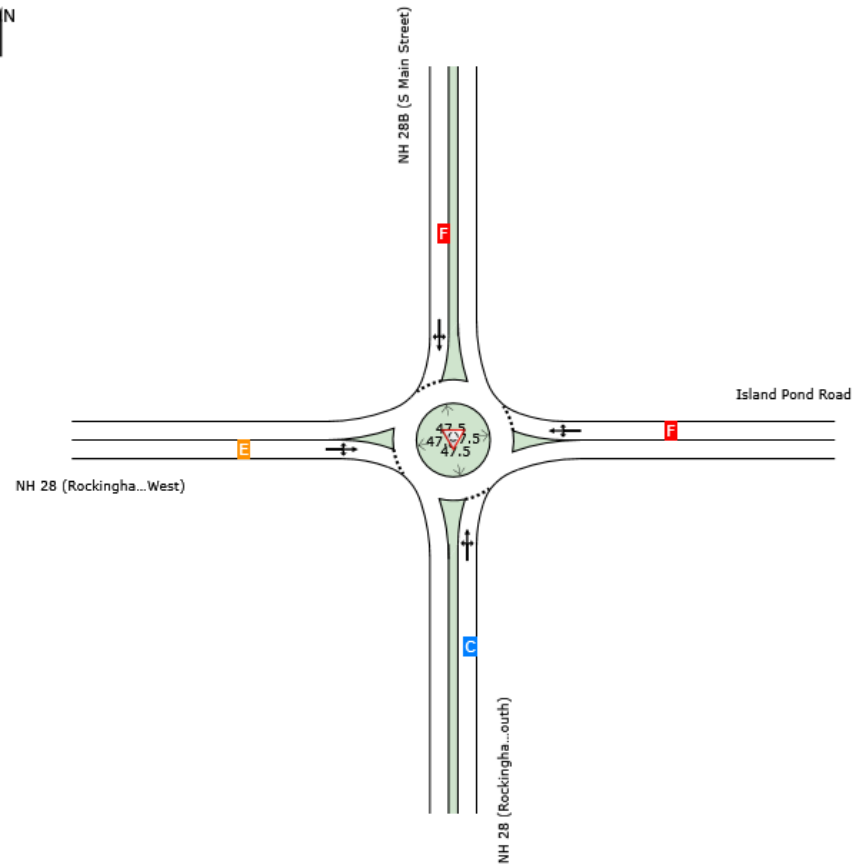
Lane Level of Service

Site: 101 [NH 28 / NH 28 B / Island Pond Rd (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	F	F	E	F

APPENDIX J – SIDRA ANALYSIS



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

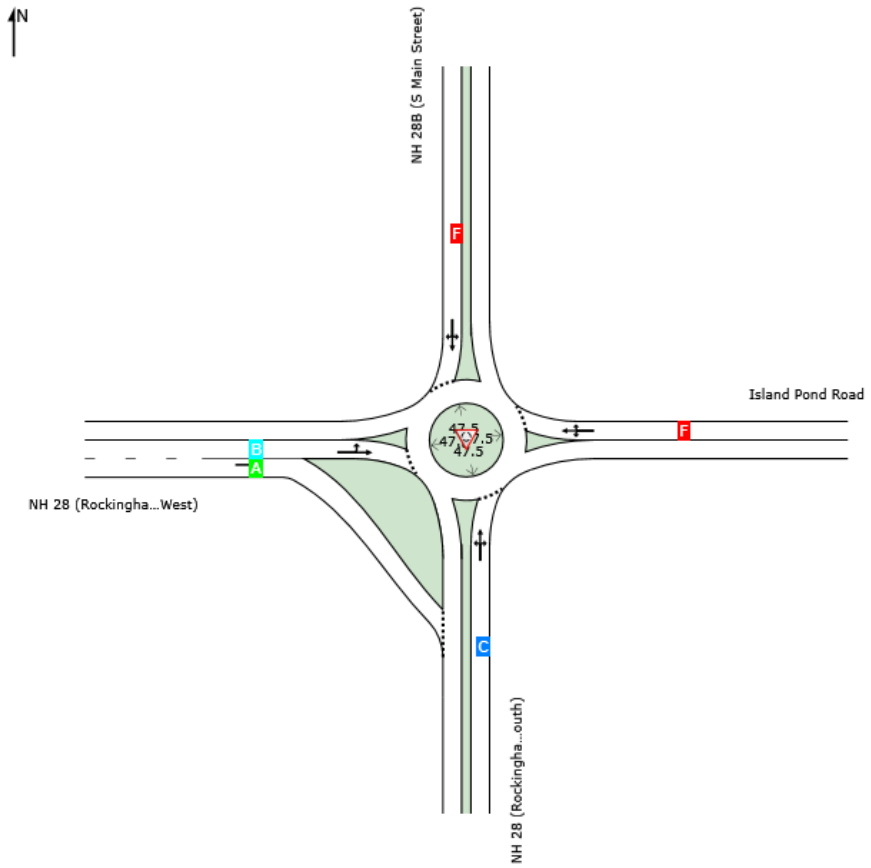
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 101 [NH 28 / NH 28 B / Island Pond Rd - w SW Slip (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	F	F	B	F



