

Burlington Development Review Board

645 Pine Street, Dept. of Permitting & Inspections
Burlington, VT 05401
www.burlingtonvt.gov/DPI/DRB
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BURLINGTON DEVELOPMENT REVIEW BOARD

Tuesday, July 7, 2020, 5:00 PM

PUBLIC HEARING NOTICE

REMOTE MEETING

Zoom: <https://us02web.zoom.us/j/85200949242?pwd=V1EzNnhqeJNOYlJvNUpSbEVzQTBEQT09>

Webinar ID: 852 0094 9242

Password: 842557

Call in telephone: US: +1 301 715 8592 or +1 312 626 6799 or +1 929 205 6099 or +1 253 215 8782 or
+1 346 248 7799 or +1 669 900 6833

1. 20-0792CA; 291 Appletree Point Rd (RL-W, Ward 4N) Gordon M. Maher

Appeal of an administrative denial for an after-the-fact patio removal and replacement with deck on different footprint.

2. 20-0794SN; 66 North Ave (RM, Ward 3C) Sarah M. Holbrook Community Center

Appeal of an administrative denial for a proposed new sign.

3. 20-0854CA/CU; 266 Queen City Park Rd (ELM, Ward 5S) Burton Corporation

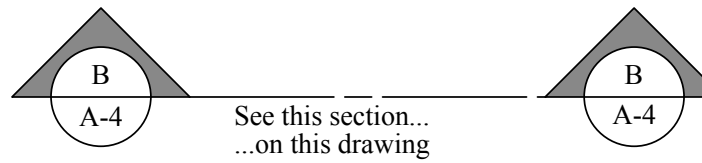
Conditional use application to create 11,560 SF Performing Arts Center use within an existing 85,000+ SF structure; proposed façade improvements to existing building exterior.

Plans may be viewed upon request by contacting the Department of Permitting & Inspections between the hours of 8:00 a.m. and 4:30 p.m. Participation in the DRB proceeding is a prerequisite to the right to take any subsequent appeal. Please note that ANYTHING submitted to the Zoning office is considered public and cannot be kept confidential. This may not be the final order in which items will be heard. Please view final Agenda, at www.burlingtonvt.gov/dpi/drbb/agendas or the office notice board, one week before the hearing for the order in which items will be heard.

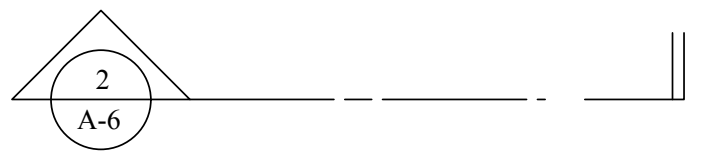
The City of Burlington will not tolerate unlawful harassment or discrimination on the basis of political or religious affiliation, race, color, national origin, place of birth, ancestry, age, sex, sexual orientation, gender identity, marital status, veteran status, disability, HIV positive status, crime victim status or genetic information. The City is also committed to providing proper access to services, facilities, and employment opportunities. For accessibility information or alternative formats, please contact Human Resources Department at (802) 540-2505.

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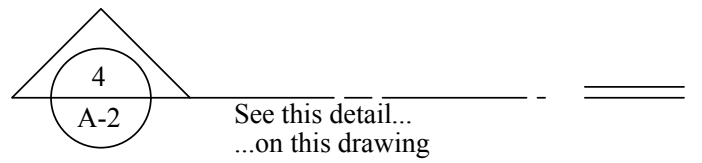
DRAWING SYMBOLS



