GRANDIS POND PUD
BLAINE, WASHINGTON

TRAFFIC IMPACT ANALYSIS

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1.0 PROJECT SUMMARY

Grandis Pond, LLC is proposing to develop the property known as Grandis Pond (Grandis), a Planned Unit Development (PUD) in Blaine, Washington. This development site is approximately 440 acres and is located one mile east of Harvey Road, between the north side of 'H' Street Road (H Street) and the Canadian border. H Street is owned by the City of Blaine with the city limits at the south side of the road right-of-way. The study area is within Sections 33, 34, and 35, Township 41 North, Range 1 East, W.M. in Whatcom County.

The proposed development is designed to include 810 single-family lots, 72 cottage homes, 48 duplex/paired housing units, and 100 multi-family housing units, for a total of 1,030 residential units. In addition, 48,000 square feet of commercial building space is proposed. The development is anticipated to be constructed in five development areas with an estimated 60 dwelling units constructed each year between 2009 and 2026.

The total development has been estimated to generate about 926 trips in the PM peak hour on a typical weekday. Volumes were counted at five intersections in the vicinity of the proposed project. These intersections were analyzed to determine their existing level of service (LOS). A two percent constant growth rate was then applied to existing volumes in order to project future baseline conditions for the years of completion for the five proposed development areas – 2016 (Area 1), 2020 (Area 2), 2024 (Area 3) and 2026 (Areas 4 and 5). LOS analysis was performed for baseline and with-project conditions in each of these years.

Assuming the full development of the Grandis site and the existing road system, all but one of the intersections analyzed operate at a LOS D or better for all phases of the project (assuming completion of the current road widening project on SR 543 in the fall of 2008). The one intersection below LOS D is Valley View Road and 'H' Street which operates at LOS F with project trips in 2024 and 2026. However, assuming the City's proposed Mott Hill Parkway, connecting N. Harvey Road, the Grandis site, and H Street at the east end of the Grandis site is constructed by 2024, the LOS at this intersection would likely improve to LOS D in both 2024 and 2026. This improvement is due to the diversion of project trips from 'H' Street to the new parkway. Without the new parkway, some mitigation will be needed at this intersection by 2024.

2.0 PROJECT DESCRIPTION

The Grandis Pond development is a proposed mixed-use development in the City of Blaine with 930 single-family, paired duplexes and cottage homes, 100 multi-family housing units, and 48,000 gross square feet of commercial space, to be constructed in five development areas (see **Figure 1**). Development Area 1, consisting of 345 single-family residential lots and 72 cottage homes, is expected to begin construction in 2009 with an estimated full build out in 2016. Development Area 2, consisting of 83 single-family homes, 48 duplex/paired housing units, 100 multi-family housing units and 48,000 gross square feet of commercial space, is expected to be constructed between 2016 and 2020. Development Area 3, consisting of 258 additional single-family residential units, is expected to be completed in 2024. Development Areas 4 and 5, consisting of a total of 124 additional single-family residential units, are expected to be completed in 2026.

Three new accesses will be constructed on 'H' Street for the project: a west access built with Development Area 1; a central access built with Development Area 2; and an east access built with Development Area 3. The spacing between the west and central accesses will be about 3,000 feet, and the spacing between the central and east accesses will be about 2,400 feet. The east access will

be constructed to align with Valley View Road to become the north leg of that existing intersection with 'H' Street.

The character of homes and the marketing plan for the development will be aimed at attracting a high percentage of work-at-home and retired residents. It was assumed that enough of the residents will fall into this category that daily and PM peak hour work trips will be reduced by 12 to 13 percent overall on any given weekday. It was also assumed that the remaining PM peak hour trips made each weekday would be distributed 1/6 toward Lynden, 1/3 toward Blaine, and 1/2 toward Bellingham. Based on these distribution assumptions and on travel time studies conducted for the study area, it was estimated that 58 percent of the project trips each day trips would travel on 'H' Street west of the site and 42 percent would use 'H' Street east of the site for ingress and egress.

3.0 EXISTING CONDITIONS

The roadway network in the vicinity of the project was inventoried. Intersection geometry data recorded in the field in April and August 2005 is shown in **Figure 2.** Roadways that will be particularly impacted by the development are described below.

'H' Street is an east-west arterial with one 12-foot travel lane in each direction and one- to four-foot gravel or grass shoulders. It extends from downtown Blaine at its western terminus east to SR 539. In the project vicinity it has a 45-mph speed limit. The speed limit east of the project drops to 35 mph, and the speed limit west of Harvey Road drops to 35 mph and then drops to 25 mph west of Odell Street. The primary land use along this corridor is residential with level of development changing from rural to suburban as you drive west from Valley View Road to Odell Street. There is no curb, gutter, and sidewalk along 'H' Street in the vicinity of the project site. There is curb and gutter west of Odell Street and sporadic sidewalk east of Odell Street as well. The vertical alignment of 'H' Street consists of rolling terrain.

Valley View Road is a north-south local street which forms a T intersection from the south with 'H' Street. It has one 12-foot travel lane in each direction and one- to two-foot gravel or grass shoulders. Its approach to 'H' Street is controlled by a "STOP" sign.

Harvey Road is a north-south local street which forms two offset T intersections with 'H' Street. The north approach is located several hundred feet west of the south approach. It has one 12-foot travel lane in each direction and two-foot gravel or grass shoulders. The approaches to 'H' Street are controlled by "STOP" signs.

Odell Street is a north-south collector street which forms a T intersection from the south with 'H' Street. It has one 12-foot travel lane in each direction and along with curb, gutter, and sidewalk along both sides of the street. Its approach to 'H' Street is controlled by a "STOP" sign and includes a left-turn lane and a right-turn lane.

SR 543 is a north-south arterial that serves as the truck crossing for the United States/Canada border. In the project vicinity the road is being rebuilt as described in the following section, but currently consists of two northbound 12-foot travel lanes (one for general-purpose and one truck-only lane), and one southbound lane. The intersection with 'H' Street is signalized and the geometry consists of two northbound 12-foot travel lanes; one for general-purpose, and one truck-only lane. The southbound approach consists of a left-turn lane and a shared through/right-turn lane. The eastbound and westbound approaches each consist of one right-turn lane, one through lane, and one left-turn lane. There is curb, gutter, and sidewalk along the north and south sides of 'H' Street in the vicinity of SR 543 but only ten-foot paved shoulders along SR 543.

Sweet Road is a two-lane, east-west roadway located south of the site. It curves into Valley View Road and extends to the north. The east approach of the Sweet Road/Stadsvold Road intersection is stop-controlled while the west and south legs are free flow, forming the through movements.

Stadsvold Road is a two-lane roadway that extends in a north-south direction within the study area. Whatcom County has requested that its intersection with Sweet Road be analyzed because it is part of a travel route vehicles would take to access I-5 southbound at Birch Bay-Lynden Road.

No transit routes travel in the vicinity of the project site. The nearest route is the 70x, which runs between Blaine and Bellingham on I-5, and stops at Blaine City Hall on 'H' Street.

4.0 FUTURE CONDITIONS

According to the Washington State Department of Transportation (WSDOT) website, WSDOT is currently constructing a widening improvement on SR 543 from Boblett Street to the border crossing. The new configuration will include a southbound-to-westbound right-turn lane and an additional through lane northbound at 'H' Street, adding substantial capacity at this intersection. This project is scheduled for completion by fall 2008, and the proposed new intersection configuration has been included in the traffic analyses for all three project phases.

The WSDOT project will also add an overpass at 'D' Street further to the north to allow local traffic to cross SR 543 with less delay. The City of Blaine and Whatcom County are considering a new east-west parkway located in a corridor north of 'H' Street that would extend 'D' Street to the east to make better use of the new overpass. This is described more fully in the following paragraph.

The City's long term plan for servicing the East Blaine area, as discussed in the City of Blaine, *East Blaine Draft Sub-Area Infrastructure Plan*, by CHS Engineers, LLC, Draft October 31, 2006 (East Blaine Plan), includes the construction of a new parkway from N. Harvey Road to the Grandis site midway between H Street and the Canadian border. This minor arterial, the future Motts Hill Parkway, is proposed to begin on N. Harvey Road and will connect with the Grandis site's central collector road. The parkway will continue to the east end of the Grandis site and turn south to connect to H Street (see Figure 1). At this time the City does not own, or have any immediate plans to purchase, right-of-way (ROW) or easements for the new Motts Hill Parkway. Due to the uncertainty in the City's acquisition of this property, the baseline analysis will assume that this parkway will not be constructed until the Grandis site's full build out in 2026. An alternate analysis was also performed that assumes the parkway is operating by 2019, 10 years after the Grandis site begins construction. No other roadway capacity improvements are programmed for completion by 2026.

5.0 TRAFFIC ANALYSES

5.1 Methodology

The City of Blaine requires a minimum acceptable LOS of D. Level of service at two-way stop-controlled intersections is a function of delay at the minor (stopped) approaches, as defined by the *Highway Capacity Manual* (Transportation Research Board, 2000). Level of service at all-way stop-controlled intersections reflects the average delay experienced by vehicles at all approaches. Level of service criteria can be found in **Appendix A**. The analysis methodology follows requirements set out by the City of Blaine in March 2005 and a request by Whatcom County to analyze the intersection of Sweet Road and Stadsvold Road.

Existing PM peak hour turning movement volumes at four of the study area intersections were obtained from traffic counts collected by Traffic Count Consultants, Inc. on Thursday, April 21, 2005. The intersection of Sweet Road and Stadsvold Road was counted on Tuesday, August 9, 2005. Existing volumes are shown in **Figure 3**. These 2005 counts were then increased by two percent per year to estimate the baseline PM peak hour traffic volumes at these intersections in 2016 (see **Figure 4**), 2020 (see **Figure 7**), 2024 (see **Figure 10**) and 2026 (see **Figure 13**). No pipeline trips were identified, so the future baseline condition included only an increase in background traffic. Worksheets showing the growth rate calculations are attached in **Appendix B**.

Project trips were determined based on information in the *Institute of Transportation Engineers Trip Generation Manual (7th Edition), 2005*. Worksheets showing trip generation for the single-family residential units and proposed commercial spaces are attached in **Appendix C**. The estimated distribution of project trips at the site access point(s) and through the five study intersections is shown for Area 1 (2016) in **Figure 5**, for Area 2 (2020) in **Figure 8**, for Area 3 (2024) in **Figure 11** and for Areas 4 and 5 (2026) in **Figure 14**.

The combined totals of the baseline volumes and project trips are shown for Area 1 (2016) in **Figure 6**, for Area 2 (2020) in **Figure 9**, for Area 3 (2024) in **Figure 12** and for Areas 4 and 5 (2026) in **Figure 15**.

5.2 Results

2.5.1 Without Motts Hill Parkway by 2026

As shown in **Table 1**, the intersections in the vicinity of the proposed development currently operate at LOS B or better - well above the LOS D considered the minimum acceptable level of service at urbanized county intersections.

Table 1. 2005 LOS at Study Intersections

Intersection	Critical Movement	2005 LOS (Delay) [1]
Valley View Road/ 'H' Street	Northbound	A (9.2)
Sweet Road/Stadsvold Road	Westbound	A (9.2)
Harvey Road/ 'H' Street	Northbound	A (9.0)
Odell Street/ 'H' Street	Northbound	B (10.6)
SR 543/ 'H' Street	Intersection	A (8.6)

[1] Delay is expressed in seconds per vehicle.

Baseline delay and level of service (LOS) in the PM peak hour were calculated for each of the five intersections to determine how the baseline road system would operate without project trips in 2016, 2020, 2024 and 2026. Then the project trips estimated for each phase were added to the baseline volumes, and the delay and LOS were recalculated for the five intersections (and the site access point(s) for each phase) to see what impact the trips from each area would have on baseline delay and LOS in 2009, 2014, and 2019 (the years of completion for the five project areas). Results of the LOS calculations are shown for each area in **Tables 2, 3, 4 and 5**.

Level of Service calculations for all conditions are reported in **Appendix D**.

Table 2. 2016 LOS at Study Intersections for Baseline and Baseline plus Project Trips

Intersection	Critical Movement	2016 Baseline [1] LOS (Delay [3])	With-Project [2] LOS (Delay [3])
Valley View Road/ 'H' Street	Northbound	A (9.3)	B (10.9)
Sweet Road/Stadsvold Road	Northbound	A (9.5)	A (9.9)
Harvey Road/ 'H' Street	Northbound	A (9.2)	B (10.3)
Odell Street/ 'H' Street	Northbound	B (12.3)	B (13.8)
SR 543/ 'H' Street	Intersection	A (8.9)	A (8.8)
East Site Access/ 'H' Street	Southbound	N/A	N/A
Central Site Access / 'H' Street	Southbound	N/A	N/A
West Site Access/ 'H' Street	Southbound	N/A	B (11.3)

[1] 2005 counts were increased by 2% per year for eleven years to obtain 2016 baseline volumes.
[2] With-Project includes 2016 baseline volumes plus project trips generated by 345 houses and 72 cottages.
[3] Delay is expressed in seconds per vehicle.

Table 3. 2020 LOS at Study Intersections for Baseline and Baseline plus Project Trips

Intersection	Critical Movement	2020 Baseline [1] LOS (Delay [3])	With-Project [2] LOS (Delay [3])
Valley View Road/ 'H' Street	Northbound	A (9.4)	B (12.8)
Sweet Road/Stadsvold Road	Northbound	A (9.5)	B (10.4)
Harvey Road/ 'H' Street	Northbound	A (9.2)	B (11.4)
Odell Street/ 'H' Street	Northbound	B (12.8)	C (17.2)
SR 543/ 'H' Street	Intersection	A (9.2)	B (11.4)
East Site Access/ 'H' Street	Southbound	N/A	N/A
Central Site Access / 'H' Street	Southbound	N/A	B (12.0)
West Site Access/ 'H' Street	Southbound	N/A	B (12.4)

[1] 2005 counts were increased by 2% per year for fifteen years to obtain 2020 baseline volumes.
[2] With-Project includes 2020 baseline volumes plus project trips generated by 428 houses, 72 cottages, 100 condo/ multi-family, 48 paired duplexes and 48,000 gross square feet of commercial.
[3] Delay is expressed in seconds per vehicle.

Table 4. 2024 LOS at Study Intersections for Baseline and Baseline plus Project Trips

Intersection	Critical Movement	2024 Baseline[1] LOS (Delay[3])	With-Project[2] LOS (Delay[3])
Valley View Road/ 'H' Street	Southbound		B(12.8)
	Northbound	A (9.4)	F (53.6)
Sweet Road/Stadsvold Road	Northbound	A (9.6)	B (11.0)
Harvey Road/ 'H' Street	Northbound	A (9.3)	B (12.8)
Odell Street/ 'H' Street	Northbound	B (13.3)	C (22.2)
SR 543/ 'H' Street	Intersection	A (9.5)	B (12.2)
East Site Access/ 'H' Street	Southbound	N/A	B (12.5)
Central Site Access / 'H' Street	Southbound	N/A	B (13.9)
West Site Access/ 'H' Street	Southbound	N/A	B (14.3)

[1] 2005 counts were increased by 2% per year for nineteen years to obtain 2024 baseline volumes.
[2] With-Project includes 2024 baseline volumes plus project trips generated by 686 houses, 72 cottages, 100 condo/ multi-family, 48 paired duplexes and 48,000 gross square feet of commercial.
[3] Delay is expressed in seconds per vehicle.

Table 5. 2026 LOS at Study Intersections for Baseline and Baseline plus Project Trips

Intersection	Critical Movement	2026 Baseline[1] LOS (Delay[3])	With-Project[2] LOS (Delay[3])
Valley View Road/ 'H' Street	Southbound		B(13.9)
	Northbound	A (9.5)	F (51.6)
Sweet Road/Stadsvold Road	Northbound	A (9.6)	B (11.3)
Harvey Road/ 'H' Street	Northbound	A (9.3)	B (13.6)
Odell Street/ 'H' Street	Northbound	B (13.6)	D (26.2)
SR 543/ 'H' Street	Intersection	A (9.7)	B (14.5)
Central Site Access / 'H' Street	Southbound	N/A	B (12.9)
West Site Access/ 'H' Street	Southbound	N/A	B (13.2)

[1] 2005 counts were increased by 2% per year for twenty-one years to obtain 2026 baseline volumes.
[2] With-Project includes 2026 baseline volumes plus project trips generated by 810 houses, 72 cottages, 100 condo/ multi-family, 48 paired duplexes and 48,000 gross square feet of commercial.
[3] Delay is expressed in seconds per vehicle.

2.5.2 With Motts Hill Parkway

If the City is able to construct the Motts Hill Parkway by 2026, it was assumed for this study that about 50% of the project trips destined for Blaine would make use of the new route. This would represent about 16-17% of the total project trips that would no longer use 'H'Street to access the project site during the PM peak hour. As shown in Table 6, this will reduce the average delay per vehicle for many of the study intersections and cause the level of service to improve at two of the intersections, and most notably at the intersection of Valley View Road and 'H' Street which would otherwise fail to meet level of service standards.

Table 6. 2026 LOS at Study Intersections for Baseline and Baseline plus Project Trips with Motts Hill Parkway

Intersection	Critical Movement	2026 Baseline[1] LOS (Delay[3])	With-Project[2] LOS (Delay[3])
Valley View Road/ 'H' Street	Southbound		B(13.4)
	Northbound	A (9.5)	D (34.4)
Sweet Road/Stadsvold Road	Northbound	A (9.6)	B (11.3)
Harvey Road/ 'H' Street	Northbound	A (9.3)	B (12.0)
Odell Street/ 'H' Street	Northbound	B (13.6)	C (19.5)
SR 543/ 'H' Street	Intersection	A (9.7)	B (12.0)
Central Site Access / 'H' Street	Southbound	N/A	B (13.4)
West Site Access/ 'H' Street	Southbound	N/A	B (13.1)

[1] 2005 counts were increased by 2% per year for twenty-one years to obtain 2026 baseline volumes.

[2] With-Project includes 2026 baseline volumes plus project trips generated by 810 houses, 72 cottages, 100 condo/ multi-family, 48 paired duplexes and 48,000 gross square feet of commercial.