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

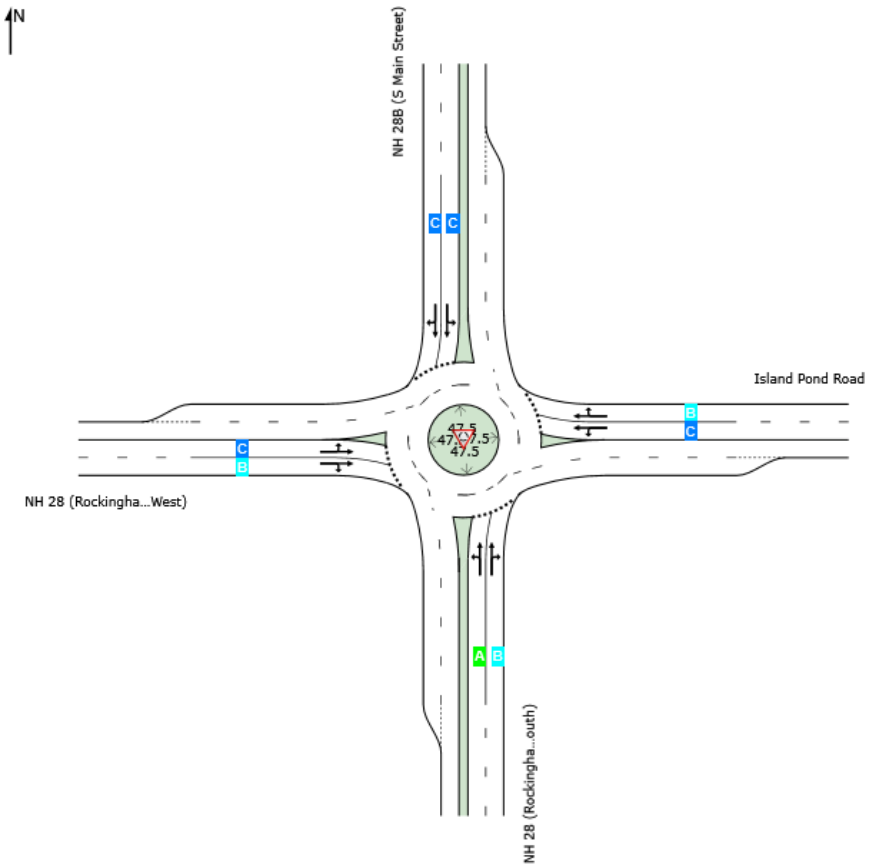
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 101 [NH 28 / NH 28 B / Island Pond Rd - 2Lane (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	C	C	C	C



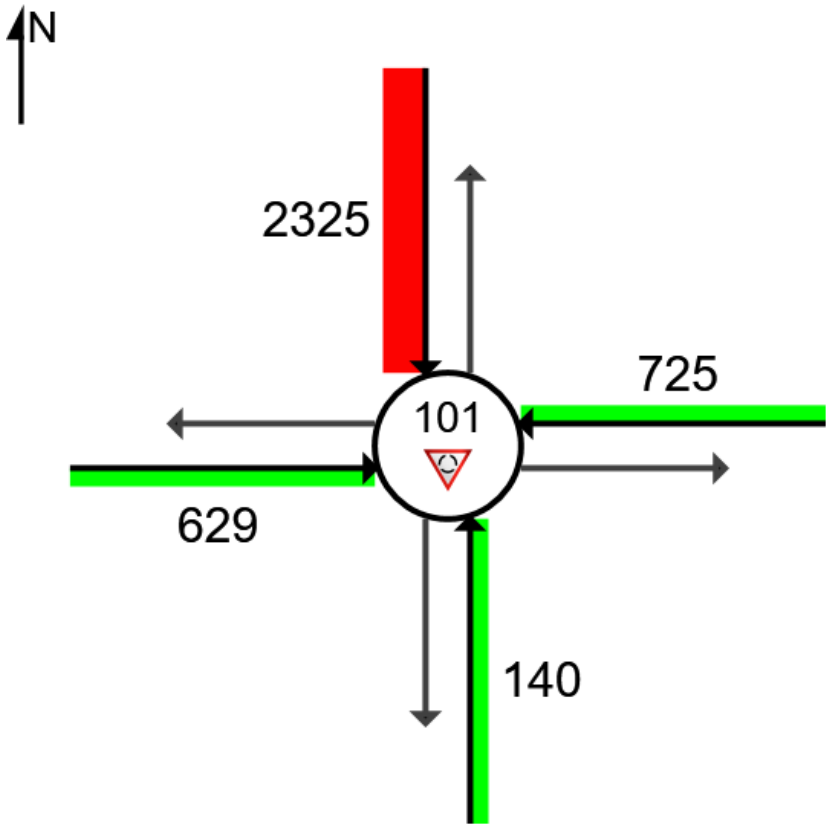
Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

QUEUE DISTANCE (PERCENTILE)

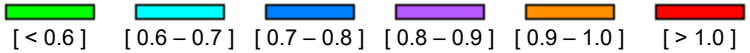
Largest 95% Back of Queue Distance for any lane on the approach (feet)

Site: 101 [NH 28 / NH 28 B / Island Pond Rd (Site Folder: General)]

New Site
Site Category: (None)
Roundabout



Colour code based on Queue Storage Ratio



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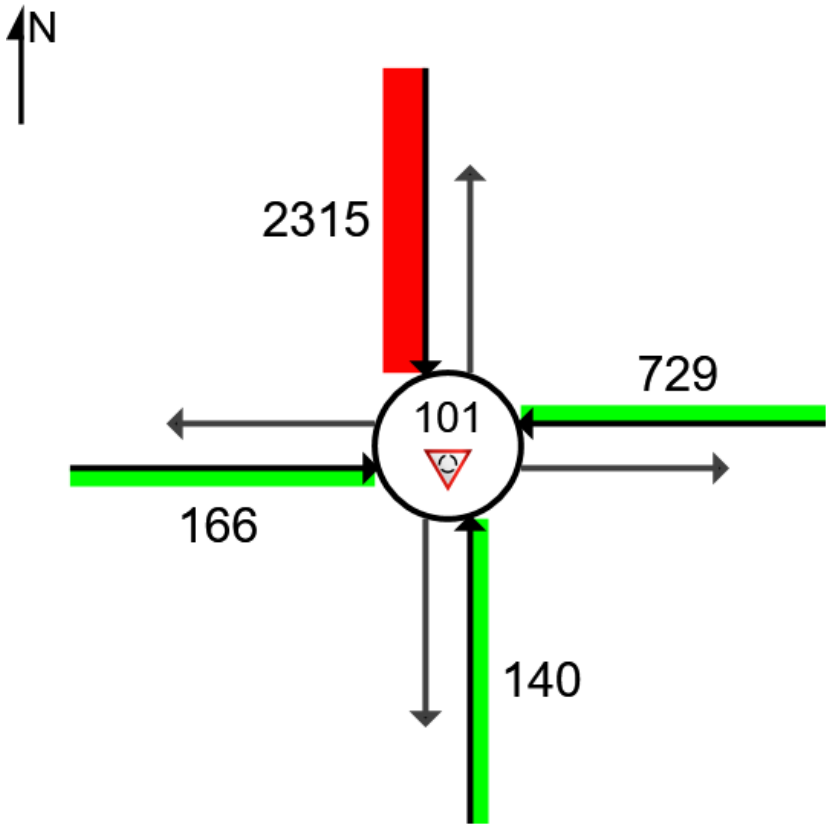
Queue Model: HCM Queue Formula.

