fishbeck
Engineers | Architects | Scientists | Constructors

1515 Arboretum Drive, SE
Grand Rapids, Michigan 49546

616.575.3824 | fishbeck.com

Transmittal

Mr. Christopher P Grobbel, PhD
GROBBEL ENVIRONMENTAL & PLANNING ASSOCIATES
PO BOX 58
Lake Leelanau, MI 49653
231-499-7165
grobbelenvironmental@gmail.com
or cgrobbel@grobbelenvironmental.com

August 31, 2023

Re: Leelanau Pines Campground Site Plan

Project No. 211505

☒ FOR REVIEW
☒ FOR YOUR USE
☐ AS REQUESTED

Sent By: Jason T. Vander Kodde, PE

COPIES	DATE	DESCRIPTION
1	09/01/23	Site plan drawings G001, C100-C403, L101-L104 (24 pgs)
1	09/01/23	Site plan application form and materials (18 pgs)
1	12/15/22	Stormwater Management Calculations (10 pgs)
1	11/16/22	Traffic Impact Study (76 pgs)
1	Varies	Evidence of on-going agency coordination and permitting with: Road Commission, Health Department, Drain Commission, Fire Department, Sheriff's Department, Building Department and School District

COMMENTS

Per our recent conversation on 8/29/23 attached please find the site plan application information as required by the zoning ordinance Article 13 for the Leelanau Pines Campground Improvements for the planning commission's consideration during next regularly scheduled meeting. Please note that this site plan reflects the 320 total campsites and the 82 total boat slips per the mediated agreement with Centerville Township.

If you have any further questions, please feel free to contact us via phone or email.

By email
Copy: Brion Doyle, Varnum
Chelsea Bossenbroek, Northgate Leelanau Pines, LLC
Katy Hallgren, Northgate Leelanau Pines, LLC

Resubmitted on 8/31/23 with updated project narrative and site plan checklist (per 8/29/23 telephone discussion with Centerville Township Planner)

CENTERVILLE TOWNSHIP
APPLICATION FOR SITE PLAN REVIEW

1. APPLICANT

Name Northgate Leelanau Pines, LLC.

Address 38 Commerce Ave SW, Ste 200

City Grand Rapids State MI Zip Code 49503

1a. OWNER(S) OF RECORD

Complete this section only if the Owner of Record is not the Applicant.

The following individual(s) is/are the owner of record of the subject parcel (or firm or corporation having a legal or equitable interest in the land):

Name Northgate Leelanau Pines, LLC.

Address 38 Commerce Ave SW, Ste 200

City Grand Rapids State MI Zip Code 49503

1b. OFFICIAL REPRESENTATIVE

The following individual may act on behalf of the Applicant:

Name Northgate Resorts, Attn: Chelsea Bossenbroek

Address 38 Commerce Ave SW, Ste 200

City Grand Rapids State MI Zip Code 49503

2. DEVELOPER

Complete this section only if the Developer is not the Applicant.

The following individual(s) or firm is the project developer:

Name Same as applicant

Address

City State Zip Code

3. PROOF OF PROPERTY OWNERSHIP

Please attach a full legal description of the subject property. A copy of the deed or land contract is acceptable.

Are there any options on the property, or liens against it? If yes, please explain. If space provided is not sufficient, please attach a separate sheet.

See attached deed copy

4. PARCEL INFORMATION

Property Tax Identification Number of the subject parcel: 45 - 002 - 35 - 003 - 13

Official address of the subject parcel *(if known)*: 6500 E Leelanau Pines Dr, Cedar, MI, 49621

Parcel size (in acres): 80.08 Acres +/-

5. CURRENT LAND USE

Please list the current land uses, zoning classifications, and existing structures on:

The subject parcel:

Current Land Use: Campground and Marina

Current Zoning Classification: Commercial Resort

Existing Structures: Campground office, arcade, maintenance building, lift stations

The parcel(s) directly north of the subject parcel:

Current Land Use: Idle forest and Agriculture

Current Zoning Classification: Residential 1, Commercial Resort, and Agricultural

Existing Structures: No Structures adjacent

5. CURRENT LAND USE (CONT'D.)

The parcel(s) directly south of the subject parcel:

Current Land Use: Residential

Current Zoning Classification: Commercial Resort

Existing Structures: Single family home

The parcel(s) directly west of the subject parcel:

Current Land Use: Idle forest and Agricultural

Current Zoning Classification: Agricultural

Existing Structures: No structures adjacent

The parcel(s) directly east of the subject parcel:

Current Land Use: Lake Leelanau

Current Zoning Classification: Lake Leelanau

Existing Structures: Lake Leelanau

6. PROJECT DESCRIPTION

Please provide a Site Plan, description of the proposed project, including (if applicable) the total number of structures, units, bedrooms, offices, square feet, total and usable floor area, parking spaces, carports or garages, employees by shift, amount of recreation and open space, type of recreation facilities to be provided, and related information as pertinent or otherwise required by the Centerville Township Zoning Ordinance.

-See attached

7. PROJECT SCHEDULE

Please provide a statement detailing project phases and completion schedule.

-See attached

8. PROJECT IMPACTS

By the time of official site plan review, please provide written statements relative to project impacts on existing infrastructure (including traffic capacity of streets, schools, and existing utilities) and on the natural environment of the site and adjoining lands. Statements may be required from the following officials or agencies: -See attached correspondence (prior to meeting date and under separate cover)

County and Local Agencies

- Leelanau County Road Commission
- Leelanau County Health Department (septic/well permits)
- Leelanau County Drain Commissioner (drains).
- Solon - Centerville Fire Department (water lines, hydrants, emergency vehicle access)
- Leelanau County Sheriff's Department
- Leelanau County Inspections Department (building code, soil erosion and sedimentation control permits).
- Local School District
- Leelanau County Soil Conservation Service

State Agencies

- Michigan Department of Transportation (driveway permits, access onto property along state trunklines).
- Michigan Department of Natural Resources (floodplains, inland lakes and streams permits, wetlands permits, solid waste disposal permits, hazardous waste disposal permits, air discharge permits)
- Michigan Department of Commerce (if applicable)
- Condominium approvals (if applicable)
- Plat approvals (if applicable)
- Mobile home park approvals (if applicable)
- Michigan State Police/Fire Marshall (for flammable materials storage, if applicable)

Federal Agencies

- US Army Corps of Engineers (Permits for activities in certain wetlands, floodplains and navigable watercourses along the Great Lakes and connecting waters).

9. FEE

A non-refundable fee of seven-hundred fifty dollars ($750.00) must accompany this completed application in order to begin processing.

Make checks payable to the **Centerville Township Treasurer.**

10. SIGNATURE(S)

Applicant(s) _____ Date 6/21/22

Owner of Record _____ Date 6/21/22

Official Representative _____ Date 6/21/22

Return this completed application to:
Centerville Township Zoning Administrator
Post Office Box 226
Lake Leelanau, MI 49653

If you have questions or need assistance completing this application, please contact Mr. Tim Cypher, Centerville Township Zoning Administrator, at (231) 360-2557 during business hours.

THIS APPLICATION MUST BE ENTIRELY COMPLETE IN ORDER TO BE PROCESSED. INCOMPLETE APPLICATIONS WILL BE RETURNED TO THE APPLICANT.

Leelanau Pine Campground

Masterplan and Siteplan approval application

August 2, 2022

Revised August 31, 2023

Fishbeck Project Number 211505

6. PROJECT DESCRIPTION

Please provide a Site Plan, description of the proposed project, including (if applicable) the total number of structures, units, bedrooms, offices, square feet, total and usable floor area, parking spaces, carports or garages, employees by shift, amount of recreation and open space, type of recreation facilities to be provided, and related information as pertinent or otherwise required by the Centerville Township Zoning Ordinance.

In December of 2021, Northgate Leelanau Pines, LLC purchased the existing campground located at 6500 E Leelanau Pines Drive from the previous owners. The new owner wishes to modernize the existing facilities and make new improvements to continue serving existing families and grow to serve more people. The masterplan and site plan documents have been provided to graphically depict the location and type of improvements. The following table summarizes the proposed modernization and improvements in a concise format for ease of review:

Campground Feature	*Existing*	*Proposed*	*Total*
Campsites for Seasonal, RV and Campers	*170*	*150*	*320*
Future campsites	*0*	*0*	*0*
Check-in Office (stick built)	*0*	*New*	*1,930 sf +/-*
Camp office and restrooms with parking	*2,056 sf*	*Renovated*	*2,056 sf +/-*
Game room & storage	*1,963 sf*	*Renovated*	*1,963 sf +/-*
Waterfront Pavilion	*0*	*New*	*1,215 sf +/-*
Marina Store and F&B with parking	*0*	*New*	*4,000 sf +/-*
Bathhouse & Laundry	*862 sf*	*Renovated*	*862 sf +/-*
Bathhouse	*0*	*New*	*862 sf +/-*
Open Air Pavilion	*0*	*New*	*3,200 SF +/-*
Pools, Equipment Bldings, and Bathouse	*0*	*New*	*2x 925 + 1,350 sf+/-*
Cabin	*360 sf*	*Renovated*	*360 sf +/-*
Maintenance Building	*5,400 sf*	*New*	*5,400 sf +/-*
Commercial Marina & Boat Launch with parking	*2 Launches and 82 slips permitted*	*Same*	*2 Launches and 82 slips permitted*
Recreational amenities	*Walking Trail, Ball Diamond, Play field, Playground*	*Walking Trail, Pools Boardwalk Splash Pad, Mini Golf, Jump Pillow, Sports Courts*	*Walking Trail, Pools Boardwalk Splash Pad, Mini Golf, Jump Pillow, Sports Courts*

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7. PROJECT SCHEDULE

Please provide a statement detailing project phases and completion schedule.

*The proposed improvements are scheduled to begin renovation and installation in the fall of **2023**. This start date presumes that the design, approvals, and permitting processes follow the standard timelines. The construction will continue based upon weather and materials availability until the masterplan is completed. Northgate would like to be done with the majority of the improvements within 2 years (or the fall of **2025**).*

8. PROJECT IMPACTS

By the time of official site plan review, please provide written statements relative to project impacts on existing infrastructure (including traffic capacity of streets, schools, and existing utilities) and on the natural environment of the site and adjoining lands. Statements may be required from the following officials or agencies:

County and Local Agencies

· Leelanau County Road Commission –

*Existing Driveway in place, **Traffic Impact Assessment dated 11/7/23 approved, Driveway permit issued on 11/30/22, permit extension granted via email on 8/16/23.***

· Leelanau County Health Department (septic/well permits)

*Existing wells, pumpstations, lagoon in place, improvements to be requested for new facilities. **Permit requirements for new wells and wastewater treatment system upgrades in process, see email***

· Leelanau County Drain Commissioner (drains).

*Existing campsites and roads in place, **Drainage Calculations dated 12/15/23 approved and soil erosion measures and improvements for new facilities have preliminary approval via email.***

· Solon - Centerville Fire Department (water lines, hydrants, emergency vehicle access)

*Existing campsites and roads in place, **improvements approved via cover letter dated 11/28/22.***

· Leelanau County Sheriff's Department

*Existing campsites and roads in place, **no objection to improvements via email dated 7/18/22***

· Leelanau County Inspections Department (building code, soil erosion and sedimentation control permits).

*Building permits and SESC permit to be applied for upon site plan approval, **evidence of advance agency review and coordination provided via email.***

· Local School District

*No objection, **evidence of advance agency review and coordination provided via email.***

· Leelanau County Soil Conservation Service

Not Applicable

State Agencies

· Michigan Department of Transportation (driveway permits, access onto property along state trunklines).

Not applicable – no state highways abutting site plan boundary.

· Michigan Department of Natural Resources *(Now called Environment, Great Lakes, and Energy – EGLE)* (floodplains, inland lakes and streams permits, wetlands permits, solid waste disposal permits, hazardous waste disposal permits, air discharge permits)

Existing lagoon, bridge, marina permits in place, permitting amendments to be requested for improvements including seawall maintenance, marina, boardwalk, stormwater discharge, etc.

EGLE wetlands and marina permit applied for on April 12, 2023, application pending, see email

EGLE lagoon permit applied for on August 19, 2022, application pending, see email

· Michigan Department of Commerce (if applicable)

Not Applicable

· Condominium approvals (if applicable)

Not Applicable

· Plat approvals (if applicable)

Not Applicable

· Mobile home park approvals (if applicable)

Not Applicable

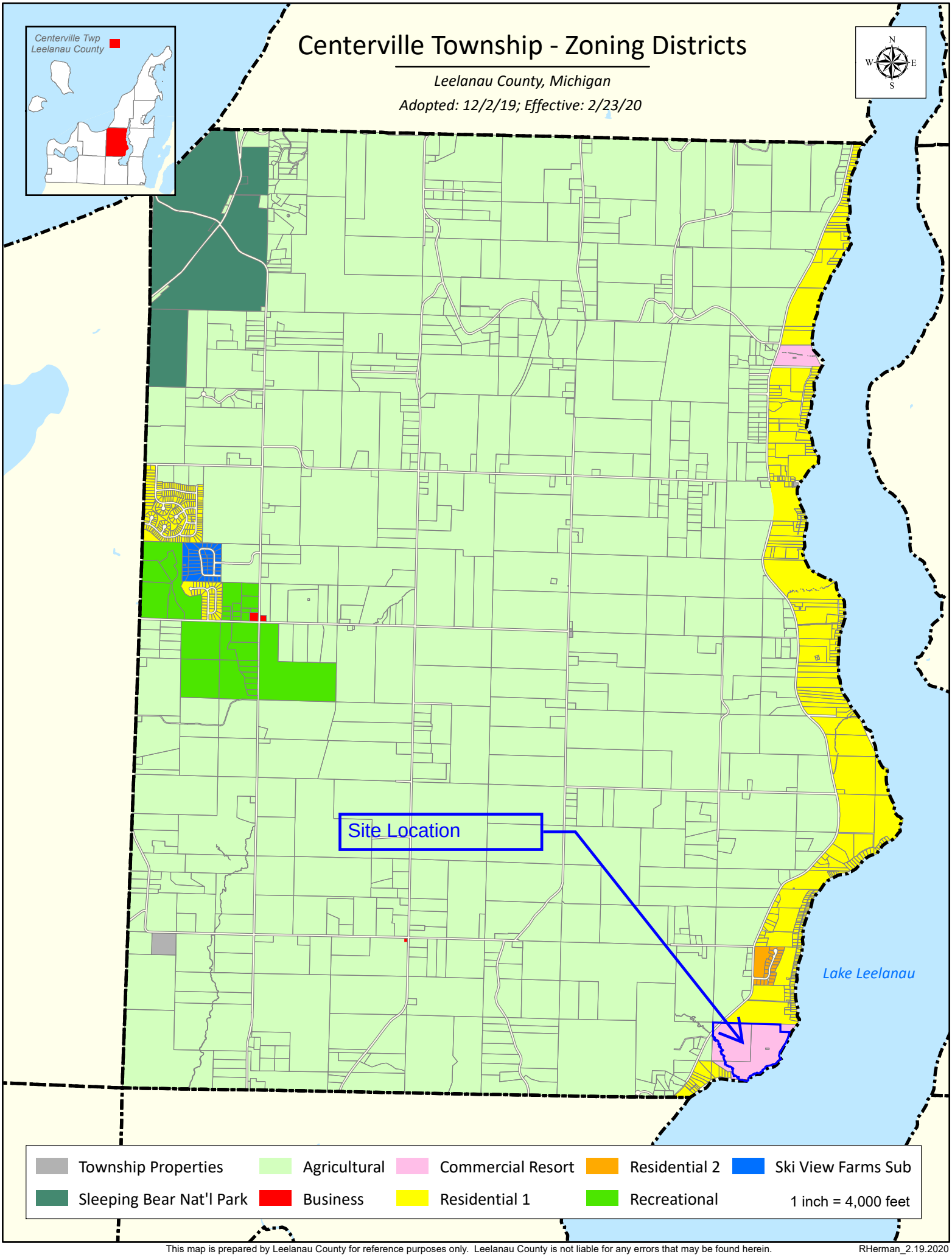
· Michigan State Police/Fire Marshall (for flammable materials storage, if applicable)

Not likely to be applicable, but if applicable any application will be handled at the time of building permit application.

Federal Agencies

· US Army Corps of Engineers (Permits for activities in certain wetlands, floodplains and navigable watercourses along the Great Lakes and connecting waters).

Not likely to be applicable, but if applicable any application will be in conjunction with the EGLE permitting noted above through the EGLE managed Joint Permit Application (JPA) process.



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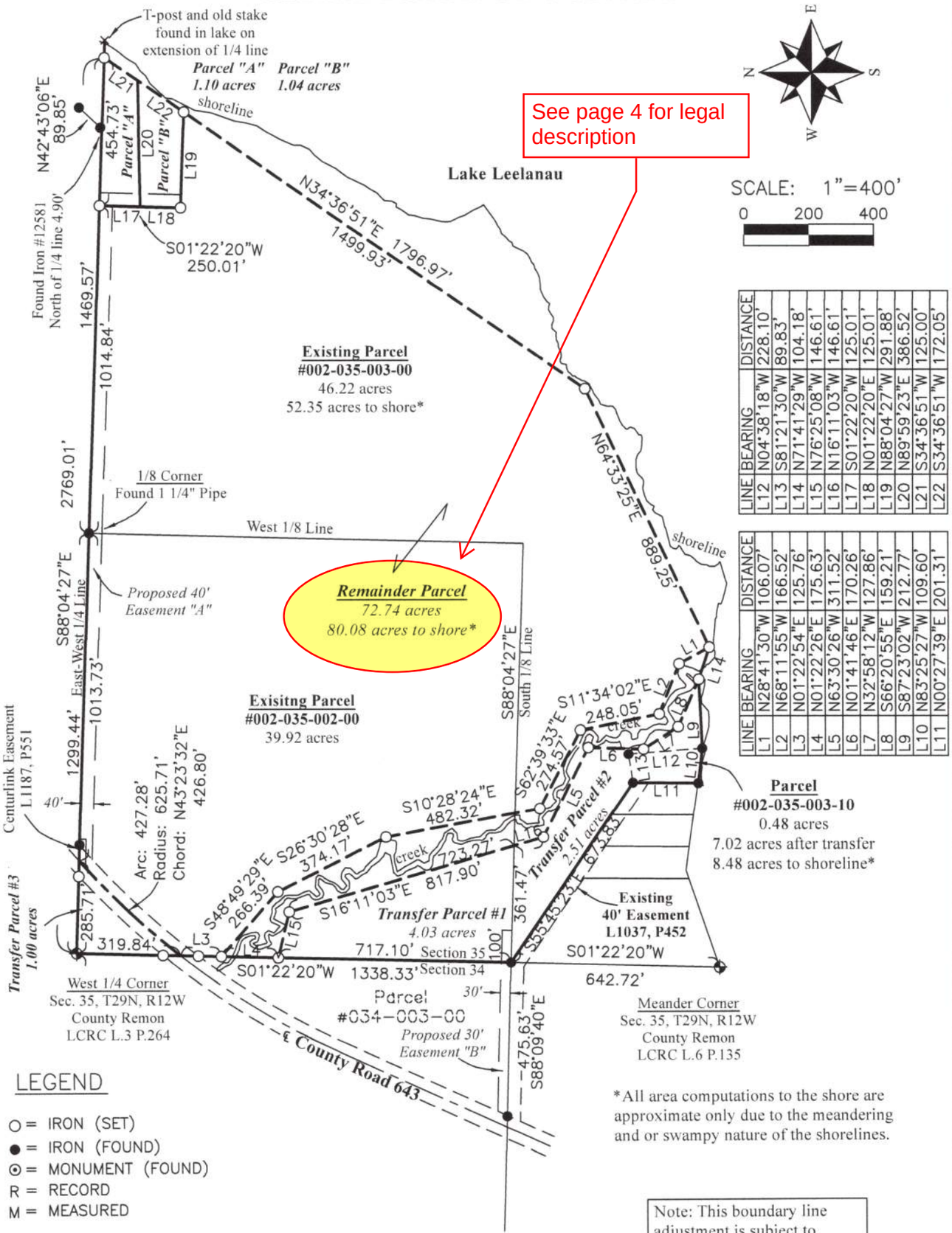
CERTIFICATE OF SURVEY



LINE	BEARING	DISTANCE
L12	N04°38'18"W	228.10'
L13	S81°21'30"W	89.83'
L14	N71°41'29"W	104.18'
L15	N76°25'08"W	146.61'
L16	N16°11'03"W	146.61'
L17	S01°22'20"W	125.01'
L18	N01°22'20"E	125.01'
L19	N88°04'27"W	291.88'
L20	N89°59'23"E	386.52'
L21	S34°36'51"W	125.00'
L22	S34°36'51"W	172.05'

LINE	BEARING	DISTANCE
L1	N28°41'30"W	106.07'
L2	N68°11'55"W	166.52'
L3	N01°22'54"E	125.76'
L4	N01°22'26"E	175.63'
L5	N63°30'26"W	311.52'
L6	N01°41'46"E	170.26'
L7	N32°58'12"W	127.86'
L8	S66°20'55"E	159.21'
L9	S87°23'02"W	212.77'
L10	N83°25'27"W	109.60'
L11	N00°27'39"E	201.31'

LEGEND

○ = IRON (SET)
● = IRON (FOUND)
⊙ = MONUMENT (FOUND)
R = RECORD
M = MEASURED

*All area computations to the shore are approximate only due to the meandering and or swampy nature of the shorelines.

Note: This boundary line adjustment is subject to township approval before it is considered valid for any future conveyance.

I, the undersigned, being a Professional Surveyor in the State of Michigan, do hereby certify that I have surveyed and mapped the parcel(s) of land as shown, that the ratio of closure of the unadjusted field observations is 1/5000+, and that I have fully complied with the requirements of P.A.132 of 1970 as amended.

Bearing Basis: MSPCS Zone 2112

GRAND TRAVERSE SURVEYING & MAPPING
PO Box 87
Cedar, MI 49621
Phone: 231-947-2555

Location: Part of the Southwest 1/4 of Section 35, T29N, R12W Centerville Township Leelanau County, MI

Client: Carol Novak

Date: 9/29/21 | Job #: 18590 | Drawn: ZSB | Sheet: 1 of 4

STATE OF MICHIGAN ★ Zachary S. Baker ★ PROFESSIONAL SURVEYOR No. 4001052468 ★ LICENSED PROFESSIONAL SURVEYOR

Zachary S. Baker, P.S. #52468

CERTIFICATE OF SURVEY

Legal Descriptions

Parcels #002-035-003-00 & #002-035-002-00: (As Recorded Liber 432, Pages 179-182)
Government Lots 3 and 4, Section 35, Town 29 North, Range 12 West, Except that part of Government Lot 4 beginning at the Northwest lot corner thereof; thence South to the shore of Lake Leelanau; thence Easterly on the shore of Lake Leelanau 598.83 feet; thence North 200 feet; thence Northwesterly to the point of beginning.

ALSO, the Northwest 1/4 of the Southwest 1/4, Section 35, Town 29 North, Range 12 West.

Parcel #002-035-003-10: (As Recorded Document No.2020006687)
That part of Government Lot 4, Section 35, Township 29 North, Range 12 West described as: Commencing at the West 1/4 corner of said Section 35, thence South 00°02'47" West, along the West line of said section, 1338.14 feet to the Northwest corner of said Government Lot 4; thence South 57°04'13" East, 673.77 feet to the Point of Beginning; thence North 80°00'52" East, 89.95 feet; thence South 06°03'25" East, 228.23 feet to a traverse line along the shore of Lake Leelanau; thence North 84°41'15" West, along said shoreline traverse, 110.00 feet; thence North 00°53'40" West, 201.20 feet to the Point of Beginning. Containing 0.56 acres of land. East and West property lines extend to the waters edge of said Lake Leelanau.

Parcel "A": (As Surveyed)
A parcel of land in Section 35, Town 29 North, Range 12 West, Centerville Township, Leelanau County, Michigan described as: Commencing at the West 1/4 corner of said section, thence along the East-West 1/4 line as monumented South 88°04'27" East, 2314.28 feet to the Point of Beginning; thence continuing South 88°04'27" East, 454.73 feet to a traverse line along the shore of Lake Leelanau; thence along said traverse line South 34°36'51" West, 125.00 feet; thence South 88°59'23" West, 386.52 feet; thence North 01°22'20" East, 125.01 feet to the Point of Beginning. Containing 1.10 acres. Together with all lands between the sidelines of the above described parcel extended and the shore of Lake Leelanau.

Together with an easement 40 feet in width for ingress and egress the North and West lines of which are described as: Commencing at the West 1/4 corner of said section, thence along the East-West 1/4 line as monumented South 88°04'27" East, 285.71 feet to the centerline of County Road 643 and the Point of Beginning; thence continuing along the North line of said 40 foot easement South 88°04'27" East, 2028.57 feet; thence South 01°22'20" West, 250.01 feet along the West line of said easement to the Point of Ending.

Subject to and together with all other covenants, servitudes, and easements of record if any.

Parcel "B": (As Surveyed)
A parcel of land in Section 35, Town 29 North, Range 12 West, Centerville Township, Leelanau County, Michigan described as: Commencing at the West 1/4 corner of said section, thence along the East-West 1/4 line as monumented South 88°04'27" East, 2314.28 feet; thence South 01°22'20" West, 125.01 feet to the Point of Beginning; thence North 88°59'23" East, 386.52 feet to a traverse line along the shore of Lake Leelanau; thence along said traverse line South 34°36'51" West, 172.05 feet; thence North 88°04'27" West, 291.88 feet; thence North 01°22'20" East, 125.01 feet to the Point of Beginning. Containing 1.04 acres. Together with all lands between the sidelines of the above described parcel extended and the shore of Lake Leelanau.

Together with an easement 40 feet in width for ingress and egress the North and West lines of which are described as: Commencing at the West 1/4 corner of said section, thence along the East-West 1/4 line as monumented South 88°04'27" East, 285.71 feet to the centerline of County Road 643 and the Point of Beginning; thence continuing along the North line of said 40 foot easement South 88°04'27" East, 2028.57 feet; thence South 01°22'20" West, 250.01 feet along the West line of said easement to the Point of Ending.

Subject to and together with all other covenants, servitudes, and easements of record if any.

*All areas listed in the above descriptions are to the traverse lines.

Note: This boundary line adjustment is subject to township approval before it is considered valid for any future conveyance.

I, the undersigned, being a Professional Surveyor in the State of Michigan, do hereby certify that I have surveyed and mapped the parcel(s) of land as shown, that the ratio of closure of the unadjusted field observations is 1/5000+, and that I have fully complied with the requirements of P.A.132 of 1970 as amended.

Bearing Basis: MSPCS Zone 2112

Zachary S. Baker, P.S. #52468

GRAND TRAVERSE SURVEYING & MAPPING
PO Box 87
Cedar, MI 49621
Phone: 231-947-2555

Location:
Part of the Southwest 1/4 of Section 35, T29N, R12W
Centerville Township
Leelanau County, MI

Client: Carol Novak

Date: 9/29/21	Job #: 18590	Drawn: ZSB	Sheet: 2 of 4

CERTIFICATE OF SURVEY

Legal Descriptions

Transfer Parcel #1: (As Surveyed)
A parcel of land in Section 35, Town 29 North, Range 12 West, Centerville Township, Leelanau County, Michigan described as: Commencing at the West 1/4 corner of said section, thence along the West line of said section South 01°22'20" West, 621.23 to the Point of Beginning; thence on a traverse line along the banks of a creek the following two courses, South 76°25'08" East, 146.61 feet; thence South 16°11'03" East, 723.27 feet to the South 1/8 line, thence along said line North 88°04'27" West, 361.47 feet to the West line of Section 35; thence along said line North 01°22'20" East, 717.10 feet to the Point of Beginning. Containing 4.03 acres more or less. Together with all lands between the sidelines of the above described parcel and the thread of the creek.

Transfer Parcel #2: (As Surveyed)
A parcel of land in Section 35, Town 29 North, Range 12 West, Centerville Township, Leelanau County, Michigan described as: Commencing at the West 1/4 corner of said section, thence along the West line of said section South 01°22'20" West, 1338.33 to the Point of Beginning; thence along the South 1/8 line South 88°04'27" East, 361.47 feet to a traverse line along the banks of a creek; thence along said traverse line the following five courses, South 16°11'03" East, 94.62 feet; thence South 63°30'26" East, 311.52 feet; thence South 01°41'46" West, 170.26 feet; thence South 32°58'12" East, 127.86 feet; thence South 66°20'55" East, 159.21 feet to a traverse line along the shore of Lake Leelanau; thence along said line South 87°23'02" West, 212.77 feet; thence leaving said traverse line North 04°38'18" West, 228.10 feet; thence South 81°21'30" West, 89.83 feet; thence North 55°45'23" West, 673.83 feet to the Point of Beginning. Containing 2.51 acres more or less.

Transfer Parcel #3: (As Surveyed)
A parcel of land in Section 35, Town 29 North, Range 12 West, Centerville Township, Leelanau County, Michigan described as: Beginning at the West 1/4 corner of said section, thence along the East-West 1/4 line of said section South 88°04'27" East, 285.71 feet to the centerline of County Road 643; thence along said centerline 427.28 feet along the arc of a 625.71 feet radius curve to the left having a long chord bearing South 43°23'32" West, 426.80 feet; thence North 01°22'20" East, 319.84 feet to the Point of Beginning. Containing 1.00 acres more or less.

Subject to the right of way of County Road 643.

Subject to and together with all other covenants, servitudes, and easements of record if any.

Parcel #002-035-003-10: (As surveyed combining transfer parcels #1, #2 and existing parcel #003-10)
A parcel of land in Section 35, Town 29 North, Range 12 West, Centerville Township, Leelanau County, Michigan described as: Commencing at the West 1/4 corner of said section, thence along the West line of said section South 01°22'20" West, 621.23 to the Point of Beginning; thence on a traverse line along the banks of a creek the following six courses, South 76°25'08" East, 146.61 feet; thence South 16°11'03" East, 817.90 feet; thence South 63°30'26" East, 311.52 feet; thence South 01°41'46" West, 170.26 feet; thence South 32°58'12" East, 127.86 feet; thence South 66°20'55" East, 159.21 feet to a traverse line along the shore of Lake Leelanau; thence along said traverse line the following two courses, South 87°23'02" West, 212.77 feet; thence North 83°25'27" West, 109.60 feet; thence leaving the traverse line North 00°27'39" East, 201.31 feet; thence North 55°45'23" West, 673.83 feet to the West line of Section 35; thence along said line North 01°22'20" East, 717.10 feet to the Point of Beginning. Together with all lands between the sidelines of above described parcel extended and the shore of Lake Leelanau and the thread of the creek. Containing 7.02 acres more or less.

Together with an easement 30 feet in width the South line of which is described as: Commencing at the West 1/4 corner of said section, thence along the West line of said section South 01°22'20" West, 1338.33 feet; thence South 88°04'27" East, 100.00 feet to the Point of Beginning; thence North 88°04'27" West, 100.00 feet; thence North 88°09'40" West, 475.63 feet along the South line of said 30 foot wide easement to the easterly right of way of County Road 643 and the Point of Ending.

Subject to and together with an easement 40 feet in width as recorded in Liber 1037, Page 452.

Subject to and together with all other covenants, servitudes, and easements of record if any.

*All areas listed in the above descriptions are to the traverse lines.

Note: This boundary line adjustment is subject to township approval before it is considered valid for any future conveyance.

I, the undersigned, being a Professional Surveyor in the State of Michigan, do hereby certify that I have surveyed and mapped the parcel(s) of land as shown, that the ratio of closure of the unadjusted field observations is 1/5000+, and that I have fully complied with the requirements of P.A.132 of 1970 as amended.

Bearing Basis: MSPCS Zone 2112

GRAND TRAVERSE SURVEYING & MAPPING
PO Box 87
Cedar, MI 49621
Phone: 231-947-2555

Location:
Part of the Southwest 1/4 of Section 35, T29N, R12W
Centerville Township
Leelanau County, MI

Client: Carol Novak

Date: 9/29/21	*Job #:* 18590	*Drawn:* ZSB	Sheet: 3 of 4

STATE OF MICHIGAN
Zachary S. Baker
PROFESSIONAL SURVEYOR
No. 0010524
LICENSED PROFESSIONAL SURVEYOR

Zachary S. Baker, P.S. #52468

CERTIFICATE OF SURVEY

Legal Descriptions

Remainder Parcel: (As surveyed combining the remainder of Parcels #002-00 and #003-00)
A parcel of land in Section 35, Town 29 North, Range 12 West, Centerville Township, Leelanau County, Michigan described as: Commencing at the West 1/4 corner of said section, thence along the East-West 1/4 line of said section South 88°04'27" East, 285.71 feet to the centerline of County Road 643 and the Point of Beginning; thence continuing along said 1/4 line South 88°04'27" East, 2028.57 feet; thence South 01°22'20" West, 250.01 feet; thence South 88°04'27" East, 291.88 feet to a traverse line along the shore of Lake Leelanau; thence along said traverse line the following two courses, South 34°36'51" West, 1499.93 feet; thence South 64°33'25" West, 889.25 feet to a traverse line along the bank of a creek; thence along said creek the following seven courses, North 28°41'30" West, 106.07 feet; thence North 68°11'55" West, 166.52 feet; thence North 11°34'02" West, 248.05 feet; thence North 62°39'33" West, 274.57 feet; thence North 10°28'24" West, 482.32 feet; thence North 26°30'28" West, 374.17 feet; thence North 48°49'29" West, 266.39 feet to the West line of Section 35; thence along said section line North 01°22'20" East, 125.76 feet to the centerline of County Road 643; thence along said centerline 427.28 feet on a 625.71 foot radius curve to the right having a long chord bearing North 43°23'32" East, 426.80 feet to the Point of Beginning. Together with all lands between the sidelines of above described parcel extended and the shore of Lake Leelanau and the thread of the creek. Containing 72.74 acres more or less.

Together with an easement 40 feet in width for ingress and egress the North and West lines of which are described as: Commencing at the West 1/4 corner of said section, thence along the East-West 1/4 line as monumented South 88°04'27" East, 285.71 feet to the centerline of County Road 643 and the Point of Beginning; thence continuing along the North line of said 40 foot easement South 88°04'27" East, 2028.57 feet; thence South 01°22'20" West, 250.01 feet along the West line of said easement to the Point of Ending.

Subject to the right of way of County Road 643.

Subject to an easement for Centurylink as recorded in Liber 1187, Page 551.

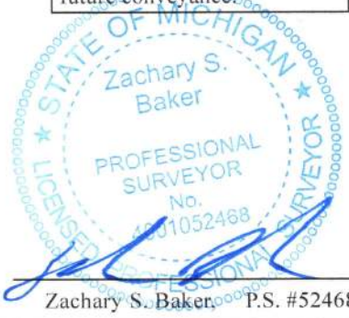
Subject to and together with all other covenants, servitudes, and easements of record if any.

*All areas listed in the above descriptions are to the traverse lines.

Note: This boundary line adjustment is subject to township approval before it is considered valid for any future conveyance.