BUILDING SECTION



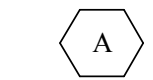
WALL SECTION



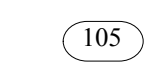
DETAIL



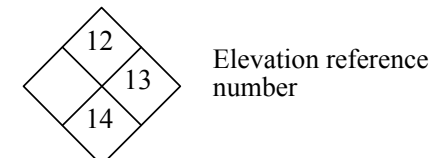
ENLARGED DETAIL



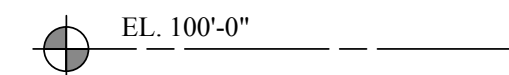
WINDOW TYPE



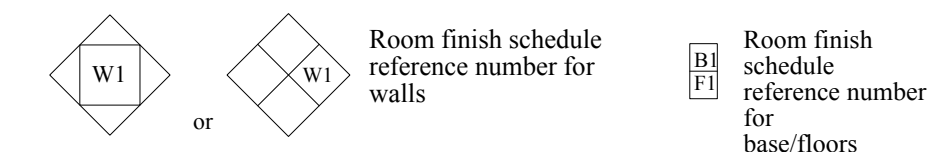
DOOR NUMBER



INTERIOR ELEVATION

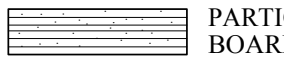
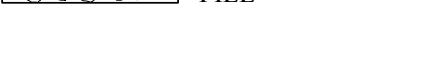
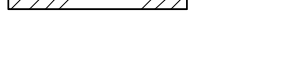
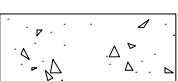
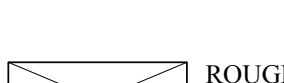
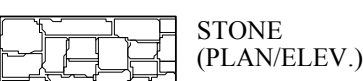


VERTICAL ELEVATION



ROOM FINISH SCHEDULE

MATERIALS



ABBREVIATIONS

ABI	additive bid item	DF	drinking fountain	JAN	janitor	SPEC	specification(s)
ACT	acoustic ceiling tile	ELEC	electric(al)	JT	joint	SQ	square
ADJ	adjustable	EL	elevation	LAV	lavatory	SS	stainless steel
AFF	above finish floor	ELEV	elevator	MAX	maximum	STD	standard
ALUM	aluminum	EQ	equal	MECH	mechanical	SD	storm drain
ANC	anchor, anchorage	EXG	existing	MFR	manufacturer	STRUC	structural
ARCH	architect(ural)	EXT	exterior	MH	manhole	SYS	system
BSMT	basement	FG	fiberglass	MO	masonry opening	TBP	tile backing panel
BIT	bituminous	FIN	finish	MTL	metal	TDO	thermoset decorative overlay
BLKG	blocking	FF	finish floor	MIN	minimum	TEL	telephone
BD	board	FE	fire extinguisher	NIC	not in contract	TG	tempered glass
BOT	bottom	FLG	flashing	NTS	not to scale	THK	thick(ness)
BRK	brick	FD	floor drain	OC	on center	TH	threshold
BLDG	building	FRT	fire retardant	OPNG	opening	T&G	tongue & groove
BTWN	between	FTG	footing	OP-CI	owner provided-contractor installed	TOC	top of concrete
CB	catch basin	FND	foundation	OP-OI	owner provided-owner installed	TOS	top of steel
CJ	control joint	GA	gage, gauge	PNT	pair	TOW	top of wall
CLG	ceiling	GALV	galvanized	PL	plate	T	tread
CT	ceramic tile	GC	general contract(or)	PNT	plate	TYP	typical
CO	clean out	GFE	government furnished equipment	PL	pressure treated	UNO	unless noted otherwise
CL	closet	GFCI	government furnished and	PT	plywood	VERT	vertical
CLR	clear(ance)	GWB	gypsum wall board	PWD	refrigerator	VCT	vinyl composition tile
COL	column	HPDL	high pressure decorative laminate	REF	riser	VR	vapor retarder
CONC	concrete	HWD	hardwood	R	rough opening	VT	vinyl tile
CMU	concrete masonry unit	HVAC	heating, ventilating &	RO	suspended acoustic ceiling	WG	wire glass
CONT	continuous or continue	HT	height	SAC	sheathing	W/O	with out
DP	dampproofing	HOR	horizontal	SHTH	similar	WD	wood
DEM	demolish, demolition	ID	inside diameter				
DET	detail	INS	insulation				
DIA	diameter						
DWG	drawing						