[3] Delay is expressed in seconds per vehicle.

6.0 CONCLUSIONS

The results in Tables 2, 3, 4, 5 and 6 point to the following conclusions:

6.1 Area 1 – Build 345 Single-Family and 72 Cottage Housing Units

- The combined 417 housing units are expected to generate 388 trips in the PM peak hour and 3,868 daily trips on a typical weekday. .
- Intersection level of service analysis using *Highway Capacity Manual* (HCM) methodology indicates that all study area intersections and the site access point will operate at LOS B or better in 2016 without and with project trips (see Table 2).
- No mitigation measures are recommended for 2016.

6.2 Area 2 – Build 83 Additional Single-Family, 48 Duplex/Paired and 100 Multi-Family Housing Units and 48,000 gsf of Commercial Space

- The project with a combined 648 total single-family housing units (Areas 1 and 2) is expected to generate 561 trips in the PM peak hour and 5,639 daily trips on a typical weekday. The 48,000 gsf of commercial space is expected to generate 102 trips in the PM peak hour and 989 daily trips on a typical weekday
- Intersection level of service analysis using HCM methodology indicates that all study area intersections and the two site access points will operate at LOS B or better without project trips and at LOS C or better with project trips in 2020 (see Table 3).
- No mitigation measures are recommended.

6.3 Area 3 – Build 258 Additional Single-Family Housing Units

- The project with a combined 906 total single-family housing units (Areas 1, 2 and 3) is expected to generate 813 trips in the PM peak hour and 8,126 daily trips on a typical weekday.

Commercial trip generation will be unchanged from Phase 1, at 102 trips in the PM peak hour and 989 daily trips.

- Intersection level of service analysis using HCM methodology indicates that all study area intersections and the three site access points will operate at LOS B or better without project trips and at LOS C or better with project trips in 2024 except the intersection of Valley View Road and 'H' Street (see Table 4).
- Mitigation will be needed to bring the intersection of. Valley View Road and 'H' Street from LOS F to LOS D, unless the Motts Hill Parkway is constructed by 2024. Without Motts Hill Parkway, mitigation could include making the intersection a four-way stop or adding turning lanes on critical approaches.

6.4 Areas 4 and 5 – Build 124 Additional Single-Family Housing Units

- The project with a combined 1,030 total single-family housing units (Areas 1, 2, 3, 4 and 5) is expected to generate 943 trips in the PM peak hour and 9,394 daily trips on a typical weekday. Commercial trip generation will be unchanged from Phase 1, at 102 trips in the PM peak hour and 989 daily trips.
- Intersection level of service analysis using HCM methodology indicates that all study area intersections and the three site access points will operate at LOS B or better without project trips and at LOS D or better with project trips in 2026 except the intersection of Valley View Road and 'H' Street (see Table 5).
- Mitigation will be needed to bring the intersection of. Valley View Road and 'H' Street from LOS F to LOS D, unless the Motts Hill Parkway is constructed by 2026. Without Motts Hill Parkway, mitigation could include making the intersection a four-way stop or adding turning lanes on critical approaches.

FIGURES

Figure 1. Vicinity Map and Site Layout
Figure 2. 2005 Existing Lane Configuration and Traffic Control
Figure 3. 2005 Existing Traffic PM Peak
Figure 4. 2016 Baseline Traffic PM Peak
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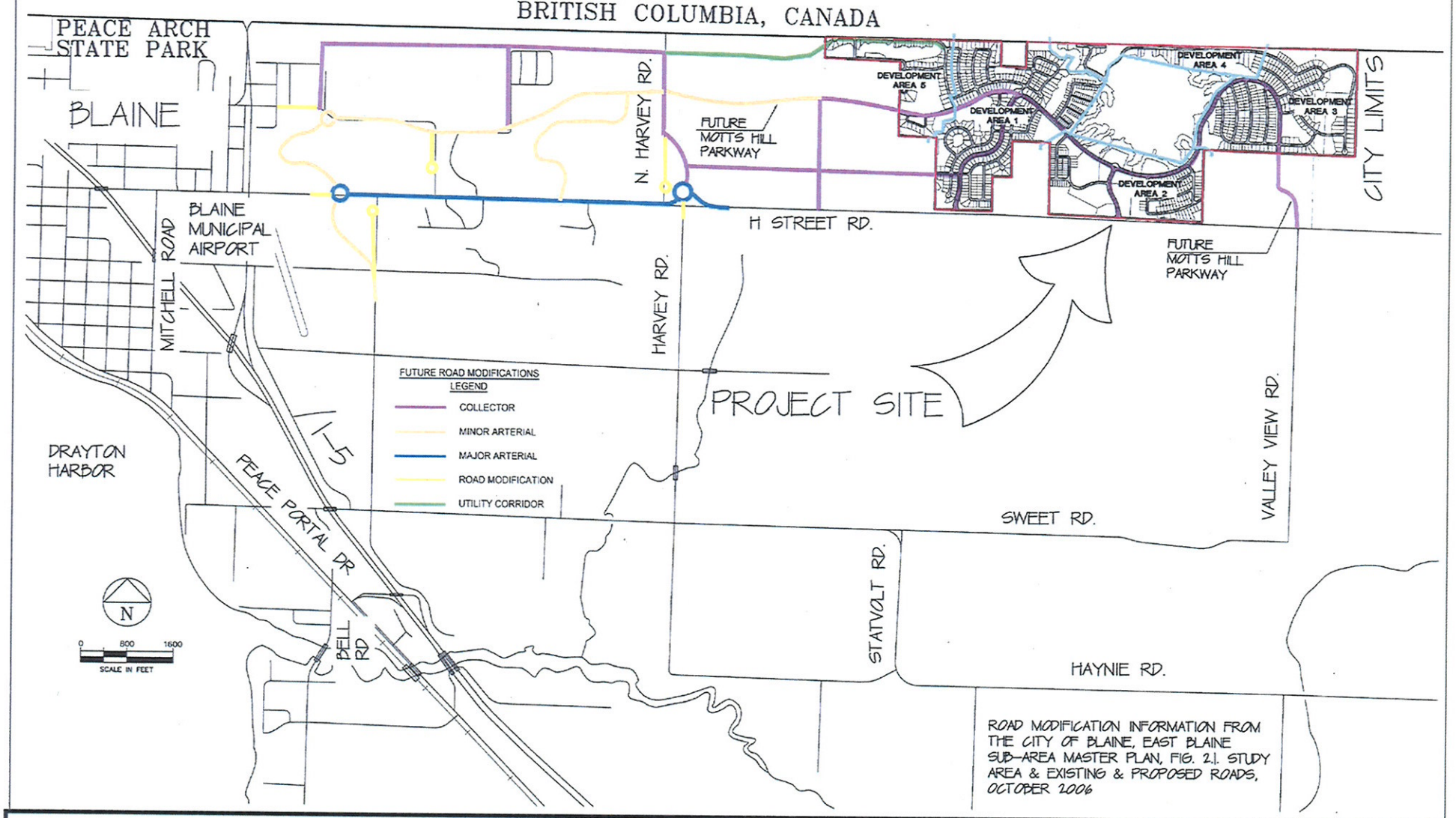
Figure 12. 2024 Total Traffic PM Peak
Figure 13. 2026 Baseline Traffic PM Peak
Figure 14. 2026 Site Generated Traffic & Trip Distribution PM Peak
Figure 15. 2026 Total Traffic PM Peak
Figure 16. 2026 Site Generated Traffic & Trip Distribution PM Peak with Motts Hill Parkway
Figure 17. 2026 Total Traffic PM Peak with Motts Hill Parkway

ROAD CIRCULATION PLAN

BRITISH COLUMBIA, CANADA



Vicinity Map and Site Layout	
Grandis Pond Development	
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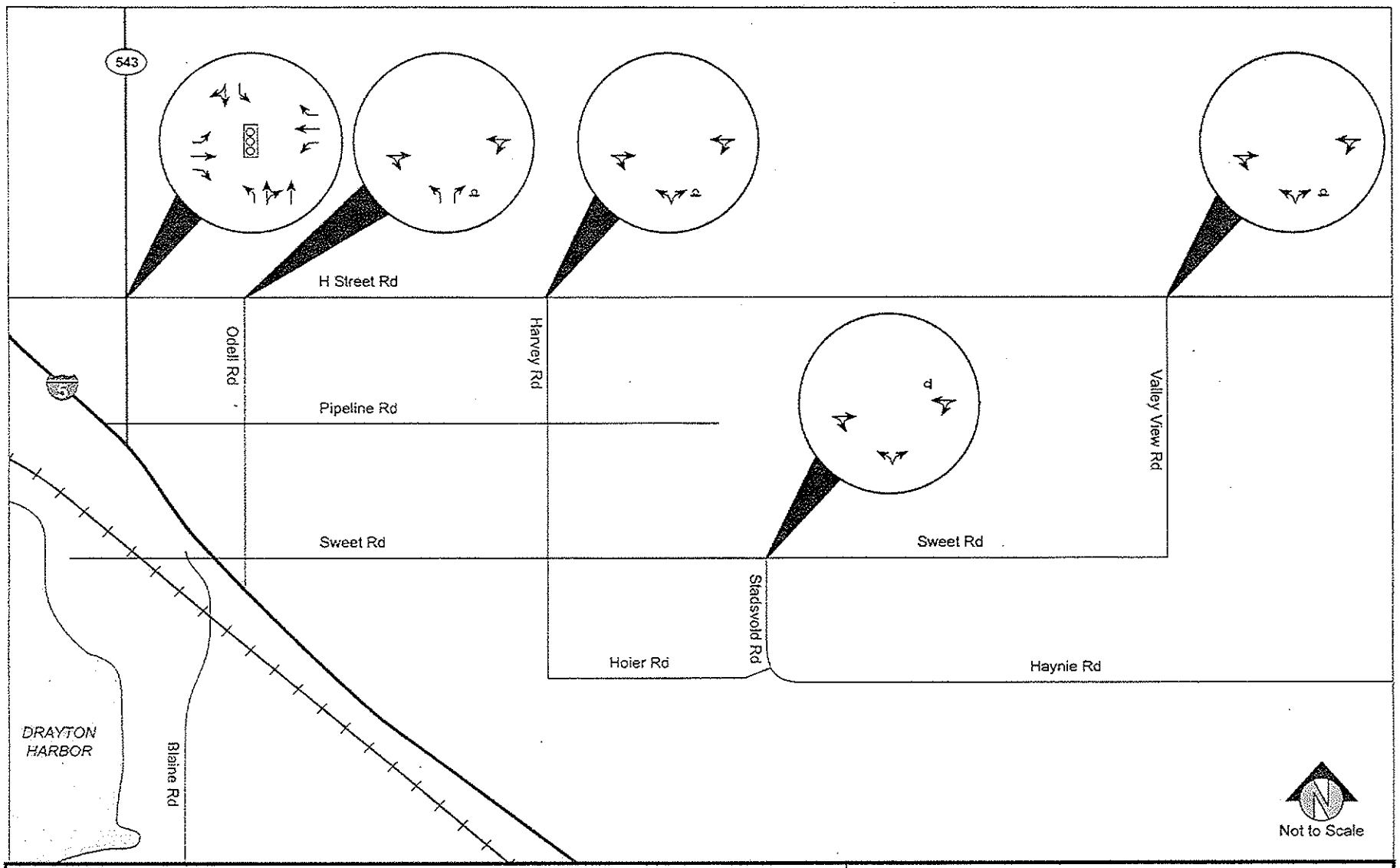

LEGEND

- Stop Sign
- Traffic Signal
- Travel Lane

2005 Existing Lane Configuration and Traffic Control

Grandis Pond Development

BLMT0000-0004

August 2005

Figure 2

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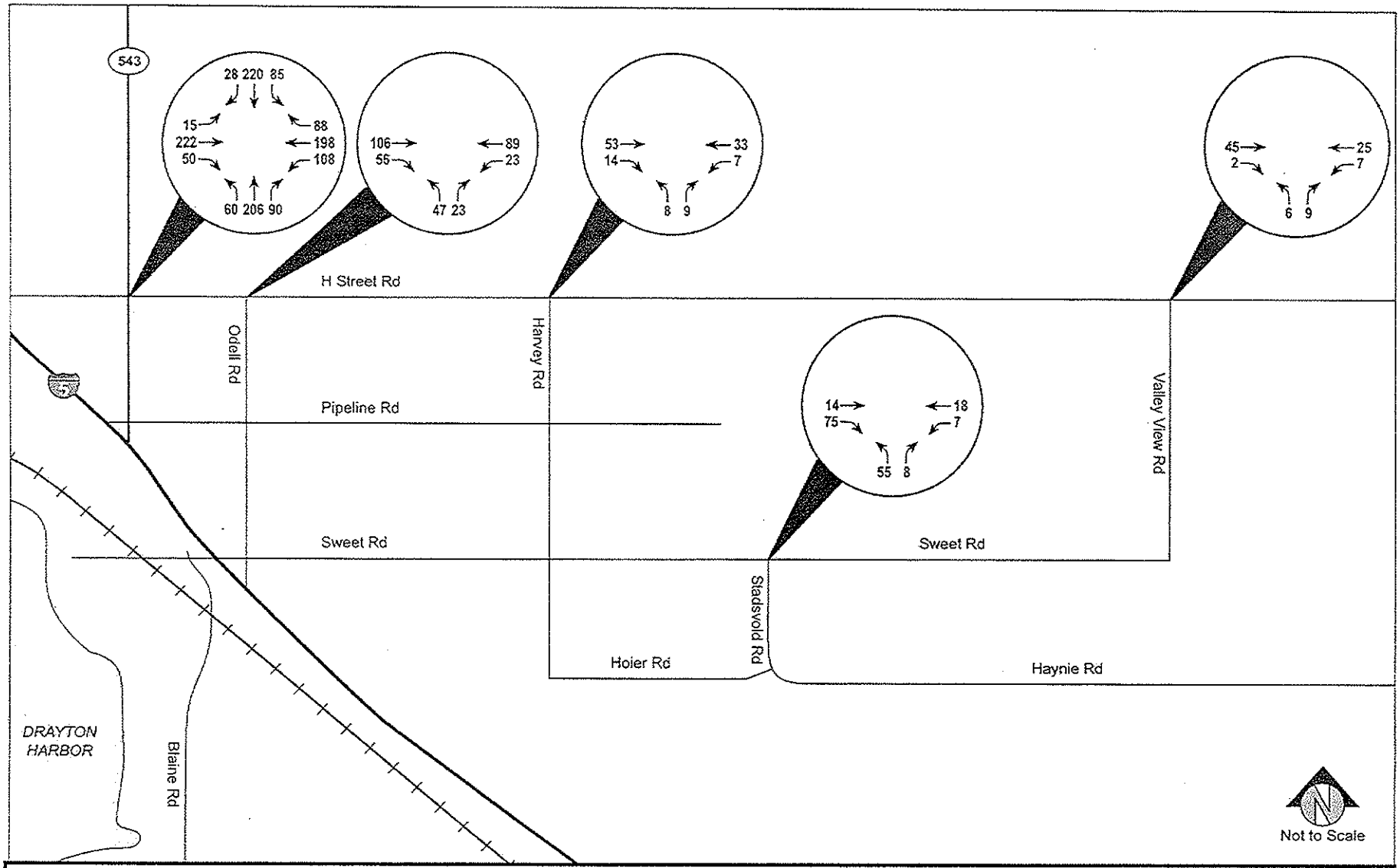

2005 Existing Traffic PM Peak

Grandis Pond Development

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August 2005

Figure 3

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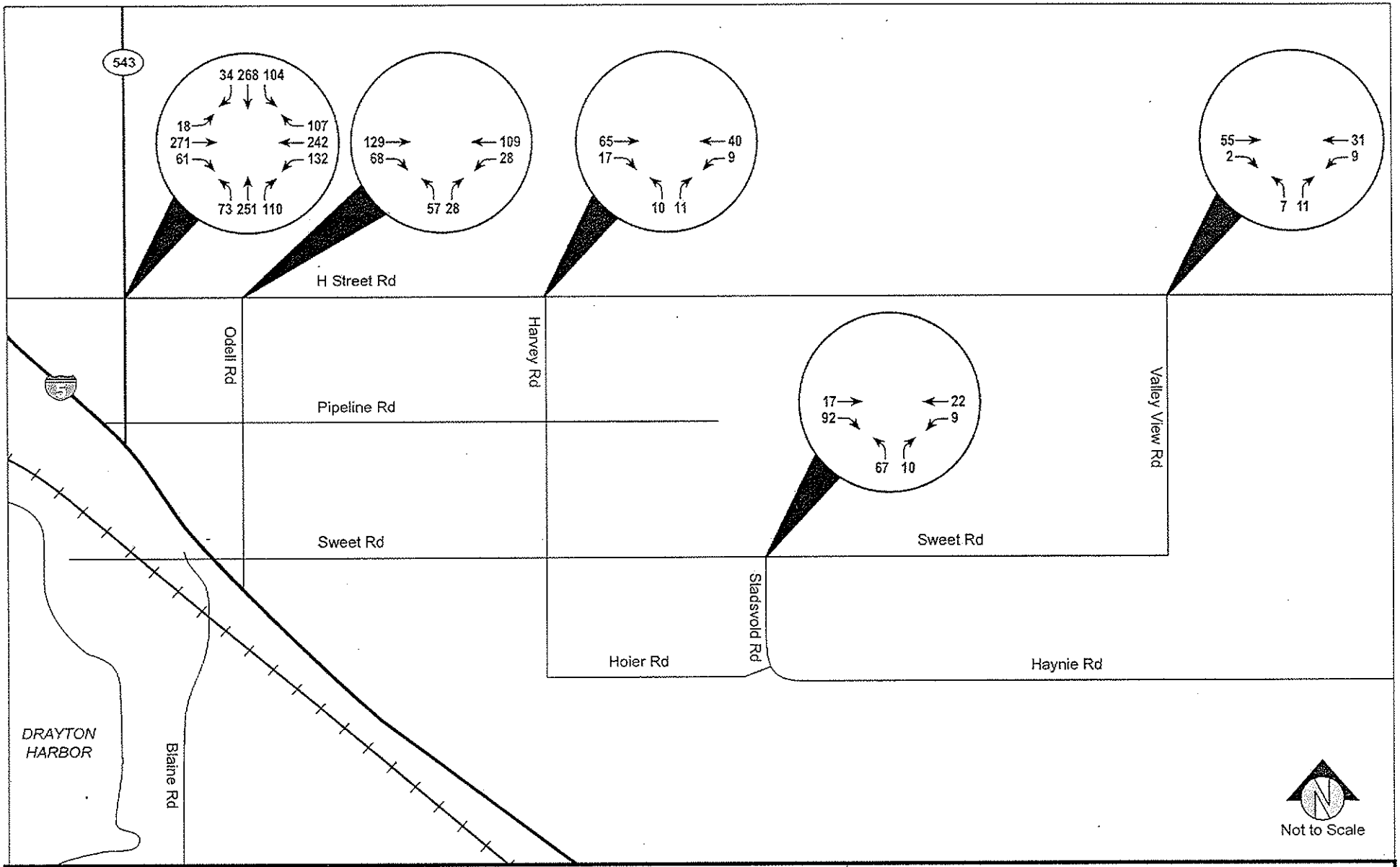