I, the undersigned, being a Professional Surveyor in the State of Michigan, do hereby certify that I have surveyed and mapped the parcel(s) of land as shown, that the ratio of closure of the unadjusted field observations is 1/5000+, and that I have fully complied with the requirements of P.A.132 of 1970 as amended.

Bearing Basis: MSPCS Zone 2112



Zachary S. Baker, P.S. #52468

GRAND TRAVERSE SURVEYING & MAPPING
PO Box 87
Cedar, MI 49621
Phone: 231-947-2555

Location:
Part of the Southwest 1/4 of Section 35, T29N, R12W
Centerville Township
Leelanau County, MI

Client: Carol Novak

Date: 9/29/21	Job #: 18590	Drawn: ZSB	Sheet: 4 of 4

DOCUMENT NO. 2021009947

Total Pages: 2
12/27/2021 04:25 PM Fees: $35.00
JENNIFER L. GRANT, Register of Deeds
Leelanau County, MI

Received in Leelanau
12/27/2021 01:45:00 PM

MICHIGAN REAL ESTATE TRANSFER TAX
2021009947

12/27/2021 04:25 PM Leelanau County, MI
Receipt# 21-10330
Tax Stamp # 27594
County Tax: $2586.65 State Tax: $17636.25

WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS: That Carol A. Novak, David L. Novak and Linda A. Novak Dwyer whose address is 6500 E. Leelanau Pines Dr, Cedar, MI 49621, convey(s) and warrant(s) to Northgate Leelanau Pines, LLC, a Michigan Limited Liability Company, whose address is 38 Commerce Avenue SW, Suite 200, Grand Rapids, MI 49503 the following described premises:

Land situated in the Township of Centerville, County of Leelanau, State of Michigan, described as follows:

Legal description attached hereto and made a part hereof marked Exhibit "A"

Commonly known as: 6500 E. Leelanau Pines Dr, Cedar, MI 49621 P/O 002-035-002-00 / P/O 002-035-003-00 /PH

This property may be located within the vicinity of farmland or a farm operation. Generally accepted agricultural and management practices which may generate noise, dust, odors and other associated conditions may be used and are protected by the Michigan Right of Farm Act.

The Grantors herein convey to Grantees all rights of division under Section 108 of the Michigan Land Division Act for the full consideration of (The property purchase price has been redacted for masterplan and site plan approval application by Fishbeck for confidentiality purposes) subject to easements and restrictions of record, if any, and further subject to liens, encumbrances and other matters subsequent to the date of this notice.

Dated this 20th day of December, 2021.

Carol A. Novak

David L. Novak

Linda A. Novak Dwyer

State of Michigan

County of Grand Traverse

Signed, sworn and acknowledged before me the 20 of December, 2021, by Carol A. Novak, David L. Novak, and Linda A. Novak Dwyer.

Notary Public

Affix stamp/seal:

CHAD E. ROYAL
NOTARY PUBLIC – STATE OF MICHIGAN
COUNTY OF GRAND TRAVERSE
MY COMMISSION EXPIRES JANUARY 19, 2027
ACTING IN THE COUNTY OF GRAND TRAVERSE

TAX CERTIFICATION
LEELANAU COUNTY SUTTONS BAY, MI 12/27/2021
I hereby certify, that according to our records, all taxes returned to this office are paid for five (5) years preceding the 20 day of 12/2021 This does not include taxes in the process of collection by Township, Cities, or Villages, Board of Review changes, Michigan Tax Tribunal changes, or changes due to Principal Residence Exemptions or corrections.

John A Gallagher III Leelanau County Treasurer
MK

Prepared by:
Carol A. Novak
6500 E. Leelanau Pines Dr
Cedar, MI 49621

When recorded mail to:
Crossroads Title Agency
413 South Union Street
Traverse City, MI 49684

File No 18458

EXHIBIT "A"

Land situated in the Township of Centerville, County of Leelanau, Michigan:

Remainder Parcel:

As described in Survey by Grand Traverse Surveying & Mapping, Zachary S. Banker, P.S. No. 52468, dated September 29, 2021, Job # 18590, A parcel of land in Section 35, Town 29 North, Range 12 West, Centerville Township. Leelanau County, Michigan described as: Commencing at the West 1/4 corner of said Section, thence along the East-West 1/4 line of said section South 88°04'27" East, 285.71 feet to the centerline of County Road 643 and the Point of Beginning; thence continuing along said 1/4 line South 88°04'27" East 2028.57 feet; thence South 01°22'20" West 250.01 feet; thence South 88°04'27" East 291.88 feet to a traverse line along the shore of Lake Leelanau; thence along said traverse line the following two courses: South 34°36'51" West 1499.93 feet; thence South 64°33'25" West 889.25 feet to a traverse line along the bank of a creek; thence along said creek the following seven courses: North 28°41'30" West 106.07 feet; thence North 68°11'55" West 166.52 feet; thence North 11°34'02" West, 248.05 feet; thence North 62°39'33" West 274.57 feet; thence North 10°28'24" West 482.32 feet; thence North 26°30'28" West 374.17 feet; thence North 48°49'29" West 266.39 feet to the West line of Section 35; thence along said section line North 01°22'20" East, 125.76 feet to the centerline of County Road 643; thence along said centerline 427.28 feet on a 2625.71 foot radius curve to the right having a long chord bearing North 43°23'32" East 426.80 feet to the Point of Beginning.

Together with an easement 40 feet in width for ingress and egress the North and West lines of which are described as: Commencing at the West 1/4 corner of said section, thence along the East-West 1/4 line as monumented South 88°04'27" East 285.71 feet to the centerline of County Road 643 and the Point of Beginning; thence continuing along the North line of said 40 foot easement South 88°04'27" East 2028.57 feet; thence South 01°22'20" West, 250.01 feet along the West line to said easement to the Point of Ending.

Subject to the right of way of County Road 643.

Leelanau Pine Campground
Site Plan Checklist
June 20, 2022
Revised August 31, 2023
Fishbeck Project Number 211505

b. The site plan shall consist of an accurate, reproducible drawing at a scale of 1" =100' or less, showing the site and all land within 300' of the site. If multiple sheets are used, each shall be labeled and the preparer identified. Each site plan shall depict the following unless previously waived by the Centerville Township Planning Commission:

1. Location of proposed and/or existing property lines, dimensions, legal description, setback lines and monument locations.
Provided on C100

2. Existing topographic elevations at two-foot intervals, proposed grades and direction of drainage flow.
Provided on C100, C101, C102, C103, C104

3. The location and type of existing soils on the site and any certifications of borings.
Provided on C100A

4. Location and type of significant existing vegetation.
Provided on C100A

5. Location and elevations of existing watercourses and water bodies, including county drains and man-made surface drainage ways, floodplain and wetlands.
Provided on C100 C101, C102, C103, C104

6. Location of existing and proposed buildings and intended uses thereof, as well as the length, width, and height of each building.
Provided on C200, C201, C202, C203, C204

7. Proposed location of accessory structures, buildings and uses, including but not limited to all flagpoles, light poles, bulkheads, docks, storage sheds, transformers, air conditioners, generators and similar equipment, and the method of screening where applicable.
Provided on C200, C201, C202, C203, C204

8. Location of existing public roads, right-of-ways and private easements of record and abutting streets.
Provided on C100, C101, C102, C103

9. Location of and dimensions of proposed streets, drives, curb cuts, and access easements, as well as acceleration, deceleration and passing lanes (if any) serving the development. Details of entryway and sign locations should be separately depicted with an elevation view.
Provided on C100, C101, C200, C201, L101

10. Location, design, and dimensions of existing and/or proposed curbing, barrier free access, carports, parking areas (including indication of all spaces and method of surfacing), fire lanes and all lighting thereof.
Provided on C200, C201, C202, C203, C204, L101, L102, L103

11. Location, size, and characteristics of all loading and unloading areas.
Provided on C200, C201, C202, C203, C204

12. Location and design of all sidewalks, walkways, bicycle paths and areas for public use.
Public use - none
Private use - Provided on C200, C201, C202, C203, C204

13. Location of water supply lines and/or wells, including fire hydrants and shut off valves, and the location and design of storm sewers, retention and detention ponds, waste water lines, clean-out locations, connection points and treatment systems, including septic systems if applicable.
Provided on C400, C401, C402, C403, C404, final locations pending agency permitting and approvals

14. Location of all other utilities on the site including but not limited to natural gas, electric, cable, telephone and fiber optic.
Provided on C400, C401, C402, C403 C404, final locations pending agency permitting and approvals

15. Proposed location, dimensions and details of common open spaces and common facilities such as community buildings or swimming pools if applicable.
Provided on C200, C201, C202, C203, C204

16. Location, size and specifications of all signs and advertising features with cross-sections.
Provided on L101, L102, L103

17. Exterior lighting locations with area of illumination illustrated as well as the type of fixtures and shielding to be used.
Provided on L101, L102, L103

18. Location and specifications for all fences, walls, and other screen features with cross-sections.
Provided on L101, L102, L103

19. Location and specifications for all proposed perimeter and internal landscaping and other buffering features. For each new landscape material the proposed size at the time of planting must be indicated. All vegetation to be retained on the site must also be indicated, as well as its typical size by general location or range of sizes as appropriate.
Provided on L101, L102, L103, L104

20. Location, size and specifications for screening of all trash receptacles and other solid waste disposal facilities.
Provided on C200, C201 (trash is collected from sites by staff daily and disposed of in 6' dumpster enclosure by maintenance building)

21. Location and specifications for any existing or proposed above or below ground storage facilities for any chemicals, salts, flammable materials, or hazardous materials as well as any containment structures or clear zones required by government authorities.
Provided on C200, C201, C202, C203, C204 – Cleaning and maintenance chemicals and chemicals associated with the operations of each building (Pools, bathhouses, marina, store, office, etc.) will be stored in designated

locations at each building. Individual architecture and storage/containment will be provided as required by law for building permits.

22. Identification of any site amenities or natural features.
Provided on C200, C201, C202, C203, C204

23. Identification of any views onto or from the site to or from adjoining areas.
Provided on L101

24. North arrow, scale and date of original submittal and last revision.
Provided on G001 and on the title block of all sheets.

25. Seal of the registered engineer, architect, landscape architect, surveyor, or planner who prepared the plan.
Provided on G001

26. Deed restrictions, Master Deed restrictions, and bylaws as applicable, for Township review to insure that the condominium subdivision, or any use or development which requires site approval, its Master Association, and the applicant have provided for the continual maintenance of the development's services and facilities, to insure protection of the natural environment; compatibility with adjacent uses of land; and general upkeep of the subdivision's land in a socially and economically desirable manner.
Not Applicable – single ownership and operation.

Leelanau County - Road Commission 1/5

Vander Kodde, Jason

From: Engineer Craig Brown <cbrown@leelanauroads.org>
Sent: Wednesday, August 16, 2023 10:34 AM
To: Vander Kodde, Jason
Cc: Manager Brendan Mullane; Katy Hallgren; Gibson, Kegan; Reidsma, Kyle; Kevin Odell
Subject: RE: Leelanau Pines Campground Driveway Permit Application

EXTERNAL EMAIL

Jason,

Accept this email as authorization to extend the expiration date for Driveway Permit 18.22C – Northgate Leelanau Pines, LLC. This authorization extends said permit until **July 27, 2024**.

As a condition of this extension, you will be required to:

- Provide an updated Certificate of Liability Insurance, the certificate we have on file expired as of 12/17/2022
- Renew the License and Permit Bond with Western Surety Company, Bond Number 66459981. The current Bond expires on November 18, 2023.

The Leelanau County Road Commission (LCRC) will revoke this permit, if the above-mentioned documentation is not provided prior to the start of construction. Once revoked and before construction is allowed to resume, applicant will need to submit for a new permit at three times the cost as outlined on LCRC's fee structure.

Let me know if you have any questions.

Thank you,
Craig

Craig M. Brown, P.E.
County Highway Engineer

Leelanau County Road Commission
10550 E. Eckerle Road | Suttons Bay | MI | 49682
Office: (231) 271-3993 ext 224 | Cell: (231) 632-7444 | Fax: (231) 271 5612
www.leelanauroads.org

From: Vander Kodde, Jason <jtvanderkodde@fishbeck.com>
Sent: Thursday, July 27, 2023 4:43 PM
To: Engineer Craig Brown <cbrown@leelanauroads.org>
Cc: Manager Brendan Mullane <bmullane@leelanauroads.org>; Katy Hallgren <khallgren@northgateholdings.com>; Gibson, Kegan <kgibson@fishbeck.com>; Reidsma, Kyle <kreidsma@fishbeck.com>; Kevin Odell <kodell@northgateholdings.com>
Subject: RE: Leelanau Pines Campground Driveway Permit Application

Good afternoon Craig,
I hope you are doing well and enjoying the summertime.
I am writing with an update on the Leelanau Pines Campground Driveway Permit in Centerville Township as issued on 11-30-22:

Leelanau County - Road Commission 2/5

Update:
Based on delays experienced in our zoning entitlements and permitting process, we now plan to begin construction in Spring of 2024.
We would like to request a one year extension on the permit from today's date (until 7/27/24).
We plan to have construction completed by then if everything falls into place for us.
We will set a reminder in our calendars for early December 2023 to provide the LCRC with a new insurance certificate as noted below.

Please let me know if this extension is acceptable, and if this email is satisfactory to memorialize it.
Warm Regards,
Jason

Jason Vander Kodde, PE, Fishbeck, w: 616.464.3938, c: 616.648.9165

From: Engineer Craig Brown <cbrown@leelanauroads.org>
Sent: Wednesday, November 30, 2022 8:46 AM
To: Vander Kodde, Jason <jtvanderkodde@fishbeck.com>
Cc: Manager Brendan Mullane <bmullane@leelanauroads.org>; Katy Hallgren <khallgren@northgateholdings.com>; Gibson, Kegan <kgibson@fishbeck.com>; Reidsma, Kyle <kreidsma@fishbeck.com>; Kevin Odell <kodell@northgateholdings.com>
Subject: RE: Leelanau Pines Campground Driveway Permit Application

Good morning Jason,

Attached is the approved driveway permit for Northgate Leelanau Pines, LLC. Please note the insurance certificate provided expires December 17, 2022, an updated certificate will be required before the start of construction.

Thank you,
Craig

Craig M. Brown, P.E.
Engineer

Leelanau County Road Commission
10550 E. Eckerle Road | Suttons Bay | MI | 49682
Office: (231) 271-3993 ext 224 | Cell: (231) 632-7444 | Fax: (231) 271 5612
www.leelanauroads.org

Leelanau County - Road Commission 3/5

LEELANAU COUNTY ROAD COMMISSION
APPLICATION AND PERMIT

to construct, operate, maintain use and/or remove within a County Road Right-of-Way

Permit Number 18.22C
Issuance Date 11-30-2022
Final Approval

Board of County Road Commissioners of **Leelanau** County, Michigan
10550 E Eckerle Road Suttons Bay 49682 (231) 271-3993

FAXED COPIES OF THIS PERMIT ARE NOT ACCEPTABLE AS A FORMAL APPLICATION.
If applicant hires a contractor to perform the work, BOTH assume responsibility for the provisions of this Application and Permit.

Applicant	Contractor/Agent
Name: Northgate Leelanau Pines, LLC	Name: Jason Vander Kodde PE - Fishbeck
Mailing Address: 38 commerce Ave SW, Ste 200 Grand Rapids, Michigan 49503	Mailing Address: 1515 Arboretum Drive, SE Grand Rapids, Michigan 49546
Phone: _____ Fax: _____	Phone: 616-464-3938 Fax: _____

Applicant/Contractor agrees to the terms of the permit.

Applicant's Signature	Contractor's Signature
Title Owner Date 07/06/2022	Title Civil Engineer Date 7/6/22

It is the responsibility of the applicant/agent to flag the proposed driveway location so the Inspector will be able to determine the exact proposed location. Failure to flag may result in considerable delay. Any construction performed before receipt of the original permit may not meet Road Commission standards and is subject to additional fees, revision, or removal at the Road Commission's request. Applicant and/or Contractor request a permit for the purpose indicated in the attached plans and specifications at the following location: ***WHEN COMPLETED YOU MUST CALL FOR FINAL INSPECTION.*** **Page two of permit must be included and initialed at the bottom acknowledging applicant has read provisions of permit prior to submitting application.**

Address 6500 E Leelanau Pines Dr, Cedar, Michigan Township Centerville Sec 35 T 29 N, R 12 W

Other Improve and pave per LCRC standards in same location as existing driveway.

New _____ Paving X Use of Existing X Residential _____ Commercial X Other _____

DO NOT WRITE BELOW THIS LINE

Land Division Approval No. _____ Approx. location of Drive _____ Feet _____ of the _____ Property Line

PERMIT

A permit is granted in accordance with the foregoing application for the period stated above, subject to following terms agreed to by the Permit Holder. When *Applicant hires* a Contractor the "Permit Holder" is the Applicant and the *Contractor.*

Terms of the Permit:

SEE ATTACHED PAGE FOR TERMS OF PERMIT.

RECOMMENDED FOR ISSUANCE: STANDARDS AND SKETCH "____" INCLUDED.

INSPECTOR: Craig M. Brown, PE TITLE: Engineer DATE: 11/30/2022

See Back for Additional Requirements Rev. May, 2008

Leelanau County Road Commission Right of Way Permit 18.22C

Terms of the Permit:

- A permit to reconstruct an existing drive approach at Leelanau Pines Campground, the drive approach is located along S Lake Shore Drive (CR 643). Per the information provided, this drive shall, at a minimum, meet the requirements of Leelanau County Road Commission's (LCRC) Commercial Drive Approach.
- The approach shall be constructed according to the dimensions and details shown in the plans provided, last updated 11/16/2022.
- Traffic along S Lake Shore Drive shall be maintained in both directions at all times, any work at or near the edge of pavement shall be signed for a shoulder closure per MDOT – Maintaining Traffic Typicals.
- All driveways shall be graded to effectively drain storm water runoff, from the driveway and adjacent land, away from the roadway and road right of way. Storm water runoff from lawns, roofs and other areas must be handled on-site and not be drained toward the road.
- A 15" culvert is required, along with any necessary ditching to provide proper drainage.
- Place minimum 330#/syd HMA surface.
- Place topsoil, seed, and mulch on disturbed areas to prevent erosion.
- Keep construction vehicles off existing pavement or road shoulder to prevent damage.
- **Permit applicant MUST contact LCRC for grade inspection prior to placement of concrete and HMA paving.**
- The bond will be held by road commission until drive approach is completed including paving. Please call for final inspection upon completion.
- A Traffic Impact Analysis (TIA) was completed by the applicant. As stated in the TIA, "The analysis conducted for this TIA indicate the proposed development will not result in any significant impact to the capacity of the adjacent road network". The analysis provided, did not warrant turn lanes in either direction, but did warrant a right turn taper, as shown in the plans provided.
- **The results of this TIA do not relieve the developer from future improvements along the network or adjoining roadways, should problems arise as a result of this proposed development.**

Leelanau County - Road Commission 5/5

1. **Specifications.** All work performed under this permit must be done in accordance with the plans, specifications, maps and statements filed with the Road Commission and must comply with the Commission's current requirements and specifications on file at its offices and M.D.O.T. specifications. The Commission may require a site plan showing proposed drainage and details of proposed construction. Consideration as to snow removal and snow storage shall be given as part of design on all drives.
2. **Fees and Costs.** Permit Holder shall be responsible for all fees incurred by the Commission in connection with this permit and shall deposit estimated fees and costs as determined by the Commission, at the time the permit is issued.
3. **Insurance.** Applicant or Contractor shall furnish proof of liability and property damage insurance of at least $500,000.00, listing the Road Commission, its Board, Employees, and Agents as additional insured. Such insurance shall cover the entire time period of this permit and shall provide that it cannot be cancelled without ten (10) days advance written notice by certified mail (with return receipt required) to the Commission.
4. **Completion.** *Unless otherwise stated,* ***this permit is valid for six (6) months.*** **You are required to call the Road Commission for final inspection and approval.** Failure to obtain final approval may delay your occupancy permit.
5. **Maintenance.** It shall be the responsibility of the Property Owner to keep trees, brush, and vegetation cut and maintained in such a manner to preserve sight distance, as approved, for safe access to the County Road. Also, owner must maintain ditches and culverts and keep open and free of leaves and debris.
6. **Indemnification.** Permit Holder shall hold harmless and indemnify and keep indemnified the Commission, its officers and employees from all claims, suits and judgments to which the Commission, its officers, or employees may be subject and for all costs and actual attorney fees which may be incurred on account of injury to persons or damage to property, including property of the Commission, whether due to the negligence of the Permit Holder or the joint negligence of the Permit Holder and the Commission, arising out of the work under this permit, or in connection with work not authorized by this permit, or resulting from failure to comply with the terms of this permit, or arising out of the continued existence of the work product which is the subject of this permit.
7. **Miss Dig.** The Permit Holder must comply with the requirements of Act 53 of Public Acts of 1974, as amended. CALL MISS DIG AT (800) 482-7171 AT LEAST THREE (3) FULL WORKING DAYS, BUT NOT MORE THAN TWENTY-ONE (21) CALENDAR DAYS, BEFORE YOU START WORK. Permit Holder assumes all responsibility for damage to or interruption of underground utilities.
8. **Safety.** Permit Holder agrees to work under this permit in a safe manner and to keep the area affected by this permit in a safe condition until the work is completed. All work site conditions shall comply with Michigan Manual of Uniform Traffic Control Devices.
9. **Restoration and Repair of Road.** Permit Holder agrees to restore the road and right-of-way to a condition equal to or better than its condition before the work began; and to repair any damage to the road right-of-way which is the result of the facility whenever it occurs or appears.
10. **Limitation of Permit.** This permit does not relieve Permit Holder from meeting other applicable laws and regulations of other agencies. Permit Holder is responsible for obtaining additional permits or releases which may be required in connection with this work from other governmental agencies, public utilities, corporations and individuals, including property owners. Permission may be required from the adjoining property owners.
11. **Revocation of Permit.** The permit may be suspended or revoked at will, and the Permit Holder shall surrender this permit and alter, relocate or remove its facilities at its expense at the request of the Commission.
12. **Violation of Permit.** This permit shall become immediately null and void if Permit Holder violates the terms of this permit, and the Commission may require immediate removal of Permit Holders facilities, or the Commission may remove them without notice at Permit Holders expense.
13. **Assignability.** This permit may not be assigned without the prior approval of the Commission. If approval is granted, the assignor shall remain liable and the assignee shall be bound by all the terms of this permit.
14. **Supplemental Specifications**. This permit is subject to supplemental specifications on file with the Road Commission and Act 200 of Public Acts of 1969.
15. **Road Right-of-Way.** The Road Commission **does not allow** sprinklers, tree planting, landscaping, etc. in the Road right-of-way. Unauthorized items placed in the right-of-way are at the sole risk of the landowner. Damage to same shall be at no cost to the Road Commission. No objects will be allowed which may obstruct the sight distance of neighboring property.

Vander Kodde, Jason

From: Wade, Ariana
Sent: Thursday, August 24, 2023 4:53 PM
To: Eric Johnston
Cc: Vander Kodde, Jason
Subject: Re: Northgate Resorts - Leelanau Pines Campground Supply Wells

Hi Eric,

Just following up. We have a meeting with Northgate tomorrow, so I just wanted to check if there was an update for them. Have you heard from your EGLE contact yet?

Thank you,
Ariana

Ariana Wade | Water/Wastewater Engineer
Fishbeck |w: 616.464.3906 |c: 989.996.1161 | Fishbeck.com

From: Wade, Ariana <awade@fishbeck.com>
Sent: Monday, August 21, 2023 11:00 AM
To: Eric Johnston <ejohnston@bldhd.org>
Subject: RE: Northgate Resorts - Leelanau Pines Campground Supply Wells

Great, thank you for the update!

Ariana Wade | Water/Wastewater Engineer
Fishbeck |w: 616.464.3906 |c: 989.996.1161 | Fishbeck.com

From: Eric Johnston <ejohnston@bldhd.org>
Sent: Monday, August 21, 2023 10:09 AM
To: Wade, Ariana <awade@fishbeck.com>
Subject: RE: Northgate Resorts - Leelanau Pines Campground Supply Wells

Hello Ariana,
My EGLE contact has been out of the office since I received your information about the lagoons. I believe that they have returned to the office today and I hope to have an answer soon.
Thank you for your patience.
Eric

J. Eric Johnston, R.S.
Director of Environmental Health
6051 Frankfort Hwy.
Suite 100
Benzonia, MI 49616
Office: 231-882-2109
ejohnston@bldhd.org

From: Wade, Ariana <awade@fishbeck.com>
Sent: Thursday, August 10, 2023 4:47 PM
To: Eric Johnston <ejohnston@bldhd.org>
Subject: RE: Northgate Resorts - Leelanau Pines Campground Supply Wells

Hi Eric,

I apologize for not responding sooner. The existing sewer system includes a stabilization and seepage lagoon with a maximum discharge rate of 20,000 gal/day and an annual average discharge rate of 10,000 gal/day.

We understand that new wells would be subject to the 800' isolation distance from the existing lagoon due to the discharge to groundwater. However the new lagoon would be lined with no discharge to groundwater at the lagoon.

Thank you,
Ariana

Ariana Wade | Water/Wastewater Engineer
Fishbeck |w: 616.464.3906 |c: 989.996.1161 | Fishbeck.com

From: Eric Johnston <ejohnston@bldhd.org>
Sent: Friday, July 28, 2023 8:31 AM
To: Wade, Ariana <awade@fishbeck.com>
Cc: McNamara, Tim <tdmcnamara@fishbeck.com>; Vander Kodde, Jason <jtvanderkodde@fishbeck.com>
Subject: RE: Northgate Resorts - Leelanau Pines Campground Supply Wells

Ariana,
Thank you for that information. Can you please provide me information for the existing lagoon system as well?
Eric

J. Eric Johnston, R.S.
Director of Environmental Health
6051 Frankfort Hwy.
Suite 100
Benzonia, MI 49616
Office: 231-882-2109
ejohnston@bldhd.org

Vander Kodde, Jason

From: Collin Oosse <coosse@leelanau.gov>
Sent: Tuesday, December 20, 2022 1:56 PM
To: Vander Kodde, Jason
Cc: Steve Christensen
Subject: Leelanau Pines Campground Site Plan Review

EXTERNAL EMAIL

Hi Jason,

Thank you for meeting with Steve Christensen and I last month. We have reviewed the Leelanau Pines Campground plans and see no major issues at this time. The project observes the requirements for Soil Erosion and Sedimentation Control; allowing acceptable distance between disturbance and sensitive areas (wetlands and streams), adequate stormwater storage volumes, appropriate aggregate material for drainage and infiltration, and proper use of sedimentation controls (i.e. silt fence). A Soil Erosion Control permit will be required for this project should approval be granted. Please submit your application at that time and we may revisit the spillway and overflow pipe design then. For now, the project has our preliminary approval and we will work with you and your client to meet the Soil Erosion standards of Leelanau County. Let me know if you have any questions.

Take care,

Collin Oosse
Natural Resource Specialist
231.256.9783 ext. 266

Leelanau Conservation District
8527 E Government Center Dr, Ste 205
Suttons Bay, MI 49682
Promoting the wise use of our natural resources.

CEDAR AREA FIRE & RESCUE

From the Desk of Chief Andy Doornbos

8907 Railroad Ave., Cedar, MI 49621 / Phone: (231) 228-5396 / Cell: (231) 631-5672

November 28, 2022

Mr. Jason Vander Kodde
Engineer, Fishbeck

Re: Leelanau Pines RV Park Expansion

Mr. Vander Kodde,

I have had the opportunity to review the plans submitted by you on behalf of Northgate Leelanau Pines, LLC (Fishbeck Project Number 211505) These plans were sent via email and delivered in hard copy, November 21st, 2022.

It appears that you have addressed all of the recommendations that were originally submitted to you in my October 21, 2022 letter. Should the plans change again, please forward me a copy of the changes for review. I am satisfied with the current drawings and appreciate your willingness to work with me on implementing this important infrastructure.

Thank you,

Andy Doornbos, Cedar Area Fire & Rescue

Vander Kodde, Jason

From: Duane Wright <dwright@leelanau.gov>
Sent: Monday, July 18, 2022 1:43 PM
To: Vander Kodde, Jason
Subject: RE: Leelanau Pines Campground Site Plan Review - Sheriff

EXTERNAL EMAIL

Hi Jason,

The Sheriff has reviewed the site plan as presented. He asked that I respond on his behalf. He said to respond that his position is neutral to the proposal. Good luck to you and the folks at Leelanau Pines Campground.

Lieutenant Duane Wright
Leelanau County Sheriff's Office
8525 E. Government Center Drive
Suttons Bay, MI. 49682
Dispatch 231-256-8800
Direct 231-256-8604
Fax 231-2562611

From: Vander Kodde, Jason <jtvanderkodde@fishbeck.com>
Sent: Wednesday, July 6, 2022 1:52 PM
To: Duane Wright <dwright@leelanau.gov>
Cc: Katy Hallgren <khallgren@northgateholdings.com>; Gibson, Kegan <kgibson@fishbeck.com>; Chelsea Bossenbroek <cbossenbroek@northgateholdings.com>
Subject: Leelanau Pines Campground Site Plan Review - Sheriff

Good afternoon Lt. Duane Wright,
Per recent phone conversation, Fishbeck has been retained by Northgate Leelanau Pines, LLC to provide professional services for this campground improvement project.
Fishbeck is providing this email as required by the Centerville Township Zoning Ordinance under Article 13, paragraph f, subsection b as follows:

ARTICLE XIII PROCEDURES FOR SITE PLAN REVIEW
F. Distribution of Required Copies and Action Alternatives.

Where Site Plan Review is required by this Ordinance, an applicant for Site Plan Approval shall complete and submit copies of an Application for Site Plan Approval, site plans, and other information where applicable, as set forth below.

b. The entire application (including Application for Site Plan Review and Site Plan) must be distributed as follows:

- Original and six (6) copies returned to the Planning Commission
- Copy, or copies, to the Road Commission per their requirements
- Copy, or copies, to the Health Department, per their requirements
- Copy, or copies, to the Drain Commission, per their requirements
- Copy, or copies, to the local Fire Department, per their requirements
- Copy, or copies, to the Leelanau County Sheriff's Department, per their requirements
- Copy, or copies, to the Leelanau County Department of Building Safety, per their requirements

Delivery may be via electronic or hardcopy format as indicated by each agency. The Planning Commission does accept electronic copies. Upon delivery of the application and site plans; the applicant shall obtain a receipt from the agencies as proof of delivery or a stamped, signed site plan indicating no comment. This receipt may be in electronic format (i.e., email). The receipt with comments, if any, from each agency shall be returned to the Planning Commission. Without these receipts and applicable comments, the site plan will not be processed.

Due to file size we have omitted the enlargement sheets and landscaping sheets from drawing set.
If you would like to receive e-copies of those via download link or hard copies US postal, please let me know and we'll send them over.

Pease acknowledge the electronic receipt of this email, and provide us with any review comments or questions you may have.
Thank-you in advance for your assistance with this Site Plan.
Jason

Jason Vander Kodde, PE | Associate | Senior Engineer
Fishbeck | w: 616.464.3938 | c: 616.648.9165 | Fishbeck.com

Vander Kodde, Jason

From: Amber Weber <aweber@leelanau.gov>
Sent: Tuesday, September 20, 2022 10:21 AM
To: Vander Kodde, Jason
Cc: Katy Hallgren; Chelsea Bossenbroek; Gibson, Kegan
Subject: RE: Leelanau Pines Campground Site Plan Review - Building

EXTERNAL EMAIL

Good Morning Jason,

Thank you for the updated drawings. My comments from before still apply, with one additional note that the pool work will also need to be permitted through our department.

Please let me know if you have any questions.

Thank you,

Amber Weber
Building Official
Leelanau County Department of Building Safety
8527 E Government Center Drive, Suite 109
Suttons Bay, MI 49682
(231) 256-9806

From: Vander Kodde, Jason <jtvanderkodde@fishbeck.com>
Sent: Tuesday, September 20, 2022 10:15 AM
To: Amber Weber <aweber@leelanau.gov>
Cc: Katy Hallgren <khallgren@northgateholdings.com>; Chelsea Bossenbroek <cbossenbroek@northgateholdings.com>; Gibson, Kegan <kgibson@fishbeck.com>
Subject: RE: Leelanau Pines Campground Site Plan Review - Building

Good morning Amber,
On behalf of Northgate, Fishbeck submitted revised Site Plan drawings yesterday to Centerville Township Planning Commission (excerpts attached).
We have removed the future phase of campsite improvements and are now only proposing an adding 167 sites to the existing 170 sites for a total of 337 sites (plus amenities).
Please confirm receipt again and offer any further comments.
Thank-you.
Jason

Jason Vander Kodde, PE | Associate | Senior Engineer
Fishbeck | w: 616.464.3938 | c: 616.648.9165 | Fishbeck.com

From: Amber Weber <aweber@leelanau.gov>
Sent: Thursday, July 7, 2022 10:27 AM
To: Vander Kodde, Jason <jtvanderkodde@fishbeck.com>

Cc: Katy Hallgren <khallgren@northgateholdings.com>; Chelsea Bossenbroek <cbossenbroek@northgateholdings.com>; Gibson, Kegan <kgibson@fishbeck.com>
Subject: RE: Leelanau Pines Campground Site Plan Review - Building

Good Morning Jason,
Thank you for the opportunity to comment on this project. As you've noted permits will be required by our department for the proposed structures as well as the electrical pedestals for the campsites.
I've attached a copy of our commercial requirements sheet for your reference. The required permits or approvals must be submitted with your permit application when you are ready to proceed with this project.
Please let me know if you have any questions.
Thank you,

Amber Weber

Building Official
Leelanau County Department of Building Safety
8527 E Government Center Drive, Suite 109
Suttons Bay, MI 49682
(231) 256-9806

Vander Kodde, Jason

From: Steve Bluhm <bluhms@mylakers.org>
Sent: Thursday, July 7, 2022 8:14 AM
To: Vander Kodde, Jason
Cc: poushob@mylakers.org; Katy Hallgren; Gibson, Kegan; Chelsea Bossenbroek
Subject: Re: FW: Leelanau Pines Campground Site Plan Review - Schools

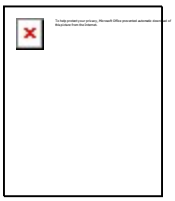
Jason,

Thank you for the information from the Leelanau Pines Campground. We will follow the progress of this project. Let me know if you have any questions for me.
Regards,

Steve

Steve Bluhm
Facilities and Transportation Supervisor
Glen Lake Community Schools
"Laker Strong!"

(231)334-3061 Ext 510



On Wed, Jul 6, 2022 at 2:12 PM Vander Kodde, Jason <jtvanderkodde@fishbeck.com> wrote:

> Good afternoon Mr. Steve Bluhm,
>
> Per our recent phone call, Fishbeck has been retained by Northgate Leelanau Pines, LLC to provide professional services for this campground improvement project.
>
> Fishbeck is providing this email as required by the Centerville Township Zoning Ordinance under Article 13, paragraph f, subsection b as follows:
>
> ARTICLE XIII PROCEDURES FOR SITE PLAN REVIEW
>
> F. Distribution of Required Copies and Action Alternatives.