QUEUE DISTANCE (PERCENTILE)

Largest 95% Back of Queue Distance for any lane on the approach (feet)

Site: 101 [NH 28 / NH 28 B / Island Pond Rd - w SW Slip (Site Folder: General)]

New Site
Site Category: (None)
Roundabout



Colour code based on Queue Storage Ratio

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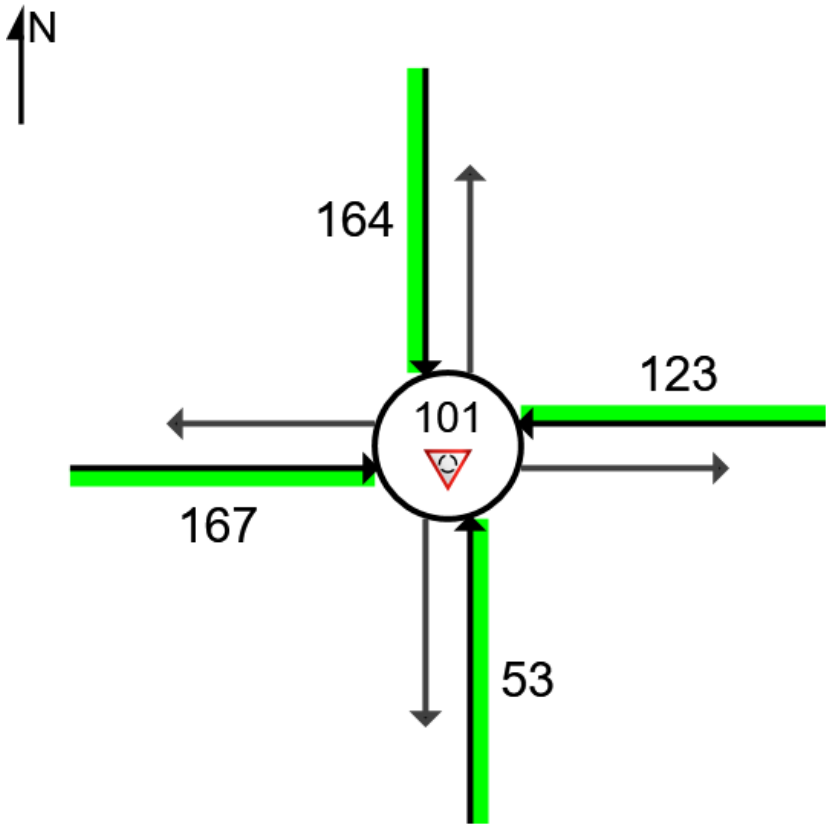
Queue Model: HCM Queue Formula.

QUEUE DISTANCE (PERCENTILE)

Largest 95% Back of Queue Distance for any lane on the approach (feet)

Site: 101 [NH 28 / NH 28 B / Island Pond Rd - 2Lane (Site Folder: General)]

New Site
Site Category: (None)
Roundabout



Colour code based on Queue Storage Ratio

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Queue Model: HCM Queue Formula.

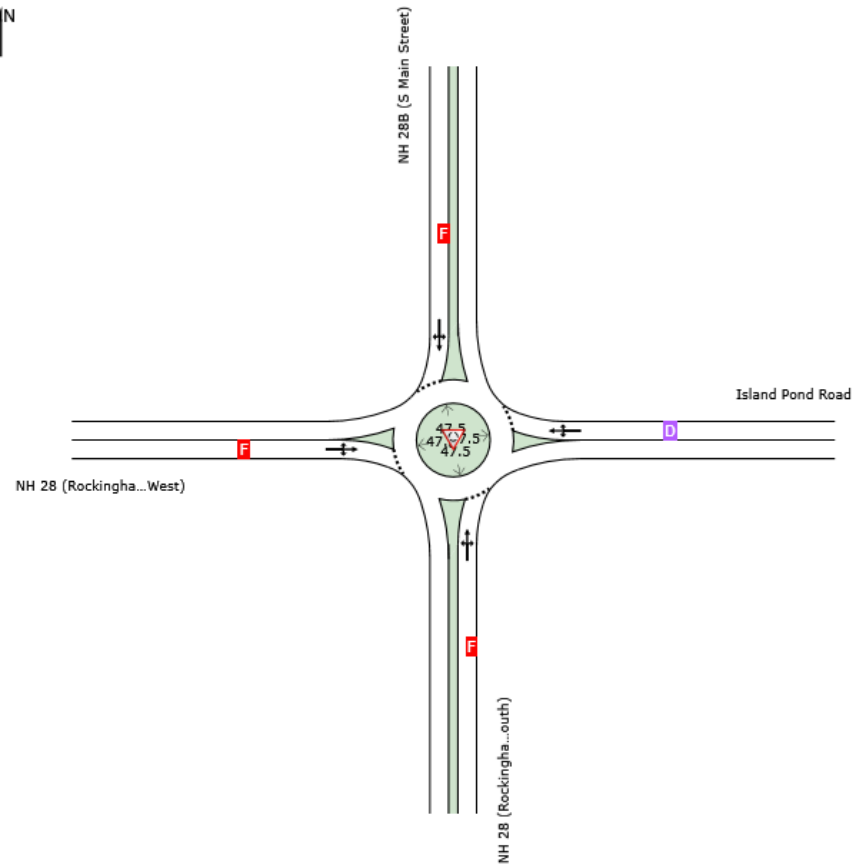
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 101 [NH 28 / NH 28 B / Island Pond Rd (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	D	F	F	F