2016 Baseline Traffic PM Peak

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Figure 4

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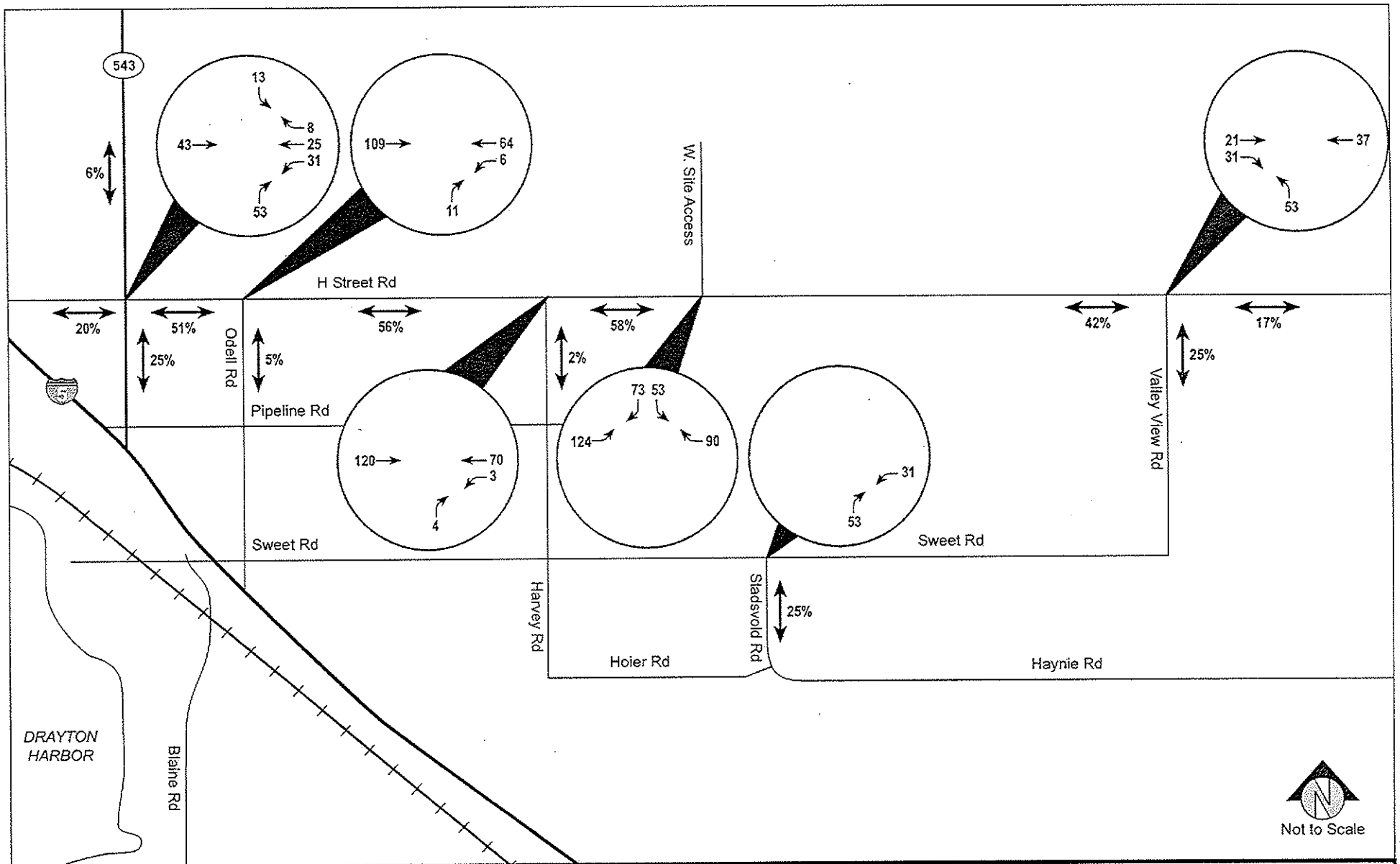

2016 Site Generated Traffic & Trip Distribution PM Peak

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Figure 5

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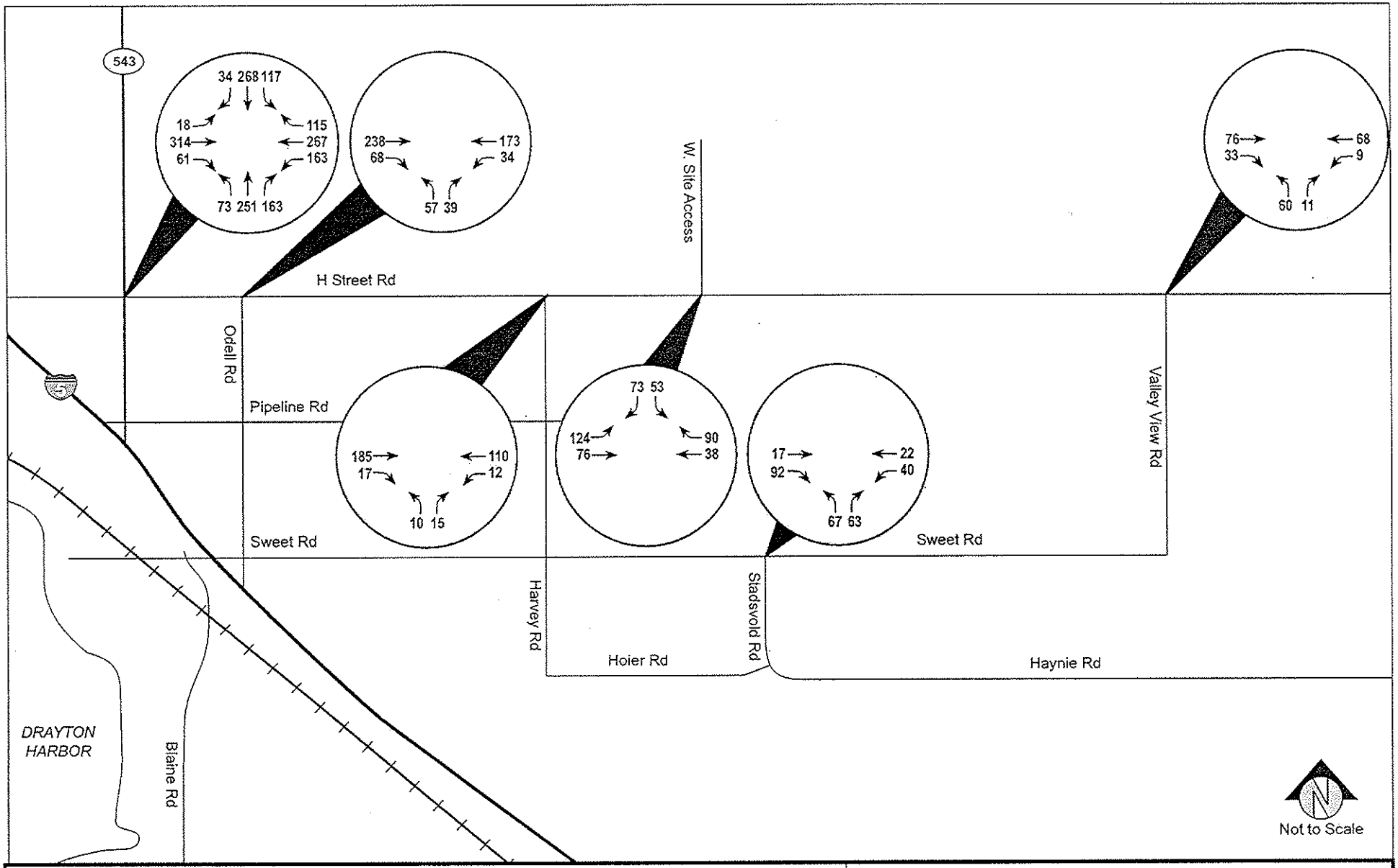

2016 Total Traffic PM Peak

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Figure 6

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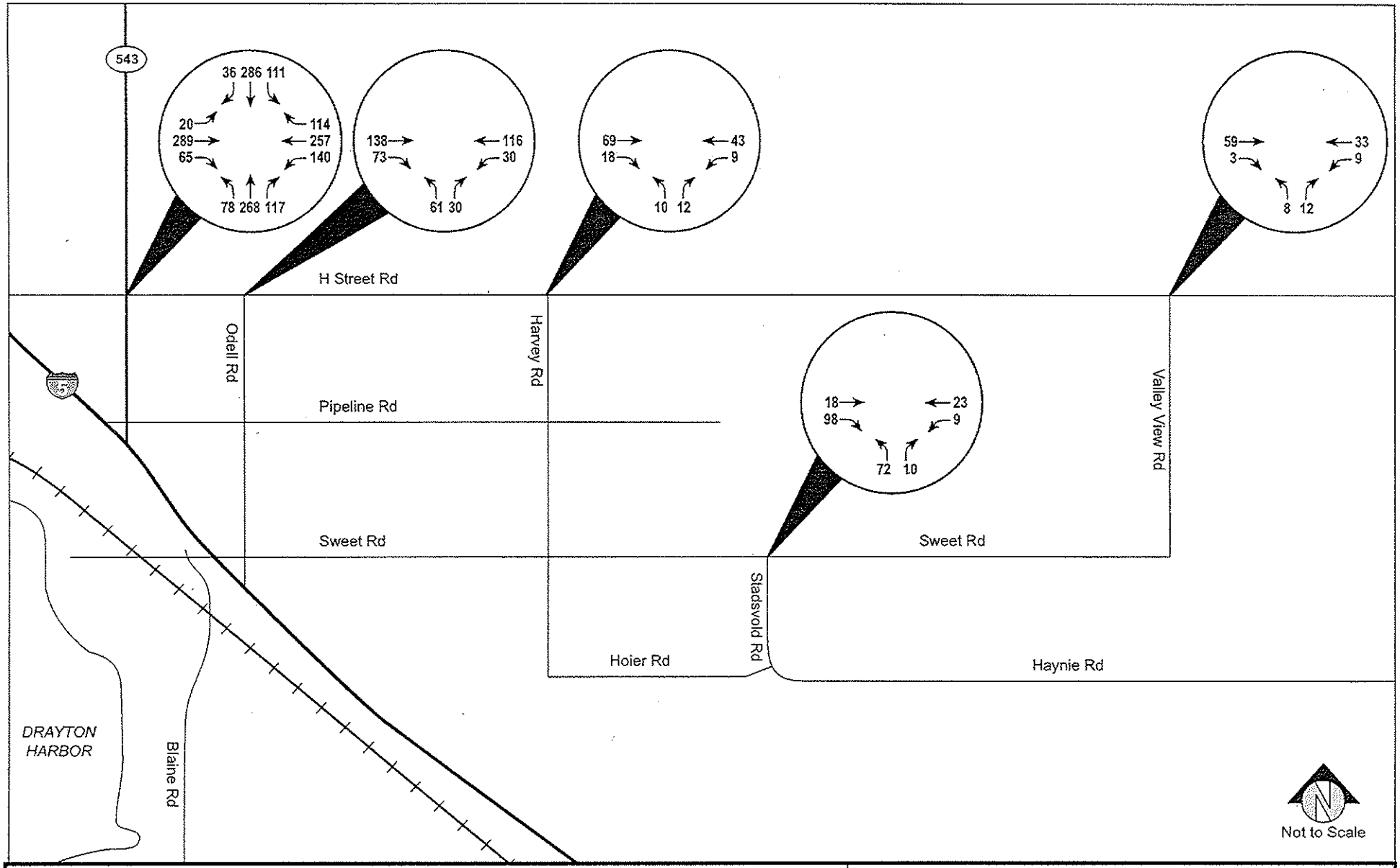

2020 Baseline Traffic PM Peak

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Figure 7

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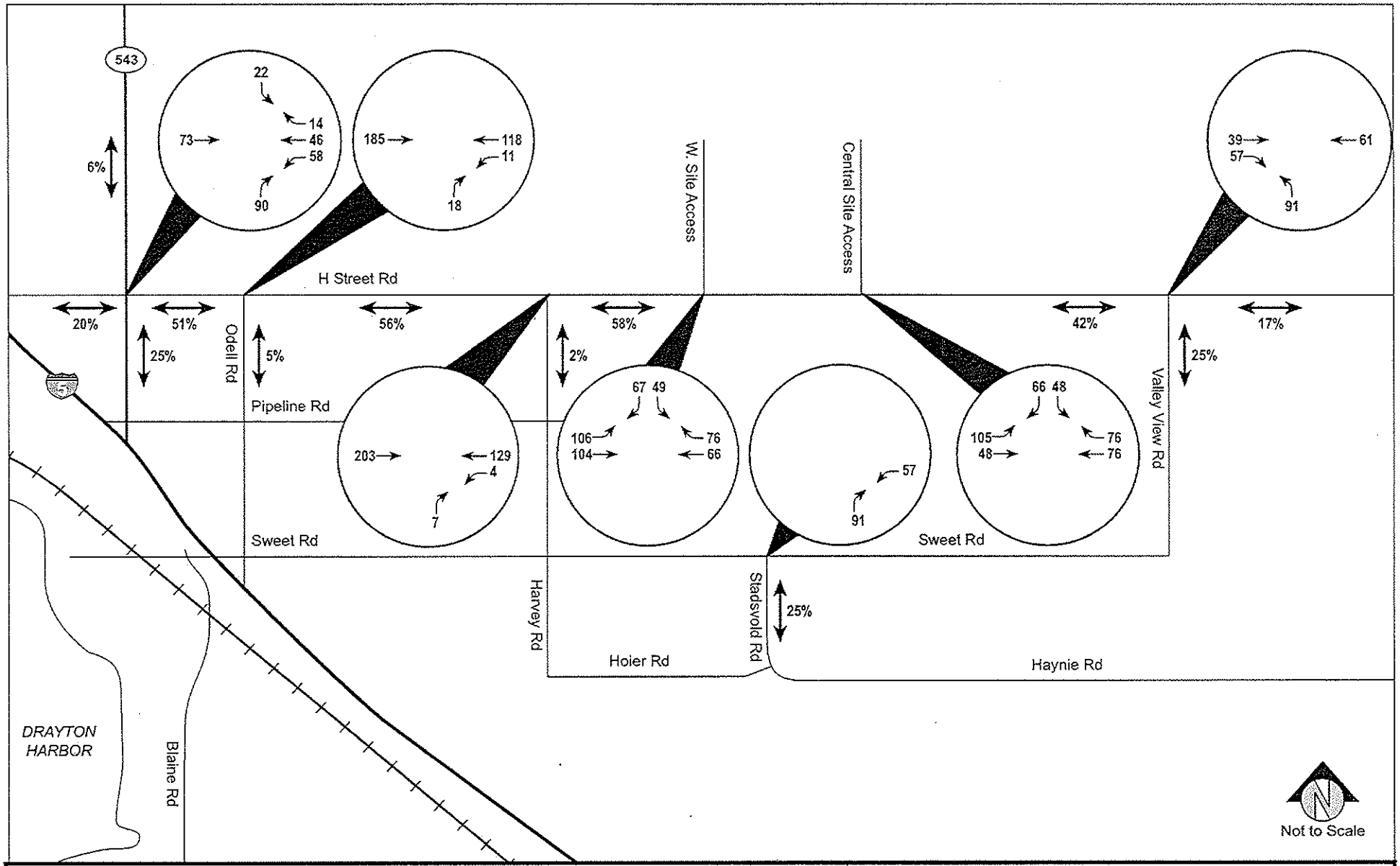

2020 Site Generated Traffic & Trip Distribution PM Peak

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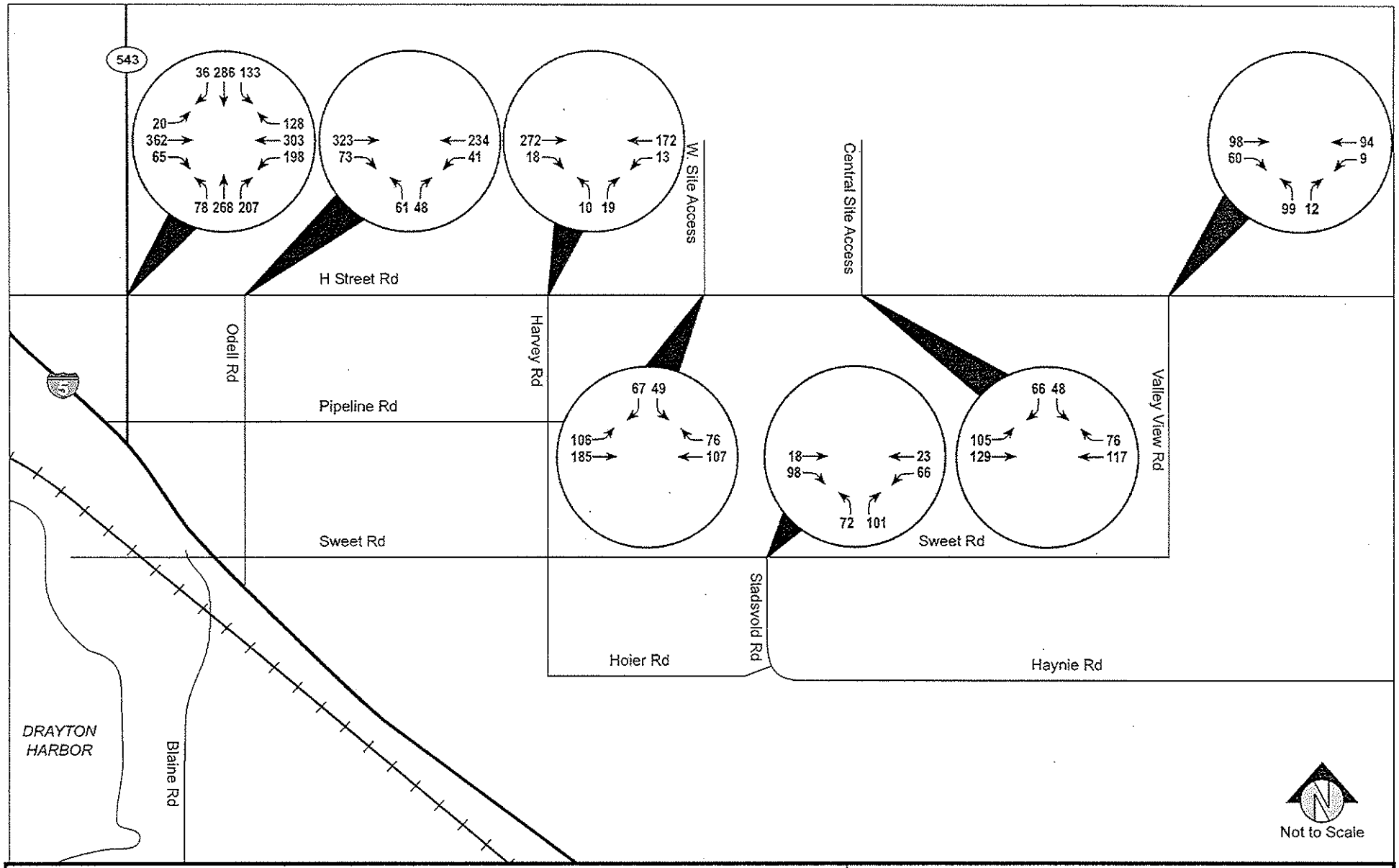
Figure 8

DAVID EVANS AND ASSOCIATES INC.