Where Site Plan Review is required by this Ordinance, an applicant for Site Plan Approval shall complete and submit copies of an Application for Site Plan Approval, site plans, and other information where applicable, as set forth below.

b. The entire application (including Application for Site Plan Review and Site Plan) must be distributed as follows:

- Original and six (6) copies returned to the Planning Commission

- Copy, or copies, to the Road Commission per their requirements

- Copy, or copies, to the Health Department, per their requirements

- Copy, or copies, to the Drain Commission, per their requirements

- Copy, or copies, to the local Fire Department, per their requirements

- Copy, or copies, to the Leelanau County Sheriff's Department, per their requirements

- Copy, or copies, to the Leelanau County Department of Building Safety, per their requirements

- Copy, or copies, to the local School District

Delivery may be via electronic or hardcopy format as indicated by each agency. The Planning Commission does accept electronic copies. Upon delivery of the application and site plans; the applicant shall obtain a receipt from the agencies as proof of delivery or a stamped, signed site plan indicating no comment. This receipt may be in electronic format (i.e., email). The receipt with comments, if any, from each agency shall be returned to the Planning Commission. Without these receipts and applicable comments, the site plan will not be processed.

Due to file size we have omitted the enlargement sheets and landscaping sheets from drawing set.

If you would like to receive e-copies of those via download link or hard copies US postal, please let me know and we'll send them over.

Pease acknowledge the electronic receipt of this email, and provide us with any review comments or questions you may have.

Thank-you in advance for your assistance with this Site Plan.

Jason

Jason Vander Kodde, PE | Associate | Senior Engineer

Fishbeck | w: 616.464.3938 | c: 616.648.9165 | Fishbeck.com

Vander Kodde, Jason

From: Schmidt, Robyn (EGLE) <SCHMIDTR1@michigan.gov>
Sent: Thursday, August 10, 2023 3:00 PM
To: Vander Kodde, Jason
Subject: FW: FW: Submission Status Change Notification - HPR-59MH-CX6Z7, Leelanau Pines Campground

EXTERNAL EMAIL

Jason,

I am looking at the week of September 18th to hold the public hearing, specifically Tuesday, September 19th. Hearings start at 6:00pm with a Q&A, then into the formal hearing. The length of time for the hearing depends on the number of participants that wish to make comments.

Lansing requires 30 days to schedule the hearing. My goal right now is to get a general hearing announcement with the hearing date in the PN, adding the specific details into MiEnviro soon after. Let me know if this date, or another date that week works for your group's schedules. Thank you.

Robyn Schmidt
Water Resources Division-Cadillac District Office
Michigan Department of Environment, Great Lakes, and Energy (EGLE)
231-383-5952 | SchmidtR1@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

From: Schmidt, Robyn (EGLE)
Sent: Monday, August 7, 2023 12:33 PM
To: Vander Kodde, Jason <jtvanderkodde@fishbeck.com>
Subject: RE: FW: Submission Status Change Notification - HPR-59MH-CX6Z7, Leelanau Pines Campground

Please see responses below.

Robyn Schmidt
Water Resources Division-Cadillac District Office
Michigan Department of Environment, Great Lakes, and Energy (EGLE)
231-383-5952 | SchmidtR1@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

MiEnviro help: EGLE-WRD-MiWaters@michigan.gov
** **FYI- MiWaters was renamed MiEnviro on November 1st****
General Questions: egle-assist@michigan.gov ⋮ 800.662.9278

From: Vander Kodde, Jason <jtvanderkodde@fishbeck.com>
Sent: Monday, August 7, 2023 8:58 AM
To: Schmidt, Robyn (EGLE) <SCHMIDTR1@michigan.gov>
Subject: RE: FW: Submission Status Change Notification - HPR-59MH-CX6Z7, Leelanau Pines Campground

Thanks for the update Robyn,
Is EGLE still using the Zoom/Teams/Virtual format for these public hearings (PH)? Yes, Zoom.
How much time would you like the applicant to spend presenting during the PH? We typically offer 10mins for the applicant to present the project, during the formal PHing. However, the Q&A session beforehand, in my experience, has been in-depth and a lot of questions are best answered by the applicant. We can talk prior to the hearing.
Do you need to make another site visit? Yes, now that there is a set plan, I will need to review the project on-site.
(and if so, please coordinate via telephone with us to meet you on-site.) Understood.
Thanks,
Jason

Jason Vander Kodde, PE | Associate | Senior Engineer
Fishbeck | w: 616.464.3938 | c: 616.648.9165 | Fishbeck.com

From: Schmidt, Robyn (EGLE) <SCHMIDTR1@michigan.gov>
Sent: Wednesday, August 2, 2023 1:03 PM
To: Vander Kodde, Jason <jtvanderkodde@fishbeck.com>
Subject: RE: FW: Submission Status Change Notification - HPR-59MH-CX6Z7, Leelanau Pines Campground

Received. Thank you.

Per our previous conversations, I am going to begin the process of scheduling the public hearing for this application. I will make note of this in the public notice document. Let me know if you have any questions or would like any additional information. Thank you.

Robyn Schmidt
Water Resources Division-Cadillac District Office
Michigan Department of Environment, Great Lakes, and Energy (EGLE)
231-383-5952 | SchmidtR1@Michigan.gov
Follow Us | **Michigan.gov/EGLE**

MiEnviro help: EGLE-WRD-MiWaters@michigan.gov
** **FYI- MiWaters was renamed MiEnviro on November 1st****
General Questions: egle-assist@michigan.gov ⋮ 800.662.9278

Vander Kodde, Jason

From: Redner, Josh
Sent: Friday, August 11, 2023 9:15 AM
To: Vander Kodde, Jason; mcarrier@northgateholdings.com; Shannon Sullivan; Chelsea Bossenbroek; Katy Hallgren; Kevin Odell
Subject: FW: External Meeting: Leelanau Pines Campground

Good Morning Team,

I received the below message that Marissa Hudgins, our lead permit writer for the wastewater permit, will be leaving EGLE a week from today. I've asked who we should be working with after her departure.

Unfortunately, we need answers from EGLE on the permit limits before we can design wastewater improvements.

Jason passed along your question regarding increasing the flow to the existing lagoon. I'm looking into this and we will provide a response.

Thank you,
Josh

Joshua Redner | Senior Water & Wastewater Engineer
Fishbeck | w: 616.464.3848 | c: 616.460.2814 | Fishbeck.com

From: Redner, Josh <jredner@fishbeck.com>
Sent: Friday, August 11, 2023 8:53 AM
To: Hudgins, Marissa (EGLE) <HudginsM@michigan.gov>
Cc: Rendon, Kristine (EGLE) <RendonK@michigan.gov>
Subject: RE: External Meeting: Leelanau Pines Campground

Marissa,

Thank you for the update and for your help navigating the permitting process. Can you please let us know who we should be working with if a determination is made on which permit writer will be taking over?

I hope all goes well for you in your next endeavor,
Josh

Joshua Redner | Senior Water & Wastewater Engineer
Fishbeck | w: 616.464.3848 | c: 616.460.2814 | Fishbeck.com

From: Hudgins, Marissa (EGLE) <HudginsM@michigan.gov>
Sent: Friday, August 11, 2023 8:43 AM
To: Redner, Josh <jredner@fishbeck.com>
Cc: Rendon, Kristine (EGLE) <RendonK@michigan.gov>
Subject: RE: External Meeting: Leelanau Pines Campground

Hi Josh,

My last day with EGLE will be next Friday, August 18. This permit will be transferred to one of the other permit writers on our team. I have made sure to document the conversations and meetings we have had as best I can so that this transitions smoothly. I have also reviewed the application revision and made some notes for the next permit writer to follow up on.

It has been great working with you.

Thank you,
Marissa Hudgins
Environmental Quality Analyst
Water Resources Division | Groundwater Permits Unit
Michigan Department of Environment, Great Lakes, and Energy
517-290-5336 | hudginsm@michigan.gov

From: Redner, Josh <jredner@fishbeck.com>
Sent: Thursday, August 10, 2023 3:40 PM
To: Hudgins, Marissa (EGLE) <HudginsM@michigan.gov>
Cc: Rendon, Kristine (EGLE) <RendonK@michigan.gov>; Makries, Jeanette (EGLE) <MAKRIESJ@michigan.gov>; Strong, Angela (EGLE) <STRONGA2@michigan.gov>; Christian, Barry (EGLE) <ChristianB2@michigan.gov>; Vander Kodde, Jason <jtvanderkodde@fishbeck.com>; mcarrier@northgateholdings.com; ssullivan@northgateholdings.com; cbossenbroek@northgateholdings.com; khallgren@northgateholdings.com; Kevin Odell <kodell@northgateholdings.com>
Subject: RE: External Meeting: Leelanau Pines Campground

Hi Marissa,

Just checking in to see if you have any update or need any additional information on the permit application.

Thank you,
Josh

Joshua Redner | Senior Water & Wastewater Engineer
Fishbeck | w: 616.464.3848 | c: 616.460.2814 | Fishbeck.com

From: Redner, Josh <jredner@fishbeck.com>
Sent: Thursday, July 27, 2023 4:14 PM
To: Hudgins, Marissa (EGLE) <HudginsM@michigan.gov>
Cc: Rendon, Kristine (EGLE) <RendonK@michigan.gov>; Makries, Jeanette (EGLE) <MAKRIESJ@michigan.gov>; Strong, Angela (EGLE) <STRONGA2@michigan.gov>; Christian, Barry (EGLE) <ChristianB2@michigan.gov>; Vander Kodde, Jason <jtvanderkodde@fishbeck.com>; mcarrier@northgateholdings.com; ssullivan@northgateholdings.com; cbossenbroek@northgateholdings.com; khallgren@northgateholdings.com; Kevin Odell <kodell@northgateholdings.com>
Subject: RE: External Meeting: Leelanau Pines Campground

Hi Marissa,

I wanted to let you know that we updated the application on 7/13 and wanted to check to see if you need any additional information in order to provide a draft permit. I'm available to answer any questions that you may have.

Thank you for your help,
Josh

Joshua Redner | Senior Water & Wastewater Engineer
Fishbeck | w: 616.464.3848 | c: 616.460.2814 | Fishbeck.com

fishbeck
Engineers | Architects | Scientists | Constructors

1515 Arboretum Drive, SE
Grand Rapids, Michigan 49546

616.575.3824 | fishbeck.com

Memo

TO: Steve Christensen – Leelanau County Drain Commissioner

FROM: Kegan Gibson & Jason Vander Kodde

DATE: September 21, 2022
REVISED December 15, 2022

PROJECT NO.: 211505

RE: Stormwater Management Summary, Schematic Design

Site Overview

The Leelanau Pines Campground is an existing campground consisting of 182 campground sites, camp office, game room, a bathhouse and laundry building. The campground is located at 6500 E Leelanau Pines Drive in Cedar, Michigan. The proposed improvements to the Leelanau Pines Campground include adding campsites, a check-in building, maintenance building, staff housing, bathhouse, boat launch, and boat cleaning stations. The campground improvements will also include campground activity areas including dock improvements, mini golf course, sports courts, camp store, a pool and splash pad. The site will be served by private water wells and a private sanitary sewer treatment collection system and lagoon located on site. The following information outlines the standards and calculations used to size the proposed detention basins ***and infiltration trenches*** on site.

Design Standard

According to the Leelanau County Drain Commissioners (LCDC) site development rules, detention basins are required to be sized based on the difference in runoff volume generated from the undeveloped condition of a two-year twenty-four hour duration storm, compared to the developed condition of a twenty-five year twenty-four hour frequency event. The runoff volume generated shall be calculated using the Rational Method.

Calculation Summary

The site will be served by three separate detention basins ***and infiltration trenches***. The drainage areas were determined based on the existing drainage patterns of the site which will be modified slightly to account for camp improvements while helping convey water through detention basins before being discharged. Each basin drainage area can be identified in the C310 – Overall Site Drainage map provided, and corresponding area itemizations with composite C value calculations for both existing and proposed conditions are provided as well.

The first basin is located on the west edge of the property and will serve a developed drainage area of 7.33 acres. The existing composite C value for the area is 0.22 with a proposed C value of 0.35. Using the Rational Method specified by the LCDC standards above the required storage volume is 9,806 cubic feet. The first basin is designed to store a volume of 12,496 cubic feet up to the outlet elevation at 595.50 feet.

The second basin is located on the south edge of the campsites on the property and will drain a developed drainage area of 12.49 acres. The existing C value for the drainage area is 0.28 with a proposed C value of 0.40.

The required storage volume for the drainage area is calculated to 18,916 cubic feet. The basin is designed to hold a storage volume of 21,877 cubic feet up to the outlet elevation at 593.50 feet.

The third basin is located on the east side of the property and will serve a developed drainage area of 6.46 acres. The drainage area has an existing composite C value of 0.20 with a proposed C value of 0.29. The required storage volume for the drainage area is 6,330 cubic feet. The provided storage volume is 12,209 cubic feet up to the outlet elevation at 592.50 feet.

The remaining area consisting of the existing campground sites road and buildings are in a developed drainage area of 12.60 acres. The drainage area has an existing composite C value of 0.29 with a proposed C value of 0.37. The required storage volume for the drainage area is 16,220 cubic feet. ***Due to the location and elevation of the existing campground and improvements, it is not feasible to provide a traditional detention basin. Instead, Leelanau Pines has designed a combination of infiltration trenches (a.k.a. French Drains) and compensatory detention volume in other basins (a.k.a. oversized)***

The infiltration trenches are placed along the perimeter of the new hardscape including the pool decks, the marina buildings and the parking lot. There is approximately 1,050 linear feet of infiltration trench in these areas. Using the allowed 50% void space a total of 4,733 cubic feet is provided, leaving 11,487 cubic feet for compensatory volume.

The three basins ***and infiltration trenches*** provide a total storage of 51,315 cubic feet to provide for the required total storage of 51,272 cubic feet, which produces an approximate excess of 43 cubic feet beyond the volume requirements.

Each detention basin will discharge the low flow via infiltration into the groundwater. Approximately 1/4 way up, a small culvert is provided to minimize ponding depth, and durations after rain events. The culvert has been sized to pass the predeveloped runoff rate when the basin reaches its full state. Once the basin is full, any additional stormwater runoff will be discharged through an overland spillway into the adjacent wetlands or stream. Soil borings have been completed to verify ground water elevations for the detention basin bottoms.

Site C Value Calculation

PROJECT: Leelanau Pines
JOB NUMBER: 211505
DATE: 12/15/2022
BY: KAG
LOCATION
COUNTY (MI): Leelanau
COUNTY (OH): 0
TOWNSHIP: Centerville

AREA	UNITS	GRASS 0.20	ASPHALT 0.90	TOTAL AREA	WEIGHTED C
Proposed Basin 1	sf	249,675	69,550	319,225	0.35
	acres	5.73	1.60	7.33	
Proposed Basin 2	sf	392,372	151,564	543,936	0.40
	acres	9.01	3.48	12.49	
Proposed Basin 3	sf	247,190	34,242	281,432	0.29
	acres	5.67	0.79	6.46	
Proposed Area	sf	417,099	131,919	549,018	0.37
	acres	9.58	3.03	12.60	
PROPOSED TOTAL	sf	1,306,336	387,275	1,693,611	**0.38**
	acres	29.99	8.89	38.88	
Existing 1	sf	308,805	10,420	319,225	0.22
	acres	7.09	0.24	7.33	
Existing 2	sf	483,445	60,491	543,936	0.28
	acres	11.10	1.39	12.49	
Existing 3	sf	281,432	0	281,432	0.20
	acres	6.46	0.00	6.46	
Existing Area	sf	475,282	73,736	549,018	0.29
	acres	10.91	1.69	12.60	
EXISTING TOTAL	sf	1,548,964	144,647	1,693,611	**0.26**
	acres	35.56	3.32	38.88	

Leelanau Pines Campground Detention Calculations

By: KAG Date: 12/15/2022

Using Basin Design Method

Basin	Area (SF)	Area (Acres)	Existing C	Existing Volume (2 yr, 24 hr)	Proposed C	Proposed Volume (25 yr, 24hr)	Difference	Allowable Discharge (cu. ft/s)	Discharge Provided (cu. ft/s)
1	319,225	7.33	0.22	1,959	0.35	11,765	9,806	1.47	1.10
2	543,936	12.49	0.28	5,279	0.40	24,195	18,916	2.50	2.39
3	281,432	6.46	0.20	1,464	0.29	7,794	6,330	1.29	1.14
Remain.	549,018	12.60	0.29	5,677	0.37	21,897	16,220	2.52	
			Total	8,702		65,651	51,272		

Using Hand Rational Method

Basin	Area (SF)	Area (Acres)	Existing C	Q Value (2 yr, 24 hr)	Time of Concentration	Volume	Proposed C	Q Value (25 yr, 24 hr)	Time of Concentration	Volume	Difference
1	319,225	7.33	0.22	3.658	15	1,973	0.35	4.728	60	11743	9,769
2	543,936	12.49	0.28	5.343	30	5,122	0.40	9.027	60	23508	18,386
3	281,432	6.46	0.20	2.894	15	1,442	0.29	3.372	60	7486	6,044
Remain.	549,018	12.60	0.29	8.301	15	5,202	0.37	8.492	60	21498	16,296
		Total Site Area			Total	13,739			Total	64235	50,495
Allowable Discharge Rate		81.52	0.20	36.521							
	Allowable Discharge (Q/A) =			0.448	> 0.2 ->Use 0.2 cfs/ac						

Storm Intensity Table

	Existing		Proposed	
Basin	Duration	Intensity	Duration	Intensity
1	15	2.24	60	1.83
2	30	1.54	60	1.83
3	15	2.24	60	1.83

Infiltration Trench Drain Capacity

Pea Stone Bed	Length (ft)	Width (in)	Height (in)	Void Space (%)	Volume provided (cu. ft.)
	1050	48	26	50	4550

Perferated Pipe	Length (ft)	Diameter (in)	Volume provided (cu. ft.)
	1050	8	183
		Total:	4733

Basin 1 Outlet - 10" @ 0.25%

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.25000	%
Normal Depth	0.83	ft
Diameter	10.00	in
Discharge	1.10	ft³/s

Results

Discharge	1.10	ft³/s
Normal Depth	0.83	ft
Flow Area	0.55	ft²
Wetted Perimeter	2.62	ft
Hydraulic Radius	0.21	ft
Top Width	0.00	ft
Critical Depth	0.47	ft
Percent Full	100.0	%
Critical Slope	0.00691	ft/ft
Velocity	2.01	ft/s
Velocity Head	0.06	ft
Specific Energy	0.90	ft
Froude Number	0.00	
Maximum Discharge	1.18	ft³/s
Discharge Full	1.10	ft³/s
Slope Full	0.00250	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Basin 1 Outlet - 10" @ 0.25%

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.83	ft
Critical Depth	0.47	ft
Channel Slope	0.25000	%
Critical Slope	0.00691	ft/ft

Basin 2 Outlet - 12" @ 0.45%

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.45000	%
Normal Depth	1.00	ft
Diameter	12.00	in
Discharge	2.39	ft³/s

Results

Discharge	2.39	ft³/s
Normal Depth	1.00	ft
Flow Area	0.79	ft²
Wetted Perimeter	3.14	ft
Hydraulic Radius	0.25	ft
Top Width	0.00	ft
Critical Depth	0.66	ft
Percent Full	100.0	%
Critical Slope	0.00747	ft/ft
Velocity	3.04	ft/s
Velocity Head	0.14	ft
Specific Energy	1.14	ft
Froude Number	0.00	
Maximum Discharge	2.57	ft³/s
Discharge Full	2.39	ft³/s
Slope Full	0.00450	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Basin 2 Outlet - 12" @ 0.45%

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.66	ft
Channel Slope	0.45000	%
Critical Slope	0.00747	ft/ft

Basin 3 Outlet - 10" @ 0.27%

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.27000	%
Normal Depth	0.83	ft
Diameter	10.00	in
Discharge	1.14	ft³/s

Results

Discharge	1.14	ft³/s
Normal Depth	0.83	ft
Flow Area	0.55	ft²
Wetted Perimeter	2.62	ft
Hydraulic Radius	0.21	ft
Top Width	0.00	ft
Critical Depth	0.48	ft
Percent Full	100.0	%
Critical Slope	0.00699	ft/ft
Velocity	2.09	ft/s
Velocity Head	0.07	ft
Specific Energy	0.90	ft
Froude Number	0.00	
Maximum Discharge	1.22	ft³/s
Discharge Full	1.14	ft³/s
Slope Full	0.00270	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Basin 3 Outlet - 10" @ 0.27%

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.83	ft
Critical Depth	0.48	ft
Channel Slope	0.27000	%
Critical Slope	0.00699	ft/ft

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Memo

Kyle Reidsma
Nov 16 2022 2:29 PM

TO: Katy Hallgren, Chelsea Bossenbroek – Northgate Resorts

FROM: Kyle M. Reidsma, PE, PTOE and Alyssa M. Wambold, PE, PTOE

DATE: November 7, 2022 **PROJECT NO.:** 211505

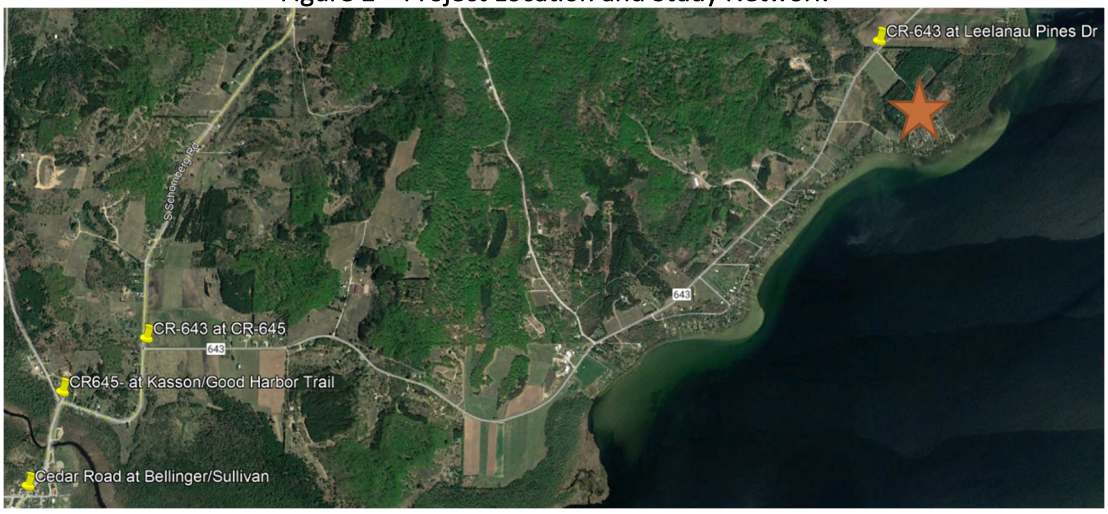
RE: Leelanau Pines Campground Traffic Impact Assessment

Introduction

On behalf of Northgate Resorts, Fishbeck has conducted a traffic impact analysis (TIA) related to the expansion of the existing Leelanau Pines Campground located on the east side of CR-643 (S Lake Shore Drive) at the intersection with E Leelanau Pines Drive in Centerville Township, Michigan. The campground currently has 183 campsites with 48 of these campsites designated as "short-term" (campsites that can be rented on a per-night basis) and 135 campsites designated as "seasonal" (campsites that are rented by a single entity for the entire camping season). With the proposed expansion, the campground will have 355 campsites, improved communal facilities, and limited staff housing. The expansion will add 172 short-term campsites for a total of 220 short-term campsites and 135 seasonal campsites. The development will be completed in one phase, assumed to be open and fully operational in 2024. The campground will use the existing driveway on CR-643 (S Lake Shore Drive).

The project location and study intersections are indicated in Figure 1 – Project Location and Study Network.

Figure 1 – Project Location and Study Network



Traffic data was collected over the Labor Day holiday weekend for the check-in and check-out times of the existing campground. It is anticipated that this provides a conservative analysis considering that during the typical spring/summer months, campers arrive and leave on various days of the week depending on the length of their stay. For Labor Day weekend, it is expected that the majority of campers arrive on Friday afternoon and leave on

Monday afternoon. The analysis also used a conservative methodology for trip generation that will be described in detail later.

Study Methodology

The objectives of this TIA were to determine what impacts, if any, the proposed project will have on adjacent roadway traffic operations, and to develop recommendations for any improvements necessary to mitigate the project impacts on the studied intersections. Study analyses were completed relative to peak operations of the campground.

The Leelanau County Road Commission (LCRC) required that a study be prepared for this development. The scope for this Traffic Impact Assessment (TIA) was approved by LCRC, and this study was executed as presented in that scope. Based on the type and size of the proposed development and the likely area of influence for the site trips, traffic operations were analyzed for the following unsignalized intersections, as recommended by the LCRC:

1. CR-643 (S Lake Shore Drive) and E Leelanau Pines Drive.
2. CR-643 (S Lake Shore Drive) and CR-645 (S Schomberg Road).
3. CR-645 (S Schomberg Road) and Kasson Street/S Good Harbor Trail.
4. CR-616 (S Cedar Road)/S Kasson Street and CR-616 (E Bellinger Road)/Sullivan Street.

This study was conducted according to the methodologies and guidance published by Institute of Transportation Engineers (ITE), American Association of State Highway and Transportation Officials (AASHTO), Michigan Department of Transportation (MDOT), and the LCRC.

Existing Traffic Volumes

Vehicular turning movement counts (TMCs) were collected to coincide with peak operations of the campground. Traffic counts were collected at the following study intersections on Labor Day Weekend during the peak check-in period (Friday September 2, 2022, from 2 p.m. to 6 p.m.) and peak check-out period (Monday September 5, 2022, 12 p.m. to 3 p.m.):

- CR-643 (S Lake Shore Drive) and E Leelanau Pines Drive.
- CR-643 (S Lake Shore Drive) and CR-645 (S Schomberg Road).
- CR-645 (S Schomberg Road) and Kasson Street/S Good Harbor Trail.
- CR-616 (S Cedar Road)/S Kasson Street and CR-616 (E Bellinger Road)/Sullivan Street.

The Leelanau Pines Campground currently operates with seasonal and short-term campsites. Current check-in time is 3 p.m. and check-out time is 1 p.m. For the 2022 season, all seasonal campsites were occupied. On Labor Day Weekend (when TMCs were completed), all short-term campsites were occupied. Occupancy data for the short-term campsites provided by Leelanau Pines Campground indicated that every weekend between July 1 and Labor Day were at or near capacity with the lowest weekend having 45 of the 48 campsites occupied.

Historical traffic data from the Michigan Department of Transportation (MDOT) Transportation Data Management System (TDMS) website was reviewed to determine if there was an impact on the current traffic volume data due to impact of COVID-19. Based on this review, there was no compelling evidence to apply an adjustment factor to the collected TMCs. Traffic volume information is attached to this memo. The TMC data for the peak check-out period was processed separately and is broken down in the attached volume information from 12 p.m. to 1 p.m. (manual counts) and from 1 p.m. to 3 p.m. (processed counts by GHA) in 15-minute segments.

Existing Conditions Analysis

Traffic Operations Analysis Methodology

Synchro software was used to perform Highway Capacity Manual (HCM) operational analyses during the Friday Check-In and Monday Check-Out peak hours for all the intersections within this study. According to the most recent editions of the HCM, LOS is a qualitative measure describing operational conditions of a traffic stream or intersection. LOS ranges from A to F, with LOS A representing desirable traffic operations characterized by low delay and LOS F representing extremely poor traffic operations characterized by excessive delays and long vehicle queues. LOS D is generally considered acceptable for most areas. Table 1 – LOS Criteria presents the HCM criteria for various LOS for unsignalized intersections. Output from the Synchro analyses for the various conditions are attached to this memo.

Table 1 – LOS Criteria for Unsignalized Intersections

LOS	Average Stopped Vehicle Delay (seconds)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

While TMC data was collected for four hours for the check-in time period, and three hours for the check-out time period, the traffic analysis is based on the peak hour (i.e., 60 minutes) of those time periods. The peak hour refers to the continuous one-hour period during which the highest volume of traffic is present at an intersection. The data was collected in 15-minute increments, and thus peak hours are calculated based on 15-minute increments of an hour (i.e., the peak hour can be from 1:15 p.m. to 2:15 p.m.) The volumes from the peak hour are then used for the traffic analyses outlined below. The times of the peak hours may differ between intersections, but the analysis is based on the peak hour for each intersection to provide a conservative analysis based on the highest overall volumes present at each intersection.

Existing Conditions Traffic Analysis

Synchro models for the existing network were created based on the existing roadway configurations and traffic controls. Where applicable, data concerning the existing intersection and roadway lane configurations, geometry, and traffic control that were observed in the field were entered in the models.

Typically, when entering traffic data into Synchro, heavy vehicle percentages are entered per approach (EB/WB/NB/SB) and not by movement (left/through/right). For this study, any passenger vehicle towing a camper, trailer, boat, or 5th-wheel RV were considered heavy vehicles to provide a more conservative analysis of LOS/delay. Additionally, to better understand the traffic impacts of these vehicles, heavy vehicle percentages were evaluated by movement (left/through/right) to more accurately depict the travel path of site trips to/from the campground through the study area intersections.

The intersection of CR-643 (S Lake Shore Drive) and E Leelanau Pines Drive operates with stop-control for the westbound E Leelanau Pines Drive approach. Northbound and southbound CR-643 (S Lake Shore Drive) are not required to stop or yield. Each approach of this intersection consists of a single lane in each direction.

The intersection of CR-643 (S Lake Shore Drive) and CR-645 (S Schomberg Road) operates with stop-control for the westbound CR-643 (S Lake Shore Drive) approach. Northbound and southbound CR-645 (S Schomberg Road) are not required to stop or yield. Each approach of this intersection consists of a single lane in each direction.

The intersection of CR-645 (S Schomberg Road) and Kasson Street/Good Harbor Trail operates with stop-controlfor the westbound CR-645 (S Schomberg Road) approach. Northbound and southbound Kasson Street/S Good Harbor Trail are not required to stop or yield. Each approach of this intersection consists of a single lane in each direction.

The intersection of CR-616 (S Cedar Road)/S Kasson Street and CR-616 (E Bellinger Road)/Sullivan Street operates with all-way stop-control, where all approaches are required to stop. Each approach of this intersection consists of a single lane in each direction.

The resulting LOS and delay for the existing conditions are indicated in Table 2 – LOS Analysis for Existing (2022) Conditions. Existing conditions LOS reports are attached to this memo.

Table 2 – LOS Analysis for Existing (2022) Conditions

Approach/Lane Group	LOS/Delay(s)			
	Friday Check-In		Monday Check-Out	
CR-643 (S Lake Shore Drive) and E Leelanau Pines Drive				
WB E Leelanau Pines Drive	A	8.9	A	9.5
NB CR-643 (S Lake Shore Drive)	A	0.0	A	0.0
SB CR-643 (S Lake Shore Drive)	A	0.7	A	0.2
Overall	A	1.2	A	2.2
CR-643 (S Lake Shore Drive) and CR-645 (S Schomberg Road)				
WB CR-643 (S Lake Shore Drive)	A	9.8	A	9.6
NB CR-645 (S Schomberg Road)	A	0.0	A	0.0
SB CR-645 (S Schomberg Road)	A	0.0	A	0.8
Overall	A	2.7	A	3.6
CR-645 (S Schomberg Road) and Kasson Street/S Good Harbor Trail				
WB CR-645 (S Schomberg Road)	B	11.9	B	10.8
NB Kasson Street	A	0.0	A	0.0
SB S Good Harbor Trail	A	0.0	A	0.2
Overall	A	2.4	A	2.5
CR-616 (S Cedar Road)/S Kasson Street and CR-616 (E Bellinger Road)/Sullivan Street				
EB CR-616 (E Bellinger Road)	A	9.1	A	8.2
WB Sullivan Street	A	8.4	A	9.3
NB CR-616 (S Cedar Road)	B	10.5	A	8.7
SB S Kasson St	B	10.1	A	8.6
Overall	B	10.1	A	8.6

Background Conditions Analysis

Historical traffic data on the MDOT TDMS website was referenced to determine the applicable growth rate for the existing traffic volumes to the project build-out year in 2024. Based on this review, a background growth rate of 0.5% was utilized. Background conditions are a no-build condition to serve as a baseline of comparison for the proposed site improvements.

Background Conditions Traffic Analysis

The resulting LOS and delay for the background conditions are shown in Table 3 – LOS Analysis for Background (2024) Conditions. Background conditions LOS reports are attached to this memo.