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

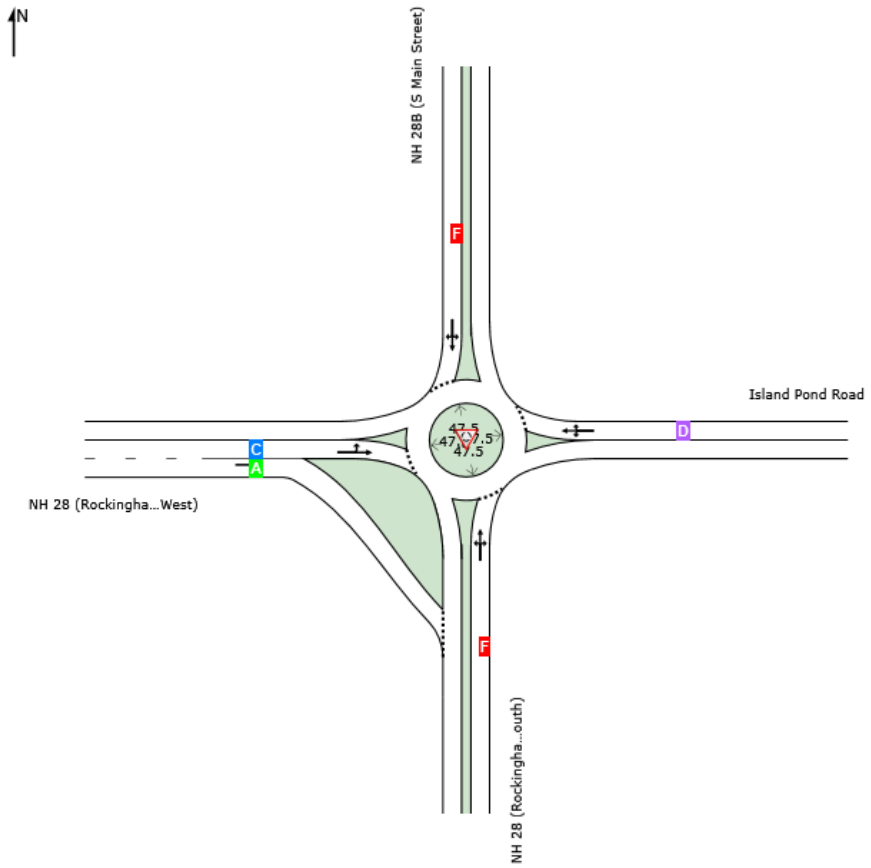
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 101 [NH 28 / NH 28 B / Island Pond Rd w SW Slip (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	F	D	F	C	F



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

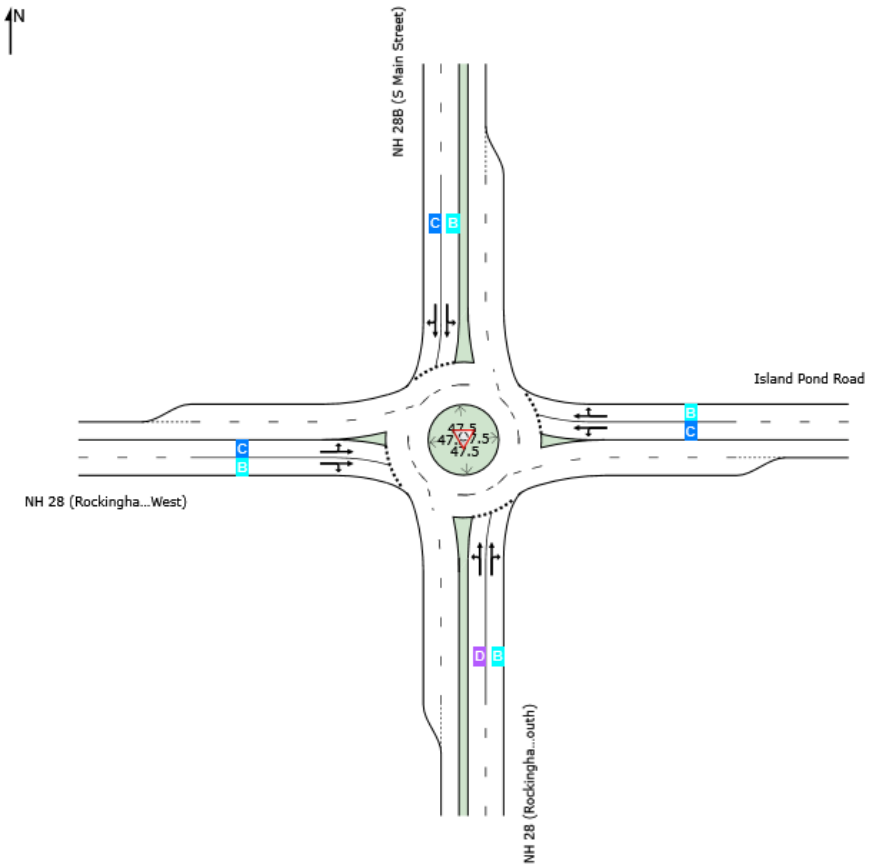
LANE LEVEL OF SERVICE

Lane Level of Service

Site: 101 [NH 28 / NH 28 B / Island Pond Rd - 2Lane (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	C	B	C	C



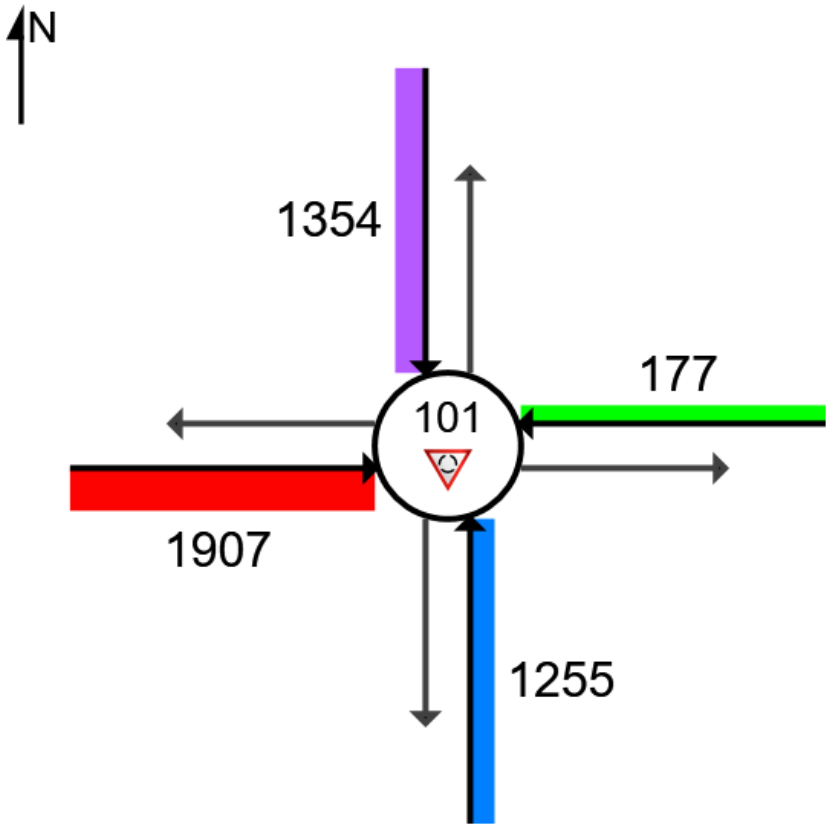
Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Delay Model: HCM Delay Formula (Geometric Delay is not included).