Gx1520



2020 Total Traffic PM Peak

Grandis Pond Development

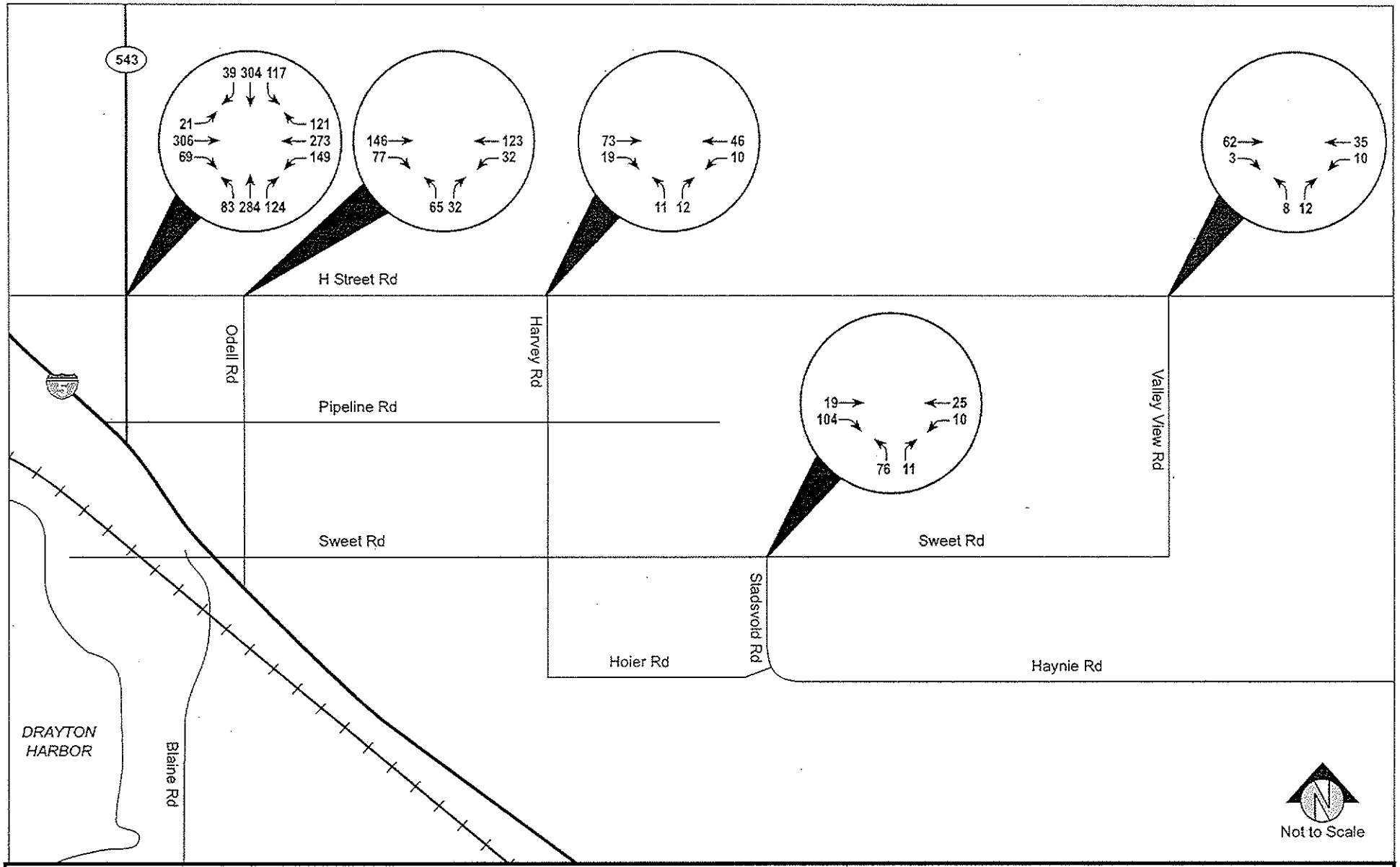
BLMT0000-0004

May 2007

Figure 9

DAVID EVANS AND ASSOCIATES INC.

Gx1520



2024 Baseline Traffic PM Peak

Grandis Pond Development

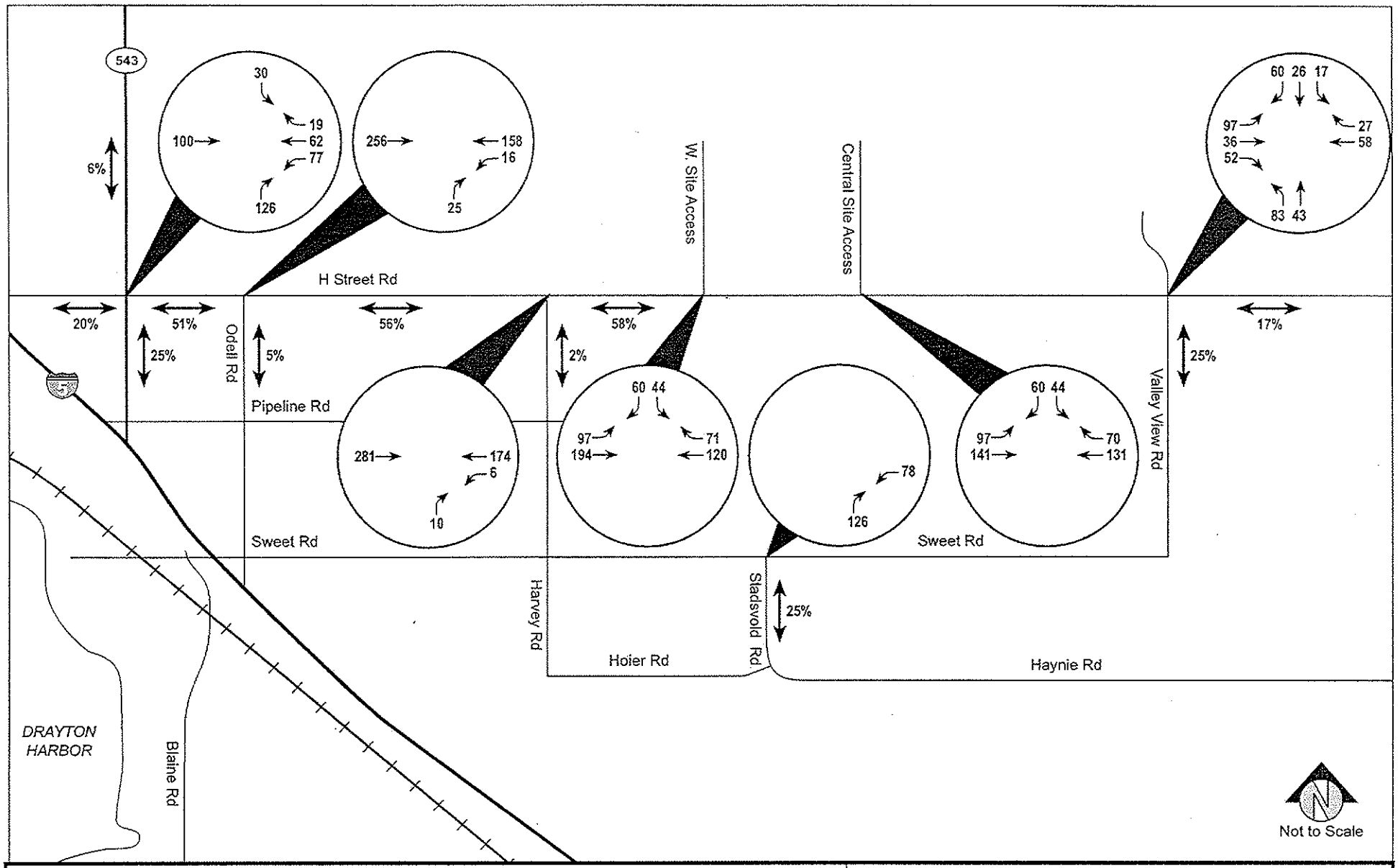
BLMT0000-0004

May 2007

Figure 10

DAVID EVANS AND ASSOCIATES INC.

Gx1520



2024 Site Generated Traffic & Trip Distribution PM Peak

Grandis Pond Development

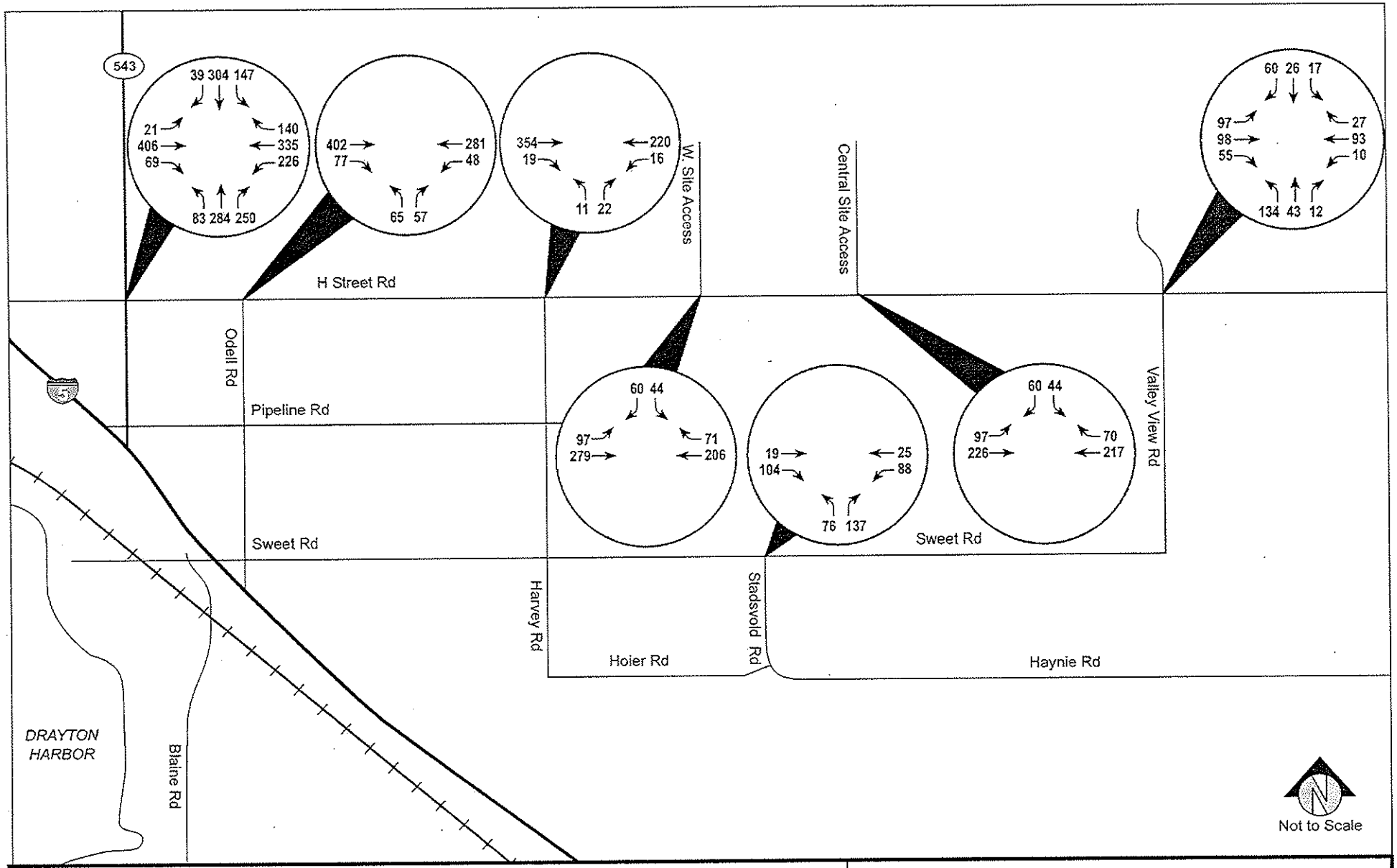
BLMT0000-0004

May 2007

Figure 11

DAVID EVANS AND ASSOCIATES INC.

Gx1520



2024 Total Traffic PM Peak

Grandis Pond Development

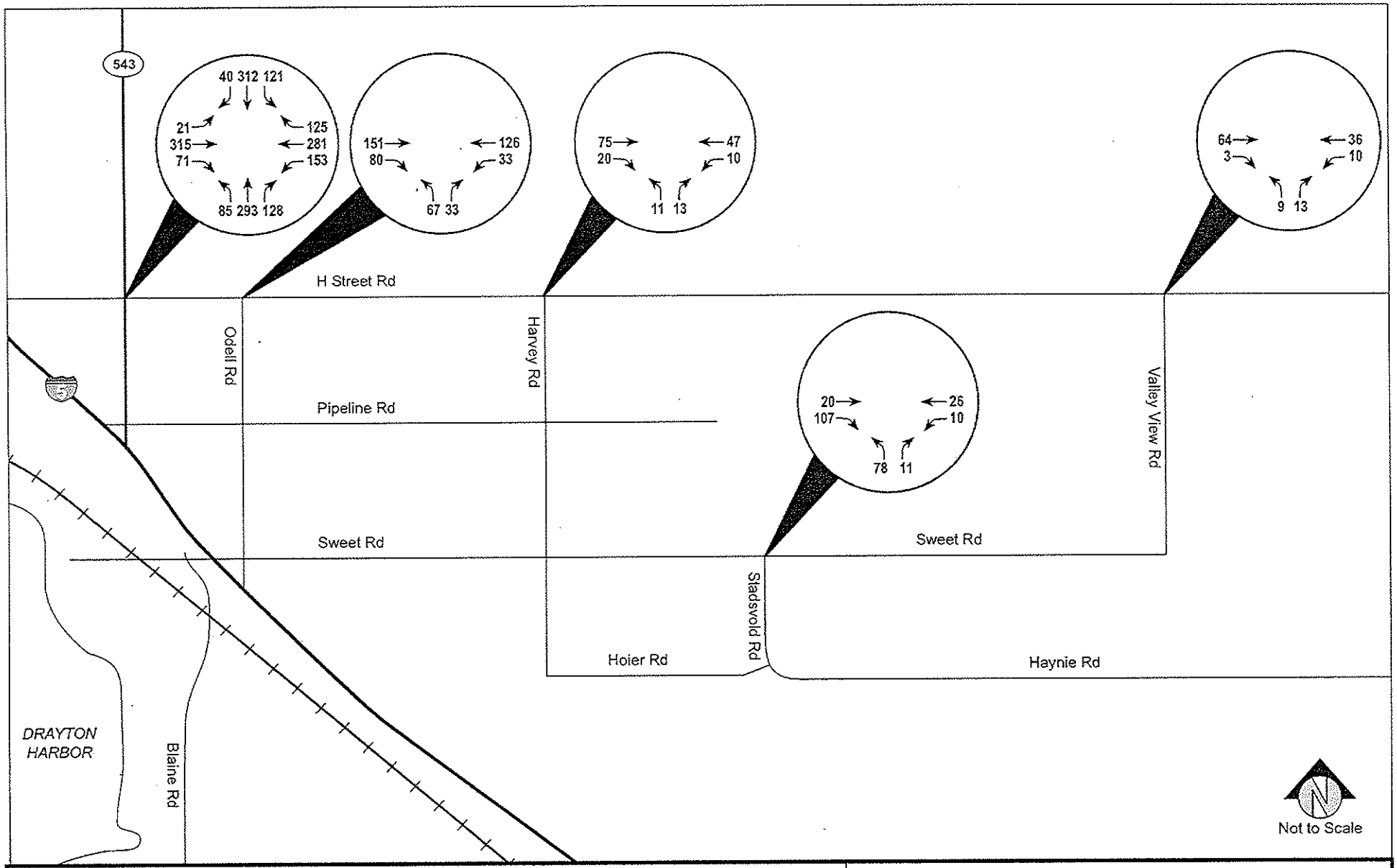
BLMT0000-0004

May 2007

Figure 12

DAVID EVANS AND ASSOCIATES INC.