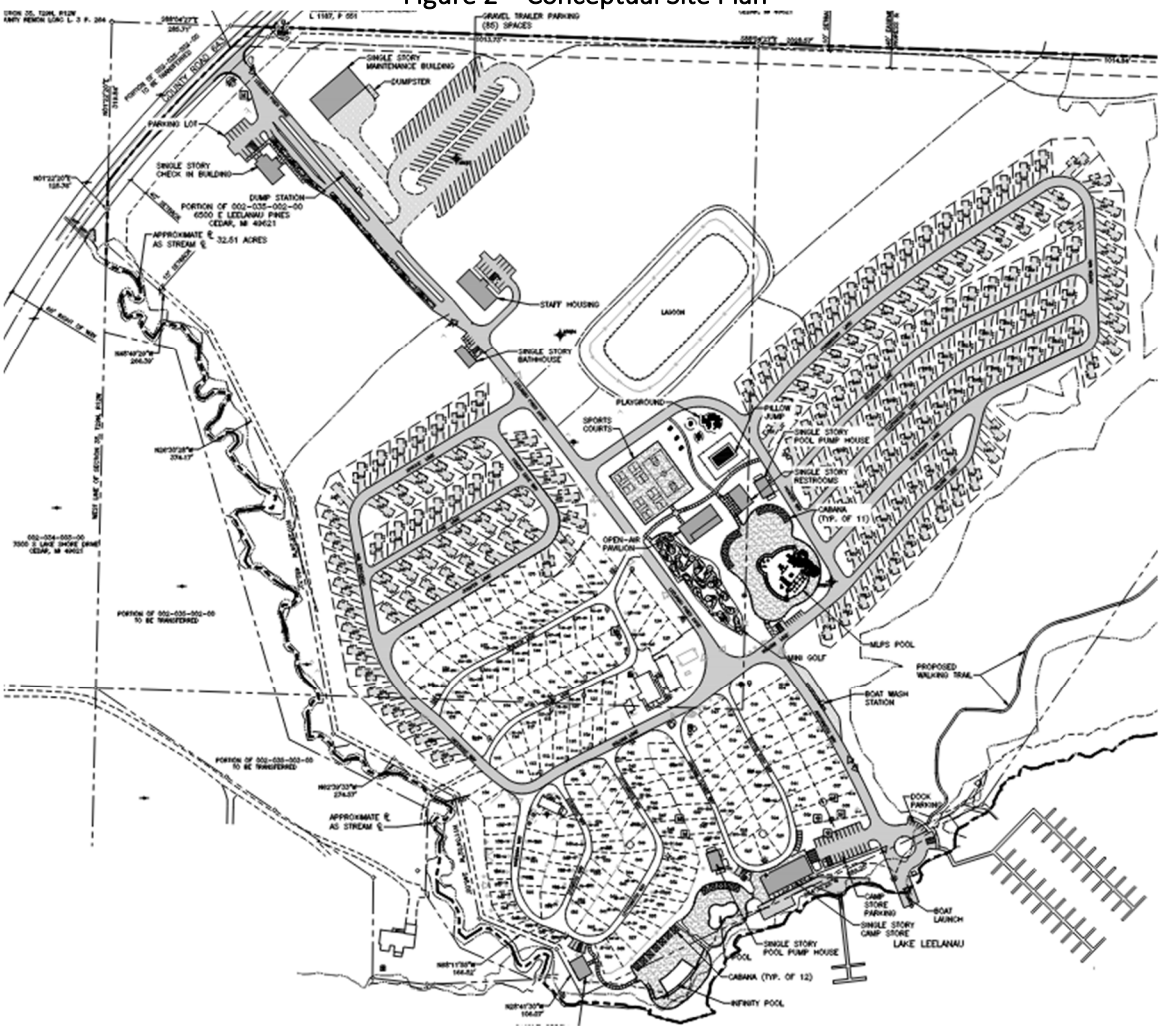
Table 3 – LOS Analysis for Background (2024) Conditions

Approach/Lane Group	LOS/Delay(s)			
	Friday Check-In		Monday Check-Out	
CR-643 (S Lake Shore Drive) and E Leelanau Pines Drive				
WB E Leelanau Pines Drive	A	8.9	A	9.5
NB CR-643 (S Lake Shore Drive)	A	0.0	A	0.0
SB CR-643 (S Lake Shore Drive)	A	0.7	A	0.2
Overall	A	1.2	A	2.2
CR-643 (S Lake Shore Drive) and CR-645 (S Schomberg Road)				
WB CR-643 (S Lake Shore Drive)	A	9.8	A	9.6
NB CR-645 (S Schomberg Road)	A	0.0	A	0.0
SB CR-645 (S Schomberg Road)	A	0.0	A	0.8
Overall	A	2.7	A	3.6
CR-645 (S Schomberg Road) and Kasson Street/S Good Harbor Trail				
WB CR-645 (S Schomberg Road)	B	11.9	B	10.8
NB Kasson Street	A	0.0	A	0.0
SB S Good Harbor Trail	A	0.0	A	0.2
Overall	A	2.4	A	2.5
CR-616 (S Cedar Road)/S Kasson Street and CR-616 (E Bellinger Road)/Sullivan Street				
EB CR-616 (E Bellinger Road)	A	9.1	A	8.2
WB Sullivan Street	A	8.4	A	9.3
NB CR-616 (S Cedar Road)	B	10.7	A	8.7
SB S Kasson St	B	10.2	A	8.6
Overall	B	10.2	A	8.6

Site Traffic Characteristics

A representation of the current conceptual site plan is provided in Figure 2 – Conceptual Site Plan below.

Figure 2 – Conceptual Site Plan



Trip Generation

Using the information and methodologies specified in the latest version of Trip Generation (11th Edition), Fishbeck forecast the trips associated with the proposed development during the Friday Check-In and Monday Check-Out peak periods.

The data available in the latest version of Trip Generation for this type of development (Land Use Code 416 – Campground/Recreational Vehicle Park) is based on four other developments that contain between 21 and 135 campsites. The Trip Generation manual advises that local data or specialized data should be collected for this TIA as the proposed development is significantly larger than data available in the manual.

Traffic counts were completed during the Friday Check-In and Monday Check-Out periods of Labor Day Weekend. The Leelanau Pines Campground indicated that they were fully booked for the entirety of the holiday weekend. The number of existing inbound and outbound trips during both peak hours was tabulated. To determine the trip generation of the campground once the expansion is complete, the number of existing sites was compared to the number of proposed sites. While the number of seasonal sites will remain the same (135) the number of

short-term sites will increase from 48 to 220, or a factor of 4.58. Given that the short-term rentals tend to arrive and depart during the peak hours and generate more trips than the seasonal campsites, the existing trip generation volumes from the TMCs were multiplied by the calculated adjustment factor to determine the proposed trip generation.

As described in the existing conditions traffic analysis section above, passenger vehicles towing a camper, trailer, boat, or 5th-wheel RV were considered as heavy vehicles for this study. Conservatively, all of the site generated traffic was assumed to be a heavy vehicle, and new heavy vehicle percentages were calculated for each movement in the future conditions.

Additionally, Northgate Resorts provided a traffic study for a campsite of similar size to the proposed site expansion. The trips counted as part of the provided study are similar or slightly lower than the trip generation calculated for this proposed expansion.

Finally, review of the limited data available in the ITE Trip Generation Manual revealed that the data collected at the existing Leelanau Pines Campground and the trip generation forecast for the proposed expansion are higher than the rates provided in the Trip Generation Manual. The Trip Generation Manual for a campground/RV park has a small sample size of studies, all of which were smaller sized campgrounds than what is being proposed.

A comparison was conducted of the trip generation methods described above of an adjustment factor based on the existing campground, the previous traffic study for a similar-sized campground, and the data from the ITE Trip Generation Manual. The use of the adjustment factor based on the local data collected at the existing Leelanau Pines Campground provided the highest number of proposed trips and therefore the most conservative analysis. The analysis was performed using this method for trip generation. Labor Day is typically the "last weekend of summer" where a majority of campers arrive on Friday evening and leave on Monday afternoon. Compared to a typical summer weekend where campers are more likely to stay for a longer duration of time, counting inbound and outbound traffic on Labor Day Weekend represents a higher-than-normal rate of entering and exiting traffic, will allows for a conservative analysis.

Table 4 – Trip Generation for Leelanau Pines Campground presents the resulting trip generation for the development.

Table 4 – Trip Generation for Leelanau Pines Campground

Scenario	Units		Friday Check-In			Monday Check-Out		
			In	Out	Total	In	Out	Total
Existing	183	Campsites	19	11	30	16	38	54
Proposed	355	Campsites	87	51	138	74	174	248

Trip Distribution

The directions that site traffic will travel to and from were based upon existing traffic patterns during the Friday Check-In and Monday Check-Out peak periods and the location of the campground. Given the location of the campground and surrounding road network, a majority of traffic will travel to/from the south. Table 5 – Trip Distribution provides the probable distribution based on the existing traffic patterns and campground location.

Table 5 – Trip Distribution

Direction	Via	Split
North	CR-643 (S Lake Shore Drive)	10%
South	CR-651 (S Cedar Road)	90%

Future Conditions Analysis

Turn Lane Warrants

An evaluation was performed in accordance with MDOT requirements to determine if left turn passing lanes or right turn deceleration lanes are required at the site driveway. The results of the analysis indicated that a right turn taper is warranted on CR-643 (S Lake Shore Drive) at E Leelanau Pines Drive. All turn lane warrant charts are attached to this memo. The results of the analysis are presented in Table 6 – Turn Lane Warrants. Although a northbound right turn lane is not warranted, the proposed entrance improvements will include a right turn lane per the standard driveway detail providing by the Road Commission. MDOT turn lane warrant information is attached to this memo.

Table 6 – Turn Lane Warrants

Intersection	Movement	Result
CR-643 (S Lake Shore Drive) and E Leelanau Pines Drive	NB Right Turn	Taper Warranted
	SB Left Turn	Not Warranted

Future Conditions Traffic Analysis

The calculated trips for the proposed site were distributed through the Background Conditions roadway network to analyze the future conditions of the study area intersections. The resulting LOS and delay for the future conditions are shown in Table 7 – LOS Analysis for Future Conditions. Future conditions LOS reports are attached to this memo.

Table 7 – LOS Analysis for Future Conditions

Approach/Lane Group	LOS/Delay(s)			
	Friday Check-In		Monday Check-Out	
CR-643 (S Lake Shore Drive) and E Leelanau Pines Drive				
WB E Leelanau Pines Drive	B	11.4	B	14.6
NB CR-643 (S Lake Shore Drive)	A	0.0	A	0.0
SB CR-643 (S Lake Shore Drive)	A	1.9	A	1.4
Overall	A	3.6	A	7.7
CR-643 (S Lake Shore Drive) and CR-645 (S Schomberg Road)				
WB CR-643 (S Lake Shore Drive)	B	11.7	B	13.0
NB CR-645 (S Schomberg Road)	A	0.0	A	0.0
SB CR-645 (S Schomberg Road)	A	0.0	A	0.8
Overall	A	3.8	A	7.0
CR-645 (S Schomberg Road) and Kasson Street/S Good Harbor Trail				
WB CR-645 (S Schomberg Road)	B	14.5	C	16.6
NB Kasson Street	A	0.0	A	0.0
SB S Good Harbor Trail	A	0.0	A	0.2
Overall	A	3.4	A	6.6
CR-616 (S Cedar Road)/S Kasson Street and CR-616 (E Bellinger Road)/Sullivan Street				
EB CR-616 (E Bellinger Road)	B	10.5	A	9.8
WB Sullivan Street	A	8.9	A	9.9
NB CR-616 (S Cedar Road)	B	12.6	A	10.0
SB S Kasson St	B	11.5	B	11.2
Overall	B	11.8	B	10.6

Findings and Recommendations

The analyses conducted for this TIA indicate the proposed development will not result in any significant impact to the capacity of the adjacent road network. The proposed site access configuration is appropriate and will acceptably facilitate site ingress and egress. The traffic analysis was based on traffic volumes from Labor Day weekend, which presents a more conservative analysis than a typical summer day when campers arrive and leave throughout the week and are not focused on a Friday arrival and Monday exit like the Labor Day weekend. Trip generation for the proposed site was performed by using a rate based on the existing site volumes on Labor Day weekend. It was found that this method of trip generation was higher, and more conservative, than trip generation from the ITE Trip Generation Manual and a similar sized site that Northgate operates.

The increase in average delay experienced by motorists does not increase more than 2.6 seconds during the Friday Check-In peak hour and does not increase more than 5.8 seconds during the Monday Check-Out period. The overall intersection LOS remain at LOS A and B with the proposed conditions, and the proposed conditions do not degrade the LOS by more than one grade for any approach or intersection. The LOS for all movements at the study intersections operate acceptably today and are shown to continue to do so under the proposed conditions.

Attachments
By email

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#1 - CR-643 (S Lake Shore Drive) and E Leelanau Pines Drive	Friday Check-In 09/02/22		PHF				0.69				0.87			0.95	
			% Heavy				0%		0%		6%	21%	20%	8%	
			Heavy Vehicles				0		0		3	3	1	4	
		2022	Existing				**5**		**6**		**52**	**14**	**5**	**48**	
		2022	Existing Adj.				5		6		52	14	5	48	
		2024	Background				5		6		53	14	5	48	
			Bckgrd. Dev. A												
			Bckgrd. Dev. B												
			Bckgrd. Dev. C												
			Total Background				**5**		**6**		**53**	**14**	**5**	**48**	
			Site Generated				46		5			78	9		
			Pass By												
			Total Site Gen				46		5		0	78	9	0	
			% Heavy Future				90%		45%		6%	88%	71%	8%	
			Total Future				**51**		**11**		**53**	**92**	**14**	**48**	

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#2 - CR-643 (S Lake Shore Drive) and CR-645 (S Schomberg Road)	Friday Check-In 09/02/22		PHF				0.68				0.83			0.75	
			% Heavy				6%		0%		4%	7%	0%	8%	
			Heavy Vehicles				3		0		2	5	0	3	
		2022	Existing				**52**		**0**		**54**	**76**	**0**	**36**	
		2022	Existing Adj.				52		0		54	76	0	36	
		2024	Background				53		0		55	77	0	36	
			Bckgrd. Dev. A												
			Bckgrd. Dev. B												
			Bckgrd. Dev. C												
			Total Background				**53**		**0**		**55**	**77**	**0**	**36**	
			Site Generated				46					78			
			Pass By												
			Total Site Gen				46		0		0	78	0	0	
			% Heavy Future				49%		0%		4%	54%	0%	8%	
			Total Future				**99**		**0**		**55**	**155**	**0**	**36**	

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#3 - CR-645 (S Schomberg Road) and Kasson Street/S Good Harbor Trail	Friday Check-In 09/02/22		PHF				0.85				0.87			0.81	
			% Heavy				6%		0%		3%	7%	0%	6%	
			Heavy Vehicles				5		0		4	9	0	7	
		2022	Existing				**90**		**2**		**132**	**126**	**0**	**110**	
		2022	Existing Adj.				90		2		132	126	0	110	
		2024	Background				91		2		133	127	0	111	
			Bckgrd. Dev. A												
			Bckgrd. Dev. B												
			Bckgrd. Dev. C												
			Total Background				**91**		**2**		**133**	**127**	**0**	**111**	
			Site Generated				46					78			
			Pass By												
			Total Site Gen				46		0		0	78	0	0	
			% Heavy Future				37%		0%		3%	42%	0%	6%	
			Total Future				**137**		**2**		**133**	**205**	**0**	**111**	

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#4 - CR-651 (S Cedar Road)/S Kasson Street and CR-616 (E Bellinger Road)/Sullivan Street	Friday Check-In 09/02/22		PHF	0.85			0.60			0.88			0.92		
			% Heavy	4%	0%	7%	0%	0%	20%	4%	5%	0%	25%	6%	6%
			Heavy Vehicles	2	0	3	0	0	1	2	10	0	1	10	2
		2022	Existing	**52**	**1**	**46**	**5**	**3**	**5**	**53**	**210**	**2**	**4**	**168**	**33**
		2022	Existing Adj.	52	1	46	5	3	5	53	210	2	4	168	33
		2024	Background	53	1	46	5	3	5	54	212	2	4	170	33
			Bckgrd. Dev. A												
			Bckgrd. Dev. B												
			Bckgrd. Dev. C												
			Total Background	**53**	**1**	**46**	**5**	**3**	**5**	**54**	**212**	**2**	**4**	**170**	**33**
			Site Generated	16							62			39	7
			Pass By												
			Total Site Gen	16	0	0	0	0	0	0	62	0	0	39	7
			% Heavy Future	26%	0%	7%	0%	0%	20%	4%	26%	0%	25%	23%	23%
			Total Future	**69**	**1**	**46**	**5**	**3**	**5**	**54**	**274**	**2**	**4**	**209**	**40**

Count Date:	9/2/2022
Count Year:	2022
Existing Adj. Year:	2022
Existing Adjustment Rate:	1.00
Growth Rate:	0.5%
Buildout Year:	2024
Scenario:	Friday Check-In
Bckgrd. Dev. A:	
Bckgrd. Dev. B:	
Bckgrd. Dev. C:	

Count Date:	9/5/2022
Count Year:	2022
Existing Adj. Year:	2022
Existing Adjustment Rate:	1.00
Growth Rate:	0.5%
Buildout Year:	2024
Scenario:	Monday Check-Out
Bckgrd. Dev. A:	
Bckgrd. Dev. B:	
Bckgrd. Dev. C:	

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#1 - CR-643 (S Lake Shore Drive) and E Leelanau Pines Drive	Monday Check-Out 09/05/22		PHF				0.67				0.75		0.86		
			% Heavy				36%		30%		16%	11%	0%	11%	
			Heavy Vehicles				8		3		7	1	0	5	
		2022	Existing				**22**		**10**		**45**	**9**	**1**	**47**	
		2022	Existing Adj.				22		10		45	9	1	47	
		2024	Background				22		10		45	9	1	47	
			Bckgrd. Dev. A												
			Bckgrd. Dev. B												
			Bckgrd. Dev. C												
			Total Background				**22**		**10**		**45**	**9**	**1**	**47**	
			Site Generated				157		17			66	8		
			Pass By												
			Total Site Gen				157		17		0	66	8	0	
			% Heavy Future				92%		74%		16%	89%	89%	11%	
			Total Future				**179**		**27**		**45**	**75**	**9**	**47**	

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#2 - CR-643 (S Lake Shore Drive) and CR-645 (S Schomberg Road)	Monday Check-Out 09/05/22		PHF				0.90				0.83		0.68		
			% Heavy				15%		0%		0%	13%	0%	4%	
			Heavy Vehicles				10		0		0	7	0	1	
		2022	Existing				**66**		**2**		**28**	**52**	**3**	**24**	
		2022	Existing Adj.				66		2		28	52	3	24	
		2024	Background				67		2		28	53	3	24	
			Bckgrd. Dev. A												
			Bckgrd. Dev. B												
			Bckgrd. Dev. C												
			Total Background				**67**		**2**		**28**	**53**	**3**	**24**	
			Site Generated				157					66			
			Pass By												
			Total Site Gen				157		0		0	66	0	0	
			% Heavy Future				75%		0%		0%	61%	0%	4%	
			Total Future				**224**		**2**		**28**	**119**	**3**	**24**	

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#3 - CR-645 (S Schomberg Road) and Kasson Street/S Good Harbor Trail	Monday Check-Out 09/05/22		PHF				0.95				0.85		0.81		
			% Heavy				5%		0%		3%	6%	0%	3%	
			Heavy Vehicles				4		0		2	5	0	3	
		2022	Existing				**86**		**2**		**77**	**83**	**3**	**101**	
		2022	Existing Adj.				86		2		77	83	3	101	
		2024	Background				87		2		78	84	3	102	
			Bckgrd. Dev. A												
			Bckgrd. Dev. B												
			Bckgrd. Dev. C												
			Total Background				**87**		**2**		**78**	**84**	**3**	**102**	
			Site Generated				157					66			
			Pass By												
			Total Site Gen				157		0		0	66	0	0	
			% Heavy Future				66%		0%		3%	47%	0%	3%	
			Total Future				**244**		**2**		**78**	**150**	**3**	**102**	

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#4 - CR-651 (S Cedar Road)/S Kasson Street and CR-616 (E Bellinger Road)/Sullivan Street	Monday Check-Out 09/05/22		PHF	0.93			0.75			0.84			0.90		
			% Heavy	6%	0%	5%	0%	100%	0%	0%	5%	0%	0%	4%	7%
			Heavy Vehicles	2	0	2	0	1	0	0	6	0	0	7	2
		2022	Existing	**32**	**2**	**37**	**0**	**1**	**2**	**36**	**129**	**2**	**1**	**158**	**28**
		2022	Existing Adj.	32	2	37	0	1	2	36	129	2	1	158	28
		2024	Background	32	2	37	0	1	2	36	130	2	1	160	28
			Bckgrd. Dev. A												
			Bckgrd. Dev. B												
			Bckgrd. Dev. C												
			Total Background	**32**	**2**	**37**	**0**	**1**	**2**	**36**	**130**	**2**	**1**	**160**	**28**
			Site Generated	13							53			134	23
			Pass By												
			Total Site Gen	13	0	0	0	0	0	0	53	0	0	134	23
			% Heavy Future	33%	0%	5%	0%	100%	0%	0%	32%	0%	0%	48%	49%
			Total Future	**45**	**2**	**37**	**0**	**1**	**2**	**36**	**183**	**2**	**1**	**294**	**51**

#1 - CR-643 (S Lake Shore Drive) and E Leelanau Pines Drive										
	Westbound			Northbound			Southbound			Int
	L	R	App	T	R	App	L	T	App	
12:00 PM	11	1	12	1	5	6	1	14	15	33
12:15 PM	7	1	8	3	2	5	1	6	7	20
12:30 PM	4	2	6	11	2	13	1	10	11	30
12:45 PM	7	5	12	10	4	14	0	13	13	39
1:00 PM	5	2	7	8	1	9	0	10	10	26
1:15 PM	6	1	7	16	2	18	0	14	14	39
1:30 PM	3	0	3	8	2	10	1	11	12	25
1:45 PM	2	1	3	10	2	12	0	11	11	26
2:00 PM	4	0	4	9	3	12	2	4	6	22
2:15 PM	2	1	3	9	1	10	2	8	10	23
2:30 PM	2	0	2	8	0	8	0	11	11	21
2:45 PM	2	1	3	8	2	10	0	5	5	18

Peak Hour Determination					
		Intersection Number			
		1*	2	3	4
12:00 PM	1:00 PM	122	393	336	175
12:15 PM	1:15 PM	115	395	321	171
12:30 PM	1:30 PM	134	398	305	172
12:45 PM	1:45 PM	129	375	302	170
1:00 PM	2:00 PM	116	366	282	170
1:15 PM	2:15 PM	112	388	301	175
1:30 PM	2:30 PM	96	391	323	171
1:45 PM	2:45 PM	92	410	334	165
2:00 PM	3:00 PM	84	427	352	159

#2 - CR-643 (S Lake Shore Drive) and CR-645 (S Schomberg Road)																	
	Eastbound				Westbound				Northbound				Southbound				Int
	L	T	R	App	L	T	R	App	L	T	R	App	L	T	R	App	
12:00 PM	2	2	5	9	2	1	0	3	5	21	2	28	1	41	5	47	87
12:15 PM	5	0	11	16	0	2	0	2	7	34	0	41	1	34	5	40	99
12:30 PM	9	1	11	21	0	0	0	0	15	22	1	38	0	40	6	46	105
12:45 PM	12	0	8	20	0	0	0	0	4	30	0	34	1	41	6	48	102
1:00 PM	7	0	6	13	0	0	0	0	11	24	0	35	0	31	10	41	89
1:15 PM	6	0	17	23	0	1	0	1	7	30	0	37	0	33	8	41	102
1:30 PM	8	0	7	15	0	0	0	0	5	21	0	26	0	35	6	41	82
1:45 PM	4	0	5	9	1	0	1	2	8	28	1	37	0	36	9	45	93
2:00 PM	9	0	9	18	0	0	1	1	10	40	0	50	0	34	8	42	111
2:15 PM	8	0	9	17	0	0	0	0	9	26	2	37	0	44	7	51	105
2:30 PM	7	2	10	19	0	0	1	1	6	33	0	39	1	37	4	42	101
2:45 PM	8	0	9	17	0	1	0	1	10	30	0	40	0	43	9	52	110

#3 - CR-645 (S Schomberg Road) and Kasson Street/S Good Harbor Trail										
	Westbound			Northbound			Southbound			Int
	L	R	App	T	R	App	L	T	App	
12:00 PM	35	0	35	27	9	36	0	11	11	82
12:15 PM	22	1	23	22	18	40	1	21	22	85
12:30 PM	25	0	25	17	17	34	0	15	15	74
12:45 PM	29	0	29	21	24	45	1	20	21	95
1:00 PM	25	0	25	16	13	29	0	13	13	67
1:15 PM	24	1	25	13	17	30	0	14	14	69
1:30 PM	26	0	26	9	19	28	1	16	17	71
1:45 PM	24	1	25	13	18	31	1	18	19	75
2:00 PM	21	0	21	21	26	47	0	18	18	86
2:15 PM	21	1	22	17	21	38	1	30	31	91
2:30 PM	22	0	22	20	17	37	1	22	23	82
2:45 PM	22	1	23	19	19	38	1	31	32	93

#4 - CR-651 (S Cedar Rd)/S Kasson St and CR-616 (E Bellinger Rd)/Sullivan St										
	Westbound			Northbound			Southbound			Int
	L	R	App	T	R	App	L	T	App	
12:00 PM	23	0	23	6	7	13	0	7	7	43
12:15 PM	20	0	20	7	12	19	0	3	3	42
12:30 PM	20	0	20	4	13	17	2	8	10	47
12:45 PM	16	0	16	3	17	20	0	7	7	43
1:00 PM	19	0	19	6	8	14	1	5	6	39
1:15 PM	17	1	18	3	12	15	3	7	10	43
1:30 PM	18	1	19	8	13	21	0	5	5	45
1:45 PM	18	0	18	8	12	20	0	5	5	43
2:00 PM	13	0	13	9	15	24	0	7	7	44
2:15 PM	11	0	11	11	10	21	0	7	7	39
2:30 PM	16	0	16	5	12	17	0	6	6	39
2:45 PM	9	1	10	7	11	18	1	8	9	37

CR-643 at Leelanau Pines Dr - TMC

Fri Sep 2, 2022
Full Length (2 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982501, Location: 44.869774, -85.734683

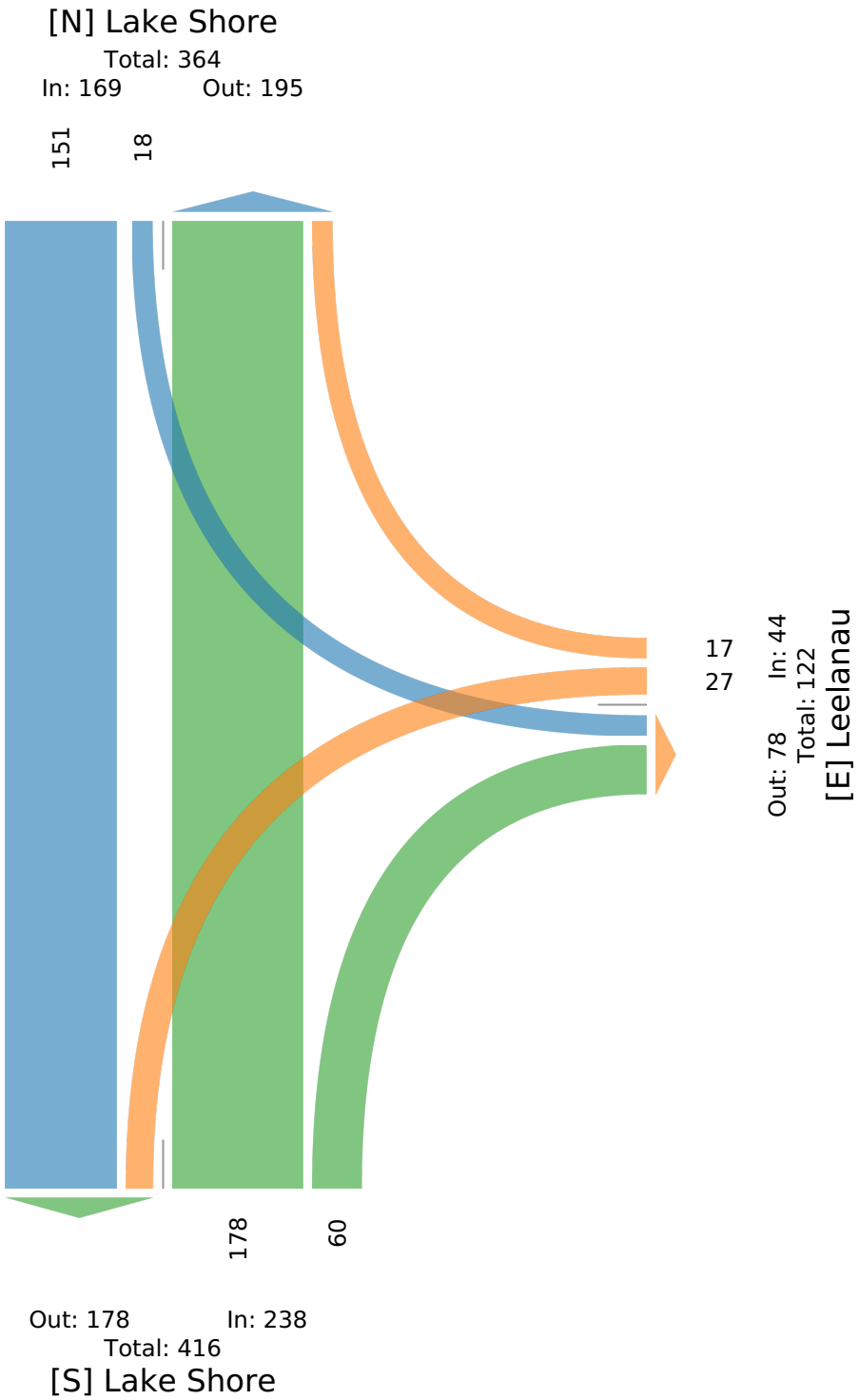
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Leelanau				Lake Shore				Lake Shore				
Direction	Westbound				Northbound				Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-02 2:00PM	4	0	0	**4**	12	0	0	**12**	4	10	0	**14**	**30**
2:15PM	2	1	0	**3**	5	4	0	**9**	0	9	0	**9**	**21**
2:30PM	4	1	0	**5**	16	5	0	**21**	0	7	0	**7**	**33**
2:45PM	3	1	0	**4**	12	2	0	**14**	0	11	0	**11**	**29**
Hourly Total	13	3	0	**16**	45	11	0	**56**	4	37	0	**41**	**113**
3:00PM	1	1	0	**2**	11	1	0	**12**	2	8	0	**10**	**24**
3:15PM	0	2	0	**2**	7	6	0	**13**	0	4	0	**4**	**19**
3:30PM	1	1	0	**2**	11	8	0	**19**	0	6	0	**6**	**27**
3:45PM	0	1	0	**1**	16	1	0	**17**	0	14	0	**14**	**32**
Hourly Total	2	5	0	**7**	45	16	0	**61**	2	32	0	**34**	**102**
4:00PM	2	2	0	**4**	11	2	0	**13**	1	11	0	**12**	**29**
4:15PM	2	1	0	**3**	9	8	0	**17**	3	11	0	**14**	**34**
4:30PM	1	2	0	**3**	16	3	0	**19**	1	12	0	**13**	**35**
4:45PM	3	1	0	**4**	10	6	0	**16**	2	5	0	**7**	**27**
Hourly Total	8	6	0	**14**	46	19	0	**65**	7	39	0	**46**	**125**
5:00PM	1	1	0	**2**	11	0	0	**11**	0	8	0	**8**	**21**
5:15PM	0	1	0	**1**	14	2	0	**16**	1	9	0	**10**	**27**
5:30PM	3	1	0	**4**	11	8	0	**19**	4	16	0	**20**	**43**
5:45PM	0	0	0	**0**	6	4	0	**10**	0	10	0	**10**	**20**
Hourly Total	4	3	0	**7**	42	14	0	**56**	5	43	0	**48**	**111**
Total	27	17	0	**44**	178	60	0	**238**	18	151	0	**169**	**451**
% Approach	61.4%	38.6%	0%	**-**	74.8%	25.2%	0%	**-**	10.7%	89.3%	0%	**-**	-
% Total	6.0%	3.8%	0%	**9.8%**	39.5%	13.3%	0%	**52.8%**	4.0%	33.5%	0%	**37.5%**	-
Lights	25	17	0	**42**	178	60	0	**238**	16	149	0	**165**	445
% Lights	92.6%	100%	0%	**95.5%**	100%	100%	0%	**100%**	88.9%	98.7%	0%	**97.6%**	98.7%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	2	0	0	**2**	0	0	0	**0**	2	2	0	**4**	6
% Buses and Single-Unit Trucks	7.4%	0%	0%	**4.5%**	0%	0%	0%	**0%**	11.1%	1.3%	0%	**2.4%**	1.3%

*L: Left, R: Right, T: Thru, U: U-Turn

CR-643 at Leelanau Pines Dr - TMC
Fri Sep 2, 2022
Full Length (2 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982501, Location: 44.869774, -85.734683

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR-643 at Leelanau Pines Dr - TMC

Fri Sep 2, 2022
PM Peak (3:45 PM - 4:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982501, Location: 44.869774, -85.734683

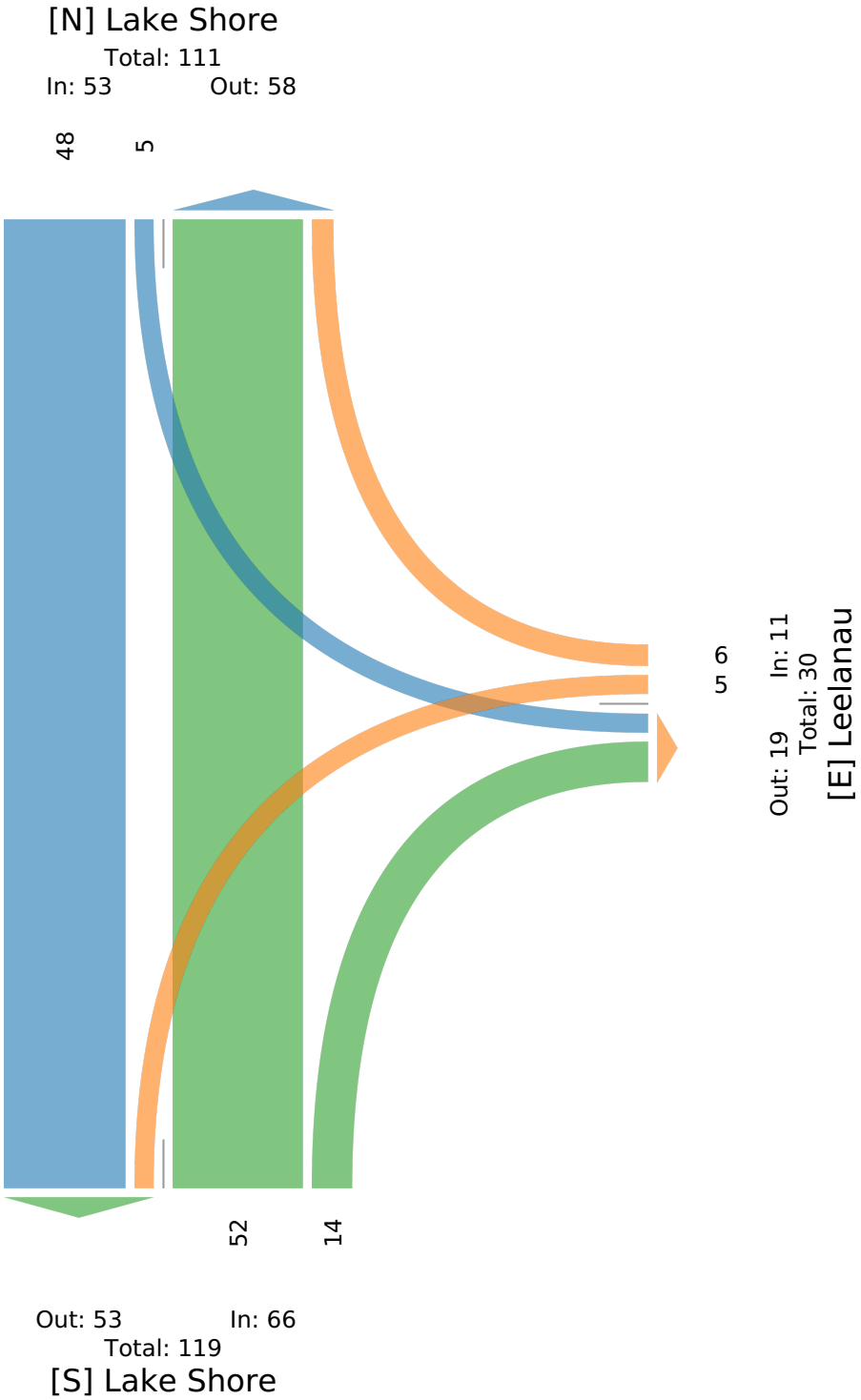
GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Leelanau				Lake Shore				Lake Shore				
Direction	Westbound				Northbound				Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-02 3:45PM	0	1	0	**1**	16	1	0	**17**	0	14	0	**14**	**32**
4:00PM	2	2	0	**4**	11	2	0	**13**	1	11	0	**12**	**29**
4:15PM	2	1	0	**3**	9	8	0	**17**	3	11	0	**14**	**34**
4:30PM	1	2	0	**3**	16	3	0	**19**	1	12	0	**13**	**35**
Total	5	6	0	**11**	52	14	0	**66**	5	48	0	**53**	**130**
% Approach	45.5%	54.5%	0%	**-**	78.8%	21.2%	0%	**-**	9.4%	90.6%	0%	**-**	-
% Total	3.8%	4.6%	0%	**8.5%**	40.0%	10.8%	0%	**50.8%**	3.8%	36.9%	0%	**40.8%**	-
PHF	0.625	0.750	-	**0.688**	0.813	0.438	-	**0.868**	0.417	0.857	-	**0.946**	0.929
Lights	5	6	0	**11**	52	14	0	**66**	4	47	0	**51**	128
% Lights	100%	100%	0%	**100%**	100%	100%	0%	**100%**	80.0%	97.9%	0%	**96.2%**	98.5%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	**0**	0	0	0	**0**	1	1	0	**2**	2
% Buses and Single-Unit Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	20.0%	2.1%	0%	**3.8%**	1.5%