HULA BUILDING 32

32 LAKESIDE AVENUE
BURLINGTON, VERMONT

BURLINGTON PERMIT SET

JUNE 12, 2020

LIST OF DRAWINGS

CIVIL DRAWINGS

C-1.0 EXISTING CONDITIONS & DEMOLITION PLAN

C-1.1 SITE LAYOUT & GRADING PLAN

ARCHITECTURAL DRAWINGS

XC-1.0 EXISTING CONDITIONS PHOTOS

L-1.0 SITE PLAN
L-1.1 HULA CAMPUS OVERALL SITE PLAN

A-1.0 PLAN - FIRST LEVEL

A-2.0 EXTERIOR ELEVATIONS

A-3.0 WALL SECTIONS

A-4.0 RENDERINGS

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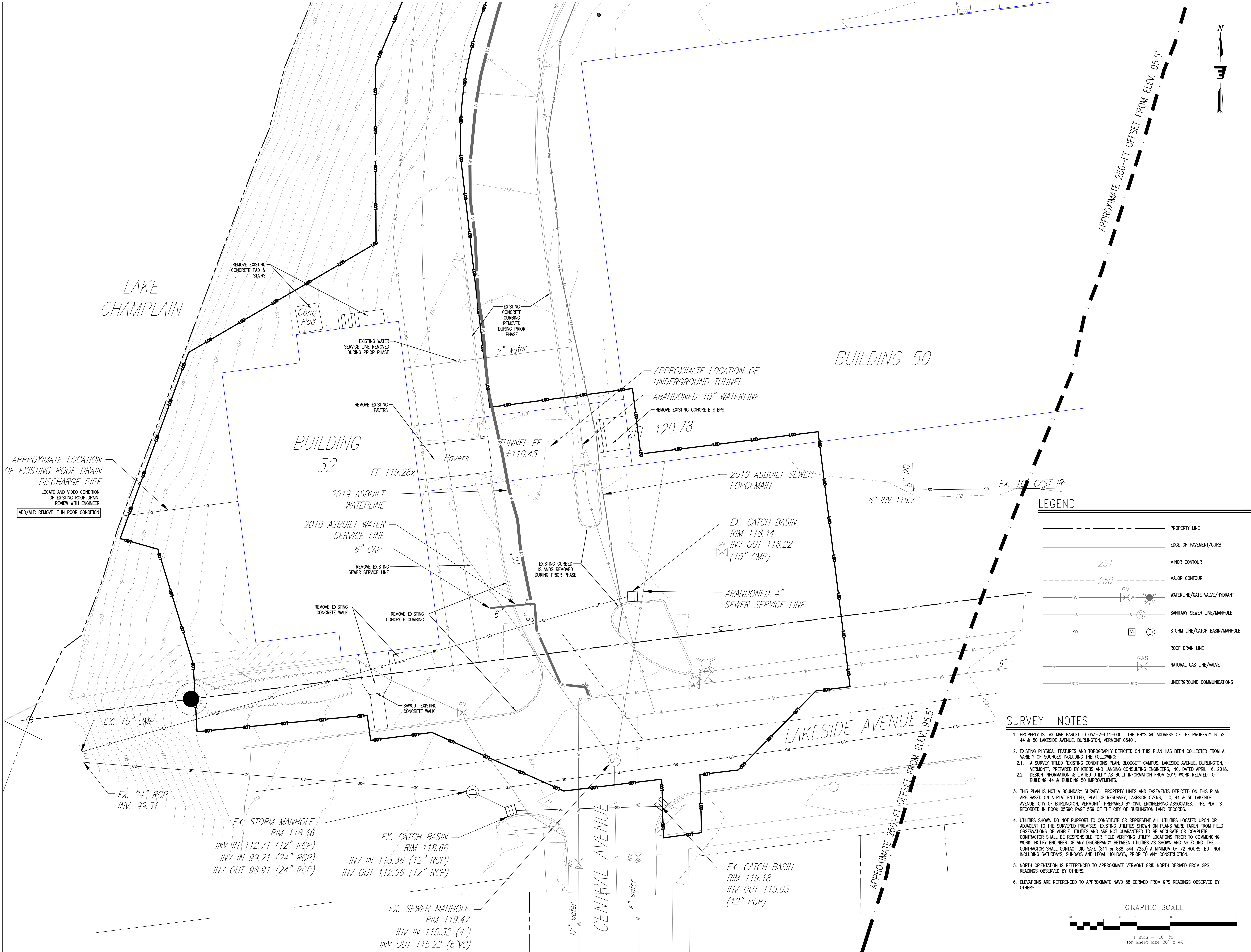
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HULA