Gx1520



2026 Baseline Traffic PM Peak

Grandis Pond Development

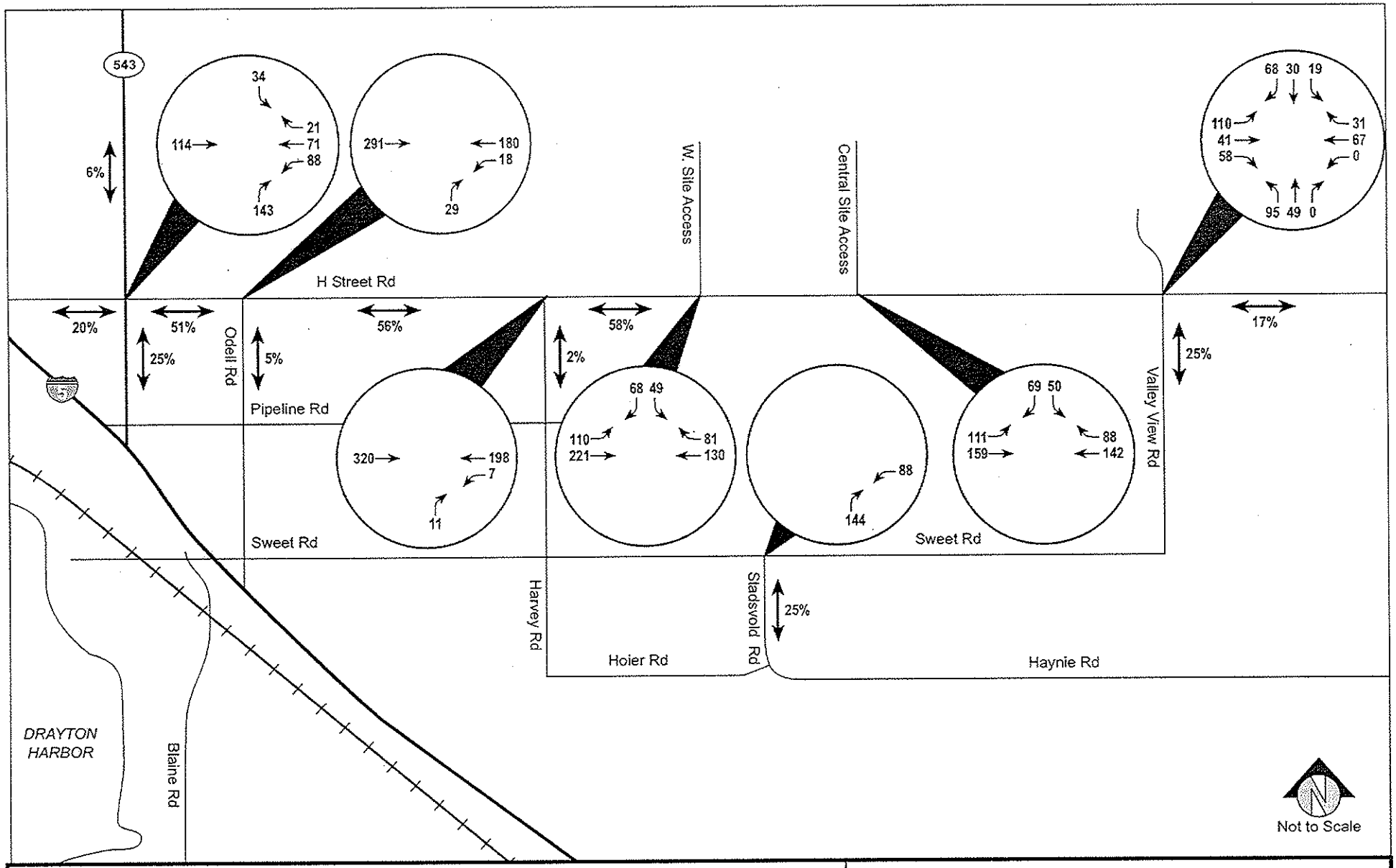
BLMT0000-0004

May 2007

Figure 13

DAVID EVANS AND ASSOCIATES INC.

Gx1520



2026 Site Generated Traffic & Trip Distribution PM Peak

Grandis Pond Development

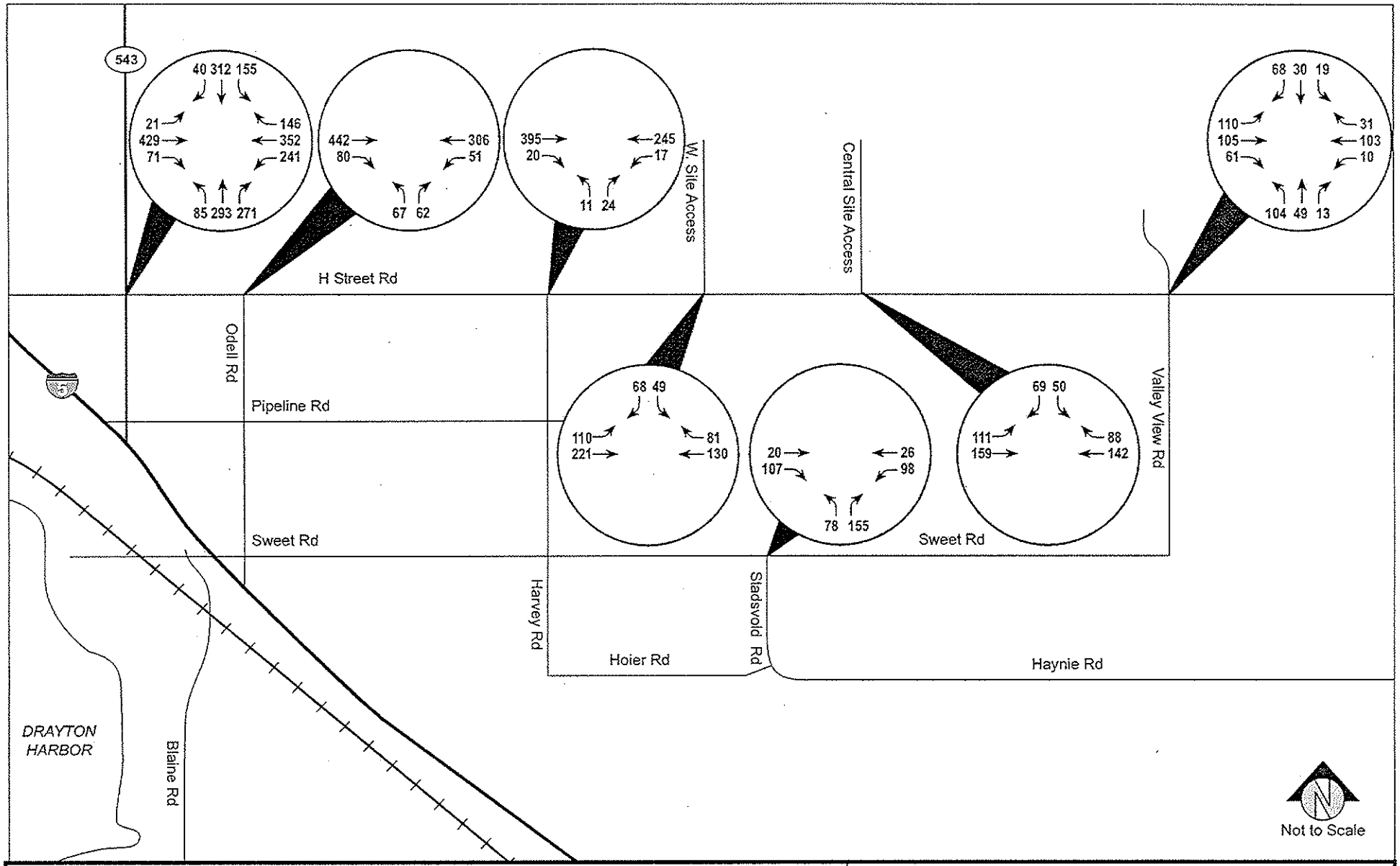
BLMT0000-0004

May 2007

Figure 14

DAVID EVANS AND ASSOCIATES INC.

Gx1520



2026 Total Traffic PM Peak

Grandis Pond Development

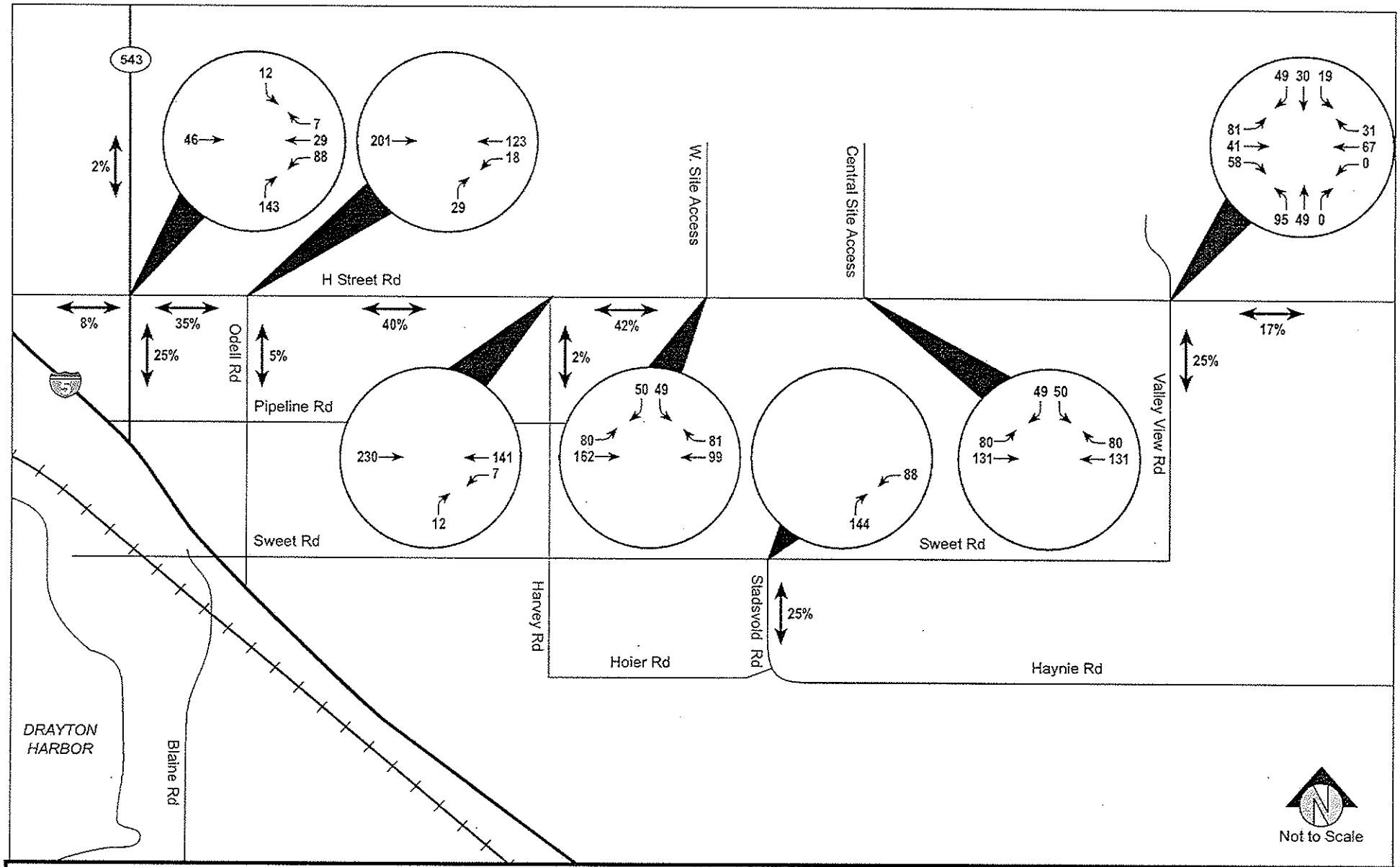
BLMT0000-0004

May 2007

Figure 15

DAVID EVANS AND ASSOCIATES INC.

Gx1520



NOTE: It is assumed for this figure that one-half of the project trips destined for Blaine will use Motts Hill Parkway if it is constructed.

2026 Site Generated Traffic & Trip Distribution PM Peak with Motts Hill Parkway

Grandis Pond Development

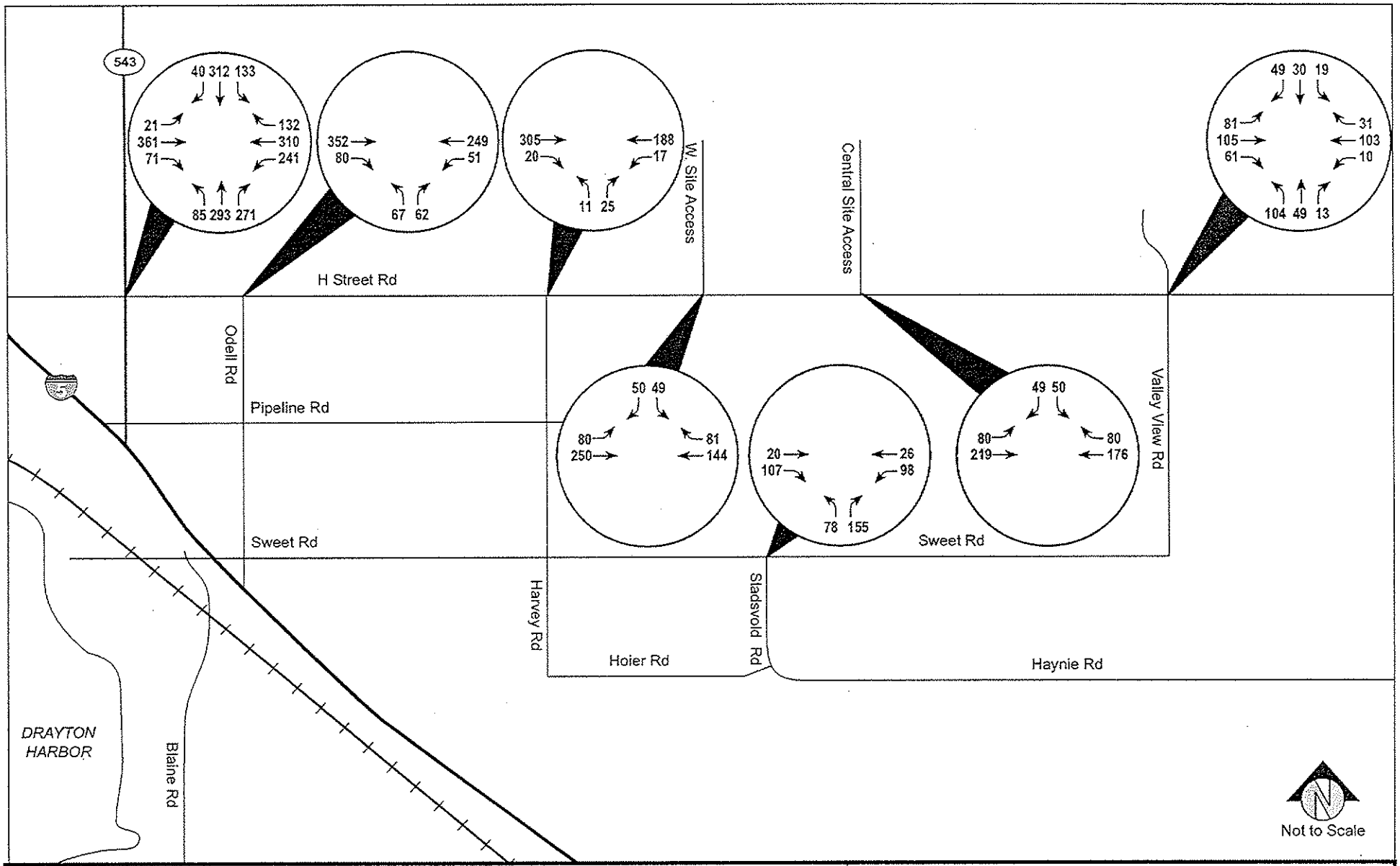
BLMT0000-0004

May 2007

Figure 16

DAVID EVANS AND ASSOCIATES INC.

Gx1520



2026 Total Traffic PM Peak with Motts Hill Parkway

Grandis Pond Development

BLMT0000-0004

May 2007

Figure 17

DAVID EVANS AND ASSOCIATES INC.

Gx1520

APPENDIX A – LEVEL OF SERVICE CRITERIA

Level of Service Criteria

Level of Service (LOS) is a qualitative measure describing operational conditions within a traffic stream and the perception thereof by road users. For unsignalized and signalized intersections, LOS is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. There are six LOS levels ranging from LOS A to LOS F, with LOS A representing the best operating conditions and LOS F the worst. Specifically, LOS criteria are stated in terms of the average stopped vehicle delay for a peak 15-minute analysis period, factored to a full hour, for the intersection as a whole. **Table C-1** provides the LOS criteria for both signalized and unsignalized intersections.

Table A-1: Level of Service Criteria

LOS	Signalized Intersection Control Delay/Vehicle	Unsignalized Intersection Control Delay/Vehicle	Expected Delays
A	≤ 10.0 seconds	≤ 10.0 seconds	Little or no delay
B	10.1 to 20.0 seconds	10.1 to 15.0 seconds	Short traffic delays
C	20.1 to 35.0 seconds	15.1 to 25.0 seconds	Average traffic delays
D	35.1 to 55.0 seconds	25.1 to 35.0 seconds	Long traffic delays
E	55.1 to 80.0 seconds	35.1 to 50.0 seconds	Very long traffic delays
F	> 80.0 seconds	> 50.0 seconds	*

*When demand volume exceeds the capacity of the movement, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. SOURCE: *2000 Highway Capacity Manual* (TRB SR 209, 2000)

For signalized intersections, delay is a complex measure and is dependent upon a number of variables, including the quality of progression, the cycle length, the ratio of green signal time to total cycle length, and the volume-to-capacity ratio for the lane group in question.