QUEUE DISTANCE (PERCENTILE)

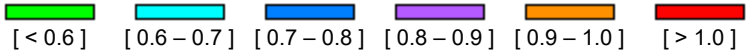
Largest 95% Back of Queue Distance for any lane on the approach (feet)

Site: 101 [NH 28 / NH 28 B / Island Pond Rd (Site Folder: General)]

New Site
Site Category: (None)
Roundabout



Colour code based on Queue Storage Ratio



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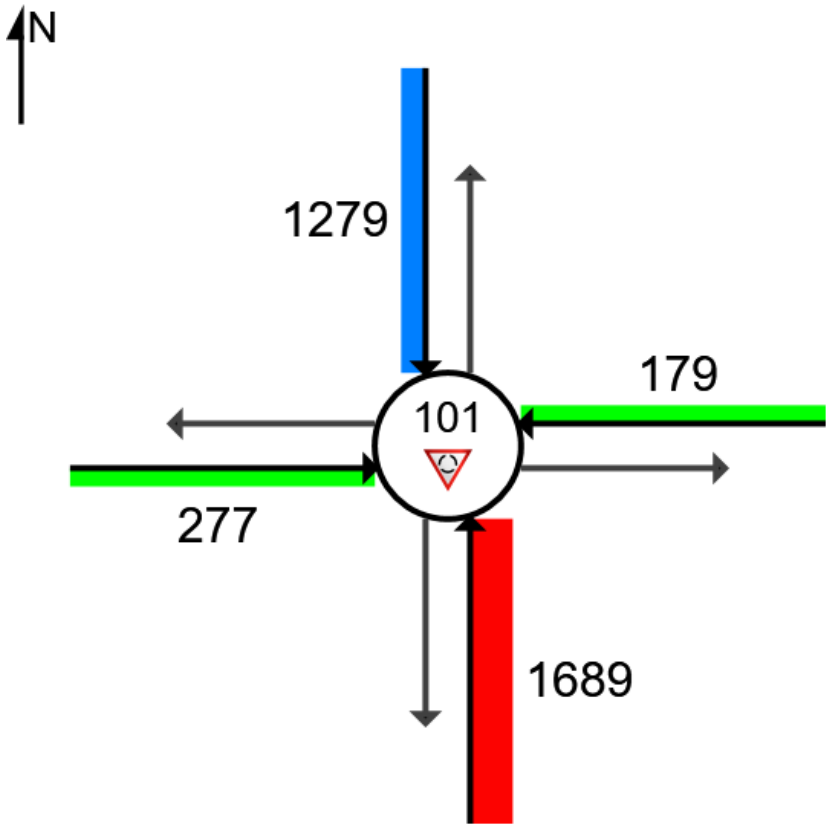
Queue Model: HCM Queue Formula.

QUEUE DISTANCE (PERCENTILE)

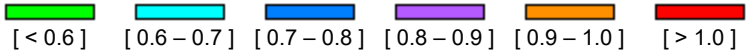
Largest 95% Back of Queue Distance for any lane on the approach (feet)

Site: 101 [NH 28 / NH 28 B / Island Pond Rd w SW Slip (Site Folder: General)]

New Site
Site Category: (None)
Roundabout



Colour code based on Queue Storage Ratio



[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

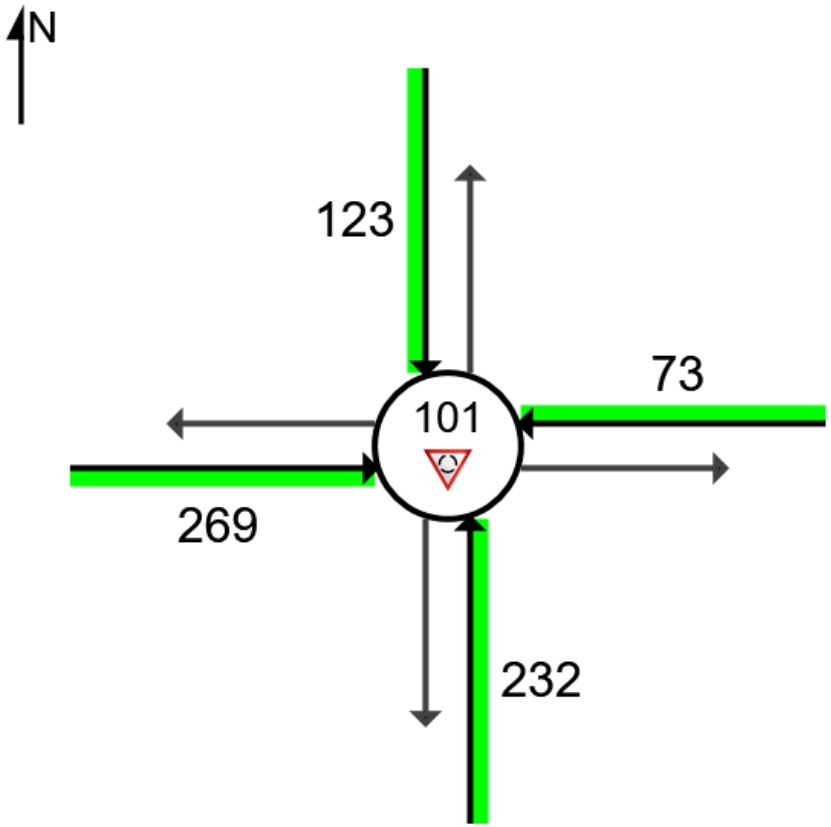
Queue Model: HCM Queue Formula.