BUILDING 32

SAS PROJECT NO. 1017



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SAS PROJECT NUMBER: 1017

PROJECT

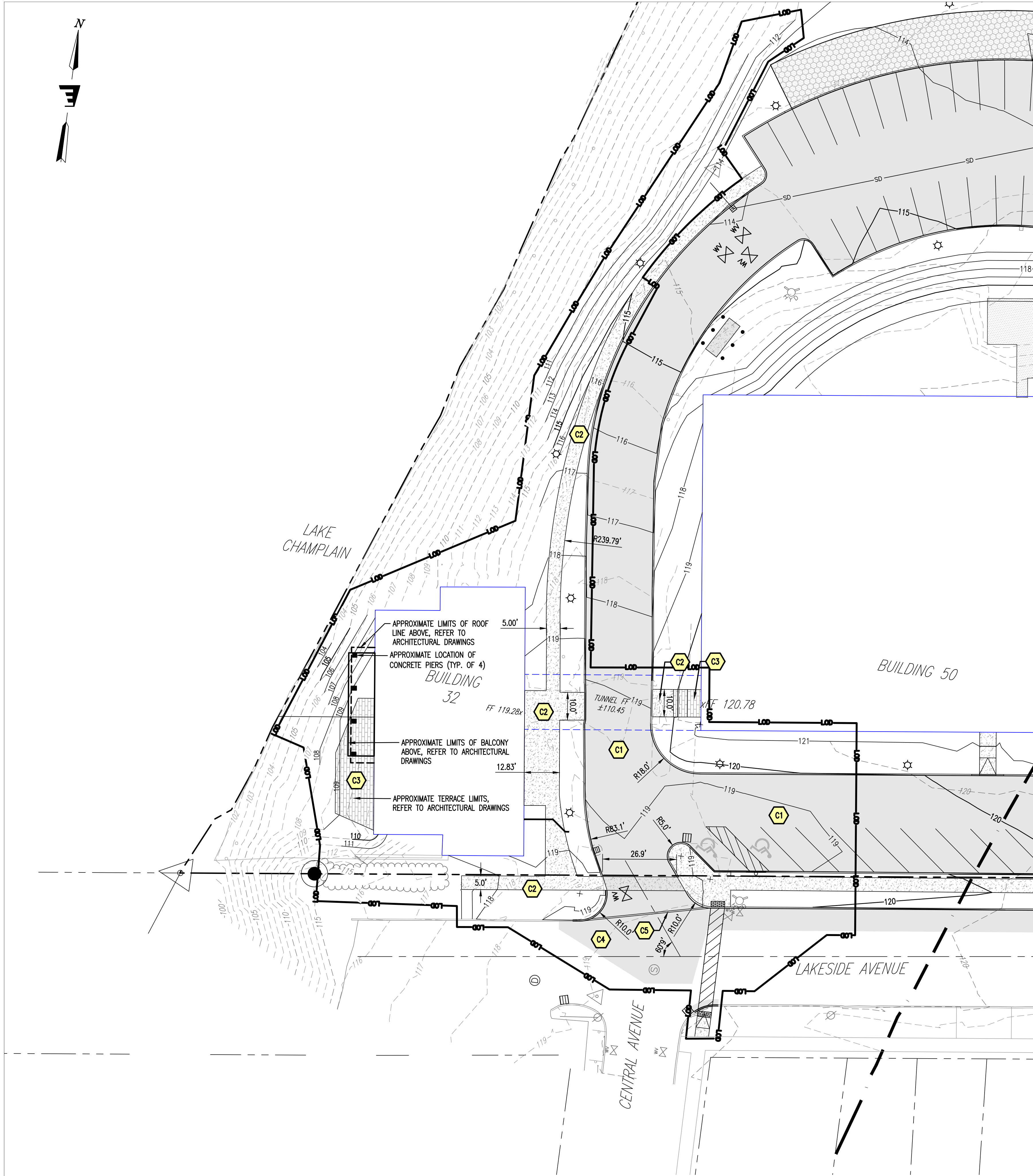
HULA
•
BUILDING 32
•
32 LAKESIDE AVE
BURLINGTON, VT