The level of service criteria for unsignalized intersections are somewhat different from the criteria used for signalized intersections. The primary reason for this is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, several driver behavior considerations, such as driver attentiveness and delay, combine to make delays at signalized intersections less onerous than at unsignalized intersections. For these reasons, it is considered that the total delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection.

APPENDIX B – TRAFFIC GROWTH RATE CALCULATIONS

2.0%	Enter Annual Growth Rate					
	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
			Enter value here		2016	2016
1 - Phase 1						
Enter values here		2005	1.00			
EBR	50	2005	1.00	50	11	61
EBT	222	2005	1.00	222	11	271
EBL	15	2005	1.00	15	11	18
SBR	28	2005	1.00	28	11	34
SBT	220	2005	1.00	220	11	268
SBL	85	2005	1.00	85	11	104
WBR	88	2005	1.00	88	11	107
WBT	198	2005	1.00	198	11	242
WBL	108	2005	1.00	108	11	132
NBR	90	2005	1.00	90	11	110
NBT	206	2005	1.00	206	11	251
NBL	60	2005	1.00	60	11	73
	---			---		---
TOTAL	1,370			1,370		1,671
2 - Phase 1						
Enter values here		2005	1.00			
EBR	56	2005	1.00	56	11	68
EBT	106	2005	1.00	106	11	129
EBL	-	2005	1.00	0	11	-
SBR	-	2005	1.00	0	11	-
SBT	-	2005	1.00	0	11	-
SBL	-	2005	1.00	0	11	-
WBR	-	2005	1.00	0	11	-
WBT	89	2005	1.00	89	11	109
WBL	23	2005	1.00	23	11	28
NBR	23	2005	1.00	23	11	28
NBT	-	2005	1.00	0	11	-
NBL	47	2005	1.00	47	11	57
	---			---		---
TOTAL	344			344		419

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2016	2016
3 - Phase 1						
Enter values here		2005	1.00			
EBR	14	2005	1.00	14	11	17
EBT	53	2005	1.00	53	11	65
EBL	-	2005	1.00	0	11	-
SBR	-	2005	1.00	0	11	-
SBT	-	2005	1.00	0	11	-
SBL	-	2005	1.00	0	11	-
WBR	-	2005	1.00	0	11	-
WBT	33	2005	1.00	33	11	40
WBL	7	2005	1.00	7	11	9
NBR	9	2005	1.00	9	11	11
NBT	-	2005	1.00	0	11	-
NBL	8	2005	1.00	8	11	10
	---			---		---
TOTAL	124			124		152
4 - Phase 1						
Enter values here		2005	1.00			
EBR	2	2005	1.00	2	11	2
EBT	45	2005	1.00	45	11	55
EBL	-	2005	1.00	0	11	-
SBR	-	2005	1.00	0	11	-
SBT	-	2005	1.00	0	11	-
SBL	-	2005	1.00	0	11	-
WBR	-	2005	1.00	0	11	-
WBT	25	2005	1.00	25	11	31
WBL	7	2005	1.00	7	11	9
NBR	9	2005	1.00	9	11	11
NBT	-	2005	1.00	0	11	-
NBL	6	2005	1.00	6	11	7
	---			---		---
TOTAL	94			94		115

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2016	2016
5 - Phase 1						
Enter values here		2005	1.00			
EBR	75	2005	1.00	75	11	92
EBT	14	2005	1.00	14	11	17
EBL	-	2005	1.00	0	11	-
SBR	-	2005	1.00	0	11	-
SBT	-	2005	1.00	0	11	-
SBL	-	2005	1.00	0	11	-
WBR	-	2005	1.00	0	11	-
WBT	18	2005	1.00	18	11	22
WBL	7	2005	1.00	7	11	9
NBR	8	2005	1.00	8	11	10
NBT	-	2005	1.00	0	11	-
NBL	55	2005	1.00	55	11	67
	---			---		---
TOTAL	177			177		217
West - Phase 1						
Enter values here		2016	1.00			
EBR	[redacted]	2016	1.00	0	0	-
EBT	67	2016	1.00	67	0	67
EBL	[redacted]	2016	1.00	0	0	-
SBR	[redacted]	2016	1.00	0	0	-
SBT	[redacted]	2016	1.00	0	0	-
SBL	[redacted]	2016	1.00	0	0	-
WBR	[redacted]	2016	1.00	0	0	-
WBT	33	2016	1.00	33	0	33
WBL	[redacted]	2016	1.00	0	0	-
NBR	[redacted]	2016	1.00	0	0	-
NBT	[redacted]	2016	1.00	0	0	-
NBL	[redacted]	2016	1.00	0	0	-
	---			---		---
TOTAL	100			100		100

P:\b\BLMT0000-0004\0600_TRANS\05-07 Revised Report\05-07 Revised Data\05-07 Grandis Pond 2016 Worksheet.xls

2.0%	Enter Annual Growth Rate					
	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
			Enter value here		2020	2020
1 - Phase 2						
Enter values here		2005	1.00			
EBR	50	2005	1.00	50	15	65
EBT	222	2005	1.00	222	15	289
EBL	15	2005	1.00	15	15	20
SBR	28	2005	1.00	28	15	36
SBT	220	2005	1.00	220	15	286
SBL	85	2005	1.00	85	15	111
WBR	88	2005	1.00	88	15	114
WBT	198	2005	1.00	198	15	257
WBL	108	2005	1.00	108	15	140
NBR	90	2005	1.00	90	15	117
NBT	206	2005	1.00	206	15	268
NBL	60	2005	1.00	60	15	78
	---			---		---
TOTAL	1,370			1,370		1,781
2 - Phase 2						
Enter values here		2005	1.00			
EBR	56	2005	1.00	56	15	73
EBT	106	2005	1.00	106	15	138
EBL	-	2005	1.00	0	15	-
SBR	-	2005	1.00	0	15	-
SBT	-	2005	1.00	0	15	-
SBL	-	2005	1.00	0	15	-
WBR	-	2005	1.00	0	15	-
WBT	89	2005	1.00	89	15	116
WBL	23	2005	1.00	23	15	30
NBR	23	2005	1.00	23	15	30
NBT	-	2005	1.00	0	15	-
NBL	47	2005	1.00	47	15	61
	---			---		---
TOTAL	344			344		448

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2020	2020
3 - Phase 2						
Enter values here		2005	1.00			
EBR	14	2005	1.00	14	15	18
EBT	53	2005	1.00	53	15	69
EBL	-	2005	1.00	0	15	-
SBR	-	2005	1.00	0	15	-
SBT	-	2005	1.00	0	15	-
SBL	-	2005	1.00	0	15	-
WBR	-	2005	1.00	0	15	-
WBT	33	2005	1.00	33	15	43
WBL	7	2005	1.00	7	15	9
NBR	9	2005	1.00	9	15	12
NBT	-	2005	1.00	0	15	-
NBL	8	2005	1.00	8	15	10
	---			---		---
TOTAL	124			124		161
4 - Phase 2						
Enter values here		2005	1.00			
EBR	2	2005	1.00	2	15	3
EBT	45	2005	1.00	45	15	59
EBL	-	2005	1.00	0	15	-
SBR	-	2005	1.00	0	15	-
SBT	-	2005	1.00	0	15	-
SBL	-	2005	1.00	0	15	-
WBR	-	2005	1.00	0	15	-
WBT	25	2005	1.00	25	15	33
WBL	7	2005	1.00	7	15	9
NBR	9	2005	1.00	9	15	12
NBT	-	2005	1.00	0	15	-
NBL	6	2005	1.00	6	15	8
	---			---		---
TOTAL	94			94		124

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2020	2020
5 - Phase 2						
Enter values here		2005	1.00			
EBR	75	2005	1.00	75	15	98
EBT	14	2005	1.00	14	15	18
EBL	-	2005	1.00	0	15	-
SBR	-	2005	1.00	0	15	-
SBT	-	2005	1.00	0	15	-
SBL	-	2005	1.00	0	15	-
WBR	-	2005	1.00	0	15	-
WBT	18	2005	1.00	18	15	23
WBL	7	2005	1.00	7	15	9
NBR	8	2005	1.00	8	15	10
NBT	-	2005	1.00	0	15	-
NBL	55	2005	1.00	55	15	72
	---			---		---
TOTAL	177			177		230
West - Phase 2						
Enter values here		2020	1.00			
EBR	[redacted]	2020	1.00	0	0	-
EBT	74	2020	1.00	74	0	74
EBL	[redacted]	2020	1.00	0	0	-
SBR	[redacted]	2020	1.00	0	0	-
SBT	[redacted]	2020	1.00	0	0	-
SBL	[redacted]	2020	1.00	0	0	-
WBR	[redacted]	2020	1.00	0	0	-
WBT	37	2020	1.00	37	0	37
WBL	[redacted]	2020	1.00	0	0	-
NBR	[redacted]	2020	1.00	0	0	-
NBT	[redacted]	2020	1.00	0	0	-
NBL	[redacted]	2020	1.00	0	0	-
	---			---		---
TOTAL	111			111		111

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2020	2020
Central - Phase 2						
Enter values here		2020	1.00			
EBR		2020	1.00	0	0	-
EBT	74	2020	1.00	74	0	74
EBL		2020	1.00	0	0	-
SBR		2020	1.00	0	0	-
SBT		2020	1.00	0	0	-
SBL		2020	1.00	0	0	-
WBR		2020	1.00	0	0	-
WBT	37	2020	1.00	37	0	37
WBL		2020	1.00	0	0	-
NBR		2020	1.00	0	0	-
NBT		2020	1.00	0	0	-
NBL		2020	1.00	0	0	-
	---			---		---
TOTAL	111			111		111
XX						
Enter values here		2014	1.00			
EBR		2014	1.00	0	6	-
EBT		2014	1.00	0	6	-
EBL		2014	1.00	0	6	-
SBR		2014	1.00	0	6	-
SBT		2014	1.00	0	6	-
SBL		2014	1.00	0	6	-
WBR		2014	1.00	0	6	-
WBT		2014	1.00	0	6	-
WBL		2014	1.00	0	6	-
NBR		2014	1.00	0	6	-
NBT		2014	1.00	0	6	-
NBL		2014	1.00	0	6	-
	---			---		---
TOTAL	0			0		0

2.0%	Enter Annual Growth Rate					
	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
			Enter value here		2024	2024
1 - Phase 3						
Enter values here		2005	1.00			
EBR	50	2005	1.00	50	19	69
EBT	222	2005	1.00	222	19	306
EBL	15	2005	1.00	15	19	21
SBR	28	2005	1.00	28	19	39
SBT	220	2005	1.00	220	19	304
SBL	85	2005	1.00	85	19	117
WBR	88	2005	1.00	88	19	121
WBT	198	2005	1.00	198	19	273
WBL	108	2005	1.00	108	19	149
NBR	90	2005	1.00	90	19	124
NBT	206	2005	1.00	206	19	284
NBL	60	2005	1.00	60	19	83
	---			---		---
TOTAL	1,370			1,370		1,890
2 - Phase 3						
Enter values here		2005	1.00			
EBR	56	2005	1.00	56	19	77
EBT	106	2005	1.00	106	19	146
EBL	-	2005	1.00	0	19	-
SBR	-	2005	1.00	0	19	-
SBT	-	2005	1.00	0	19	-
SBL	-	2005	1.00	0	19	-
WBR	-	2005	1.00	0	19	-
WBT	89	2005	1.00	89	19	123
WBL	23	2005	1.00	23	19	32
NBR	23	2005	1.00	23	19	32
NBT	-	2005	1.00	0	19	-
NBL	47	2005	1.00	47	19	65
	---			---		---
TOTAL	344			344		475

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2024	2024
3 - Phase 3						
Enter values here		2005	1.00			
EBR	14	2005	1.00	14	19	19
EBT	53	2005	1.00	53	19	73
EBL	-	2005	1.00	0	19	-
SBR	-	2005	1.00	0	19	-
SBT	-	2005	1.00	0	19	-
SBL	-	2005	1.00	0	19	-
WBR	-	2005	1.00	0	19	-
WBT	33	2005	1.00	33	19	46
WBL	7	2005	1.00	7	19	10
NBR	9	2005	1.00	9	19	12
NBT	-	2005	1.00	0	19	-
NBL	8	2005	1.00	8	19	11
	---			---		---
TOTAL	124			124		171
4 - Phase 3						
Enter values here		2005	1.00			
EBR	2	2005	1.00	2	19	3
EBT	45	2005	1.00	45	19	62
EBL	-	2005	1.00	0	19	-
SBR	-	2005	1.00	0	19	-
SBT	-	2005	1.00	0	19	-
SBL	-	2005	1.00	0	19	-
WBR	-	2005	1.00	0	19	-
WBT	25	2005	1.00	25	19	35
WBL	7	2005	1.00	7	19	10
NBR	9	2005	1.00	9	19	12
NBT	-	2005	1.00	0	19	-
NBL	6	2005	1.00	6	19	8
	---			---		---
TOTAL	94			94		130

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2024	2024
5 - Phase 3						
Enter values here		2005	1.00			
EBR	75	2005	1.00	75	19	104
EBT	14	2005	1.00	14	19	19
EBL	-	2005	1.00	0	19	-
SBR	-	2005	1.00	0	19	-
SBT	-	2005	1.00	0	19	-
SBL	-	2005	1.00	0	19	-
WBR	-	2005	1.00	0	19	-
WBT	18	2005	1.00	18	19	25
WBL	7	2005	1.00	7	19	10
NBR	8	2005	1.00	8	19	11
NBT	-	2005	1.00	0	19	-
NBL	55	2005	1.00	55	19	76
	---			---		---
TOTAL	177			177		245
West - Phase 3						
Enter values here		2024	1.00			
EBR		2024	1.00	0	0	-
EBT	80	2024	1.00	80	0	80
EBL		2024	1.00	0	0	-
SBR		2024	1.00	0	0	-
SBT		2024	1.00	0	0	-
SBL		2024	1.00	0	0	-
WBR		2024	1.00	0	0	-
WBT	40	2024	1.00	40	0	40
WBL		2024	1.00	0	0	-
NBR		2024	1.00	0	0	-
NBT		2024	1.00	0	0	-
NBL		2024	1.00	0	0	-
	---			---		---
TOTAL	120			120		120

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2024	2024
Central - Phase 3						
Enter values here		2024	1.00			
EBR		2024	1.00	0	0	-
EBT	80	2024	1.00	80	0	80
EBL		2024	1.00	0	0	-
SBR		2024	1.00	0	0	-
SBT		2024	1.00	0	0	-
SBL		2024	1.00	0	0	-
WBR		2024	1.00	0	0	-
WBT	40	2024	1.00	40	0	40
WBL		2024	1.00	0	0	-
NBR		2024	1.00	0	0	-
NBT		2024	1.00	0	0	-
NBL		2024	1.00	0	0	-
	---			---		---
TOTAL	120			120		120
East - Phase 3						
Enter values here		2024	1.00			
EBR		2024	1.00	0	0	-
EBT	80	2024	1.00	80	0	80
EBL		2024	1.00	0	0	-
SBR		2024	1.00	0	0	-
SBT		2024	1.00	0	0	-
SBL		2024	1.00	0	0	-
WBR		2024	1.00	0	0	-
WBT	40	2024	1.00	40	0	40
WBL		2024	1.00	0	0	-
NBR		2024	1.00	0	0	-
NBT		2024	1.00	0	0	-
NBL		2024	1.00	0	0	-
	---			---		---
TOTAL	120			120		120

2.0%	Enter Annual Growth Rate					
	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
			Enter value here		2026	2026
1 - Phase 4/5						
Enter values here		2005	1.00			
EBR	50	2005	1.00	50	21	71
EBT	222	2005	1.00	222	21	315
EBL	15	2005	1.00	15	21	21
SBR	28	2005	1.00	28	21	40
SBT	220	2005	1.00	220	21	312
SBL	85	2005	1.00	85	21	121
WBR	88	2005	1.00	88	21	125
WBT	198	2005	1.00	198	21	281
WBL	108	2005	1.00	108	21	153
NBR	90	2005	1.00	90	21	128
NBT	206	2005	1.00	206	21	293
NBL	60	2005	1.00	60	21	85
	---			---		---
TOTAL	1,370			1,370		1,945
2 - Phase 4/5						
Enter values here		2005	1.00			
EBR	56	2005	1.00	56	21	80
EBT	106	2005	1.00	106	21	151
EBL	-	2005	1.00	0	21	-
SBR	-	2005	1.00	0	21	-
SBT	-	2005	1.00	0	21	-
SBL	-	2005	1.00	0	21	-
WBR	-	2005	1.00	0	21	-
WBT	89	2005	1.00	89	21	126
WBL	23	2005	1.00	23	21	33
NBR	23	2005	1.00	23	21	33
NBT	-	2005	1.00	0	21	-
NBL	47	2005	1.00	47	21	67
	---			---		---
TOTAL	344			344		490

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2026	2026
3 - Phase 4/5						
Enter values here		2005	1.00			
EBR	14	2005	1.00	14	21	20
EBT	53	2005	1.00	53	21	75
EBL	-	2005	1.00	0	21	-
SBR	-	2005	1.00	0	21	-
SBT	-	2005	1.00	0	21	-
SBL	-	2005	1.00	0	21	-
WBR	-	2005	1.00	0	21	-
WBT	33	2005	1.00	33	21	47
WBL	7	2005	1.00	7	21	10
NBR	9	2005	1.00	9	21	13
NBT	-	2005	1.00	0	21	-
NBL	8	2005	1.00	8	21	11
	---			---		---
TOTAL	124			124		176
4 - Phase 4/5						
Enter values here		2005	1.00			
EBR	2	2005	1.00	2	21	3
EBT	45	2005	1.00	45	21	64
EBL	-	2005	1.00	0	21	-
SBR	-	2005	1.00	0	21	-
SBT	-	2005	1.00	0	21	-
SBL	-	2005	1.00	0	21	-
WBR	-	2005	1.00	0	21	-
WBT	25	2005	1.00	25	21	36
WBL	7	2005	1.00	7	21	10
NBR	9	2005	1.00	9	21	13
NBT	-	2005	1.00	0	21	-
NBL	6	2005	1.00	6	21	9
	---			---		---
TOTAL	94			94		135