QUEUE DISTANCE (PERCENTILE)

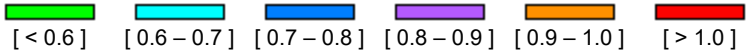
Largest 95% Back of Queue Distance for any lane on the approach (feet)

Site: 101 [NH 28 / NH 28 B / Island Pond Rd - 2Lane (Site Folder: General)]

New Site
Site Category: (None)
Roundabout



Colour code based on Queue Storage Ratio



[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

Queue Model: HCM Queue Formula.

APPENDIX K – CONCEPTUAL PLAN

7/11/2022
12:51:23 PM
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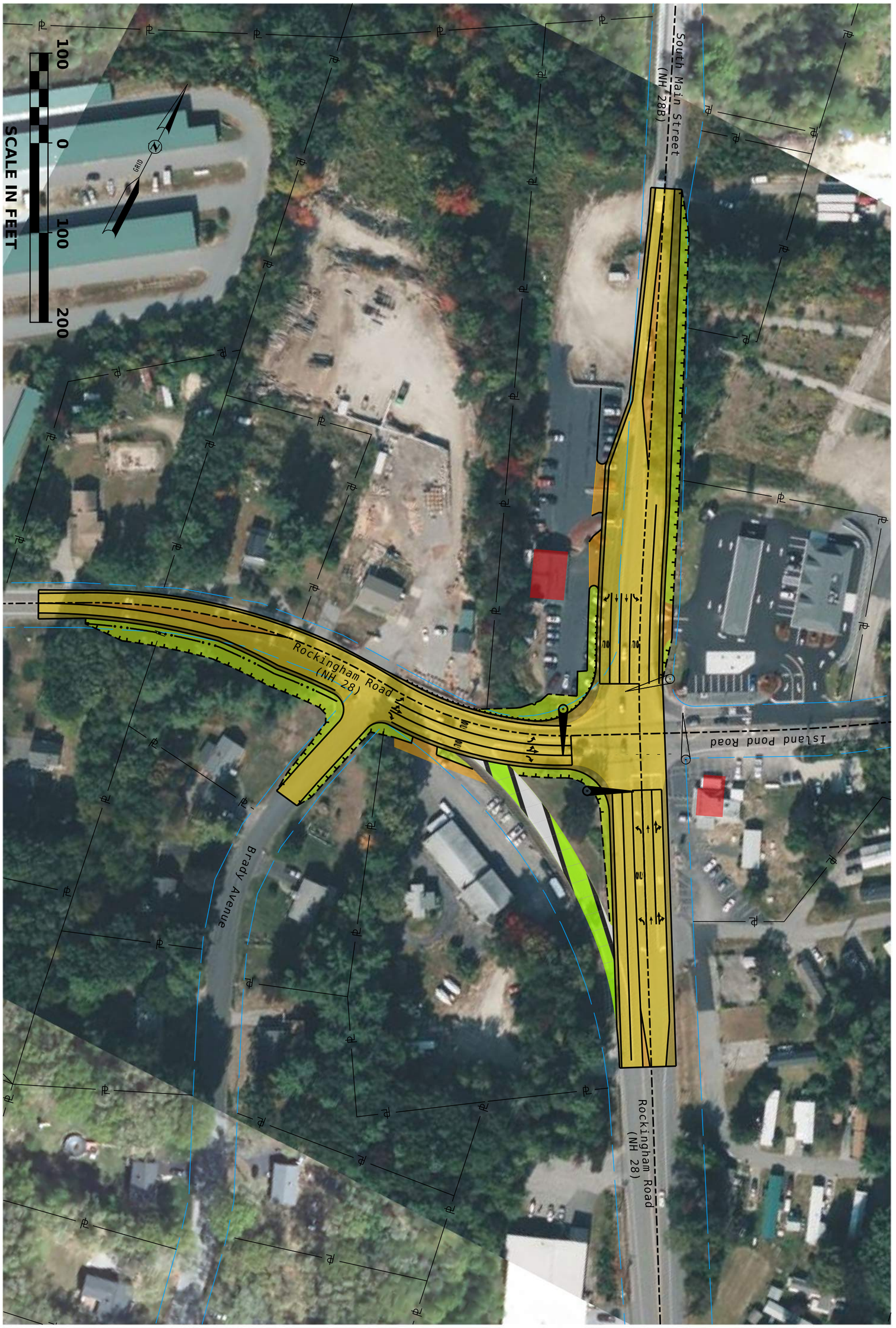


FIGURE 1 OF 1

FIGURE 1

PROJECT NO. 22.914701.00

TOWN OF DERRY
DERRY, NEW HAMPSHIRE

WEST RUNNING BROOK CORRIDOR STUDY

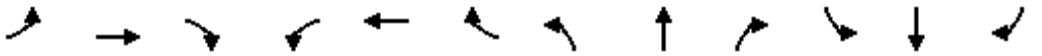
CONCEPTUAL IMPROVEMENTS TO INTERSECTION
OF NH 28 / NH 28B / ISLAND POND ROAD

HOYLE TANNER

150 Dow Street • Manchester, NH 03301
(603) 669-5555 • www.hoyletanner.com

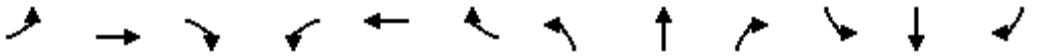
FILENAME	Genplan.dgn
DESIGNED	JFMS
MODEL NAME	GEN01
DRAWN	JFMS
SCALE	AS SHOWN
CHECKED	SBH
DATE	JULY, 2022