DATE: 06/12/2020
SCALE: AS NOTED
CHECKED: KW
DRAWN BY: HKW

REVISIONS

EXISTING CONDITIONS & DEMOLITION PLAN

C1.0



SITE LAYOUT PLAN
SCALE: 1" = 20'

PROPOSED SURFACE LEGEND

- PROPOSED BITUMINOUS PAVEMENT
- PROPOSED CONCRETE
- PROPOSED GRANITE PAVERS
- PROPOSED VEHICULAR CONCRETE
- PROPOSED DEPRESSED CURB WITH TRANSITION

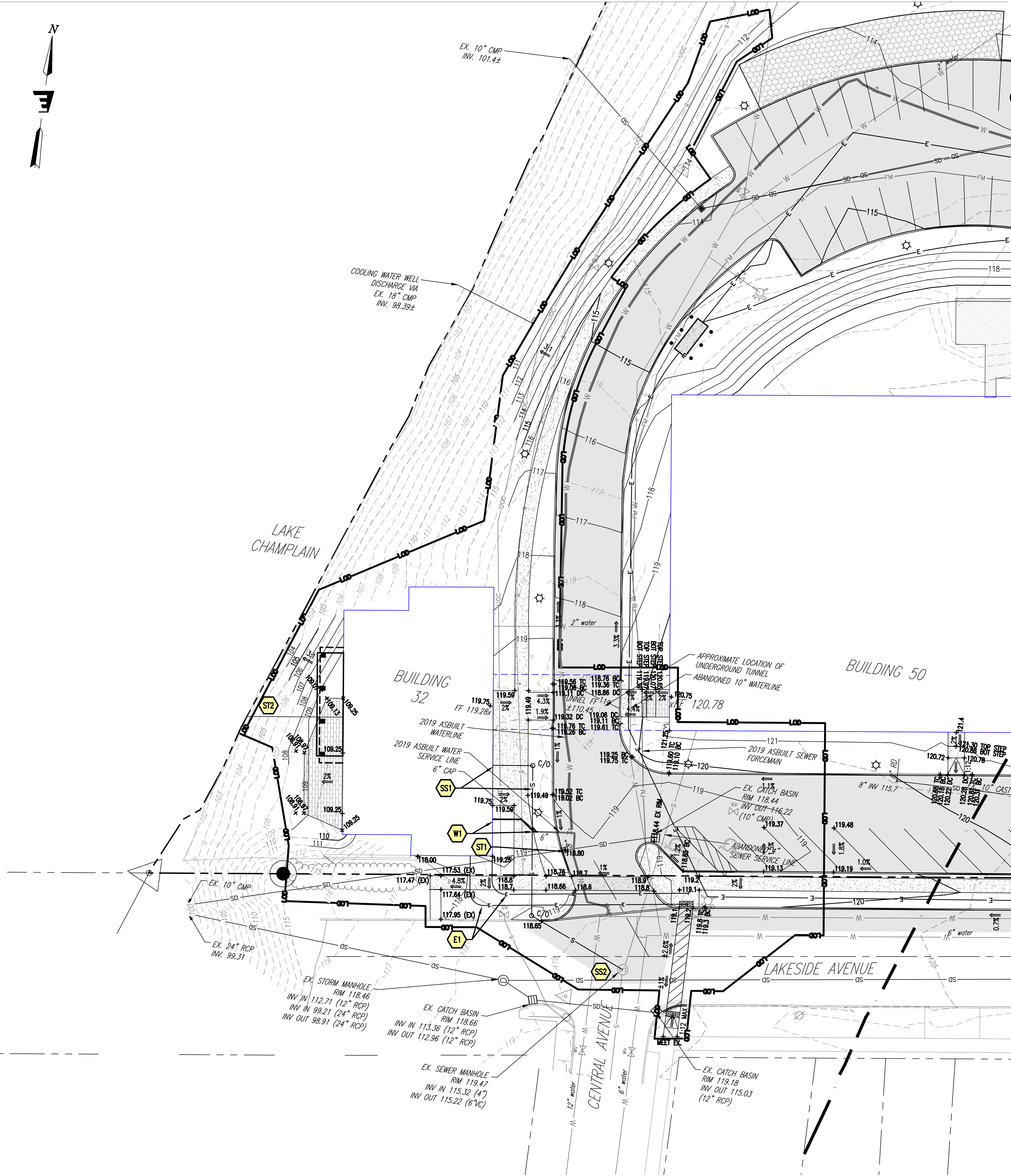
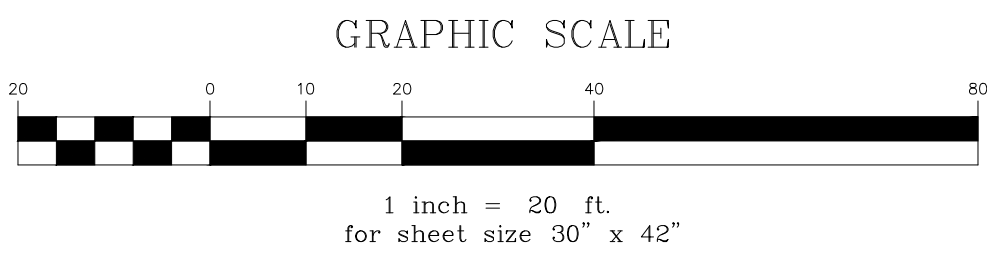
REFER TO ARCHITECTURAL DRAWINGS FOR CONCRETE FINISH & SCORING PATTERN