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2026	2026
5 - Phase 4/5						
Enter values here		2005	1.00			
EBR	75	2005	1.00	75	21	107
EBT	14	2005	1.00	14	21	20
EBL	-	2005	1.00	0	21	-
SBR	-	2005	1.00	0	21	-
SBT	-	2005	1.00	0	21	-
SBL	-	2005	1.00	0	21	-
WBR	-	2005	1.00	0	21	-
WBT	18	2005	1.00	18	21	26
WBL	7	2005	1.00	7	21	10
NBR	8	2005	1.00	8	21	11
NBT	-	2005	1.00	0	21	-
NBL	55	2005	1.00	55	21	78
	---			---		---
TOTAL	177			177		252
West - Phase 4/5						
Enter values here		2026	1.00			
EBR		2026	1.00	0	0	-
EBT	80	2026	1.00	80	0	80
EBL		2026	1.00	0	0	-
SBR		2026	1.00	0	0	-
SBT		2026	1.00	0	0	-
SBL		2026	1.00	0	0	-
WBR		2026	1.00	0	0	-
WBT	40	2026	1.00	40	0	40
WBL		2026	1.00	0	0	-
NBR		2026	1.00	0	0	-
NBT		2026	1.00	0	0	-
NBL		2026	1.00	0	0	-
	---			---		---
TOTAL	120			120		120

P:\b\BLMT0000-0004\0600_TRANS\05-07 Revised Report\05-07 Revised Data\05-07 Grandis Pond 2026 Worksheet.xls

	Existing Volumes	Count Year	Seasonal Factor	Existing Seasonal Volumes	Years Until	Seasonal Volumes -
					2026	2026
Central - Phase 4/5						
Enter values here		2026	1.00			
EBR		2026	1.00	0	0	-
EBT	80	2026	1.00	80	0	80
EBL		2026	1.00	0	0	-
SBR		2026	1.00	0	0	-
SBT		2026	1.00	0	0	-
SBL		2026	1.00	0	0	-
WBR		2026	1.00	0	0	-
WBT	40	2026	1.00	40	0	40
WBL		2026	1.00	0	0	-
NBR		2026	1.00	0	0	-
NBT		2026	1.00	0	0	-
NBL		2026	1.00	0	0	-
	---			---		---
TOTAL	120			120		120
East - Phase 4/5						
Enter values here		2026	1.00			
EBR		2026	1.00	0	0	-
EBT	80	2026	1.00	80	0	80
EBL		2026	1.00	0	0	-
SBR		2026	1.00	0	0	-
SBT		2026	1.00	0	0	-
SBL		2026	1.00	0	0	-
WBR		2026	1.00	0	0	-
WBT	40	2026	1.00	40	0	40
WBL		2026	1.00	0	0	-
NBR		2026	1.00	0	0	-
NBT		2026	1.00	0	0	-
NBL		2026	1.00	0	0	-
	---			---		---
TOTAL	120			120		120

APPENDIX C – PROJECT TRIP GENERATION

Grandis Pond Traffic Analysis - Appendix C
BLMT0000-0004
KOO
05/04/07

Trip Generations

Area	Land Use	LUC	Quantity	Units	Measurement	Average Daily				PM Peak Hour			
						ADT Rate	In	Out	Total	PM Rate	In	Out	Total
1	Single-Family Detached Housing/Cottage Homes	210	417	Each	Dwelling Unit		50%	50%	100%		63%	37%	100%
							1934	1934	3868		244	143	388
	Total						**1934**	**1934**	**3868**		**244**	**143**	**388**
2	Single-Family Detached Housing	210	83	Each	Dwelling Unit		50%	50%	100%		63%	37%	100%
							438	438	876		57	34	91
	Condo/Multi-Family/Paired/Duplex	230	148	Each	Dwelling Unit		50%	50%	100%		67%	33%	100%
							448	448	896		56	27	83
	Total						**886**	**886**	**1772**		**113**	**61**	**174**
1 and 2							**2820**	**2820**	**5639**		**357**	**204**	**561**
3	Single-Family Detached Housing	210	258	Each	Dwelling Unit		50%	50%	100%		63%	37%	100%
							1243	1243	2487		158	93	252
	Total						**1243**	**1243**	**2487**		**158**	**93**	**252**
1, 2 and 3							**4063**	**4063**	**8126**		**515**	**297**	**813**
4 and 5	Single-Family Detached Housing	210	124	Each	Dwelling Unit		50%	50%	100%		63%	37%	100%
							634	634	1267		82	48	130
	Total						**634**	**634**	**1267**		**82**	**48**	**130**
All							**4697**	**4697**	**9394**		**597**	**345**	**943**

Grandis Pond Traffic Analysis - Appendix C
BLMT0000-0004
KOO
03/08/07

Estimate of Trips for 48,000 Gross Square Feet of Commercial Space

Commercial Land Use	ITE (1) Land Use Code (LUC)	Units of Independent Variable "X"	Quantity of "X"	PM Peak Hour Trip Rate / PM Peak Hour Trips	PM Peak Entering Percent / PM Peak Entering Trips	PM Peak Exiting Percent / PM Peak Exiting Trips	Daily Trip Rate (2) / Daily Trips
Coffee Shop Data	933	1,000 gsf	2	28.79	52%	48%	127.15
Coffee Shop Trips		*Passby Rate =*	*50%*	**29**	**15**	**14**	**127**
Specialty Retail Data	814	1,000 gsf	18	2.71	44%	56%	44.32
Specialty Retail Trips		*Passby Rate =*	*35%*	**32**	**14**	**18**	**519**
Office Park Data	750	1,000 gsf	24	1.50	52%	48%	11.42
Office Park Trips		*Passby Rate =*	*0%*	**36**	**19**	**17**	**274**
Community Center Data	495	1,000 gsf	4	1.64	52%	48%	22.88
Community Center Trips		*Passby Rate =*	*25%*	**5**	**3**	**2**	**69**
		1,000's of gsf =	**48**	**102** ***PM Peak Hour Trips***	**51** ***Entering Trips***	**51** ***Exiting Trips***	**989** ***Daily Trips***

(1) ITE = Institute of Transportation Engineers

(2) There are no weekday daily trip data available for LUC 933, "Coffee Shop," so the weekday daily trip rate for LUC 932, "High Turnover (Sit-Down) Restaurant," was used to approximate daily trips for LUC 933.

APPENDIX D – LEVEL OF SERVICE CALCULATIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	1615	1703	1792	1524	1530	4557		1504	3008	1346
Flt Permitted	0.53	1.00	1.00	0.47	1.00	1.00	0.58	1.00		0.47	1.00	1.00
Satd. Flow (perm)	1001	1900	1615	850	1792	1524	926	4557		740	3008	1346
Volume (vph)	18	314	61	163	267	115	73	251	163	117	268	34
Peak-hour factor, PHF	0.91	0.91	0.91	0.87	0.87	0.87	0.86	0.86	0.86	0.93	0.93	0.93
Adj. Flow (vph)	20	345	67	187	307	132	85	292	190	126	288	37
RTOR Reduction (vph)	0	0	44	0	0	88	0	105	0	0	0	21
Lane Group Flow (vph)	20	345	23	187	307	44	85	377	0	126	288	16
Heavy Vehicles (%)	0%	0%	0%	6%	6%	6%	18%	0%	18%	20%	20%	20%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	12.3	12.3	12.3	12.3	12.3	12.3	16.3	16.3		16.3	16.3	16.3
Effective Green, g (s)	12.3	12.3	12.3	12.3	12.3	12.3	16.3	16.3		16.3	16.3	16.3
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34	0.34	0.45	0.45		0.45	0.45	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	336	639	543	286	602	512	412	2029		330	1340	599
v/s Ratio Prot		0.18			0.17			0.08			0.10	
v/s Ratio Perm	0.02		0.01	c0.22		0.03	0.09			c0.17		0.01
v/c Ratio	0.06	0.54	0.04	0.65	0.51	0.09	0.21	0.19		0.38	0.21	0.03
Uniform Delay, d1	8.2	9.9	8.2	10.3	9.7	8.3	6.2	6.1		6.8	6.2	5.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	0.9	0.0	5.3	0.7	0.1	1.1	0.2		0.7	0.1	0.0
Delay (s)	8.3	10.7	8.2	15.6	10.4	8.4	7.3	6.3		7.5	6.3	5.7
Level of Service	A	B	A	B	B	A	A	A		A	A	A
Approach Delay (s)		10.2			11.5			6.5			6.6	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	36.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	238	68	34	173	57	39
Peak Hour Factor	0.78	0.78	0.74	0.74	0.73	0.73
Hourly flow rate (vph)	305	87	46	234	78	53
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			392		674	349
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			392		674	349
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		81	92
cM capacity (veh/h)			1177		406	699

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	392	280	78	53
Volume Left	0	46	78	0
Volume Right	87	0	0	53
cSH	1700	1177	406	699
Volume to Capacity	0.23	0.04	0.19	0.08
Queue Length 95th (ft)	0	3	18	6
Control Delay (s)	0.0	1.7	16.0	10.6
Lane LOS		A	C	B
Approach Delay (s)	0.0	1.7	13.8	
Approach LOS			B	

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	185	17	12	110	10	15
Peak Hour Factor	0.88	0.88	0.77	0.77	0.53	0.53
Hourly flow rate (vph)	210	19	16	143	19	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			230		394	220
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			230		394	220
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		97	97
cM capacity (veh/h)			1321		607	825

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	230	158	47
Volume Left	0	16	19
Volume Right	19	0	28
cSH	1700	1321	721
Volume to Capacity	0.14	0.01	0.07
Queue Length 95th (ft)	0	1	5
Control Delay (s)	0.0	0.9	10.3
Lane LOS		A	B
Approach Delay (s)	0.0	0.9	10.3
Approach LOS			B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	25.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	76	33	9	68	60	11
Peak Hour Factor	0.73	0.73	0.80	0.80	0.63	0.63
Hourly flow rate (vph)	104	45	11	85	95	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			149		234	127
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			149		234	127
tC, single (s)			4.2		6.7	6.5
tC, 2 stage (s)						
tF (s)			2.3		3.7	3.5
p0 queue free %			99		86	98
cM capacity (veh/h)			1408		697	861

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	149	96	113
Volume Left	0	11	95
Volume Right	45	0	17
cSH	1700	1408	718
Volume to Capacity	0.09	0.01	0.16
Queue Length 95th (ft)	0	1	14
Control Delay (s)	0.0	0.9	10.9
Lane LOS		A	B
Approach Delay (s)	0.0	0.9	10.9
Approach LOS			B

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	21.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	17	92	40	22	67	63
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	100	43	24	73	68
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			118		179	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			118		179	68
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		91	93
cM capacity (veh/h)			1470		786	995

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	118	67	141
Volume Left	0	43	73
Volume Right	100	0	68
cSH	1700	1470	875
Volume to Capacity	0.07	0.03	0.16
Queue Length 95th (ft)	0	2	14
Control Delay (s)	0.0	4.9	9.9
Lane LOS		A	A
Approach Delay (s)	0.0	4.9	9.9
Approach LOS			A

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	24.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	124	76	38	90	53	73
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	135	83	41	98	58	79
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	139				442	90
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	139				442	90
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				89	92
cM capacity (veh/h)	1444				519	968

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	217	139	137
Volume Left	135	0	58
Volume Right	0	98	79
cSH	1444	1700	710
Volume to Capacity	0.09	0.08	0.19
Queue Length 95th (ft)	8	0	18
Control Delay (s)	5.1	0.0	11.3
Lane LOS	A		B
Approach Delay (s)	5.1	0.0	11.3
Approach LOS			B

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	1615	1703	1792	1524	1530	4495		1504	3008	1346
Flt Permitted	0.47	1.00	1.00	0.41	1.00	1.00	0.56	1.00		0.43	1.00	1.00
Satd. Flow (perm)	888	1900	1615	732	1792	1524	909	4495		688	3008	1346
Volume (vph)	20	362	65	198	303	128	78	268	207	133	286	36
Peak-hour factor, PHF	0.91	0.91	0.91	0.87	0.87	0.87	0.86	0.86	0.86	0.93	0.93	0.93
Adj. Flow (vph)	22	398	71	228	348	147	91	312	241	143	308	39
RTOR Reduction (vph)	0	0	44	0	0	91	0	135	0	0	0	22
Lane Group Flow (vph)	22	398	27	228	348	56	91	418	0	143	308	17
Heavy Vehicles (%)	0%	0%	0%	6%	6%	6%	18%	0%	18%	20%	20%	20%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	16.7	16.7	16.7	16.7	16.7	16.7	19.4	19.4		19.4	19.4	19.4
Effective Green, g (s)	16.7	16.7	16.7	16.7	16.7	16.7	19.4	19.4		19.4	19.4	19.4
Actuated g/C Ratio	0.38	0.38	0.38	0.38	0.38	0.38	0.44	0.44		0.44	0.44	0.44
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	336	720	612	277	679	577	400	1977		303	1323	592
v/s Ratio Prot		0.21			0.19			0.09			0.10	
v/s Ratio Perm	0.02		0.02	c0.31		0.04	0.10			c0.21		0.01
v/c Ratio	0.07	0.55	0.04	0.82	0.51	0.10	0.23	0.21		0.47	0.23	0.03
Uniform Delay, d1	8.7	10.8	8.7	12.4	10.6	8.8	7.7	7.6		8.7	7.7	7.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	0.9	0.0	17.6	0.7	0.1	1.3	0.2		1.2	0.1	0.0
Delay (s)	8.8	11.7	8.7	30.0	11.2	8.9	9.0	7.9		9.9	7.8	7.0
Level of Service	A	B	A	C	B	A	A	A		A	A	A
Approach Delay (s)		11.1			16.7			8.0			8.3	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	11.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	44.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	323	73	41	234	61	48
Peak Hour Factor	0.78	0.78	0.74	0.74	0.73	0.73
Hourly flow rate (vph)	414	94	55	316	84	66
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			508		888	461
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			508		888	461
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		72	89
cM capacity (veh/h)			1068		300	605

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	508	372	84	66
Volume Left	0	55	84	0
Volume Right	94	0	0	66
cSH	1700	1068	300	605
Volume to Capacity	0.30	0.05	0.28	0.11
Queue Length 95th (ft)	0	4	28	9
Control Delay (s)	0.0	1.7	21.5	11.7
Lane LOS		A	C	B
Approach Delay (s)	0.0	1.7	17.2	
Approach LOS			C	

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	272	18	13	172	10	19
Peak Hour Factor	0.88	0.88	0.77	0.77	0.53	0.53
Hourly flow rate (vph)	309	20	17	223	19	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			330		576	319
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			330		576	319
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		96	95
cM capacity (veh/h)			1213		475	726

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	330	240	55
Volume Left	0	17	19
Volume Right	20	0	36
cSH	1700	1213	614
Volume to Capacity	0.19	0.01	0.09
Queue Length 95th (ft)	0	1	7
Control Delay (s)	0.0	0.7	11.4
Lane LOS		A	B
Approach Delay (s)	0.0	0.7	11.4
Approach LOS			B

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	29.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	98	60	9	94	99	12
Peak Hour Factor	0.73	0.73	0.80	0.80	0.63	0.63
Hourly flow rate (vph)	134	82	11	118	157	19
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			216		315	175
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			216		315	175
tC, single (s)			4.2		6.7	6.5
tC, 2 stage (s)						
tF (s)			2.3		3.7	3.5
p0 queue free %			99		75	98
cM capacity (veh/h)			1330		624	807

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	216	129	176
Volume Left	0	11	157
Volume Right	82	0	19
cSH	1700	1330	639
Volume to Capacity	0.13	0.01	0.28
Queue Length 95th (ft)	0	1	28
Control Delay (s)	0.0	0.7	12.8
Lane LOS		A	B
Approach Delay (s)	0.0	0.7	12.8
Approach LOS			B

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	18	98	66	23	72	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	107	72	25	78	110
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			126		241	73
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			126		241	73
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		89	89
cM capacity (veh/h)			1460		710	989

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	126	97	188
Volume Left	0	72	78
Volume Right	107	0	110
cSH	1700	1460	850
Volume to Capacity	0.07	0.05	0.22
Queue Length 95th (ft)	0	4	21
Control Delay (s)	0.0	5.7	10.4
Lane LOS		A	B
Approach Delay (s)	0.0	5.7	10.4
Approach LOS			B

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	28.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	106	185	107	76	49	67
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	115	201	116	83	53	73
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	199				589	158
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	199				589	158
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				88	92
cM capacity (veh/h)	1373				431	888

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	316	199	126
Volume Left	115	0	53
Volume Right	0	83	73
cSH	1373	1700	613
Volume to Capacity	0.08	0.12	0.21
Queue Length 95th (ft)	7	0	19
Control Delay (s)	3.3	0.0	12.4
Lane LOS	A		B
Approach Delay (s)	3.3	0.0	12.4
Approach LOS			B

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	105	129	117	76	48	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	140	127	83	52	72
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	210				537	168
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	210				537	168
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				89	92
cM capacity (veh/h)	1361				462	876

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	254	210	124
Volume Left	114	0	52
Volume Right	0	83	72
cSH	1361	1700	636
Volume to Capacity	0.08	0.12	0.19
Queue Length 95th (ft)	7	0	18
Control Delay (s)	3.9	0.0	12.0
Lane LOS	A		B
Approach Delay (s)	3.9	0.0	12.0
Approach LOS			B