*L: Left, R: Right, T: Thru, U: U-Turn

CR-643 at Leelanau Pines Dr - TMC
Fri Sep 2, 2022
PM Peak (3:45 PM - 4:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982501, Location: 44.869774, -85.734683

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR-643 at Leelanau Pines Dr - TMC

Mon Sep 5, 2022
Full Length (1 PM-3 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982497, Location: 44.869774, -85.734683

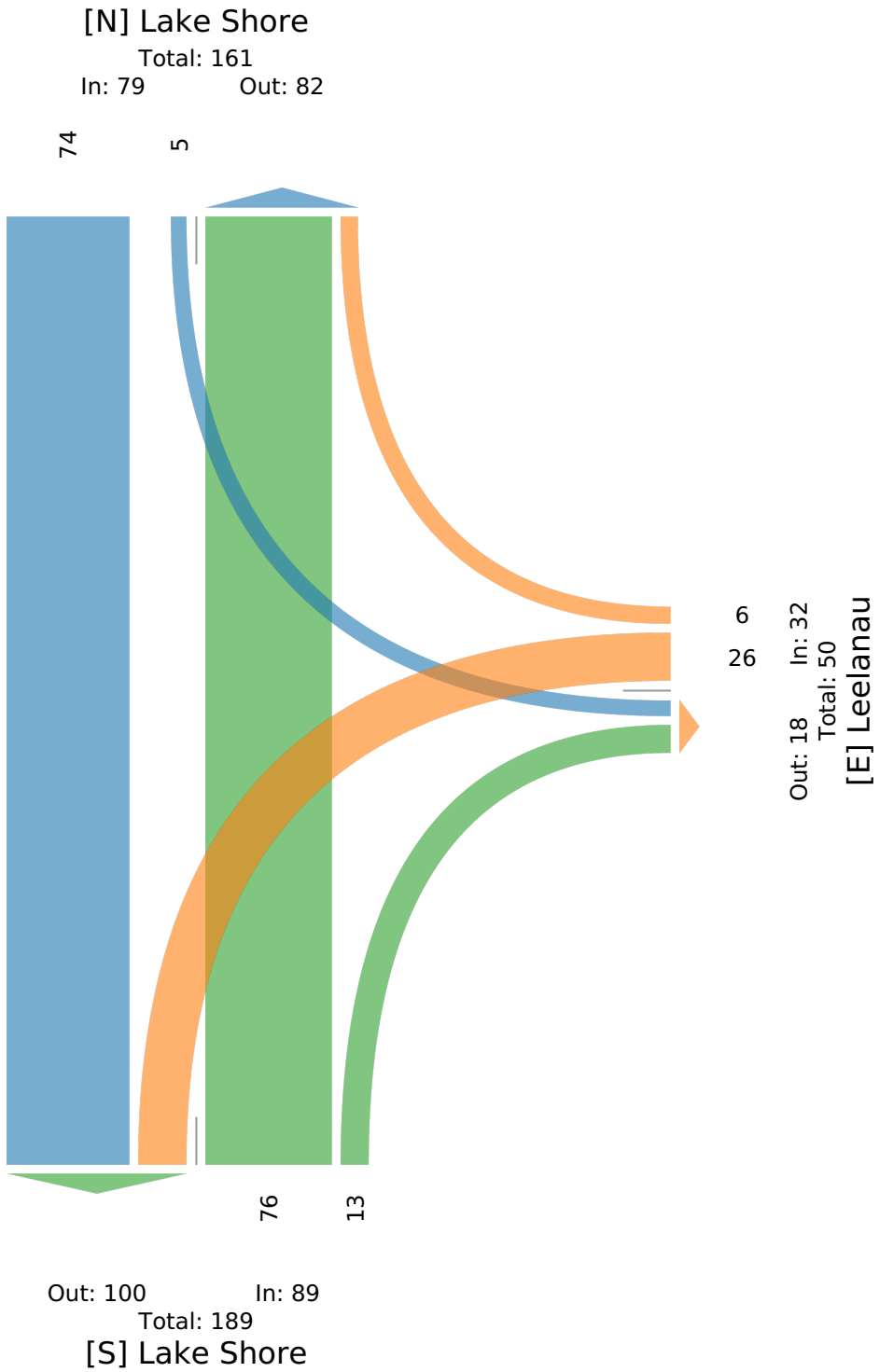
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Leelanau				Lake Shore				Lake Shore				
Direction	Westbound				Northbound				Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-05 1:00PM	5	2	0	**7**	8	1	0	**9**	0	10	0	**10**	**26**
1:15PM	6	1	0	**7**	16	2	0	**18**	0	14	0	**14**	**39**
1:30PM	3	0	0	**3**	8	2	0	**10**	1	11	0	**12**	**25**
1:45PM	2	1	0	**3**	10	2	0	**12**	0	11	0	**11**	**26**
Hourly Total	16	4	0	**20**	42	7	0	**49**	1	46	0	**47**	**116**
2:00PM	4	0	0	**4**	9	3	0	**12**	2	4	0	**6**	**22**
2:15PM	2	1	0	**3**	9	1	0	**10**	2	8	0	**10**	**23**
2:30PM	2	0	0	**2**	8	0	0	**8**	0	11	0	**11**	**21**
2:45PM	2	1	0	**3**	8	2	0	**10**	0	5	0	**5**	**18**
Hourly Total	10	2	0	**12**	34	6	0	**40**	4	28	0	**32**	**84**
Total	26	6	0	**32**	76	13	0	**89**	5	74	0	**79**	**200**
% Approach	81.3%	18.8%	0%	**-**	85.4%	14.6%	0%	**-**	6.3%	93.7%	0%	**-**	-
% Total	13.0%	3.0%	0%	**16.0%**	38.0%	6.5%	0%	**44.5%**	2.5%	37.0%	0%	**39.5%**	-
Lights	26	6	0	**32**	75	13	0	**88**	5	74	0	**79**	199
% Lights	100%	100%	0%	**100%**	98.7%	100%	0%	**98.9%**	100%	100%	0%	**100%**	99.5%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	**0**	1	0	0	**1**	0	0	0	**0**	1
% Buses and Single-Unit Trucks	0%	0%	0%	**0%**	1.3%	0%	0%	**1.1%**	0%	0%	0%	**0%**	0.5%

*L: Left, R: Right, T: Thru, U: U-Turn

CR-643 at Leelanau Pines Dr - TMC
Mon Sep 5, 2022
Full Length (1 PM-3 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982497, Location: 44.869774, -85.734683

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR-643 at Leelanau Pines Dr - TMC

Mon Sep 5, 2022
Midday Peak, PM Peak (1 PM - 2 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982497, Location: 44.869774, -85.734683

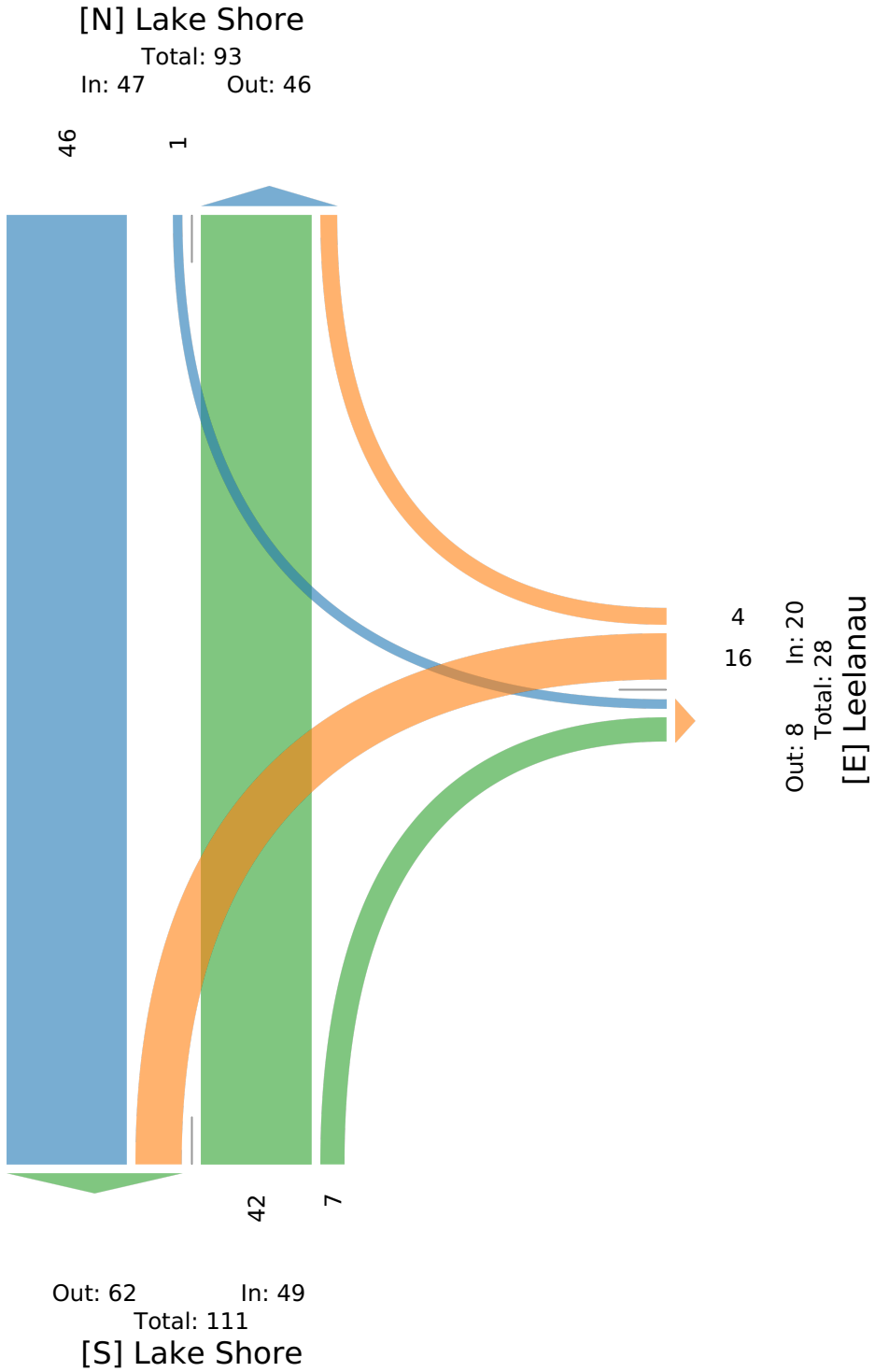
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Leelanau				Lake Shore				Lake Shore				
Direction	Westbound				Northbound				Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-05 1:00PM	5	2	0	**7**	8	1	0	**9**	0	10	0	**10**	**26**
1:15PM	6	1	0	**7**	16	2	0	**18**	0	14	0	**14**	**39**
1:30PM	3	0	0	**3**	8	2	0	**10**	1	11	0	**12**	**25**
1:45PM	2	1	0	**3**	10	2	0	**12**	0	11	0	**11**	**26**
Total	16	4	0	**20**	42	7	0	**49**	1	46	0	**47**	**116**
% Approach	80.0%	20.0%	0%	**-**	85.7%	14.3%	0%	**-**	2.1%	97.9%	0%	**-**	-
% Total	13.8%	3.4%	0%	**17.2%**	36.2%	6.0%	0%	**42.2%**	0.9%	39.7%	0%	**40.5%**	-
PHF	0.667	0.500	-	**0.714**	0.656	0.875	-	**0.681**	0.250	0.821	-	**0.839**	0.744
Lights	16	4	0	**20**	42	7	0	**49**	1	46	0	**47**	116
% Lights	100%	100%	0%	**100%**	100%	100%	0%	**100%**	100%	100%	0%	**100%**	100%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Buses and Single-Unit Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%

*L: Left, R: Right, T: Thru, U: U-Turn

CR-643 at Leelanau Pines Dr - TMC
Mon Sep 5, 2022
Midday Peak, PM Peak (1 PM - 2 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982497, Location: 44.869774, -85.734683

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR-643 at CR-645 - TMC

Fri Sep 2, 2022
Full Length (2 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982502, Location: 44.854828, -85.786677

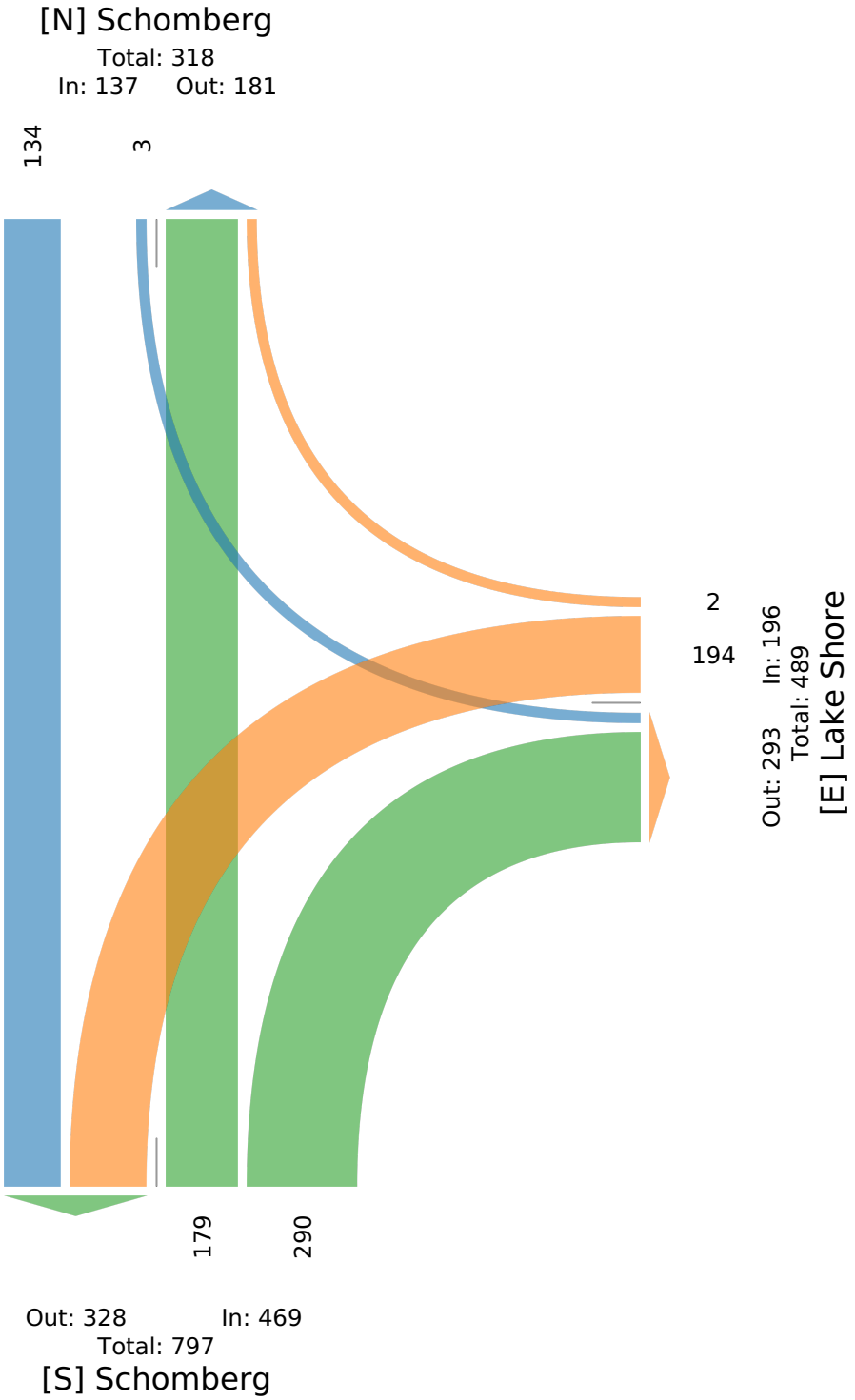
GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Lake Shore				Schomberg				Schomberg				
Direction	Westbound				Northbound				Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-02 2:00PM	12	0	0	**12**	10	14	0	**24**	0	12	0	**12**	**48**
2:15PM	15	0	0	**15**	10	18	0	**28**	1	1	0	**2**	**45**
2:30PM	12	0	0	**12**	10	24	0	**34**	0	7	0	**7**	**53**
2:45PM	14	1	0	**15**	6	13	0	**19**	0	7	0	**7**	**41**
Hourly Total	53	1	0	**54**	36	69	0	**105**	1	27	0	**28**	**187**
3:00PM	12	0	0	**12**	10	19	0	**29**	1	5	0	**6**	**47**
3:15PM	6	1	0	**7**	9	13	0	**22**	0	7	0	**7**	**36**
3:30PM	9	0	0	**9**	14	19	0	**33**	0	12	0	**12**	**54**
3:45PM	12	0	0	**12**	8	19	0	**27**	0	11	0	**11**	**50**
Hourly Total	39	1	0	**40**	41	70	0	**111**	1	35	0	**36**	**187**
4:00PM	14	0	0	**14**	13	16	0	**29**	0	13	0	**13**	**56**
4:15PM	13	0	0	**13**	9	19	0	**28**	0	9	0	**9**	**50**
4:30PM	11	0	0	**11**	17	22	0	**39**	1	8	0	**9**	**59**
4:45PM	11	0	0	**11**	13	15	0	**28**	0	7	0	**7**	**46**
Hourly Total	49	0	0	**49**	52	72	0	**124**	1	37	0	**38**	**211**
5:00PM	12	0	0	**12**	11	18	0	**29**	0	10	0	**10**	**51**
5:15PM	10	0	0	**10**	17	22	0	**39**	0	12	0	**12**	**61**
5:30PM	19	0	0	**19**	13	21	0	**34**	0	7	0	**7**	**60**
5:45PM	12	0	0	**12**	9	18	0	**27**	0	6	0	**6**	**45**
Hourly Total	53	0	0	**53**	50	79	0	**129**	0	35	0	**35**	**217**
Total	194	2	0	**196**	179	290	0	**469**	3	134	0	**137**	**802**
% Approach	99.0%	1.0%	0%	**-**	38.2%	61.8%	0%	**-**	2.2%	97.8%	0%	**-**	-
% Total	24.2%	0.2%	0%	**24.4%**	22.3%	36.2%	0%	**58.5%**	0.4%	16.7%	0%	**17.1%**	-
Lights	192	2	0	**194**	175	290	0	**465**	3	130	0	**133**	792
% Lights	99.0%	100%	0%	**99.0%**	97.8%	100%	0%	**99.1%**	100%	97.0%	0%	**97.1%**	98.8%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	2	0	0	**2**	4	0	0	**4**	0	4	0	**4**	10
% Buses and Single-Unit Trucks	1.0%	0%	0%	**1.0%**	2.2%	0%	0%	**0.9%**	0%	3.0%	0%	**2.9%**	1.2%

*L: Left, R: Right, T: Thru, U: U-Turn

CR-643 at CR-645 - TMC
Fri Sep 2, 2022
Full Length (2 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982502, Location: 44.854828, -85.786677

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR-643 at CR-645 - TMC

Fri Sep 2, 2022
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982502, Location: 44.854828, -85.786677

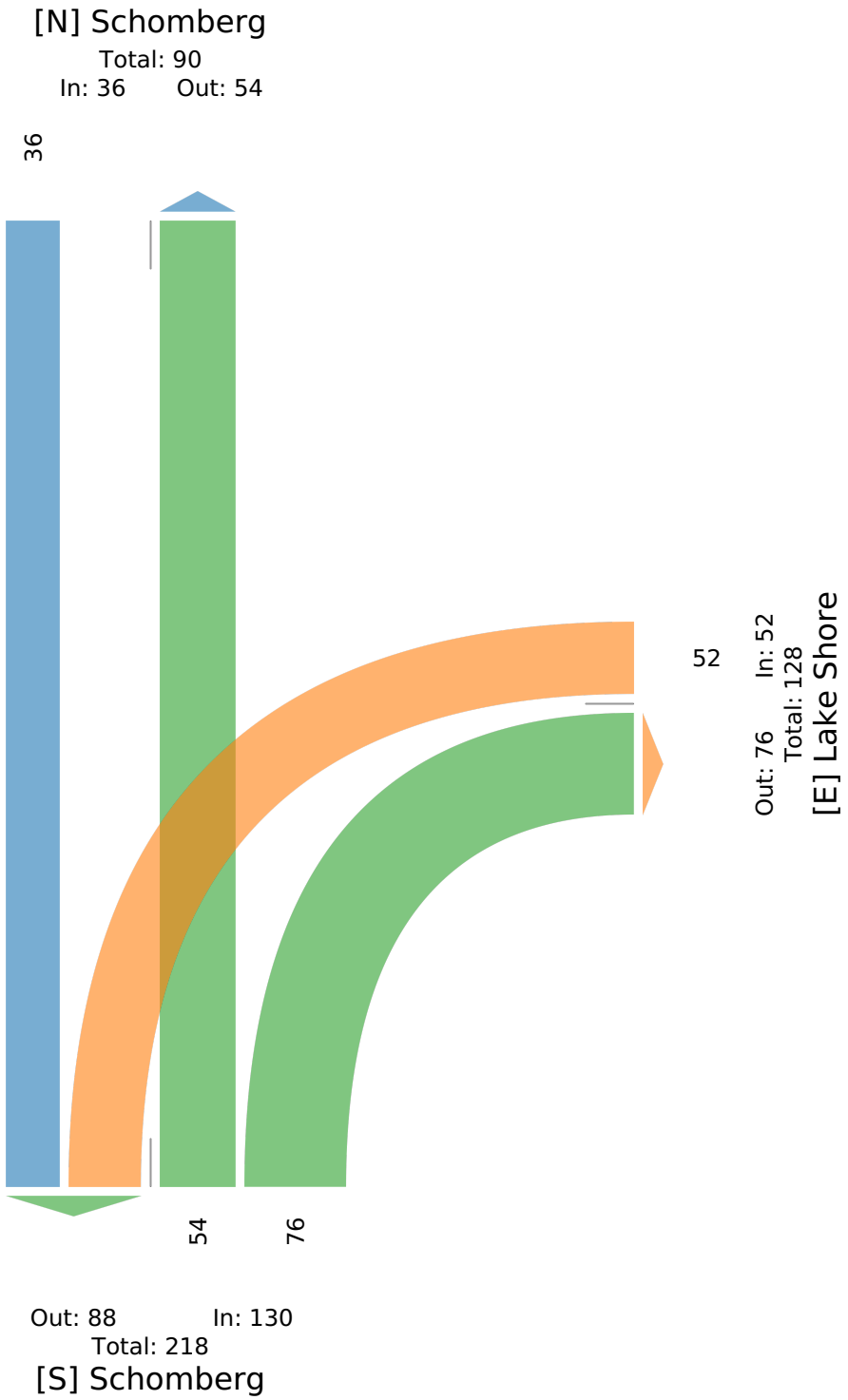
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Lake Shore				Schomberg				Schomberg				
Direction	Westbound				Northbound				Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-02 4:45PM	11	0	0	**11**	13	15	0	**28**	0	7	0	**7**	**46**
5:00PM	12	0	0	**12**	11	18	0	**29**	0	10	0	**10**	**51**
5:15PM	10	0	0	**10**	17	22	0	**39**	0	12	0	**12**	**61**
5:30PM	19	0	0	**19**	13	21	0	**34**	0	7	0	**7**	**60**
Total	52	0	0	**52**	54	76	0	**130**	0	36	0	**36**	**218**
% Approach	100%	0%	0%	**-**	41.5%	58.5%	0%	**-**	0%	100%	0%	**-**	-
% Total	23.9%	0%	0%	**23.9%**	24.8%	34.9%	0%	**59.6%**	0%	16.5%	0%	**16.5%**	-
PHF	0.684	-	-	**0.684**	0.794	0.864	-	**0.833**	-	0.750	-	**0.750**	0.893
Lights	52	0	0	**52**	52	76	0	**128**	0	33	0	**33**	213
% Lights	100%	0%	0%	**100%**	96.3%	100%	0%	**98.5%**	0%	91.7%	0%	**91.7%**	97.7%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	**0**	2	0	0	**2**	0	3	0	**3**	5
% Buses and Single-Unit Trucks	0%	0%	0%	**0%**	3.7%	0%	0%	**1.5%**	0%	8.3%	0%	**8.3%**	2.3%

*L: Left, R: Right, T: Thru, U: U-Turn

CR-643 at CR-645 - TMC
Fri Sep 2, 2022
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982502, Location: 44.854828, -85.786677

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR-643 at CR-645 - TMC

Mon Sep 5, 2022
Full Length (1 PM-3 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982498, Location: 44.854828, -85.786677

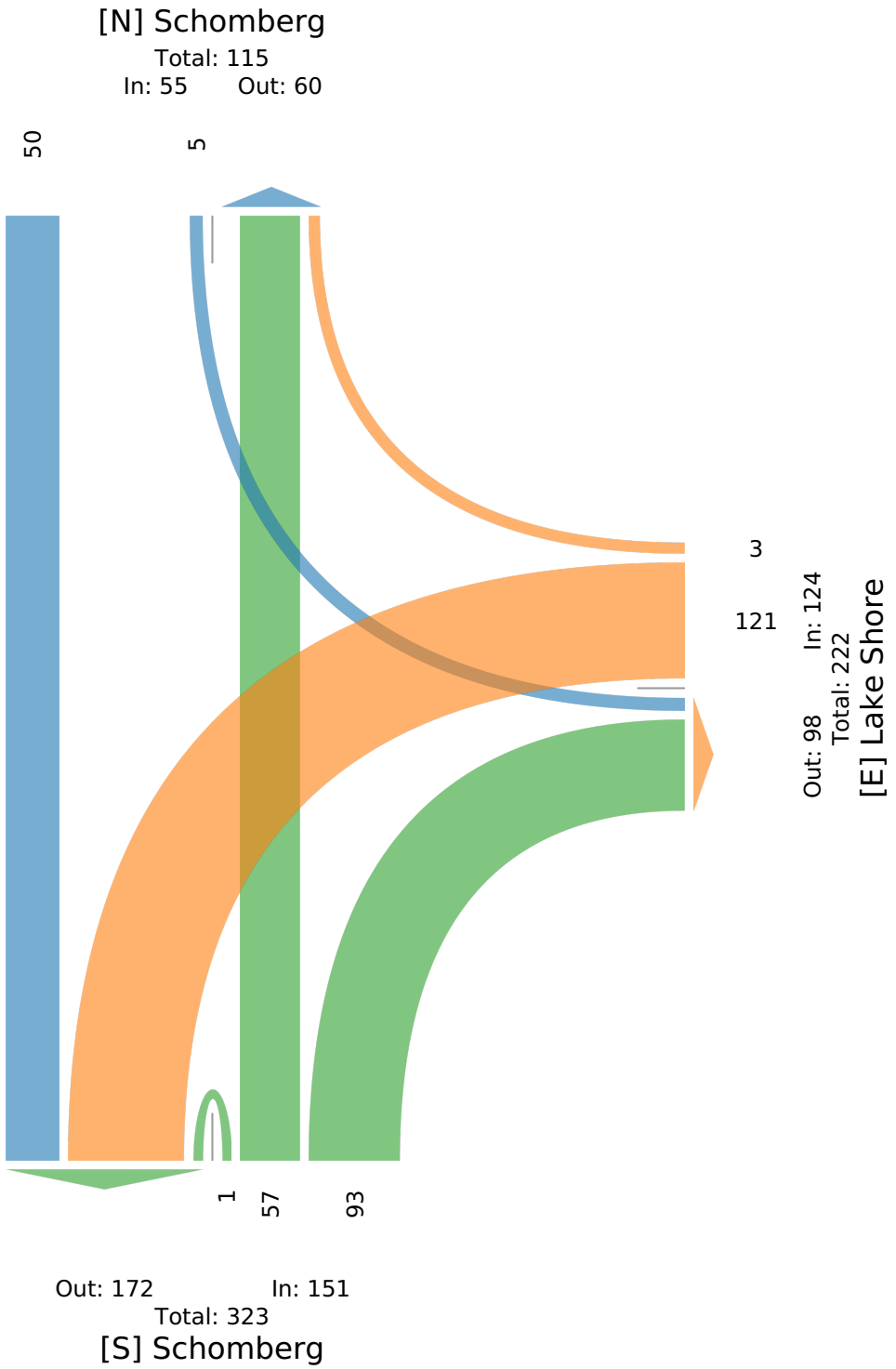
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Lake Shore				Schomberg				Schomberg				
Direction	Westbound				Northbound				Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-05 1:00PM	19	0	0	**19**	6	8	0	**14**	1	5	0	**6**	**39**
1:15PM	17	1	0	**18**	3	12	0	**15**	3	7	0	**10**	**43**
1:30PM	18	1	0	**19**	8	13	0	**21**	0	5	0	**5**	**45**
1:45PM	18	0	0	**18**	8	12	0	**20**	0	5	0	**5**	**43**
Hourly Total	72	2	0	**74**	25	45	0	**70**	4	22	0	**26**	**170**
2:00PM	13	0	0	**13**	9	15	0	**24**	0	7	0	**7**	**44**
2:15PM	11	0	0	**11**	11	10	0	**21**	0	7	0	**7**	**39**
2:30PM	16	0	0	**16**	5	12	0	**17**	0	6	0	**6**	**39**
2:45PM	9	1	0	**10**	7	11	1	**19**	1	8	0	**9**	**38**
Hourly Total	49	1	0	**50**	32	48	1	**81**	1	28	0	**29**	**160**
Total	121	3	0	**124**	57	93	1	**151**	5	50	0	**55**	**330**
% Approach	97.6%	2.4%	0%	**-**	37.7%	61.6%	0.7%	**-**	9.1%	90.9%	0%	**-**	-
% Total	36.7%	0.9%	0%	**37.6%**	17.3%	28.2%	0.3%	**45.8%**	1.5%	15.2%	0%	**16.7%**	-
Lights	121	3	0	**124**	57	91	1	**149**	5	49	0	**54**	327
% Lights	100%	100%	0%	**100%**	100%	97.8%	100%	**98.7%**	100%	98.0%	0%	**98.2%**	99.1%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	**0**	0	2	0	**2**	0	1	0	**1**	3
% Buses and Single-Unit Trucks	0%	0%	0%	**0%**	0%	2.2%	0%	**1.3%**	0%	2.0%	0%	**1.8%**	0.9%

*L: Left, R: Right, T: Thru, U: U-Turn

CR-643 at CR-645 - TMC
Mon Sep 5, 2022
Full Length (1 PM-3 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982498, Location: 44.854828, -85.786677

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR-643 at CR-645 - TMC

Mon Sep 5, 2022
Midday Peak (1 PM - 2 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982498, Location: 44.854828, -85.786677

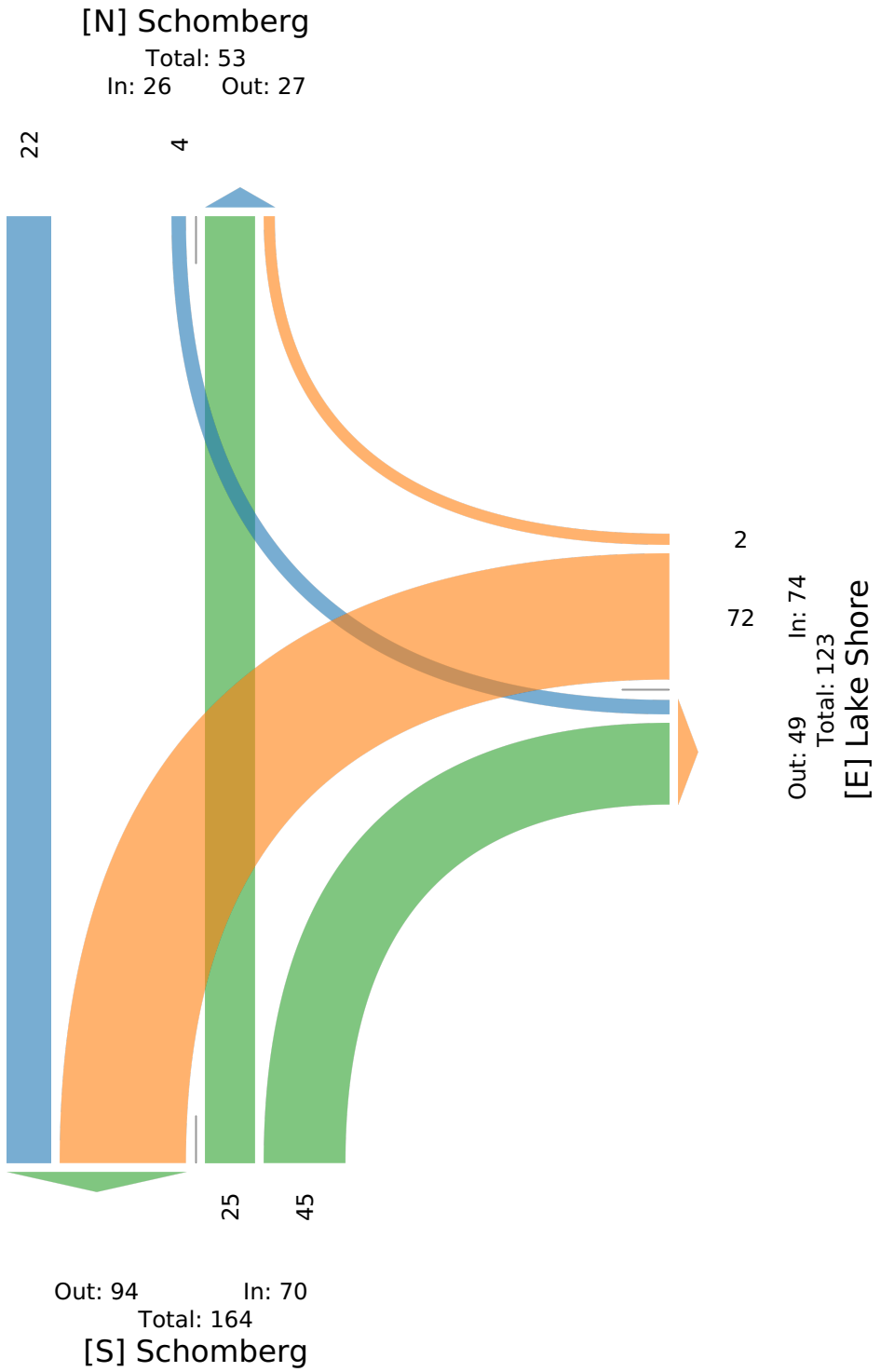
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Lake Shore Westbound				Schomberg Northbound				Schomberg Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-05 1:00PM	19	0	0	**19**	6	8	0	**14**	1	5	0	**6**	**39**
1:15PM	17	1	0	**18**	3	12	0	**15**	3	7	0	**10**	**43**
1:30PM	18	1	0	**19**	8	13	0	**21**	0	5	0	**5**	**45**
1:45PM	18	0	0	**18**	8	12	0	**20**	0	5	0	**5**	**43**
Total	72	2	0	**74**	25	45	0	**70**	4	22	0	**26**	**170**
% Approach	97.3%	2.7%	0%	**-**	35.7%	64.3%	0%	**-**	15.4%	84.6%	0%	**-**	-
% Total	42.4%	1.2%	0%	**43.5%**	14.7%	26.5%	0%	**41.2%**	2.4%	12.9%	0%	**15.3%**	-
PHF	0.947	0.500	-	**0.974**	0.781	0.865	-	**0.833**	0.333	0.786	-	**0.650**	0.944
Lights	72	2	0	**74**	25	44	0	**69**	4	21	0	**25**	168
% Lights	100%	100%	0%	**100%**	100%	97.8%	0%	**98.6%**	100%	95.5%	0%	**96.2%**	98.8%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	**0**	0	1	0	**1**	0	1	0	**1**	2
% Buses and Single-Unit Trucks	0%	0%	0%	**0%**	0%	2.2%	0%	**1.4%**	0%	4.5%	0%	**3.8%**	1.2%