PROPOSED SITE FEATURES

- C1 PAVED DRIVES, SURFACE PARKING & STRIPING
- C2 CONCRETE SIDEWALK
- C3 GRANITE PAVERS
- C4 PAVEMENT PATCH
- C5 FLUSH CURB ACROSS DRIVE

LOT COVERAGE CALCULATION

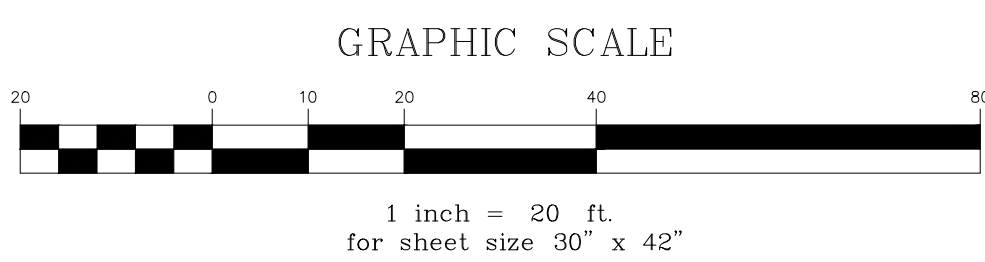
±6.67-AC PRE-DEVELOPMENT IMPERVIOUS AREA
(PRIOR TO BUILDING 44 & 50 REDEVELOPMENT PROJECT)
±6.55-AC POST-DEVELOPMENT IMPERVIOUS AREA
(PLANNED AT COMPLETION OF BUILDING 44 & 50 REDEVELOPMENT PROJECT)
±245-SF IMPERVIOUS REDUCED WITH LAKESIDE AVE ROW REVISIONS
±440-SF IMPERVIOUS EXPANSION WITH WESTERN SIDEWALK RECONFIGURATION
±550-SF IMPERVIOUS EXPANSION WITH BLD 32 TERRACE ADDITION
±750-SF (0.02-AC) NET RESULTING IMPERVIOUS EXPANSION FOR BUILDING 32 PROJECT
±6.57-AC IMPERVIOUS PARCEL POST DEVELOPMENT BUILDING 32 IMPERVIOUS
6.57-AC/14.89-AC = 44% IMPERVIOUS



SITE GRADING & UTILITY PLAN
SCALE: 1" = 20'