APPENDIX L – SYNCHRO ANALYSIS FOR PROPOSED SIGNALIZED INTERSECTION



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	308	194	167	73	329	160	149	215	28	85	398	354
Future Volume (vph)	308	194	167	73	329	160	149	215	28	85	398	354
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	6.0
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1665	1732	1568		1811	1553	1736	3411		1736	3471	1553
Flt Permitted	0.95	0.99	1.00		0.99	1.00	0.29	1.00		0.59	1.00	1.00
Satd. Flow (perm)	1665	1732	1568		1811	1553	522	3411		1070	3471	1553
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	342	216	186	81	366	178	166	239	31	94	442	393
RTOR Reduction (vph)	0	0	133	0	0	79	0	12	0	0	0	129
Lane Group Flow (vph)	274	284	53	0	447	99	166	258	0	94	442	264
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Turn Type	Split	NA	custom	Split	NA	custom	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	4	4	4 5	8	8	1 8	5	2		1	6	4
Permitted Phases			4			8	2			6		6
Actuated Green, G (s)	15.0	15.0	23.0		21.0	33.0	22.0	14.0		18.0	12.0	27.0
Effective Green, g (s)	15.0	15.0	23.0		21.0	33.0	22.0	14.0		18.0	12.0	27.0
Actuated g/C Ratio	0.19	0.19	0.29		0.26	0.41	0.28	0.18		0.22	0.15	0.34
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0		6.0	6.0	6.0
Vehicle Extension (s)	4.0	4.0			4.0		4.0	5.0		4.0	5.0	4.0
Lane Grp Cap (vph)	312	324	450		475	640	264	596		290	520	640
v/s Ratio Prot	c0.16	0.16	0.03		c0.25	0.06	c0.06	0.08		0.02	c0.13	0.08
v/s Ratio Perm							0.11			0.05		0.09
v/c Ratio	0.88	0.88	0.12		0.94	0.15	0.63	0.43		0.32	0.85	0.41
Uniform Delay, d1	31.6	31.6	21.0		28.9	14.7	23.5	29.5		25.4	33.1	20.4
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	23.7	22.9	0.2		27.3	0.2	5.2	1.1		0.9	13.5	0.6
Delay (s)	55.4	54.5	21.2		56.2	14.9	28.8	30.5		26.3	46.7	21.0
Level of Service	E	D	C		E	B	C	C		C	D	C
Approach Delay (s)		46.5			44.4			29.8			33.7	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	39.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	290	304	267	52	232	77	249	368	59	112	327	310
Future Volume (vph)	290	304	267	52	232	77	249	368	59	112	327	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0	6.0	6.0		6.0	6.0	6.0
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		0.99	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1665	1745	1568		1793	1538	1736	3399		1752	3505	1568
Flt Permitted	0.95	1.00	1.00		0.99	1.00	0.37	1.00		0.43	1.00	1.00
Satd. Flow (perm)	1665	1745	1568		1793	1538	670	3399		795	3505	1568
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	322	338	297	58	258	86	277	409	66	124	363	344
RTOR Reduction (vph)	0	0	196	0	0	57	0	16	0	0	0	112
Lane Group Flow (vph)	290	370	101	0	316	29	277	459	0	124	363	232
Heavy Vehicles (%)	3%	3%	3%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Split	NA	pt+ov	Split	NA	custom	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	4	4	4 5	8	8	1 8	5	2		1	6	4
Permitted Phases						8	2			6		6
Actuated Green, G (s)	19.0	19.0	27.0		15.9	26.9	23.7	15.7		17.7	12.7	31.7
Effective Green, g (s)	19.0	19.0	27.0		15.9	26.9	23.7	15.7		17.7	12.7	31.7
Actuated g/C Ratio	0.24	0.24	0.34		0.20	0.34	0.30	0.20		0.22	0.16	0.40
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0		6.0	6.0	6.0
Vehicle Extension (s)	4.0	4.0			4.0		4.0	5.0		4.0	5.0	4.0
Lane Grp Cap (vph)	397	416	531		358	519	306	670		236	559	742
v/s Ratio Prot	0.17	c0.21	0.06		c0.18	0.02	c0.09	0.14		0.03	0.10	0.07
v/s Ratio Perm							c0.18			0.08		0.07
v/c Ratio	0.73	0.89	0.19		0.88	0.06	0.91	0.68		0.53	0.65	0.31
Uniform Delay, d1	27.9	29.3	18.6		30.9	17.8	25.0	29.7		25.9	31.4	16.5
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	7.2	20.5	0.2		22.2	0.1	28.8	3.7		2.7	3.5	0.3
Delay (s)	35.2	49.8	18.8		53.1	17.8	53.8	33.4		28.6	34.9	16.8
Level of Service	D	D	B		D	B	D	C		C	C	B
Approach Delay (s)		35.7			45.6			40.9			26.5	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	35.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	79.6	Sum of lost time (s)	24.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	1.4	0.0	0.4	0.5
Total Del/Veh (s)	28.2	46.2	26.4	23.9	30.8
Stop Del/Veh (s)	25.5	37.5	23.6	20.3	26.3

Total Network Performance

Denied Del/Veh (s)	0.6
Total Del/Veh (s)	33.0
Stop Del/Veh (s)	26.3

Intersection: 4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street

Movement	EB	EB	EB	B7	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	R	T	LT	R	L	T	TR	L	T	T
Maximum Queue (ft)	212	246	88	56	722	220	144	148	164	109	216	192
Average Queue (ft)	137	143	39	3	323	127	63	77	56	41	116	108
95th Queue (ft)	191	218	70	24	552	281	124	124	116	88	182	183
Link Distance (ft)	147	147	147	612	1003		302	302	302		1230	1230
Upstream Blk Time (%)	5	13										
Queuing Penalty (veh)	0	0										
Storage Bay Dist (ft)						120				100		
Storage Blk Time (%)					49	0				1	15	
Queuing Penalty (veh)					80	0				1	14	

Intersection: 4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street

Movement	SB
Directions Served	R
Maximum Queue (ft)	191
Average Queue (ft)	105
95th Queue (ft)	182
Link Distance (ft)	1230
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 95

4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street Performance by approach

Approach	EB	WB	NB	SB	All
Denied Del/Veh (s)	0.0	1.1	0.0	0.5	0.3
Total Del/Veh (s)	25.4	36.3	28.7	24.1	27.4
Stop Del/Veh (s)	22.6	30.3	25.2	20.7	23.8