*L: Left, R: Right, T: Thru, U: U-Turn

CR-643 at CR-645 - TMC
Mon Sep 5, 2022
Midday Peak (1 PM - 2 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982498, Location: 44.854828, -85.786677

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR-643 at CR-645 - TMC

Mon Sep 5, 2022
PM Peak (1:15 PM - 2:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982498, Location: 44.854828, -85.786677

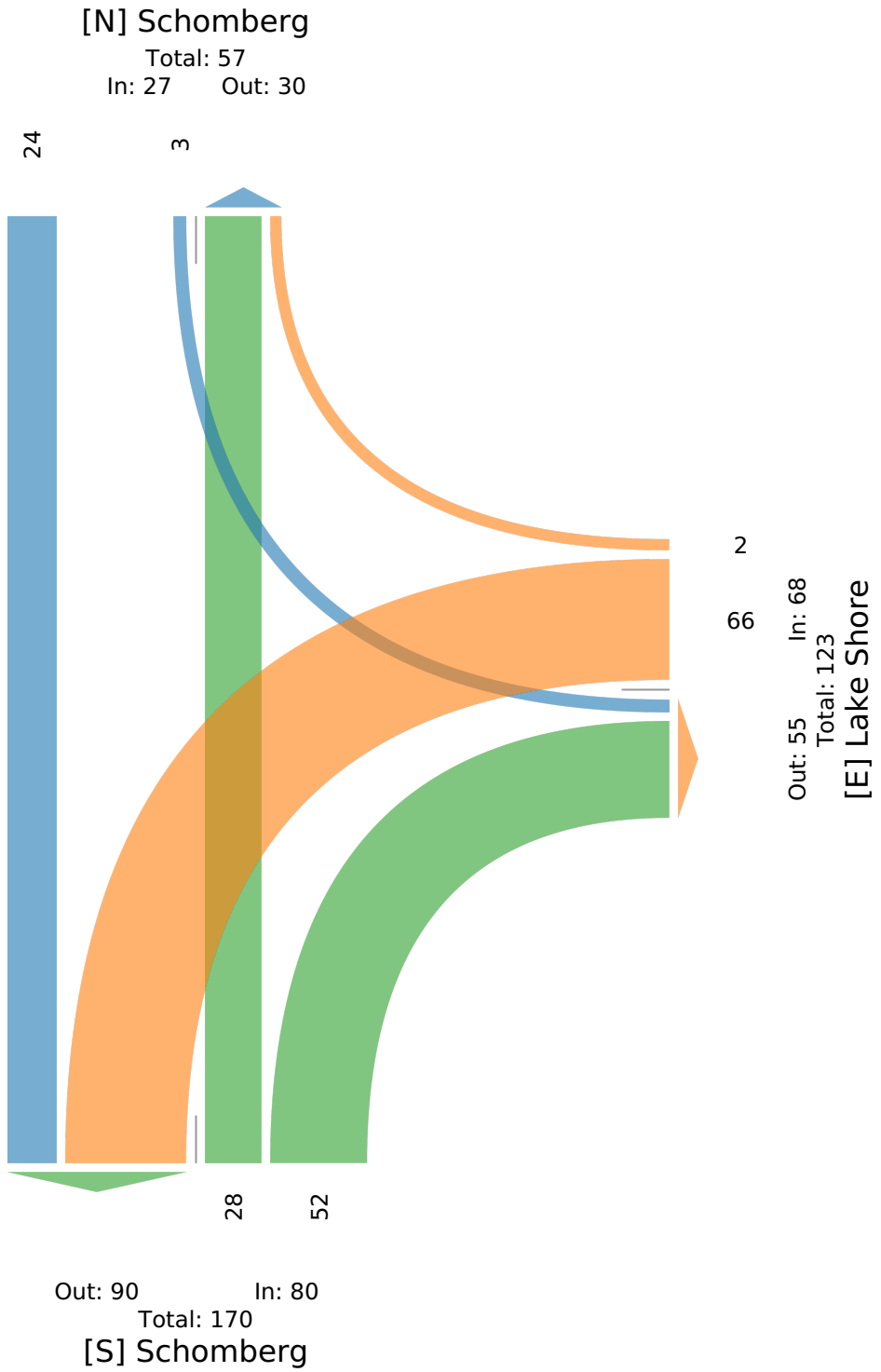
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Lake Shore				Schomberg				Schomberg				
Direction	Westbound				Northbound				Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-05 1:15PM	17	1	0	**18**	3	12	0	**15**	3	7	0	**10**	**43**
1:30PM	18	1	0	**19**	8	13	0	**21**	0	5	0	**5**	**45**
1:45PM	18	0	0	**18**	8	12	0	**20**	0	5	0	**5**	**43**
2:00PM	13	0	0	**13**	9	15	0	**24**	0	7	0	**7**	**44**
Total	66	2	0	**68**	28	52	0	**80**	3	24	0	**27**	**175**
% Approach	97.1%	2.9%	0%	**-**	35.0%	65.0%	0%	**-**	11.1%	88.9%	0%	**-**	-
% Total	37.7%	1.1%	0%	**38.9%**	16.0%	29.7%	0%	**45.7%**	1.7%	13.7%	0%	**15.4%**	-
PHF	0.917	0.500	-	**0.895**	0.778	0.867	-	**0.833**	0.250	0.857	-	**0.675**	0.972
Lights	66	2	0	**68**	28	50	0	**78**	3	23	0	**26**	172
% Lights	100%	100%	0%	**100%**	100%	96.2%	0%	**97.5%**	100%	95.8%	0%	**96.3%**	98.3%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	**0**	0	2	0	**2**	0	1	0	**1**	3
% Buses and Single-Unit Trucks	0%	0%	0%	**0%**	0%	3.8%	0%	**2.5%**	0%	4.2%	0%	**3.7%**	1.7%

*L: Left, R: Right, T: Thru, U: U-Turn

CR-643 at CR-645 - TMC
Mon Sep 5, 2022
PM Peak (1:15 PM - 2:15 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982498, Location: 44.854828, -85.786677

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR645- at Kasson/Good Harbor Trail - TMC

Fri Sep 2, 2022
Full Length (2 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982503, Location: 44.852147, -85.79263

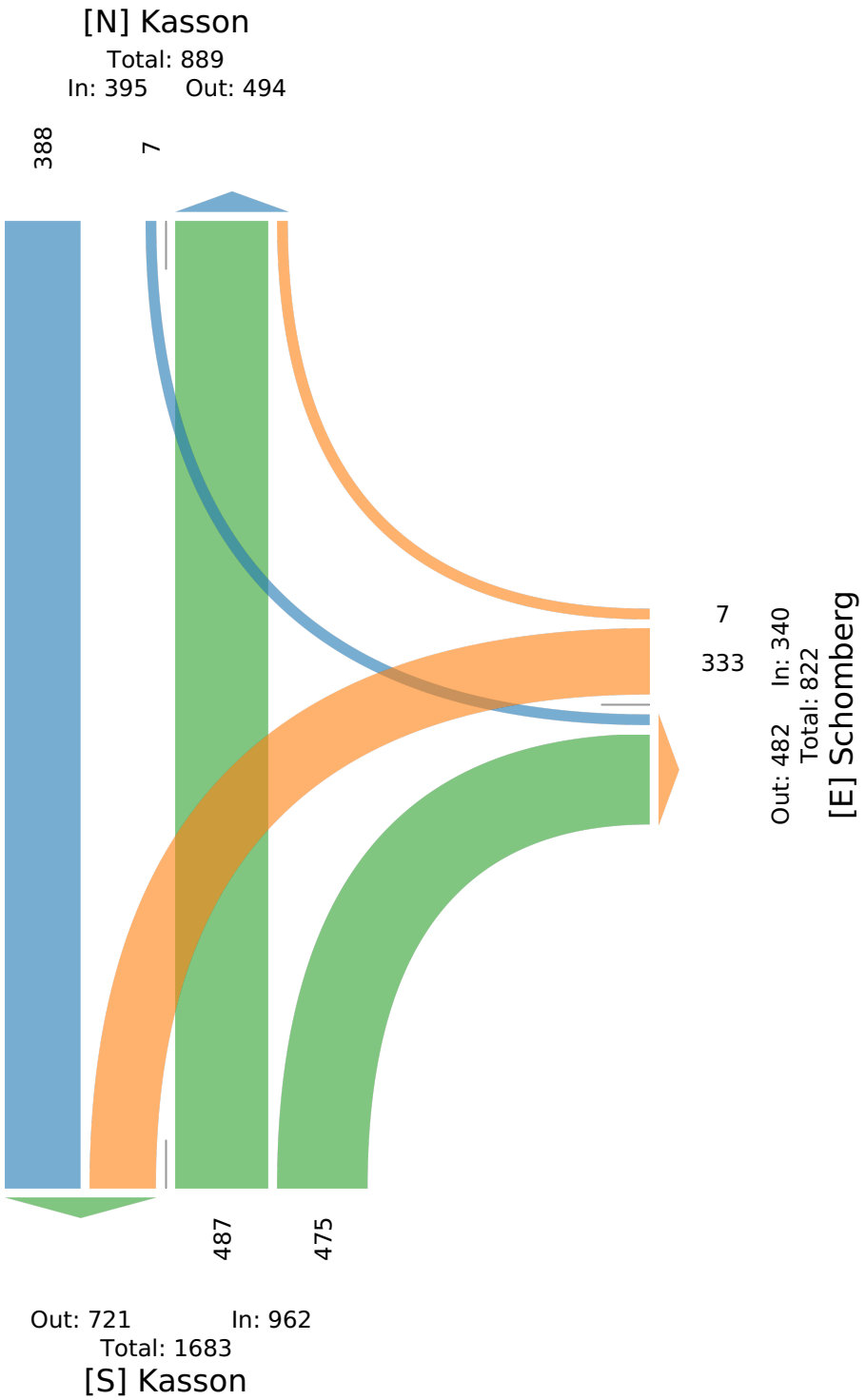
GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg / Direction	Schomberg Westbound				Kasson Northbound				Kasson Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-02 2:00PM	28	0	0	**28**	43	24	0	**67**	1	19	0	**20**	**115**
2:15PM	17	0	0	**17**	24	28	0	**52**	1	19	0	**20**	**89**
2:30PM	20	0	0	**20**	33	37	0	**70**	1	25	0	**26**	**116**
2:45PM	21	1	0	**22**	27	16	0	**43**	0	30	0	**30**	**95**
Hourly Total	86	1	0	**87**	127	105	0	**232**	3	93	0	**96**	**415**
3:00PM	18	0	0	**18**	32	30	0	**62**	2	18	0	**20**	**100**
3:15PM	13	0	0	**13**	38	23	0	**61**	0	23	0	**23**	**97**
3:30PM	22	0	0	**22**	27	34	0	**61**	1	26	0	**27**	**110**
3:45PM	23	1	0	**24**	32	27	0	**59**	0	21	0	**21**	**104**
Hourly Total	76	1	0	**77**	129	114	0	**243**	3	88	0	**91**	**411**
4:00PM	26	1	0	**27**	30	28	0	**58**	0	28	0	**28**	**113**
4:15PM	22	0	0	**22**	38	29	0	**67**	0	34	0	**34**	**123**
4:30PM	19	0	0	**19**	32	42	0	**74**	0	27	0	**27**	**120**
4:45PM	19	1	0	**20**	20	27	0	**47**	0	29	0	**29**	**96**
Hourly Total	86	2	0	**88**	120	126	0	**246**	0	118	0	**118**	**452**
5:00PM	19	1	0	**20**	32	29	0	**61**	1	18	0	**19**	**100**
5:15PM	21	1	0	**22**	26	39	0	**65**	0	25	0	**25**	**112**
5:30PM	27	1	0	**28**	29	36	0	**65**	0	22	0	**22**	**115**
5:45PM	18	0	0	**18**	24	26	0	**50**	0	24	0	**24**	**92**
Hourly Total	85	3	0	**88**	111	130	0	**241**	1	89	0	**90**	**419**
Total	333	7	0	**340**	487	475	0	**962**	7	388	0	**395**	**1697**
% Approach	97.9%	2.1%	0%	**-**	50.6%	49.4%	0%	**-**	1.8%	98.2%	0%	**-**	-
% Total	19.6%	0.4%	0%	**20.0%**	28.7%	28.0%	0%	**56.7%**	0.4%	22.9%	0%	**23.3%**	-
Lights	328	6	0	**334**	485	467	0	**952**	7	381	0	**388**	1674
% Lights	98.5%	85.7%	0%	**98.2%**	99.6%	98.3%	0%	**99.0%**	100%	98.2%	0%	**98.2%**	98.6%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	5	1	0	**6**	2	8	0	**10**	0	7	0	**7**	23
% Buses and Single-Unit Trucks	1.5%	14.3%	0%	**1.8%**	0.4%	1.7%	0%	**1.0%**	0%	1.8%	0%	**1.8%**	1.4%

*L: Left, R: Right, T: Thru, U: U-Turn

CR645- at Kasson/Good Harbor Trail - TMC
Fri Sep 2, 2022
Full Length (2 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982503, Location: 44.852147, -85.79263

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR645- at Kasson/Good Harbor Trail - TMC

Fri Sep 2, 2022
PM Peak (3:45 PM - 4:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982503, Location: 44.852147, -85.79263

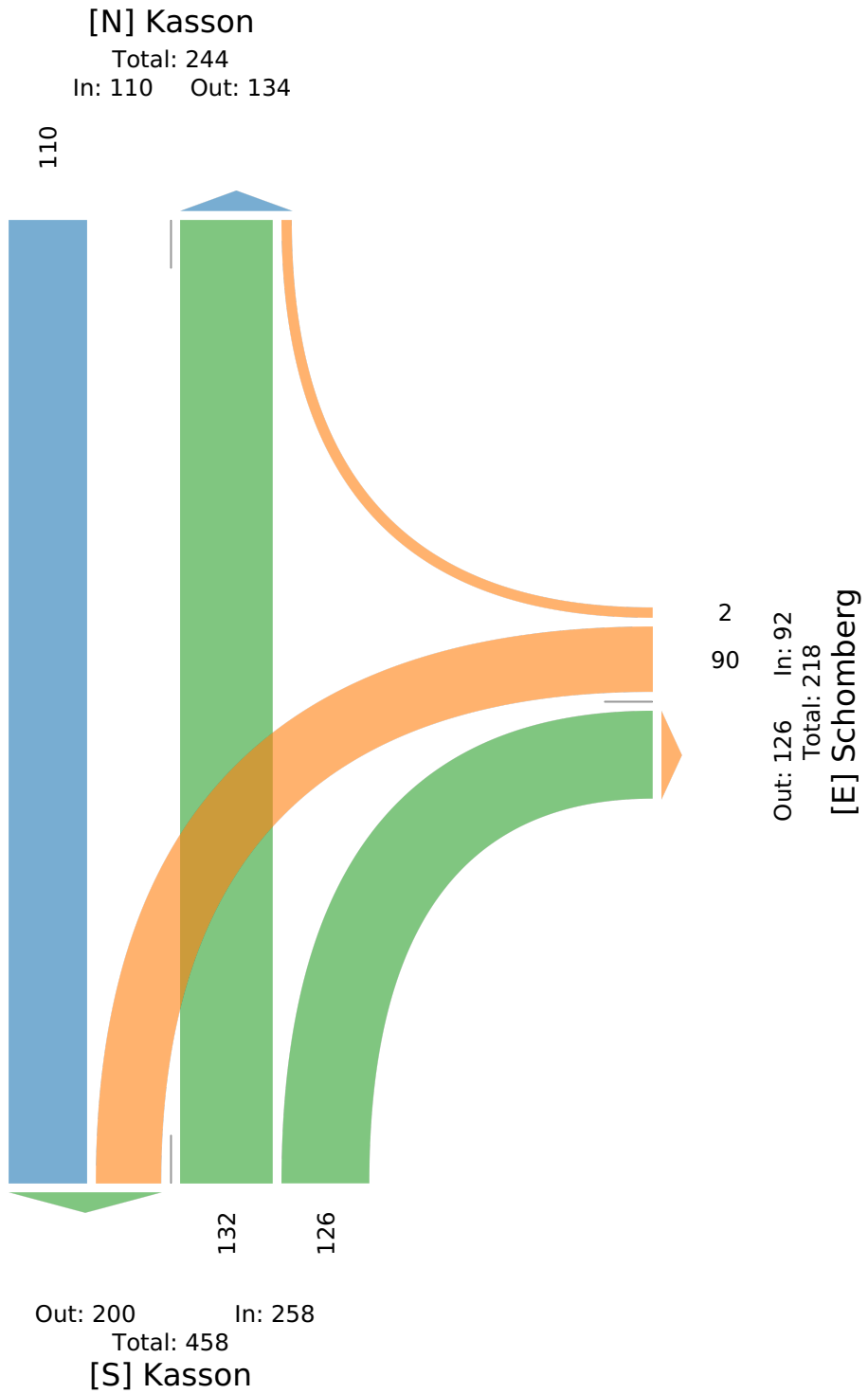
GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Schomberg				Kasson				Kasson				
Direction	Westbound				Northbound				Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-02 3:45PM	23	1	0	**24**	32	27	0	**59**	0	21	0	**21**	**104**
4:00PM	26	1	0	**27**	30	28	0	**58**	0	28	0	**28**	**113**
4:15PM	22	0	0	**22**	38	29	0	**67**	0	34	0	**34**	**123**
4:30PM	19	0	0	**19**	32	42	0	**74**	0	27	0	**27**	**120**
Total	90	2	0	**92**	132	126	0	**258**	0	110	0	**110**	**460**
% Approach	97.8%	2.2%	0%	**-**	51.2%	48.8%	0%	**-**	0%	100%	0%	**-**	-
% Total	19.6%	0.4%	0%	**20.0%**	28.7%	27.4%	0%	**56.1%**	0%	23.9%	0%	**23.9%**	-
PHF	0.865	0.500	-	**0.852**	0.868	0.750	-	**0.872**	-	0.809	-	**0.809**	0.935
Lights	89	2	0	**91**	130	125	0	**255**	0	105	0	**105**	451
% Lights	98.9%	100%	0%	**98.9%**	98.5%	99.2%	0%	**98.8%**	0%	95.5%	0%	**95.5%**	98.0%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	1	0	0	**1**	2	1	0	**3**	0	5	0	**5**	9
% Buses and Single-Unit Trucks	1.1%	0%	0%	**1.1%**	1.5%	0.8%	0%	**1.2%**	0%	4.5%	0%	**4.5%**	2.0%

*L: Left, R: Right, T: Thru, U: U-Turn

CR645- at Kasson/Good Harbor Trail - TMC
Fri Sep 2, 2022
PM Peak (3:45 PM - 4:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982503, Location: 44.852147, -85.79263

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR645- at Kasson/Good Harbor Trail - TMC

Mon Sep 5, 2022
Full Length (1 PM-3 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982499, Location: 44.852147, -85.79263

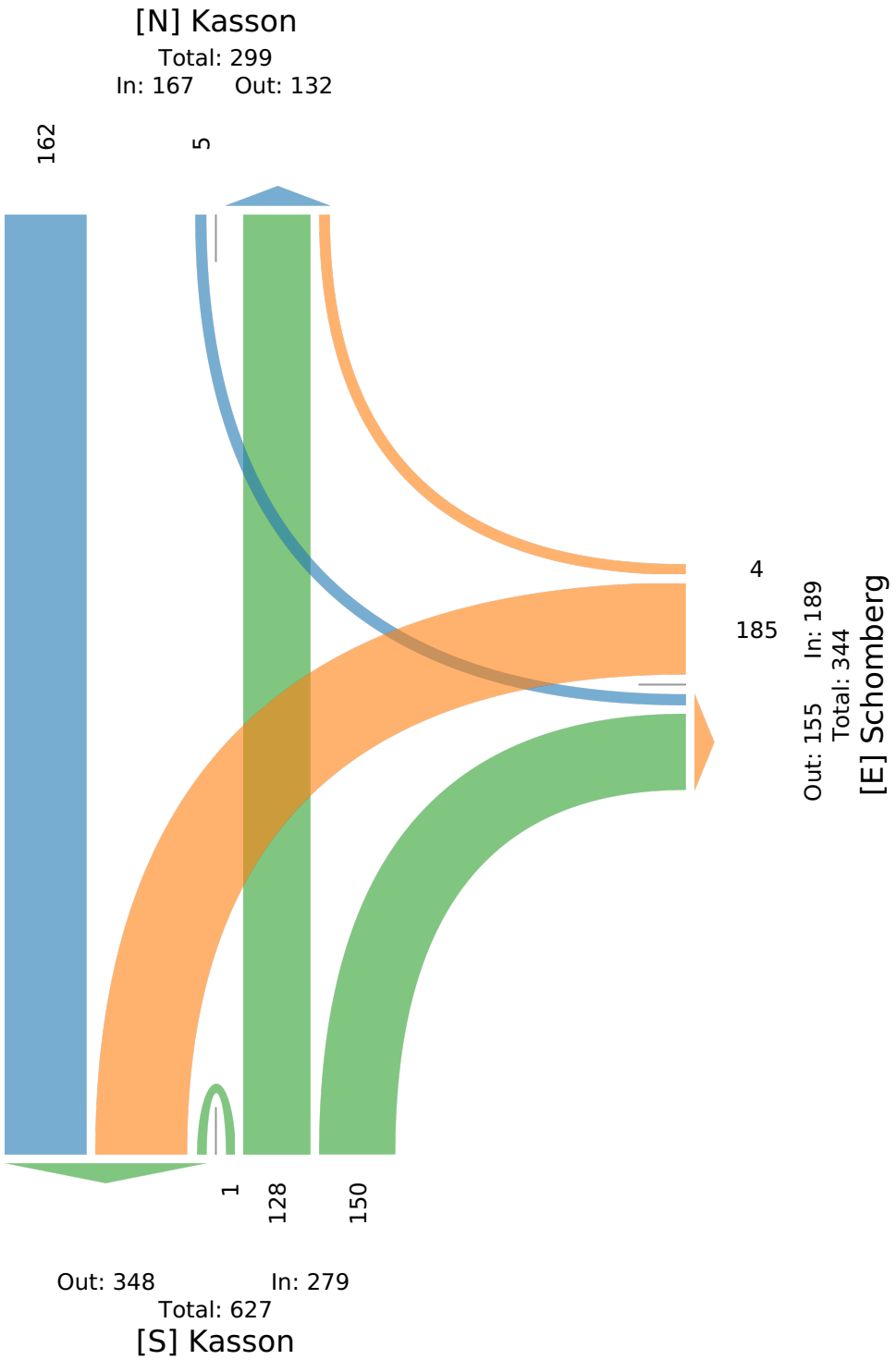
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Schomberg				Kasson				Kasson				
Direction	Westbound				Northbound				Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-05 1:00PM	25	0	0	**25**	16	13	0	**29**	0	13	0	**13**	**67**
1:15PM	24	1	0	**25**	13	17	0	**30**	0	14	0	**14**	**69**
1:30PM	26	0	0	**26**	9	19	1	**29**	1	16	0	**17**	**72**
1:45PM	24	1	0	**25**	13	18	0	**31**	1	18	0	**19**	**75**
Hourly Total	99	2	0	**101**	51	67	1	**119**	2	61	0	**63**	**283**
2:00PM	21	0	0	**21**	21	26	0	**47**	0	18	0	**18**	**86**
2:15PM	21	1	0	**22**	17	21	0	**38**	1	30	0	**31**	**91**
2:30PM	22	0	0	**22**	20	17	0	**37**	1	22	0	**23**	**82**
2:45PM	22	1	0	**23**	19	19	0	**38**	1	31	0	**32**	**93**
Hourly Total	86	2	0	**88**	77	83	0	**160**	3	101	0	**104**	**352**
Total	185	4	0	**189**	128	150	1	**279**	5	162	0	**167**	**635**
% Approach	97.9%	2.1%	0%	**-**	45.9%	53.8%	0.4%	**-**	3.0%	97.0%	0%	**-**	-
% Total	29.1%	0.6%	0%	**29.8%**	20.2%	23.6%	0.2%	**43.9%**	0.8%	25.5%	0%	**26.3%**	-
Lights	184	4	0	**188**	126	148	1	**275**	5	161	0	**166**	629
% Lights	99.5%	100%	0%	**99.5%**	98.4%	98.7%	100%	**98.6%**	100%	99.4%	0%	**99.4%**	99.1%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	1	0	0	**1**	2	2	0	**4**	0	1	0	**1**	6
% Buses and Single-Unit Trucks	0.5%	0%	0%	**0.5%**	1.6%	1.3%	0%	**1.4%**	0%	0.6%	0%	**0.6%**	0.9%

*L: Left, R: Right, T: Thru, U: U-Turn

CR645- at Kasson/Good Harbor Trail - TMC
Mon Sep 5, 2022
Full Length (1 PM-3 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982499, Location: 44.852147, -85.79263

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR645- at Kasson/Good Harbor Trail - TMC

Mon Sep 5, 2022
Midday Peak (1 PM - 2 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982499, Location: 44.852147, -85.79263

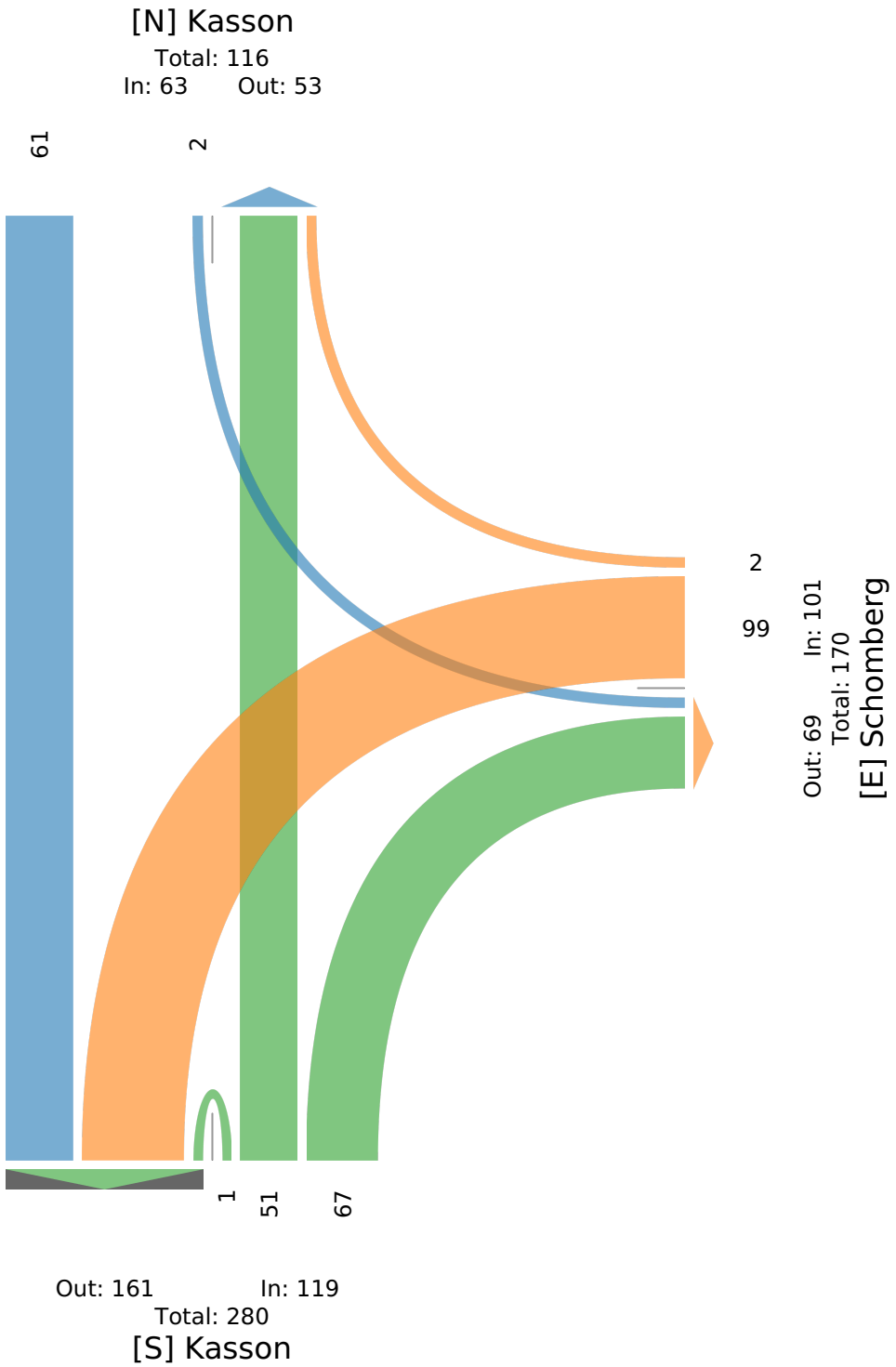
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Schomberg Westbound				Kasson Northbound				Kasson Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-05 1:00PM	25	0	0	**25**	16	13	0	**29**	0	13	0	**13**	**67**
1:15PM	24	1	0	**25**	13	17	0	**30**	0	14	0	**14**	**69**
1:30PM	26	0	0	**26**	9	19	1	**29**	1	16	0	**17**	**72**
1:45PM	24	1	0	**25**	13	18	0	**31**	1	18	0	**19**	**75**
Total	99	2	0	**101**	51	67	1	**119**	2	61	0	**63**	**283**
% Approach	98.0%	2.0%	0%	**-**	42.9%	56.3%	0.8%	**-**	3.2%	96.8%	0%	**-**	-
% Total	35.0%	0.7%	0%	**35.7%**	18.0%	23.7%	0.4%	**42.0%**	0.7%	21.6%	0%	**22.3%**	-
PHF	0.952	0.500	-	**0.971**	0.797	0.882	0.250	**0.960**	0.500	0.847	-	**0.829**	0.943
Lights	98	2	0	**100**	50	66	1	**117**	2	60	0	**62**	279
% Lights	99.0%	100%	0%	**99.0%**	98.0%	98.5%	100%	**98.3%**	100%	98.4%	0%	**98.4%**	98.6%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	1	0	0	**1**	1	1	0	**2**	0	1	0	**1**	4
% Buses and Single-Unit Trucks	1.0%	0%	0%	**1.0%**	2.0%	1.5%	0%	**1.7%**	0%	1.6%	0%	**1.6%**	1.4%

*L: Left, R: Right, T: Thru, U: U-Turn

CR645- at Kasson/Good Harbor Trail - TMC
Mon Sep 5, 2022
Midday Peak (1 PM - 2 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982499, Location: 44.852147, -85.79263

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



CR645- at Kasson/Good Harbor Trail - TMC

Mon Sep 5, 2022
PM Peak (2 PM - 3 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982499, Location: 44.852147, -85.79263

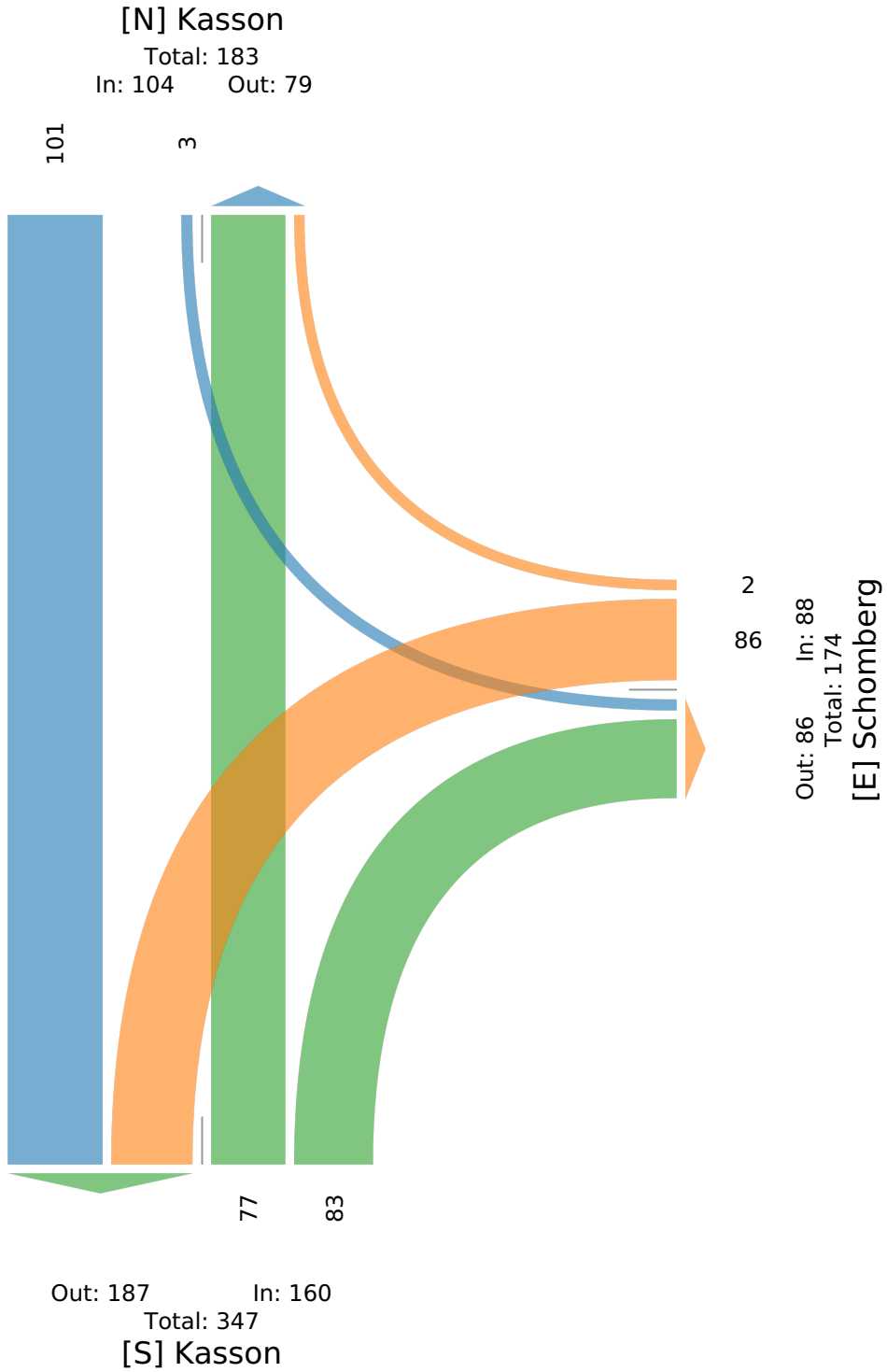
GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	Schomberg Westbound				Kasson Northbound				Kasson Southbound				
Time	L	R	U	**App**	T	R	U	**App**	L	T	U	**App**	**Int**
2022-09-05 2:00PM	21	0	0	**21**	21	26	0	**47**	0	18	0	**18**	**86**
2:15PM	21	1	0	**22**	17	21	0	**38**	1	30	0	**31**	**91**
2:30PM	22	0	0	**22**	20	17	0	**37**	1	22	0	**23**	**82**
2:45PM	22	1	0	**23**	19	19	0	**38**	1	31	0	**32**	**93**
Total	86	2	0	**88**	77	83	0	**160**	3	101	0	**104**	**352**
% Approach	97.7%	2.3%	0%	**-**	48.1%	51.9%	0%	**-**	2.9%	97.1%	0%	**-**	-
% Total	24.4%	0.6%	0%	**25.0%**	21.9%	23.6%	0%	**45.5%**	0.9%	28.7%	0%	**29.5%**	-
PHF	0.977	0.500	-	**0.957**	0.917	0.798	-	**0.851**	0.750	0.815	-	**0.813**	0.946
Lights	86	2	0	**88**	76	82	0	**158**	3	101	0	**104**	350
% Lights	100%	100%	0%	**100%**	98.7%	98.8%	0%	**98.8%**	100%	100%	0%	**100%**	99.4%
Articulated Trucks	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	**0**	1	1	0	**2**	0	0	0	**0**	2
% Buses and Single-Unit Trucks	0%	0%	0%	**0%**	1.3%	1.2%	0%	**1.3%**	0%	0%	0%	**0%**	0.6%