PROPOSED UTILITY SCHEDULE

- SS1 REPLACE SEWER LINE SERVICING BUILDING 32
PROVIDE CLEANOUTS AT BENDS
- SS2 CORE & BOOT FOR NEW TIE IN AT EXISTING STRUCTURE
- W1 NEW 6" WATER SERVICE LINE WITH 45-DEG BENDS AS INDICATED
PROVIDE 18" SEPARATION TO TOP OF SEWER SERVICE LINE
- E1 APPROXIMATE LOCATION OF UNDERGROUND ELECTRICAL LINES
PROVIDE (5) 4" CONDUITS
- ST1 PROP. 4-FT I.D. CATCH BASIN
INSTALLED INLINE WITH EXISTING CMP PIPE
MATCH EXISTING CMP INVERT ELEVATIONS
- ST2 ADD/ALT
REPLACE ROOF DRAIN DISCHARGE PIPE



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SAS PROJECT NUMBER: 1017

PROJECT

HULA
BUILDING 32
32 LAKESIDE AVE
BURLINGTON, VT

DATE: 06/12/2020
SCALE: AS NOTED
CHECKED: KW
DRAWN BY: HKW

REVISIONS

SITE LAYOUT
&
GRADING
PLAN

C1.1



VIEW FROM WEST



VIEW FROM EAST



VIEW FROM SOUTHWEST



VIEW FROM NORTH

PERMIT
SET
06/12/2020

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HULA
•
BUILDING 32
•
32 LAKESIDE AVE
BURLINGTON, VT

DATE: 06/12/2020
SCALE: AS NOTED
CHECKED: SHS
DRAWN: OBS, SAL

REVISIONS

EXISTING CONDITIONS
•
PHOTOS

XC-1.0

CANOPY LIGHT A
6" LED Downlight
LC6SL
1000/1600/1800 Lumens
120V/277V/347V
0-10V Dimming

LifeFrame
1000/1600/1800 Lumens
120V/277V/347V
0-10V Dimming

APPLICATIONS:
Canopy Light A is a 6" recessed downlight designed for use in a variety of applications. It is ideal for use in a variety of applications, including:
• Office spaces
• Retail spaces
• Industrial spaces
• Outdoor spaces
• Residential spaces

FEATURES:
• 6" LED Downlight
• 1000/1600/1800 Lumens
• 120V/277V/347V
• 0-10V Dimming
• Canopy Light A is a 6" recessed downlight designed for use in a variety of applications. It is ideal for use in a variety of applications, including:
• Office spaces
• Retail spaces
• Industrial spaces
• Outdoor spaces
• Residential spaces

INSTALLATION:
Canopy Light A is a 6" recessed downlight designed for use in a variety of applications. It is ideal for use in a variety of applications, including:
• Office spaces
• Retail spaces
• Industrial spaces
• Outdoor spaces
• Residential spaces

REVISIONS:
• 1. 06/12/2020
• 2. 06/12/2020
• 3. 06/12/2020

PROJECT:
• 06/12/2020
• 06/12/2020
• 06/12/2020

DATE:
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SCALE:
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DRAWN:
• 06/12/2020
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GENERAL:
• 06/12/2020
• 06/12/2020
• 06/12/2020

BICYCLE PARKING REQUIREMENTS:

BTV ZONING TABLE 8.2.5-1

LONG TERM SPACES

BUILDING 32

- OFFICE USE: 14,450 GSF @ 1 PER 5,000 GSF = 3 SPACES REQUIRED
20 SPACES PROVIDED (COVERED COMBINED LONG & SHORT TERM SPACES)

SHORT TERM SPACES

BUILDING 32

- OFFICE USE: 14,450 GSF @ 1 PER 10,000 GSF = 3 SPACES REQUIRED
20 SPACES PROVIDED (COVERED COMBINED LONG & SHORT TERM SPACES)

PLANTING SCHEDULE

KEY	QUANTITY	COMMON NAME	BOTANICAL NAME	SIZE
A	5	SKYLINE THORNLESS HONEYLOCUST	GLEDTISIA TRIACANTHOS	3" CAL.