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	40.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	1615	1703	1792	1524	1530	4447		1504	3008	1346
Flt Permitted	0.46	1.00	1.00	0.39	1.00	1.00	0.55	1.00		0.41	1.00	1.00
Satd. Flow (perm)	865	1900	1615	700	1792	1524	892	4447		642	3008	1346
Volume (vph)	21	406	69	226	335	140	83	284	250	147	304	39
Peak-hour factor, PHF	0.91	0.91	0.91	0.87	0.87	0.87	0.86	0.86	0.86	0.93	0.93	0.93
Adj. Flow (vph)	23	446	76	260	385	161	97	330	291	158	327	42
RTOR Reduction (vph)	0	0	44	0	0	93	0	178	0	0	0	26
Lane Group Flow (vph)	23	446	32	260	385	68	97	443	0	158	327	16
Heavy Vehicles (%)	0%	0%	0%	6%	6%	6%	18%	0%	18%	20%	20%	20%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	17.6	17.6	17.6	17.6	17.6	17.6	16.2	16.2		16.2	16.2	16.2
Effective Green, g (s)	17.6	17.6	17.6	17.6	17.6	17.6	16.2	16.2		16.2	16.2	16.2
Actuated g/C Ratio	0.42	0.42	0.42	0.42	0.42	0.42	0.39	0.39		0.39	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	364	800	680	295	755	642	346	1723		249	1166	522
v/s Ratio Prot		0.23			0.21			0.10			0.11	
v/s Ratio Perm	0.03		0.02	c0.37		0.04	0.11			c0.25		0.01
v/c Ratio	0.06	0.56	0.05	0.88	0.51	0.11	0.28	0.26		0.63	0.28	0.03
Uniform Delay, d1	7.2	9.2	7.1	11.1	8.9	7.3	8.8	8.7		10.4	8.8	7.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	0.8	0.0	25.0	0.5	0.1	2.0	0.4		5.2	0.1	0.0
Delay (s)	7.3	10.0	7.2	36.1	9.5	7.4	10.8	9.1		15.6	8.9	8.0
Level of Service	A	B	A	D	A	A	B	A		B	A	A
Approach Delay (s)		9.5			17.6			9.3			10.9	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	41.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	402	77	48	281	65	57
Peak Hour Factor	0.78	0.78	0.74	0.74	0.73	0.73
Hourly flow rate (vph)	515	99	65	380	89	78
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			614		1074	565
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			614		1074	565
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		61	85
cM capacity (veh/h)			975		229	528

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	614	445	89	78
Volume Left	0	65	89	0
Volume Right	99	0	0	78
cSH	1700	975	229	528
Volume to Capacity	0.36	0.07	0.39	0.15
Queue Length 95th (ft)	0	5	43	13
Control Delay (s)	0.0	2.0	30.3	13.0
Lane LOS		A	D	B
Approach Delay (s)	0.0	2.0	22.2	
Approach LOS			C	

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	354	19	16	220	11	22
Peak Hour Factor	0.88	0.88	0.77	0.77	0.53	0.53
Hourly flow rate (vph)	402	22	21	286	21	42
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			424		740	413
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			424		740	413
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		95	94
cM capacity (veh/h)			1119		380	643

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	424	306	62
Volume Left	0	21	21
Volume Right	22	0	42
cSH	1700	1119	522
Volume to Capacity	0.25	0.02	0.12
Queue Length 95th (ft)	0	1	10
Control Delay (s)	0.0	0.7	12.8
Lane LOS		A	B
Approach Delay (s)	0.0	0.7	12.8
Approach LOS			B

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	34.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	97	98	55	10	93	27	134	43	12	17	26	60
Peak Hour Factor	0.92	0.73	0.73	0.80	0.80	0.92	0.63	0.92	0.63	0.92	0.92	0.92
Hourly flow rate (vph)	105	134	75	12	116	29	213	47	19	18	28	65
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	146			210			618	553	172	581	576	131
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	146			210			618	553	172	581	576	131
tC, single (s)	4.1			4.2			7.4	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.7	4.0	3.5	3.5	4.0	3.3
p0 queue free %	93			99			30	88	98	95	93	93
cM capacity (veh/h)	1437			1338			303	405	811	355	393	919

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	315	158	278	112
Volume Left	105	12	213	18
Volume Right	75	29	19	65
cSH	1437	1338	331	574
Volume to Capacity	0.07	0.01	0.84	0.20
Queue Length 95th (ft)	6	1	186	18
Control Delay (s)	3.0	0.7	53.6	12.8
Lane LOS	A	A	F	B
Approach Delay (s)	3.0	0.7	53.6	12.8
Approach LOS			F	B

Intersection Summary			
Average Delay	20.2		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	19	104	88	25	76	137
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	113	96	27	83	149
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			134		296	77
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			134		296	77
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		87	85
cM capacity (veh/h)			1451		650	984

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	134	123	232
Volume Left	0	96	83
Volume Right	113	0	149
cSH	1700	1451	831
Volume to Capacity	0.08	0.07	0.28
Queue Length 95th (ft)	0	5	29
Control Delay (s)	0.0	6.1	11.0
Lane LOS		A	B
Approach Delay (s)	0.0	6.1	11.0
Approach LOS			B

Intersection Summary			
Average Delay	6.7		
Intersection Capacity Utilization	36.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	97	279	206	71	44	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	105	303	224	77	48	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	301				777	262
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	301				777	262
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				86	92
cM capacity (veh/h)	1260				335	776

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	409	301	113
Volume Left	105	0	48
Volume Right	0	77	65
cSH	1260	1700	498
Volume to Capacity	0.08	0.18	0.23
Queue Length 95th (ft)	7	0	22
Control Delay (s)	2.7	0.0	14.3
Lane LOS	A		B
Approach Delay (s)	2.7	0.0	14.3
Approach LOS			B

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	97	226	217	70	44	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	105	246	236	76	48	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	312				730	274
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	312				730	274
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				87	91
cM capacity (veh/h)	1248				356	765

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	351	312	113
Volume Left	105	0	48
Volume Right	0	76	65
cSH	1248	1700	515
Volume to Capacity	0.08	0.18	0.22
Queue Length 95th (ft)	7	0	21
Control Delay (s)	3.0	0.0	13.9
Lane LOS	A		B
Approach Delay (s)	3.0	0.0	13.9
Approach LOS			B

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	1615	1703	1792	1524	1530	4430		1504	3008	1346
Flt Permitted	0.44	1.00	1.00	0.37	1.00	1.00	0.55	1.00		0.38	1.00	1.00
Satd. Flow (perm)	827	1900	1615	665	1792	1524	885	4430		602	3008	1346
Volume (vph)	21	429	71	241	352	146	85	293	271	155	312	40
Peak-hour factor, PHF	0.91	0.91	0.91	0.87	0.87	0.87	0.86	0.86	0.86	0.93	0.93	0.93
Adj. Flow (vph)	23	471	78	277	405	168	99	341	315	167	335	43
RTOR Reduction (vph)	0	0	43	0	0	93	0	188	0	0	0	27
Lane Group Flow (vph)	23	471	35	277	405	75	99	468	0	167	335	16
Heavy Vehicles (%)	0%	0%	0%	6%	6%	6%	18%	0%	18%	20%	20%	20%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	21.3	21.3	21.3	21.3	21.3	21.3	18.2	18.2		18.2	18.2	18.2
Effective Green, g (s)	21.3	21.3	21.3	21.3	21.3	21.3	18.2	18.2		18.2	18.2	18.2
Actuated g/C Ratio	0.45	0.45	0.45	0.45	0.45	0.45	0.38	0.38		0.38	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	371	852	724	298	804	683	339	1697		231	1153	516
v/s Ratio Prot		0.25			0.23			0.11			0.11	
v/s Ratio Perm	0.03		0.02	c0.42		0.05	0.11			c0.28		0.01
v/c Ratio	0.06	0.55	0.05	0.93	0.50	0.11	0.29	0.28		0.72	0.29	0.03
Uniform Delay, d1	7.4	9.6	7.4	12.4	9.3	7.6	10.2	10.1		12.5	10.2	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	0.8	0.0	33.7	0.5	0.1	2.2	0.4		10.6	0.1	0.0
Delay (s)	7.5	10.4	7.4	46.1	9.8	7.7	12.4	10.5		23.1	10.3	9.2
Level of Service	A	B	A	D	A	A	B	B		C	B	A
Approach Delay (s)		9.9			21.2			10.7			14.2	
Approach LOS		A			C			B			B	

Intersection Summary			
HCM Average Control Delay	14.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	47.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	442	80	51	306	67	62
Peak Hour Factor	0.78	0.78	0.74	0.74	0.73	0.73
Hourly flow rate (vph)	567	103	69	414	92	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			669		1169	618
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			669		1169	618
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		54	83
cM capacity (veh/h)			930		199	493

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	669	482	92	85
Volume Left	0	69	92	0
Volume Right	103	0	0	85
cSH	1700	930	199	493
Volume to Capacity	0.39	0.07	0.46	0.17
Queue Length 95th (ft)	0	6	55	15
Control Delay (s)	0.0	2.1	37.6	13.8
Lane LOS		A	E	B
Approach Delay (s)	0.0	2.1	26.2	
Approach LOS			D	

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	395	20	17	245	11	24
Peak Hour Factor	0.88	0.88	0.77	0.77	0.53	0.53
Hourly flow rate (vph)	449	23	22	318	21	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			472		823	460
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			472		823	460
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		94	93
cM capacity (veh/h)			1075		339	605

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	472	340	66
Volume Left	0	22	21
Volume Right	23	0	45
cSH	1700	1075	485
Volume to Capacity	0.28	0.02	0.14
Queue Length 95th (ft)	0	2	12
Control Delay (s)	0.0	0.7	13.6
Lane LOS		A	B
Approach Delay (s)	0.0	0.7	13.6
Approach LOS			B

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	36.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	110	105	61	10	103	31	104	49	13	19	30	68
Peak Hour Factor	0.92	0.73	0.73	0.80	0.80	0.92	0.63	0.92	0.63	0.92	0.92	0.92
Hourly flow rate (vph)	120	144	84	12	129	34	165	53	21	21	33	74
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	162			227			686	612	186	643	637	146
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	162			227			686	612	186	643	637	146
tC, single (s)	4.1			4.2			7.4	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.7	4.0	3.5	3.5	4.0	3.3
p0 queue free %	92			99			37	86	97	93	91	92
cM capacity (veh/h)	1416			1318			262	370	796	312	358	902

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	347	175	239	127
Volume Left	120	12	165	21
Volume Right	84	34	21	74
cSH	1416	1318	299	531
Volume to Capacity	0.08	0.01	0.80	0.24
Queue Length 95th (ft)	7	1	161	23
Control Delay (s)	3.2	0.6	51.6	13.9
Lane LOS	A	A	F	B
Approach Delay (s)	3.2	0.6	51.6	13.9
Approach LOS			F	B

Intersection Summary			
Average Delay	17.2		
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	20	107	98	26	78	155
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	116	107	28	85	168
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			138		321	80
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			138		321	80
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		86	83
cM capacity (veh/h)			1446		623	980

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	138	135	253
Volume Left	0	107	85
Volume Right	116	0	168
cSH	1700	1446	822
Volume to Capacity	0.08	0.07	0.31
Queue Length 95th (ft)	0	6	33
Control Delay (s)	0.0	6.2	11.3
Lane LOS		A	B
Approach Delay (s)	0.0	6.2	11.3
Approach LOS			B

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	38.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	110	221	130	81	49	68
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	120	240	141	88	53	74
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	229				665	185
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	229				665	185
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				86	91
cM capacity (veh/h)	1339				387	857

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	360	229	127
Volume Left	120	0	53
Volume Right	0	88	74
cSH	1339	1700	568
Volume to Capacity	0.09	0.13	0.22
Queue Length 95th (ft)	7	0	21
Control Delay (s)	3.2	0.0	13.2
Lane LOS	A		B
Approach Delay (s)	3.2	0.0	13.2
Approach LOS			B

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	111	159	142	88	50	69
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	121	173	154	96	54	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	250				616	202
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	250				616	202
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				87	91
cM capacity (veh/h)	1316				412	839

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	293	250	129
Volume Left	121	0	54
Volume Right	0	96	75
cSH	1316	1700	585
Volume to Capacity	0.09	0.15	0.22
Queue Length 95th (ft)	8	0	21
Control Delay (s)	3.8	0.0	12.9
Lane LOS	A		B
Approach Delay (s)	3.8	0.0	12.9
Approach LOS			B

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1900	1615	1703	1792	1524	1530	4430		1504	3008	1346
Flt Permitted	0.48	1.00	1.00	0.43	1.00	1.00	0.55	1.00		0.39	1.00	1.00
Satd. Flow (perm)	910	1900	1615	777	1792	1524	885	4430		619	3008	1346
Volume (vph)	21	361	71	241	310	132	85	293	271	133	312	40
Peak-hour factor, PHF	0.91	0.91	0.91	0.87	0.87	0.87	0.86	0.86	0.86	0.93	0.93	0.93
Adj. Flow (vph)	23	397	78	277	356	152	99	341	315	143	335	43
RTOR Reduction (vph)	0	0	46	0	0	90	0	188	0	0	0	26
Lane Group Flow (vph)	23	397	32	277	356	62	99	468	0	143	335	17
Heavy Vehicles (%)	0%	0%	0%	6%	6%	6%	18%	0%	18%	20%	20%	20%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		6
Actuated Green, G (s)	17.3	17.3	17.3	17.3	17.3	17.3	17.1	17.1		17.1	17.1	17.1
Effective Green, g (s)	17.3	17.3	17.3	17.3	17.3	17.3	17.1	17.1		17.1	17.1	17.1
Actuated g/C Ratio	0.41	0.41	0.41	0.41	0.41	0.41	0.40	0.40		0.40	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	371	775	659	317	731	622	357	1787		250	1213	543
v/s Ratio Prot		0.21			0.20			0.11			0.11	
v/s Ratio Perm	0.03		0.02	c0.36		0.04	0.11			c0.23		0.01
v/c Ratio	0.06	0.51	0.05	0.87	0.49	0.10	0.28	0.26		0.57	0.28	0.03
Uniform Delay, d1	7.6	9.4	7.6	11.5	9.3	7.7	8.5	8.4		9.8	8.5	7.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	0.6	0.0	22.3	0.5	0.1	1.9	0.4		3.1	0.1	0.0
Delay (s)	7.7	10.0	7.6	33.9	9.8	7.8	10.4	8.8		13.0	8.6	7.7
Level of Service	A	A	A	C	A	A	B	A		B	A	A
Approach Delay (s)		9.5			17.9			9.0			9.7	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	12.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	42.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	352	80	51	249	67	62
Peak Hour Factor	0.78	0.78	0.74	0.74	0.73	0.73
Hourly flow rate (vph)	451	103	69	336	92	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			554		977	503
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			554		977	503
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		65	85
cM capacity (veh/h)			1027		262	573

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	554	405	92	85
Volume Left	0	69	92	0
Volume Right	103	0	0	85
cSH	1700	1027	262	573
Volume to Capacity	0.33	0.07	0.35	0.15
Queue Length 95th (ft)	0	5	38	13
Control Delay (s)	0.0	2.1	26.0	12.4
Lane LOS		A	D	B
Approach Delay (s)	0.0	2.1	19.5	
Approach LOS			C	

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	305	20	17	188	11	25
Peak Hour Factor	0.88	0.88	0.77	0.77	0.53	0.53
Hourly flow rate (vph)	347	23	22	244	21	47
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			369		646	358
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			369		646	358
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		95	93
cM capacity (veh/h)			1173		431	691

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	369	266	68
Volume Left	0	22	21
Volume Right	23	0	47
cSH	1700	1173	583
Volume to Capacity	0.22	0.02	0.12
Queue Length 95th (ft)	0	1	10
Control Delay (s)	0.0	0.8	12.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.8	12.0
Approach LOS			B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	81	105	61	10	103	31	104	49	13	19	30	49
Peak Hour Factor	0.92	0.73	0.73	0.80	0.80	0.92	0.63	0.92	0.63	0.92	0.92	0.92
Hourly flow rate (vph)	88	144	84	12	129	34	165	53	21	21	33	53
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	162			227			602	549	186	580	574	146
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	162			227			602	549	186	580	574	146
tC, single (s)	4.1			4.2			7.4	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.7	4.0	3.5	3.5	4.0	3.3
p0 queue free %	94			99			48	87	97	94	92	94
cM capacity (veh/h)	1416			1318			315	412	796	354	399	902

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	315	175	239	107
Volume Left	88	12	165	21
Volume Right	84	34	21	53
cSH	1416	1318	352	535
Volume to Capacity	0.06	0.01	0.68	0.20
Queue Length 95th (ft)	5	1	119	18
Control Delay (s)	2.6	0.6	34.4	13.4
Lane LOS	A	A	D	B
Approach Delay (s)	2.6	0.6	34.4	13.4
Approach LOS			D	B

Intersection Summary			
Average Delay	12.6		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	20	107	98	26	78	155
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	116	107	28	85	168
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			138		321	80
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			138		321	80
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		86	83
cM capacity (veh/h)			1446		623	980

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	138	135	253
Volume Left	0	107	85
Volume Right	116	0	168
cSH	1700	1446	822
Volume to Capacity	0.08	0.07	0.31
Queue Length 95th (ft)	0	6	33
Control Delay (s)	0.0	6.2	11.3
Lane LOS		A	B
Approach Delay (s)	0.0	6.2	11.3
Approach LOS			B

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	38.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	80	250	144	81	49	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	272	157	88	53	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	245				646	201
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	245				646	201
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				87	94
cM capacity (veh/h)	1322				407	840

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	359	245	108
Volume Left	87	0	53
Volume Right	0	88	54
cSH	1322	1700	551
Volume to Capacity	0.07	0.14	0.20
Queue Length 95th (ft)	5	0	18
Control Delay (s)	2.4	0.0	13.1
Lane LOS	A		B
Approach Delay (s)	2.4	0.0	13.1
Approach LOS			B

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	80	219	176	80	50	49
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	238	191	87	54	53
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	278				647	235
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	278				647	235
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				87	93
cM capacity (veh/h)	1284				406	804

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	325	278	108
Volume Left	87	0	54
Volume Right	0	87	53
cSH	1284	1700	538
Volume to Capacity	0.07	0.16	0.20
Queue Length 95th (ft)	5	0	18
Control Delay (s)	2.6	0.0	13.4
Lane LOS	A		B
Approach Delay (s)	2.6	0.0	13.4
Approach LOS			B

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		