*L: Left, R: Right, T: Thru, U: U-Turn

CR645- at Kasson/Good Harbor Trail - TMC
Mon Sep 5, 2022
PM Peak (2 PM - 3 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982499, Location: 44.852147, -85.79263

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Cedar Road at Bellinger/Sullivan - TMC

Fri Sep 2, 2022
Full Length (2 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982504, Location: 44.847421, -85.795062

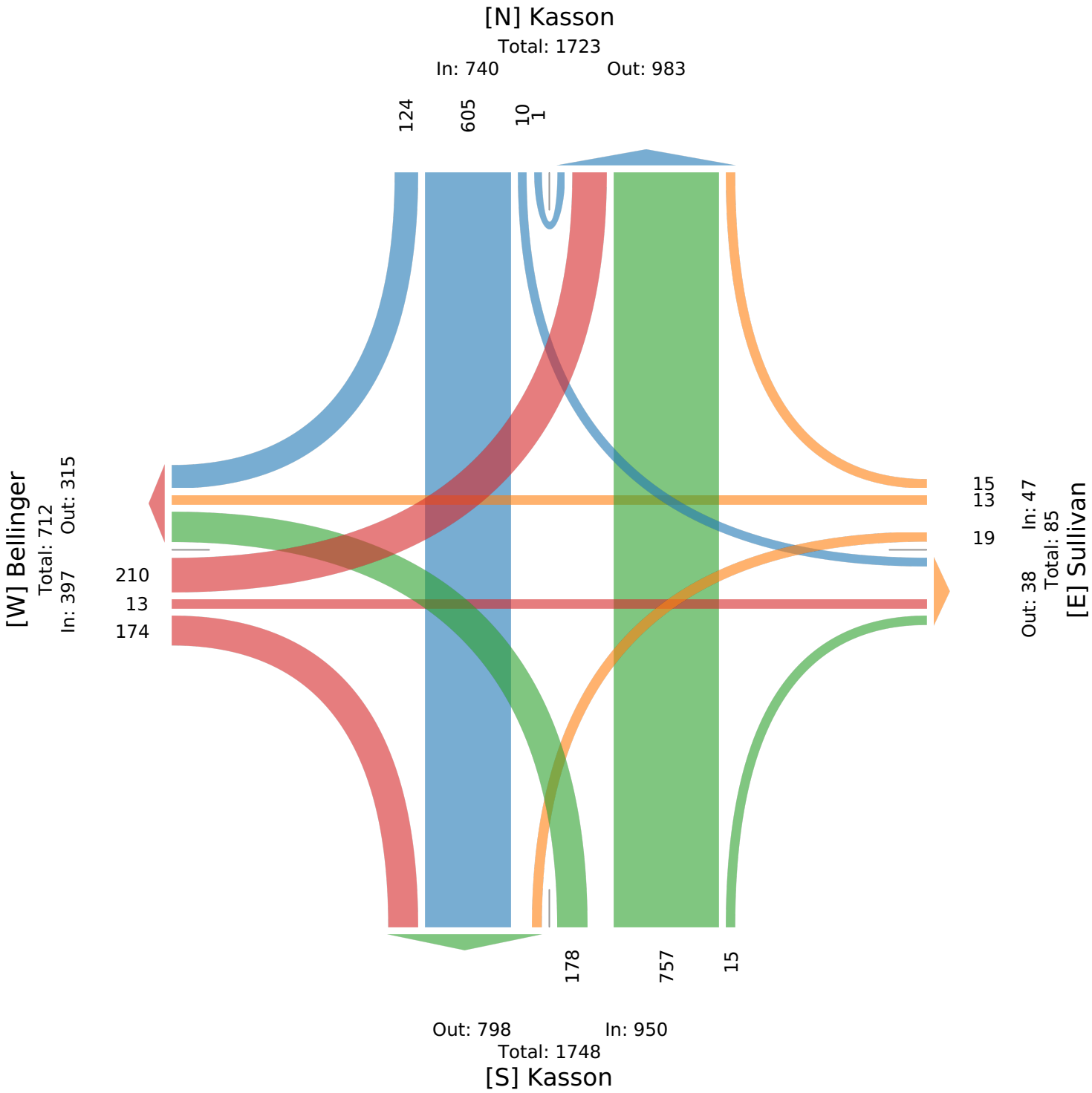
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Bellinger					Sullivan					Kasson					Kasson					
Direction	Eastbound					Westbound					Northbound					Southbound					
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2022-09-02 2:00PM	12	0	10	0	**22**	0	1	0	0	**1**	9	62	0	0	**71**	0	37	8	0	**45**	**139**
2:15PM	17	0	13	0	**30**	2	2	0	0	**4**	15	39	1	0	**55**	0	28	7	0	**35**	**124**
2:30PM	12	1	9	0	**22**	0	3	1	0	**4**	8	56	0	0	**64**	0	33	9	0	**42**	**132**
2:45PM	10	0	5	0	**15**	0	0	0	0	**0**	9	36	1	0	**46**	0	54	7	0	**61**	**122**
Hourly Total	51	1	37	0	**89**	2	6	1	0	**9**	41	193	2	0	**236**	0	152	31	0	**183**	**517**
3:00PM	9	1	18	0	**28**	1	0	0	0	**1**	14	51	3	0	**68**	0	28	8	0	**36**	**133**
3:15PM	8	3	12	0	**23**	1	0	0	0	**1**	9	54	1	0	**64**	0	30	8	0	**38**	**126**
3:30PM	15	2	5	0	**22**	0	0	1	0	**1**	9	45	0	0	**54**	0	37	9	0	**46**	**123**
3:45PM	9	0	9	0	**18**	1	1	1	0	**3**	13	53	1	0	**67**	0	45	7	0	**52**	**140**
Hourly Total	41	6	44	0	**91**	3	1	2	0	**6**	45	203	5	0	**253**	0	140	32	0	**172**	**522**
4:00PM	14	0	14	0	**28**	1	0	1	0	**2**	8	45	0	0	**53**	3	41	10	0	**54**	**137**
4:15PM	13	1	15	0	**29**	0	0	2	0	**2**	20	55	0	0	**75**	1	45	10	0	**56**	**162**
4:30PM	16	0	8	0	**24**	3	2	1	0	**6**	12	57	1	0	**70**	0	37	6	0	**43**	**143**
4:45PM	13	1	18	0	**32**	1	1	0	0	**2**	6	36	0	0	**42**	0	43	8	1	**52**	**128**
Hourly Total	56	2	55	0	**113**	5	3	4	0	**12**	46	193	1	0	**240**	4	166	34	1	**205**	**570**
5:00PM	17	0	7	0	**24**	3	0	2	0	**5**	11	42	2	0	**55**	1	28	8	0	**37**	**121**
5:15PM	20	2	11	0	**33**	2	0	3	0	**5**	13	41	1	0	**55**	4	38	5	0	**47**	**140**
5:30PM	16	0	10	0	**26**	1	0	2	0	**3**	12	47	3	0	**62**	0	47	6	0	**53**	**144**
5:45PM	9	2	10	0	**21**	3	3	1	0	**7**	10	38	1	0	**49**	1	34	8	0	**43**	**120**
Hourly Total	62	4	38	0	**104**	9	3	8	0	**20**	46	168	7	0	**221**	6	147	27	0	**180**	**525**
Total	210	13	174	0	**397**	19	13	15	0	**47**	178	757	15	0	**950**	10	605	124	1	**740**	**2134**
% Approach	52.9%	3.3%	43.8%	0%	**-**	40.4%	27.7%	31.9%	0%	**-**	18.7%	79.7%	1.6%	0%	**-**	1.4%	81.8%	16.8%	0.1%	**-**	-
% Total	9.8%	0.6%	8.2%	0%	**18.6%**	0.9%	0.6%	0.7%	0%	**2.2%**	8.3%	35.5%	0.7%	0%	**44.5%**	0.5%	28.4%	5.8%	0%	**34.7%**	-
Lights	208	12	171	0	**391**	19	13	14	0	**46**	177	751	15	0	**943**	10	596	120	1	**727**	2107
% Lights	99.0%	92.3%	98.3%	0%	**98.5%**	100%	100%	93.3%	0%	**97.9%**	99.4%	99.2%	100%	0%	**99.3%**	100%	98.5%	96.8%	100%	**98.2%**	98.7%
Articulated Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	2	0	0	**2**	2
% Articulated Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0.3%	0%	0%	**0.3%**	0.1%
Buses and Single-Unit Trucks	2	1	3	0	**6**	0	0	1	0	**1**	1	6	0	0	**7**	0	7	4	0	**11**	25
% Buses and Single-Unit Trucks	1.0%	7.7%	1.7%	0%	**1.5%**	0%	0%	6.7%	0%	**2.1%**	0.6%	0.8%	0%	0%	**0.7%**	0%	1.2%	3.2%	0%	**1.5%**	1.2%

*L: Left, R: Right, T: Thru, U: U-Turn

Cedar Road at Bellinger/Sullivan - TMC
Fri Sep 2, 2022
Full Length (2 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982504, Location: 44.847421, -85.795062

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Cedar Road at Bellinger/Sullivan - TMC

Fri Sep 2, 2022
PM Peak (3:45 PM - 4:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982504, Location: 44.847421, -85.795062

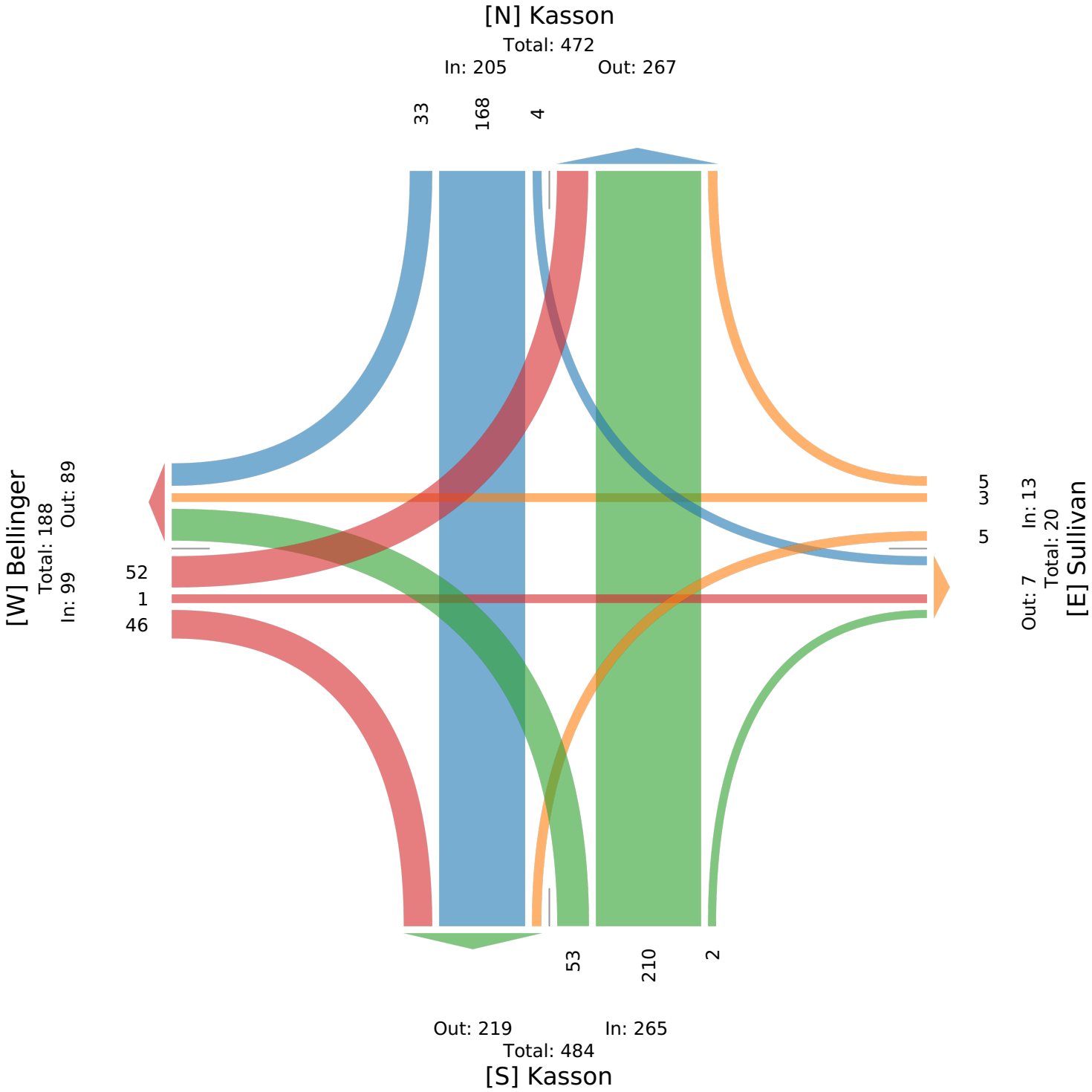
GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Bellinger					Sullivan					Kasson					Kasson					
Direction	Eastbound					Westbound					Northbound					Southbound					
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2022-09-02 3:45PM	9	0	9	0	**18**	1	1	1	0	**3**	13	53	1	0	**67**	0	45	7	0	**52**	**140**
4:00PM	14	0	14	0	**28**	1	0	1	0	**2**	8	45	0	0	**53**	3	41	10	0	**54**	**137**
4:15PM	13	1	15	0	**29**	0	0	2	0	**2**	20	55	0	0	**75**	1	45	10	0	**56**	**162**
4:30PM	16	0	8	0	**24**	3	2	1	0	**6**	12	57	1	0	**70**	0	37	6	0	**43**	**143**
Total	52	1	46	0	**99**	5	3	5	0	**13**	53	210	2	0	**265**	4	168	33	0	**205**	**582**
% Approach	52.5%	1.0%	46.5%	0%	**-**	38.5%	23.1%	38.5%	0%	**-**	20.0%	79.2%	0.8%	0%	**-**	2.0%	82.0%	16.1%	0%	**-**	-
% Total	8.9%	0.2%	7.9%	0%	**17.0%**	0.9%	0.5%	0.9%	0%	**2.2%**	9.1%	36.1%	0.3%	0%	**45.5%**	0.7%	28.9%	5.7%	0%	**35.2%**	-
PHF	0.813	0.250	0.767	-	**0.853**	0.417	0.375	0.625	-	**0.542**	0.663	0.921	0.500	-	**0.883**	0.333	0.933	0.825	-	**0.915**	0.898
Lights	52	1	46	0	**99**	5	3	4	0	**12**	53	209	2	0	**264**	4	164	31	0	**199**	574
% Lights	100%	100%	100%	0%	**100%**	100%	100%	80.0%	0%	**92.3%**	100%	99.5%	100%	0%	**99.6%**	100%	97.6%	93.9%	0%	**97.1%**	98.6%
Articulated Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	2	0	0	**2**	2
% Articulated Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	1.2%	0%	0%	**1.0%**	0.3%
Buses and Single-Unit Trucks	0	0	0	0	**0**	0	0	1	0	**1**	0	1	0	0	**1**	0	2	2	0	**4**	6
% Buses and Single-Unit Trucks	0%	0%	0%	0%	**0%**	0%	0%	20.0%	0%	**7.7%**	0%	0.5%	0%	0%	**0.4%**	0%	1.2%	6.1%	0%	**2.0%**	1.0%

*L: Left, R: Right, T: Thru, U: U-Turn

Cedar Road at Bellinger/Sullivan - TMC
Fri Sep 2, 2022
PM Peak (3:45 PM - 4:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982504, Location: 44.847421, -85.795062

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Cedar Road at Bellinger/Sullivan - TMC

Mon Sep 5, 2022
Full Length (1 PM-3 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982500, Location: 44.847421, -85.795062

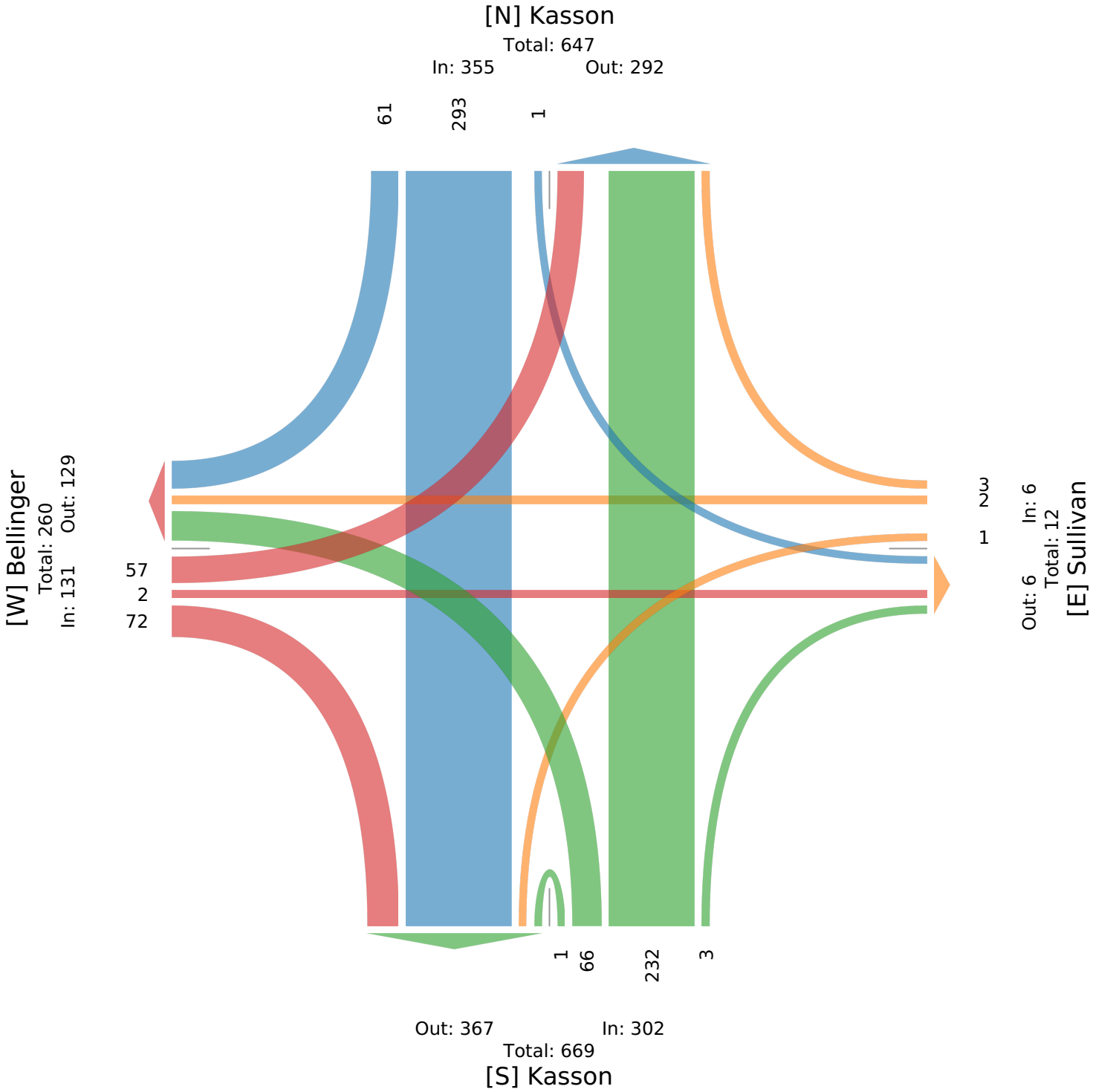
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Bellinger					Sullivan					Kasson					Kasson					
Direction	Eastbound					Westbound					Northbound					Southbound					
Time	L	T	R	U	**App**	L	T	R	U	**App**	L	T	R	U	**App**	L	T	R	U	**App**	**Int**
2022-09-05 1:00PM	7	0	6	0	**13**	0	0	0	0	**0**	11	24	0	0	**35**	0	31	10	0	**41**	**89**
1:15PM	6	0	17	0	**23**	0	1	0	0	**1**	7	30	0	0	**37**	0	33	8	0	**41**	**102**
1:30PM	8	0	7	0	**15**	0	0	0	0	**0**	5	21	0	0	**26**	0	35	6	0	**41**	**82**
1:45PM	4	0	5	0	**9**	1	0	1	0	**2**	8	28	1	0	**37**	0	36	9	0	**45**	**93**
Hourly Total	25	0	35	0	**60**	1	1	1	0	**3**	31	103	1	0	**135**	0	135	33	0	**168**	**366**
2:00PM	9	0	9	0	**18**	0	0	1	0	**1**	10	40	0	0	**50**	0	34	8	0	**42**	**111**
2:15PM	8	0	9	0	**17**	0	0	0	0	**0**	9	26	2	0	**37**	0	44	7	0	**51**	**105**
2:30PM	7	2	10	0	**19**	0	0	1	0	**1**	6	33	0	0	**39**	1	37	4	0	**42**	**101**
2:45PM	8	0	9	0	**17**	0	1	0	0	**1**	10	30	0	1	**41**	0	43	9	0	**52**	**111**
Hourly Total	32	2	37	0	**71**	0	1	2	0	**3**	35	129	2	1	**167**	1	158	28	0	**187**	**428**
Total	57	2	72	0	**131**	1	2	3	0	**6**	66	232	3	1	**302**	1	293	61	0	**355**	**794**
% Approach	43.5%	1.5%	55.0%	0%	**-**	16.7%	33.3%	50.0%	0%	**-**	21.9%	76.8%	1.0%	0.3%	**-**	0.3%	82.5%	17.2%	0%	**-**	-
% Total	7.2%	0.3%	9.1%	0%	**16.5%**	0.1%	0.3%	0.4%	0%	**0.8%**	8.3%	29.2%	0.4%	0.1%	**38.0%**	0.1%	36.9%	7.7%	0%	**44.7%**	-
Lights	57	2	72	0	**131**	1	2	3	0	**6**	66	229	3	1	**299**	1	292	61	0	**354**	790
% Lights	100%	100%	100%	0%	**100%**	100%	100%	100%	0%	**100%**	100%	98.7%	100%	100%	**99.0%**	100%	99.7%	100%	0%	**99.7%**	99.5%
Articulated Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	3	0	0	**3**	0	1	0	0	**1**	4
% Buses and Single-Unit Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	1.3%	0%	0%	**1.0%**	0%	0.3%	0%	0%	**0.3%**	0.5%

*L: Left, R: Right, T: Thru, U: U-Turn

Cedar Road at Bellinger/Sullivan - TMC
Mon Sep 5, 2022
Full Length (1 PM-3 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982500, Location: 44.847421, -85.795062

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Cedar Road at Bellinger/Sullivan - TMC

Mon Sep 5, 2022
Midday Peak (1 PM - 2 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982500, Location: 44.847421, -85.795062

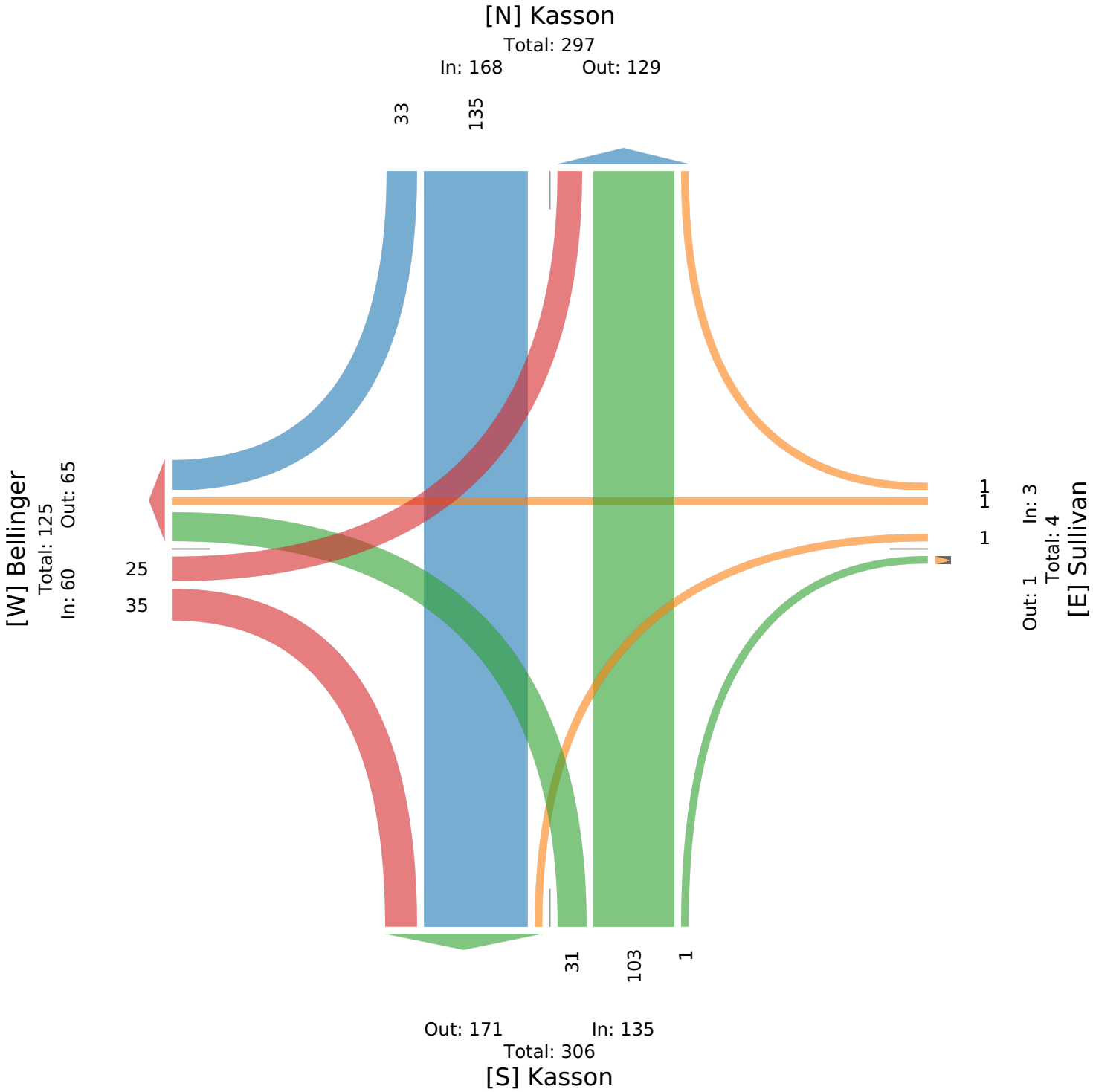
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Bellinger					Sullivan					Kasson					Kasson					
Direction	Eastbound					Westbound					Northbound					Southbound					
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2022-09-05 1:00PM	7	0	6	0	**13**	0	0	0	0	**0**	11	24	0	0	**35**	0	31	10	0	**41**	**89**
1:15PM	6	0	17	0	**23**	0	1	0	0	**1**	7	30	0	0	**37**	0	33	8	0	**41**	**102**
1:30PM	8	0	7	0	**15**	0	0	0	0	**0**	5	21	0	0	**26**	0	35	6	0	**41**	**82**
1:45PM	4	0	5	0	**9**	1	0	1	0	**2**	8	28	1	0	**37**	0	36	9	0	**45**	**93**
Total	25	0	35	0	**60**	1	1	1	0	**3**	31	103	1	0	**135**	0	135	33	0	**168**	**366**
% Approach	41.7%	0%	58.3%	0%	**-**	33.3%	33.3%	33.3%	0%	**-**	23.0%	76.3%	0.7%	0%	**-**	0%	80.4%	19.6%	0%	**-**	-
% Total	6.8%	0%	9.6%	0%	**16.4%**	0.3%	0.3%	0.3%	0%	**0.8%**	8.5%	28.1%	0.3%	0%	**36.9%**	0%	36.9%	9.0%	0%	**45.9%**	-
PHF	0.781	-	0.515	-	**0.652**	0.250	0.250	0.250	-	**0.375**	0.705	0.858	0.250	-	**0.912**	-	0.938	0.825	-	**0.933**	0.897
Lights	25	0	35	0	**60**	1	1	1	0	**3**	31	102	1	0	**134**	0	134	33	0	**167**	364
% Lights	100%	0%	100%	0%	**100%**	100%	100%	100%	0%	**100%**	100%	99.0%	100%	0%	**99.3%**	0%	99.3%	100%	0%	**99.4%**	99.5%
Articulated Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	1	0	0	**1**	0	1	0	0	**1**	2
% Buses and Single-Unit Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	1.0%	0%	0%	**0.7%**	0%	0.7%	0%	0%	**0.6%**	0.5%

*L: Left, R: Right, T: Thru, U: U-Turn

Cedar Road at Bellinger/Sullivan - TMC
Mon Sep 5, 2022
Midday Peak (1 PM - 2 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982500, Location: 44.847421, -85.795062

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Cedar Road at Bellinger/Sullivan - TMC

Mon Sep 5, 2022
PM Peak (2 PM - 3 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982500, Location: 44.847421, -85.795062

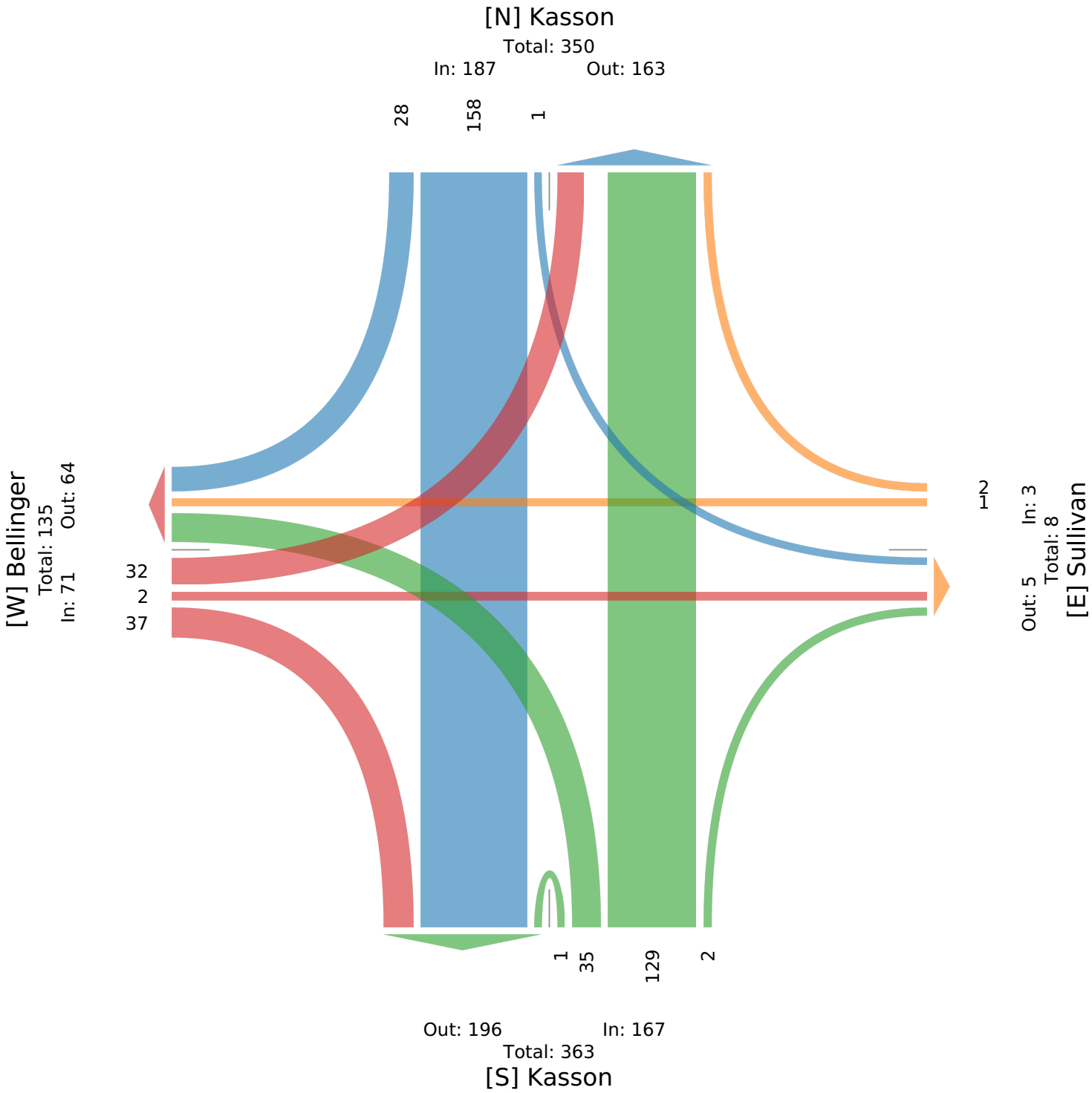
GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	Bellinger					Sullivan					Kasson					Kasson					
Direction	Eastbound					Westbound					Northbound					Southbound					
Time	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	L	T	R	U	App	Int
2022-09-05 2:00PM	9	0	9	0	**18**	0	0	1	0	**1**	10	40	0	0	**50**	0	34	8	0	**42**	**111**
2:15PM	8	0	9	0	**17**	0	0	0	0	**0**	9	26	2	0	**37**	0	44	7	0	**51**	**105**
2:30PM	7	2	10	0	**19**	0	0	1	0	**1**	6	33	0	0	**39**	1	37	4	0	**42**	**101**
2:45PM	8	0	9	0	**17**	0	1	0	0	**1**	10	30	0	1	**41**	0	43	9	0	**52**	**111**
Total	32	2	37	0	**71**	0	1	2	0	**3**	35	129	2	1	**167**	1	158	28	0	**187**	**428**
% Approach	45.1%	2.8%	52.1%	0%	**-**	0%	33.3%	66.7%	0%	**-**	21.0%	77.2%	1.2%	0.6%	**-**	0.5%	84.5%	15.0%	0%	**-**	-
% Total	7.5%	0.5%	8.6%	0%	**16.6%**	0%	0.2%	0.5%	0%	**0.7%**	8.2%	30.1%	0.5%	0.2%	**39.0%**	0.2%	36.9%	6.5%	0%	**43.7%**	-
PHF	0.889	0.250	0.925	-	**0.934**	-	0.250	0.500	-	**0.750**	0.875	0.806	0.250	0.250	**0.835**	0.250	0.898	0.778	-	**0.899**	0.964
Lights	32	2	37	0	**71**	0	1	2	0	**3**	35	127	2	1	**165**	1	158	28	0	**187**	426
% Lights	100%	100%	100%	0%	**100%**	0%	100%	100%	0%	**100%**	100%	98.4%	100%	100%	**98.8%**	100%	100%	100%	0%	**100%**	99.5%
Articulated Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	0
% Articulated Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%
Buses and Single-Unit Trucks	0	0	0	0	**0**	0	0	0	0	**0**	0	2	0	0	**2**	0	0	0	0	**0**	2
% Buses and Single-Unit Trucks	0%	0%	0%	0%	**0%**	0%	0%	0%	0%	**0%**	0%	1.6%	0%	0%	**1.2%**	0%	0%	0%	0%	**0%**	0.5%