Total Network Performance

Denied Del/Veh (s)	0.4
Total Del/Veh (s)	29.9
Stop Del/Veh (s)	23.9

Intersection: 4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street

Movement	EB	EB	EB	B7	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	R	T	LT	R	L	T	TR	L	T	T
Maximum Queue (ft)	216	246	133	147	304	220	183	192	207	118	149	176
Average Queue (ft)	133	185	77	14	198	81	107	104	101	65	104	77
95th Queue (ft)	194	243	124	73	301	214	162	171	175	103	150	141
Link Distance (ft)	147	147	147	612	1003		302	302	302		1230	1230
Upstream Blk Time (%)	6	22	0									
Queuing Penalty (veh)	0	0	0									
Storage Bay Dist (ft)						120				100		
Storage Blk Time (%)					32					2	11	
Queuing Penalty (veh)					25					4	13	

Intersection: 4: NH 28/Rockingham Road & Island Pond Road & NH 28 B/South Main Street

Movement	SB
Directions Served	R
Maximum Queue (ft)	309
Average Queue (ft)	91
95th Queue (ft)	180
Link Distance (ft)	1230
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 43

APPENDIX M – OPINION OF PROBABLE CONSTRUCTION COST

HOYLE TANNER

Project:	West Running Brook Study		
Project No.	914701.00		
Location:	Derry, NH		
Task:	Conceptual Estimate - Signalized Intersection Improvements		
Calculated By:	LDC	Date:	7/12/2022
Checked By:	JFMS	Date:	7/15/2022
QC'd By:	SBH	Date:	7/18/2022

CONCEPTUAL ESTIMATE

Signalized Intersection Improvements -West Running Brook Corridor Study

SECTION A - MAJOR ITEMS

ITEM NO.	DESCRIPTION	UNIT	QUANTIT	UNIT COST	COST
201.1	CLEARING AND GRUBBING (F)	A	0.50	$ 8,000.00	$ 4,000.00
202.7	REMOVAL OF GUARDRAIL	LF	615	$ 3.35	$ 2,060.25
203.1	COMMON EXCAVATION	CY	4100	$ 15.00	$ 61,500.00
203.6	EMBANKMENT-IN-PLACE (F)	CY	215	$ 15.00	$ 3,225.00
304.1	SAND	CY	775	$ 30.00	$ 23,250.00
304.2	GRAVEL (F)	CY	775	$ 30.00	$ 23,250.00
304.3	CRUSHED GRAVEL (F)	CY	1050	$ 35.00	$ 36,750.00
403.11XXX	HBP-VARIOUS, MACHINE METHOD	TON	1750	$ 100.00	$ 175,000.00
403.12	HBP-HAND METHOD (DRIVEWAYS)	TON	55	$ 175.00	$ 9,625.00
403.16	PAVEMENT JOINT ADHESIVE	LF	7400	$ 2.00	$ 14,800.00
410.22	ASPHALT EMULSION FOR TACK COAT	GAL	560	$ 7.50	$ 4,200.00
417	COLD PLANING BITUMINOUS SURFACES	SY	7350	$ 4.00	$ 29,400.00
606.1255	BEAM GUARDRAIL (TERMINAL UNIT TYPE EAGRT, TL 2) (STEEL POST)	U	2	$ 4,000.00	$ 8,000.00
606.18001	31" W-BEAM GUARDRAIL WITH 8" OFFSET BLOCK (STEEL POST)	LF	200	$ 30.00	$ 6,000.00
	MISCELLANEOUS ROADWAY		10% OF ABOVE TOTAL		$ 40,106.03
			SUBTOTAL A		**$ 441,166.28**

SECTION B - MISCELLANEOUS ITEMS

SIGNS, MARKINGS, LOAM/HUMUS, ETC.	10%	$ 44,116.63
	SUBTOTAL B	**$ 485,282.90**

SECTION C - DRAINAGE ITEMS

PIPES, CB's, MH's, ETC.	5%	$ 24,264.15
	SUBTOTAL C	**$ 509,547.05**

SECTION D - TRAFFIC CONTROL

ITEM NO.	DESCRIPTION	UNIT	QUANTIT	UNIT COST	COST
618.61	UNIFORMED OFFICERS WITH VEHICLE	$	9000	$ 1.00	$ 9,000.00
618.7	FLAGGERS	HR	800	$ 45.00	$ 36,000.00
619.1	MAINTENANCE OF TRAFFIC	U	1	$ 60,000.00	$ 60,000.00
	MISCELLANEOUS TRAFFIC CONTROL		10% OF ABOVE TOTAL		$ 10,500.00
			SUBTOTAL D		**$ 625,047.05**

SECTION E - EROSION AND SEDIMENT CONTROL

EROSION, SEDIMENT, AND POLLUTION CONTROL (HAY BALES, SILT FENCE, SWPPP, TEMP. WATER POLL. CONTROL, ETC.)	15% OF DRAINAGE	$ 3,639.62
	SUBTOTAL E	**$ 628,686.67**

Project:	West Running Brook Study		
Project No.	914701.00		
Location:	Derry, NH		
Task:	Conceptual Estimate - Signalized Intersection Improvements		
Calculated By:	LDC	Date:	7/12/2022
Checked By:	JFMS	Date:	7/15/2022
QC'd By:	SBH	Date:	7/18/2022

CONCEPTUAL ESTIMATE

Signalized Intersection Improvements -West Running Brook Corridor Study

SECTION F - ADDITIONAL ITEMS

BMP's		$	20,000.00
Alterations toTraffic Signals (Item 616.191)		$	120,000.00
Landscaping (Private Sites)		$	15,000.00
Mechanically Stabilized Earth Wall (Retaining)		$	20,000.00
SUBTOTAL F		**$**	**803,686.67**

SECTION G - MOBILIZATION AND CONTINGENCIES

ROADWAY MOBILIZATION	10%	$	80,368.67
SUBTOTAL G		**$**	**884,055.34**
ROUNDED CONSTRUCTION SUBTOTAL:		$	885,000.00
CONTINGENCY	15%	$	133,000.00
ROUNDED CONSTRUCTION TOTAL		**$**	**1,020,000.00**
CONSTRUCTION ENGINEERING	10%	**$**	**102,000.00**
DESIGN ENGINEERING	15%	**$**	**153,000.00**
RIGHT OF WAY ACQUISTION		**$**	**100,000.00**
INFLATION (8 YEARS)	3%	**$**	**366,808.86**
ROUNDED PROJECT TOTAL COSTS (CON, ROW, PE)		**$**	**1,750,000.00**

West Running Brook Corridor Study
Derry, New Hampshire

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