*L: Left, R: Right, T: Thru, U: U-Turn

Cedar Road at Bellinger/Sullivan - TMC
Mon Sep 5, 2022
PM Peak (2 PM - 3 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 982500, Location: 44.847421, -85.795062

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	6	52	14	5	48
Future Vol, veh/h	5	6	52	14	5	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	87	87	95	95
Heavy Vehicles, %	0	0	6	21	20	8
Mvmt Flow	7	9	60	16	5	51

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	129	68	0	0	76	0
Stage 1	68	-	-	-	-	-
Stage 2	61	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.3	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.38	-
Pot Cap-1 Maneuver	870	1001	-	-	1416	-
Stage 1	960	-	-	-	-	-
Stage 2	967	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	867	1001	-	-	1416	-
Mov Cap-2 Maneuver	867	-	-	-	-	-
Stage 1	960	-	-	-	-	-
Stage 2	963	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	0.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	935	1416	-
HCM Lane V/C Ratio	-	-	0.017	0.004	-
HCM Control Delay (s)	-	-	8.9	7.6	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	52	0	54	76	0	36
Future Vol, veh/h	52	0	54	76	0	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	68	68	83	83	75	75
Heavy Vehicles, %	6	0	4	7	0	8
Mvmt Flow	76	0	65	92	0	48

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	159	111	0	0	157	0
Stage 1	111	-	-	-	-	-
Stage 2	48	-	-	-	-	-
Critical Hdwy	6.46	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	823	948	-	-	1435	-
Stage 1	904	-	-	-	-	-
Stage 2	964	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	823	948	-	-	1435	-
Mov Cap-2 Maneuver	823	-	-	-	-	-
Stage 1	904	-	-	-	-	-
Stage 2	964	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	823	1435	-
HCM Lane V/C Ratio	-	-	0.093	-	-
HCM Control Delay (s)	-	-	9.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection	
Int Delay, s/veh	2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	90	2	132	126	0	110
Future Vol, veh/h	90	2	132	126	0	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	87	87	81	81
Heavy Vehicles, %	6	0	3	7	0	6
Mvmt Flow	106	2	152	145	0	136

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	361	225	0	0	297	0
Stage 1	225	-	-	-	-	-
Stage 2	136	-	-	-	-	-
Critical Hdwy	6.46	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	630	819	-	-	1276	-
Stage 1	803	-	-	-	-	-
Stage 2	881	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	630	819	-	-	1276	-
Mov Cap-2 Maneuver	630	-	-	-	-	-
Stage 1	803	-	-	-	-	-
Stage 2	881	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	633	1276	-
HCM Lane V/C Ratio	-	-	0.171	-	-
HCM Control Delay (s)	-	-	11.9	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.6	0	-

Intersection	
Intersection Delay, s/veh	10.1
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	52	1	46	5	3	5	53	210	2	4	168	33
Future Vol, veh/h	52	1	46	5	3	5	53	210	2	4	168	33
Peak Hour Factor	0.85	0.85	0.85	0.60	0.60	0.60	0.88	0.88	0.88	0.92	0.92	0.92
Heavy Vehicles, %	4	0	7	0	0	20	4	5	0	25	6	6
Mvmt Flow	61	1	54	8	5	8	60	239	2	4	183	36
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.1	8.4	10.6	10.1
HCM LOS	A	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	53%	38%	2%
Vol Thru, %	79%	1%	23%	82%
Vol Right, %	1%	46%	38%	16%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	265	99	13	205
LT Vol	53	52	5	4
Through Vol	210	1	3	168
RT Vol	2	46	5	33
Lane Flow Rate	301	116	22	223
Geometry Grp	1	1	1	1
Degree of Util (X)	0.387	0.163	0.031	0.305
Departure Headway (Hd)	4.621	5.05	5.153	4.923
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	777	707	690	729
Service Time	2.662	3.106	3.222	2.968
HCM Lane V/C Ratio	0.387	0.164	0.032	0.306
HCM Control Delay	10.6	9.1	8.4	10.1
HCM Lane LOS	B	A	A	B
HCM 95th-tile Q	1.8	0.6	0.1	1.3

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	22	10	45	9	1	47
Future Vol, veh/h	22	10	45	9	1	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	68	68	77	77
Heavy Vehicles, %	21	22	8	0	33	12
Mvmt Flow	28	13	66	13	1	61

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	136	73	0	0	79	0
Stage 1	73	-	-	-	-	-
Stage 2	63	-	-	-	-	-
Critical Hdwy	6.61	6.42	-	-	4.43	-
Critical Hdwy Stg 1	5.61	-	-	-	-	-
Critical Hdwy Stg 2	5.61	-	-	-	-	-
Follow-up Hdwy	3.689	3.498	-	-	2.497	-
Pot Cap-1 Maneuver	814	936	-	-	1344	-
Stage 1	904	-	-	-	-	-
Stage 2	913	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	813	936	-	-	1344	-
Mov Cap-2 Maneuver	813	-	-	-	-	-
Stage 1	904	-	-	-	-	-
Stage 2	912	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	848	1344	-
HCM Lane V/C Ratio	-	-	0.048	0.001	-
HCM Control Delay (s)	-	-	9.5	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	66	2	28	52	3	24
Future Vol, veh/h	66	2	28	52	3	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	83	83	68	68
Heavy Vehicles, %	15	0	0	13	0	4
Mvmt Flow	73	2	34	63	4	35

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	109	66	0	0	97	0
Stage 1	66	-	-	-	-	-
Stage 2	43	-	-	-	-	-
Critical Hdwy	6.55	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.55	-	-	-	-	-
Critical Hdwy Stg 2	5.55	-	-	-	-	-
Follow-up Hdwy	3.635	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	858	1003	-	-	1509	-
Stage 1	925	-	-	-	-	-
Stage 2	947	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	855	1003	-	-	1509	-
Mov Cap-2 Maneuver	855	-	-	-	-	-
Stage 1	925	-	-	-	-	-
Stage 2	944	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	0.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	859	1509	-
HCM Lane V/C Ratio	-	-	0.088	0.003	-
HCM Control Delay (s)	-	-	9.6	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection	
Int Delay, s/veh	2.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	86	2	77	83	3	101
Future Vol, veh/h	86	2	77	83	3	101
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	85	85	81	81
Heavy Vehicles, %	5	0	3	6	0	3
Mvmt Flow	91	2	91	98	4	125

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	273	140	0	0	189	0
Stage 1	140	-	-	-	-	-
Stage 2	133	-	-	-	-	-
Critical Hdwy	6.45	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	710	913	-	-	1397	-
Stage 1	879	-	-	-	-	-
Stage 2	886	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	708	913	-	-	1397	-
Mov Cap-2 Maneuver	708	-	-	-	-	-
Stage 1	879	-	-	-	-	-
Stage 2	883	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	712	1397	-
HCM Lane V/C Ratio	-	-	0.13	0.003	-
HCM Control Delay (s)	-	-	10.8	7.6	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Intersection	
Intersection Delay, s/veh	8.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	32	2	37	0	1	2	36	129	2	1	158	28
Future Vol, veh/h	32	2	37	0	1	2	36	129	2	1	158	28
Peak Hour Factor	0.93	0.93	0.93	0.75	0.75	0.75	0.84	0.84	0.84	0.90	0.90	0.90
Heavy Vehicles, %	6	0	5	0	100	0	0	5	0	0	4	7
Mvmt Flow	34	2	40	0	1	3	43	154	2	1	176	31
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.2	9.3	8.7	8.6
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	45%	0%	1%
Vol Thru, %	77%	3%	33%	84%
Vol Right, %	1%	52%	67%	15%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	167	71	3	187
LT Vol	36	32	0	1
Through Vol	129	2	1	158
RT Vol	2	37	2	28
Lane Flow Rate	199	76	4	208
Geometry Grp	1	1	1	1
Degree of Util (X)	0.24	0.099	0.007	0.243
Departure Headway (Hd)	4.344	4.671	6.2	4.216
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	829	768	578	854
Service Time	2.357	2.693	4.227	2.229
HCM Lane V/C Ratio	0.24	0.099	0.007	0.244
HCM Control Delay	8.7	8.2	9.3	8.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.9	0.3	0	1

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	6	53	14	5	48
Future Vol, veh/h	5	6	53	14	5	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	87	87	95	95
Heavy Vehicles, %	0	0	6	21	20	8
Mvmt Flow	7	9	61	16	5	51

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	130	69	0	0	77	0
Stage 1	69	-	-	-	-	-
Stage 2	61	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.3	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.38	-
Pot Cap-1 Maneuver	869	1000	-	-	1415	-
Stage 1	959	-	-	-	-	-
Stage 2	967	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	866	1000	-	-	1415	-
Mov Cap-2 Maneuver	866	-	-	-	-	-
Stage 1	959	-	-	-	-	-
Stage 2	963	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	0.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	934	1415	-
HCM Lane V/C Ratio	-	-	0.017	0.004	-
HCM Control Delay (s)	-	-	8.9	7.6	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	53	0	55	77	0	36
Future Vol, veh/h	53	0	55	77	0	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	68	68	83	83	75	75
Heavy Vehicles, %	6	0	4	7	0	8
Mvmt Flow	78	0	66	93	0	48

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	161	113	0	0	159	0
Stage 1	113	-	-	-	-	-
Stage 2	48	-	-	-	-	-
Critical Hdwy	6.46	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	821	945	-	-	1433	-
Stage 1	902	-	-	-	-	-
Stage 2	964	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	821	945	-	-	1433	-
Mov Cap-2 Maneuver	821	-	-	-	-	-
Stage 1	902	-	-	-	-	-
Stage 2	964	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	821	1433	-
HCM Lane V/C Ratio	-	-	0.095	-	-
HCM Control Delay (s)	-	-	9.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection	
Int Delay, s/veh	2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	91	2	133	127	0	111
Future Vol, veh/h	91	2	133	127	0	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	87	87	81	81
Heavy Vehicles, %	6	0	3	7	0	6
Mvmt Flow	107	2	153	146	0	137

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	363	226	0	0	299	0
Stage 1	226	-	-	-	-	-
Stage 2	137	-	-	-	-	-
Critical Hdwy	6.46	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	628	818	-	-	1274	-
Stage 1	802	-	-	-	-	-
Stage 2	880	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	628	818	-	-	1274	-
Mov Cap-2 Maneuver	628	-	-	-	-	-
Stage 1	802	-	-	-	-	-
Stage 2	880	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	631	1274	-
HCM Lane V/C Ratio	-	-	0.173	-	-
HCM Control Delay (s)	-	-	11.9	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.6	0	-

Intersection	
Intersection Delay, s/veh	10.2
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	53	1	46	5	3	5	54	212	2	4	170	33
Future Vol, veh/h	53	1	46	5	3	5	54	212	2	4	170	33
Peak Hour Factor	0.85	0.85	0.85	0.60	0.60	0.60	0.88	0.88	0.88	0.92	0.92	0.92
Heavy Vehicles, %	4	0	7	0	0	20	4	5	0	25	6	6
Mvmt Flow	62	1	54	8	5	8	61	241	2	4	185	36
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.1	8.4	10.7	10.2
HCM LOS	A	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	53%	38%	2%
Vol Thru, %	79%	1%	23%	82%
Vol Right, %	1%	46%	38%	16%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	268	100	13	207
LT Vol	54	53	5	4
Through Vol	212	1	3	170
RT Vol	2	46	5	33
Lane Flow Rate	305	118	22	225
Geometry Grp	1	1	1	1
Degree of Util (X)	0.392	0.166	0.031	0.308
Departure Headway (Hd)	4.63	5.068	5.169	4.934
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	777	705	687	727
Service Time	2.671	3.124	3.241	2.98
HCM Lane V/C Ratio	0.393	0.167	0.032	0.309
HCM Control Delay	10.7	9.1	8.4	10.2
HCM Lane LOS	B	A	A	B
HCM 95th-tile Q	1.9	0.6	0.1	1.3

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	22	10	45	9	1	47
Future Vol, veh/h	22	10	45	9	1	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	68	68	77	77
Heavy Vehicles, %	21	22	8	0	33	12
Mvmt Flow	28	13	66	13	1	61

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	136	73	0	0	79	0
Stage 1	73	-	-	-	-	-
Stage 2	63	-	-	-	-	-
Critical Hdwy	6.61	6.42	-	-	4.43	-
Critical Hdwy Stg 1	5.61	-	-	-	-	-
Critical Hdwy Stg 2	5.61	-	-	-	-	-
Follow-up Hdwy	3.689	3.498	-	-	2.497	-
Pot Cap-1 Maneuver	814	936	-	-	1344	-
Stage 1	904	-	-	-	-	-
Stage 2	913	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	813	936	-	-	1344	-
Mov Cap-2 Maneuver	813	-	-	-	-	-
Stage 1	904	-	-	-	-	-
Stage 2	912	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	848	1344	-
HCM Lane V/C Ratio	-	-	0.048	0.001	-
HCM Control Delay (s)	-	-	9.5	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	67	2	28	53	3	24
Future Vol, veh/h	67	2	28	53	3	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	83	83	68	68
Heavy Vehicles, %	15	0	0	13	0	4
Mvmt Flow	74	2	34	64	4	35

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	109	66	0	0	98	0
Stage 1	66	-	-	-	-	-
Stage 2	43	-	-	-	-	-
Critical Hdwy	6.55	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.55	-	-	-	-	-
Critical Hdwy Stg 2	5.55	-	-	-	-	-
Follow-up Hdwy	3.635	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	858	1003	-	-	1508	-
Stage 1	925	-	-	-	-	-
Stage 2	947	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	855	1003	-	-	1508	-
Mov Cap-2 Maneuver	855	-	-	-	-	-
Stage 1	925	-	-	-	-	-
Stage 2	944	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	0.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	859	1508	-
HCM Lane V/C Ratio	-	-	0.089	0.003	-
HCM Control Delay (s)	-	-	9.6	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection	
Int Delay, s/veh	2.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	87	2	78	84	3	102
Future Vol, veh/h	87	2	78	84	3	102
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	85	85	81	81
Heavy Vehicles, %	5	0	3	6	0	3
Mvmt Flow	92	2	92	99	4	126

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	276	142	0	0	191	0
Stage 1	142	-	-	-	-	-
Stage 2	134	-	-	-	-	-
Critical Hdwy	6.45	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	707	911	-	-	1395	-
Stage 1	878	-	-	-	-	-
Stage 2	885	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	705	911	-	-	1395	-
Mov Cap-2 Maneuver	705	-	-	-	-	-
Stage 1	878	-	-	-	-	-
Stage 2	882	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	709	1395	-
HCM Lane V/C Ratio	-	-	0.132	0.003	-
HCM Control Delay (s)	-	-	10.8	7.6	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Intersection Delay, s/veh	8.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	32	2	37	0	1	2	36	130	2	1	160	28
Future Vol, veh/h	32	2	37	0	1	2	36	130	2	1	160	28
Peak Hour Factor	0.93	0.93	0.93	0.75	0.75	0.75	0.84	0.84	0.84	0.90	0.90	0.90
Heavy Vehicles, %	6	0	5	0	100	0	0	5	0	0	4	7
Mvmt Flow	34	2	40	0	1	3	43	155	2	1	178	31
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.2	9.3	8.7	8.6
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	21%	45%	0%	1%
Vol Thru, %	77%	3%	33%	85%
Vol Right, %	1%	52%	67%	15%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	168	71	3	189
LT Vol	36	32	0	1
Through Vol	130	2	1	160
RT Vol	2	37	2	28
Lane Flow Rate	200	76	4	210
Geometry Grp	1	1	1	1
Degree of Util (X)	0.241	0.099	0.007	0.246
Departure Headway (Hd)	4.346	4.678	6.208	4.218
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	828	767	577	855
Service Time	2.359	2.7	4.235	2.231
HCM Lane V/C Ratio	0.242	0.099	0.007	0.246
HCM Control Delay	8.7	8.2	9.3	8.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.9	0.3	0	1

Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	51	11	53	92	14	48
Future Vol, veh/h	51	11	53	92	14	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	69	69	87	87	95	95
Heavy Vehicles, %	90	45	6	88	71	8
Mvmt Flow	74	16	61	106	15	51

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	195	114	0	0	167	0
Stage 1	114	-	-	-	-	-
Stage 2	81	-	-	-	-	-
Critical Hdwy	7.3	6.65	-	-	4.81	-
Critical Hdwy Stg 1	6.3	-	-	-	-	-
Critical Hdwy Stg 2	6.3	-	-	-	-	-
Follow-up Hdwy	4.31	3.705	-	-	2.839	-
Pot Cap-1 Maneuver	631	834	-	-	1083	-
Stage 1	732	-	-	-	-	-
Stage 2	761	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	622	834	-	-	1083	-
Mov Cap-2 Maneuver	622	-	-	-	-	-
Stage 1	732	-	-	-	-	-
Stage 2	750	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.4	0	1.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	651	1083	-
HCM Lane V/C Ratio	-	-	0.138	0.014	-
HCM Control Delay (s)	-	-	11.4	8.4	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	99	0	55	155	0	36
Future Vol, veh/h	99	0	55	155	0	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	68	68	83	83	75	75
Heavy Vehicles, %	49	0	4	54	0	8
Mvmt Flow	146	0	66	187	0	48

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	208	160	0	0	253	0
Stage 1	160	-	-	-	-	-
Stage 2	48	-	-	-	-	-
Critical Hdwy	6.89	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.89	-	-	-	-	-
Critical Hdwy Stg 2	5.89	-	-	-	-	-
Follow-up Hdwy	3.941	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	686	890	-	-	1324	-
Stage 1	766	-	-	-	-	-
Stage 2	867	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	686	890	-	-	1324	-
Mov Cap-2 Maneuver	686	-	-	-	-	-
Stage 1	766	-	-	-	-	-
Stage 2	867	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	686	1324	-
HCM Lane V/C Ratio	-	-	0.212	-	-
HCM Control Delay (s)	-	-	11.7	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.8	0	-

Intersection	
Int Delay, s/veh	3.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	137	2	133	205	0	111
Future Vol, veh/h	137	2	133	205	0	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	87	87	81	81
Heavy Vehicles, %	37	0	3	42	0	6
Mvmt Flow	161	2	153	236	0	137

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	408	271	0	0	389	0
Stage 1	271	-	-	-	-	-
Stage 2	137	-	-	-	-	-
Critical Hdwy	6.77	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.77	-	-	-	-	-
Critical Hdwy Stg 2	5.77	-	-	-	-	-
Follow-up Hdwy	3.833	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	538	773	-	-	1181	-
Stage 1	700	-	-	-	-	-
Stage 2	810	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	538	773	-	-	1181	-
Mov Cap-2 Maneuver	538	-	-	-	-	-
Stage 1	700	-	-	-	-	-
Stage 2	810	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	540	1181	-
HCM Lane V/C Ratio	-	-	0.303	-	-
HCM Control Delay (s)	-	-	14.5	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	1.3	0	-

Intersection	
Intersection Delay, s/veh	11.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	69	1	46	5	3	5	54	274	2	4	209	40
Future Vol, veh/h	69	1	46	5	3	5	54	274	2	4	209	40
Peak Hour Factor	0.85	0.85	0.85	0.60	0.60	0.60	0.88	0.88	0.88	0.92	0.92	0.92
Heavy Vehicles, %	26	0	7	0	0	20	4	26	0	25	23	23
Mvmt Flow	81	1	54	8	5	8	61	311	2	4	227	43
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.5	8.9	12.6	11.5
HCM LOS	B	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	16%	59%	38%	2%
Vol Thru, %	83%	1%	23%	83%
Vol Right, %	1%	40%	38%	16%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	330	116	13	253
LT Vol	54	69	5	4
Through Vol	274	1	3	209
RT Vol	2	46	5	40
Lane Flow Rate	375	136	22	275
Geometry Grp	1	1	1	1
Degree of Util (X)	0.499	0.219	0.034	0.392
Departure Headway (Hd)	4.793	5.787	5.663	5.126
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	746	614	636	696
Service Time	2.861	3.887	3.663	3.201
HCM Lane V/C Ratio	0.503	0.221	0.035	0.395
HCM Control Delay	12.6	10.5	8.9	11.5
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	2.8	0.8	0.1	1.9

Intersection	
Int Delay, s/veh	7.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	179	27	45	75	9	47
Future Vol, veh/h	179	27	45	75	9	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	68	68	77	77
Heavy Vehicles, %	88	73	8	84	82	12
Mvmt Flow	227	34	66	110	12	61

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	206	121	0	0	176	0
Stage 1	121	-	-	-	-	-
Stage 2	85	-	-	-	-	-
Critical Hdwy	7.28	6.93	-	-	4.92	-
Critical Hdwy Stg 1	6.28	-	-	-	-	-
Critical Hdwy Stg 2	6.28	-	-	-	-	-
Follow-up Hdwy	4.292	3.957	-	-	2.938	-
Pot Cap-1 Maneuver	624	770	-	-	1034	-
Stage 1	729	-	-	-	-	-
Stage 2	760	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	617	770	-	-	1034	-
Mov Cap-2 Maneuver	617	-	-	-	-	-
Stage 1	729	-	-	-	-	-
Stage 2	751	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.6	0	1.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	633	1034	-
HCM Lane V/C Ratio	-	-	0.412	0.011	-
HCM Control Delay (s)	-	-	14.6	8.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	2	0	-

Intersection	
Int Delay, s/veh	7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	224	2	28	119	3	24
Future Vol, veh/h	224	2	28	119	3	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	83	83	68	68
Heavy Vehicles, %	75	0	0	61	0	4
Mvmt Flow	249	2	34	143	4	35

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	149	106	0	0	177	0
Stage 1	106	-	-	-	-	-
Stage 2	43	-	-	-	-	-
Critical Hdwy	7.15	6.2	-	-	4.1	-
Critical Hdwy Stg 1	6.15	-	-	-	-	-
Critical Hdwy Stg 2	6.15	-	-	-	-	-
Follow-up Hdwy	4.175	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	698	954	-	-	1411	-
Stage 1	765	-	-	-	-	-
Stage 2	821	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	696	954	-	-	1411	-
Mov Cap-2 Maneuver	696	-	-	-	-	-
Stage 1	765	-	-	-	-	-
Stage 2	819	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	698	1411	-
HCM Lane V/C Ratio	-	-	0.36	0.003	-
HCM Control Delay (s)	-	-	13	7.6	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.6	0	-

Intersection	
Int Delay, s/veh	6.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	244	2	78	150	3	102
Future Vol, veh/h	244	2	78	150	3	102
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	85	85	81	81
Heavy Vehicles, %	66	0	3	47	0	3
Mvmt Flow	257	2	92	176	4	126

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	314	180	0	0	268	0
Stage 1	180	-	-	-	-	-
Stage 2	134	-	-	-	-	-
Critical Hdwy	7.06	6.2	-	-	4.1	-
Critical Hdwy Stg 1	6.06	-	-	-	-	-
Critical Hdwy Stg 2	6.06	-	-	-	-	-
Follow-up Hdwy	4.094	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	565	868	-	-	1307	-
Stage 1	718	-	-	-	-	-
Stage 2	757	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	563	868	-	-	1307	-
Mov Cap-2 Maneuver	563	-	-	-	-	-
Stage 1	718	-	-	-	-	-
Stage 2	755	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.6	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	565	1307	-
HCM Lane V/C Ratio	-	-	0.458	0.003	-
HCM Control Delay (s)	-	-	16.6	7.8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.4	0	-

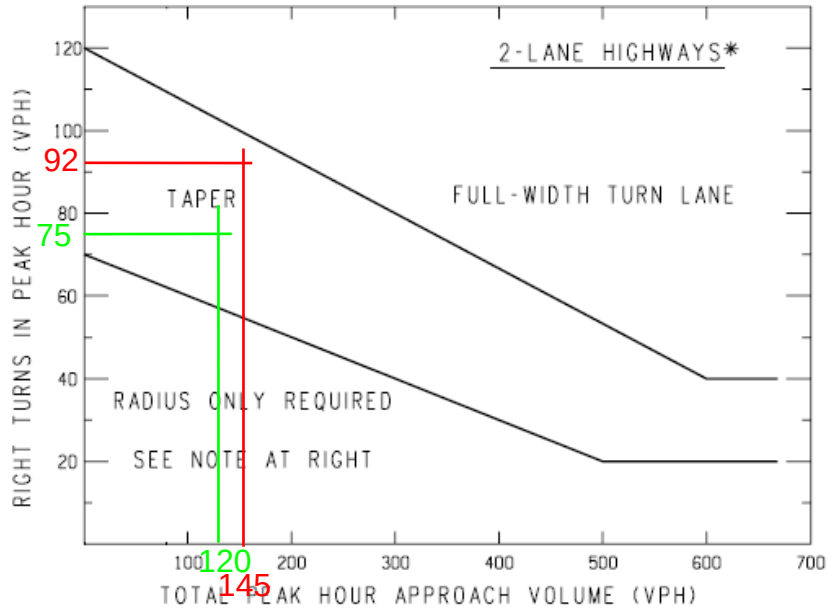
Intersection	
Intersection Delay, s/veh	10.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	2	37	0	1	2	36	183	2	1	294	51
Future Vol, veh/h	45	2	37	0	1	2	36	183	2	1	294	51
Peak Hour Factor	0.93	0.93	0.93	0.75	0.75	0.75	0.84	0.84	0.84	0.90	0.90	0.90
Heavy Vehicles, %	33	0	5	0	100	0	0	32	0	0	48	49
Mvmt Flow	48	2	40	0	1	3	43	218	2	1	327	57
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.8	9.9	10	11.2
HCM LOS	A	A	A	B

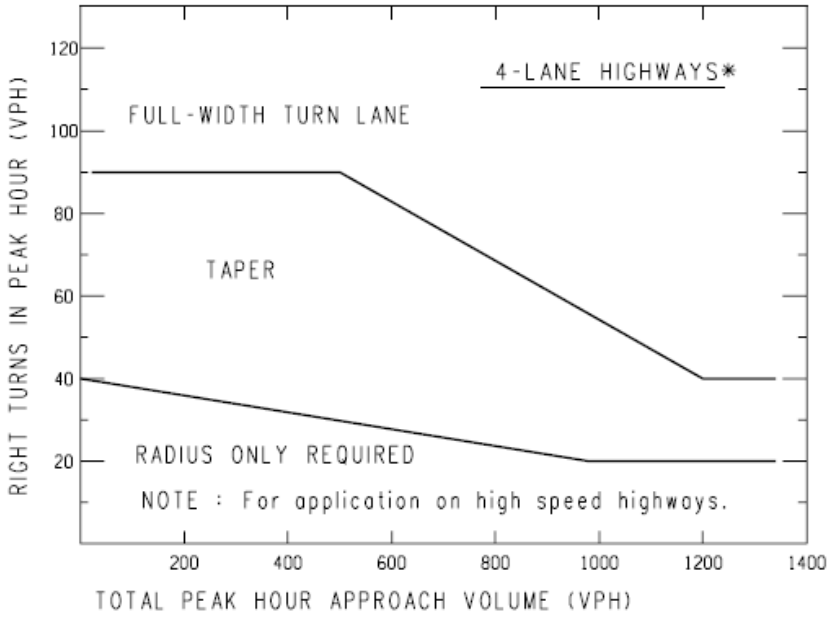
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	16%	54%	0%	0%
Vol Thru, %	83%	2%	33%	85%
Vol Right, %	1%	44%	67%	15%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	221	84	3	346
LT Vol	36	45	0	1
Through Vol	183	2	1	294
RT Vol	2	37	2	51
Lane Flow Rate	263	90	4	384
Geometry Grp	1	1	1	1
Degree of Util (X)	0.336	0.144	0.008	0.467
Departure Headway (Hd)	4.604	5.723	6.8	4.377
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	779	623	523	823
Service Time	2.645	3.786	4.878	2.411
HCM Lane V/C Ratio	0.338	0.144	0.008	0.467
HCM Control Delay	10	9.8	9.9	11.2
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	1.5	0.5	0	2.5

Friday Check-In
Monday Check-Out



NOTE: For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.

Adjust peak hour
Right turns = Peak hour Right turns – 20



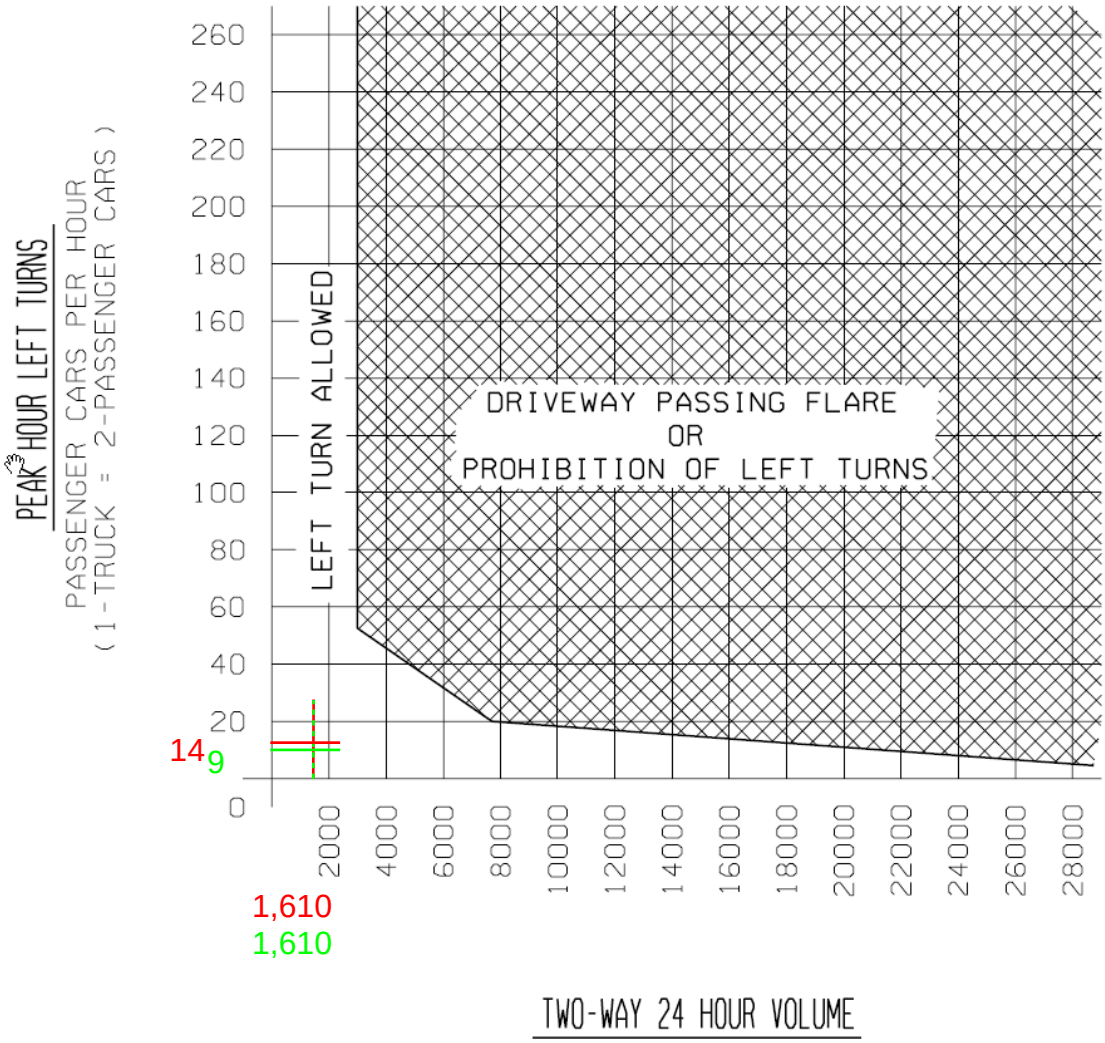
*If a center left-turn lane exists (ie 3 or 5 lane roadway), subtract the number of left turns in approach volume form the total approach volume to get an adjusted total approach volume.

Friday Check-In
Monday Check-Out

1.2.3 Traffic Volume Guidelines for Driveway Passing Flares

Driveways serving large developments along state trunkline highways frequently generate large numbers of left-turns. On two-lane, two-way roadways, this situation can aggravate the efficiency of traffic operations and often make shoulder maintenance difficult. In such situations, prohibition of left-turns at driveways to large developments or construction of driveway passing flares should be considered.

In an attempt to alleviate the types of problems outlined above, the following chart is provided showing the relationship between peak hour left-turns and 24-hour volumes. When peak hour left-turns and 24-hour volumes fall within the area above and to the right of the trend line, left-turns should be prohibited or a driveway passing flare be installed. If a driveway passing flare is constructed, the entire cost should be borne by the developer. For additional information and geometric design guidance regarding driveway passing flares, please refer to Geometric Design Guide GEO-650.



NOTE: This chart is based on Total Development and is for Two-Way Roadways.