LIGHTING SCHEDULE

KEY	DESCRIPTION	MAKE & MODEL
A	6" RECESSED CAN LED DOWNLIGHT	PRESOLITE LIGHTING LC6SL-6LCSL-10L-40K-8-WH-WT

SITE NOTES:

- PROTECT EXISTING TREES, PLANTS, AND MONUMENTS THROUGHOUT CONSTRUCTION.
- REFER TO CIVIL DRAWINGS FOR CONTRACT LIMIT LINE, BOUNDARY LINE, PROPOSED GRADING, LOT COVERAGE, & UNDERGROUND UTILITIES.
- BUILDING SERVICE/ TRASH AREA IS PART OF HULA CAMPUS

ACCESSIBLE PARKING REQUIREMENTS:

ADA TABLE 208.2:

BUILDING 32

- FOR 26-50 PARKING SPACES, 2 MINIMUM ACCESSIBLE SPACES

ACCESSIBLE PARKING:

SOUTH LOT FOR BUILDING 32:

- 2 ACCESSIBLE SPACES (1 ACCESSIBLE & 1 VAN ACCESSIBLE)

DRAWING KEY

EXISTING TREE/ SHRUB TO BE REMOVED

PROPOSED TREE/ SHRUB - SEE LANDSCAPE CONSULTANT'S DRAWINGS FOR SPECIES AND DETAILS

PROPOSED BUILDING

PREVIOUSLY PERMITTED WORK

CONCRETE - EXISTING

CONCRETE - PROPOSED

VERMONT NATURAL BLUESTONE
- 3" THICK - 24" WIDE x 4'-0" LONG UNO.
- PROVIDE SAMPLES OF LOCALLY AVAILABLE STONE IN REPRESENTATIVE SIZES.

PARKING NOTES:

PARKING REQUIREMENTS BASED ON BTV ZONING ARTICLE 8.

OFFICE USE BASED ON 2 CARS/1000 GFA

MAKER SPACE BASED ON 1 CAR/1000 GFA

PERMIT #ZP19-0202CA/MA:

BUILDING 50 OFFICE @ 80,000 SF INCLUDING MEZZANINE = 160 SPACES

BUILDING 50 MAKER SPACE @ 3,900 SF = 4 SPACES

BUILDING 44 OFFICE @ 52,000 SF = 104 SPACES

BUILDING 32 OFFICE EXG @ 9,200 SF = 18 SPACES

TOTAL REQUIRED: 286 SPACES

TOTAL PROVIDED: 381 SPACES (273 CONVENTIONAL, 108 TANDEM)

PERMIT #ZP18-0865CA:

BURLINGTON SURF CLUB = + 10 SPACES

TOTAL REQUIRED: 286 + 10 = 296 SPACES

PERMIT #ZP20-0674CU:

CHANGE OF USE: MIXED OFFICE TO TRADE SCHOOL = +1 SPACE

TOTAL REQUIRED: 296 + 1 = 297 SPACES

PERMIT #ZP20-0820CA:

BUILDING 32 NET NEW OFFICE @ 5,250 SF = + 11 SPACES

TOTAL REQUIRED: 297 + 11 = 308 SPACES

TOTAL PROVIDED: 386 SPACES (274 CONVENTIONAL, 112 TANDEM)

LAKESIDE AVENUE

LAKE CHAMPLAIN

BUILDING 32

FFE AT ENTRANCE LEVEL +/- 119.83'
(+/- 6" HIGHER THAN EXG)

ROOF ELEVATION
+/- 153.08'

BUILDING 50

FFE +/- 120'-9"

SITE PLAN
1/8" = 1'-0"

PERMIT

SET

06/12/2020

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SAS PROJECT NUMBER: 1017

PROJECT

HULA

BUILDING 32

32 LAKESIDE AVE
BURLINGTON, VT

DATE: 06/12/2020
SCALE: AS NOTED
CHECKED: SHS
DRAWN: OBS, SAL

REVISIONS

06/22/2020 - GENERAL

SITE PLAN

L-1.0

PERMIT
SET
6/12/2020

SMITH
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BURLINGTON,
VERMONT

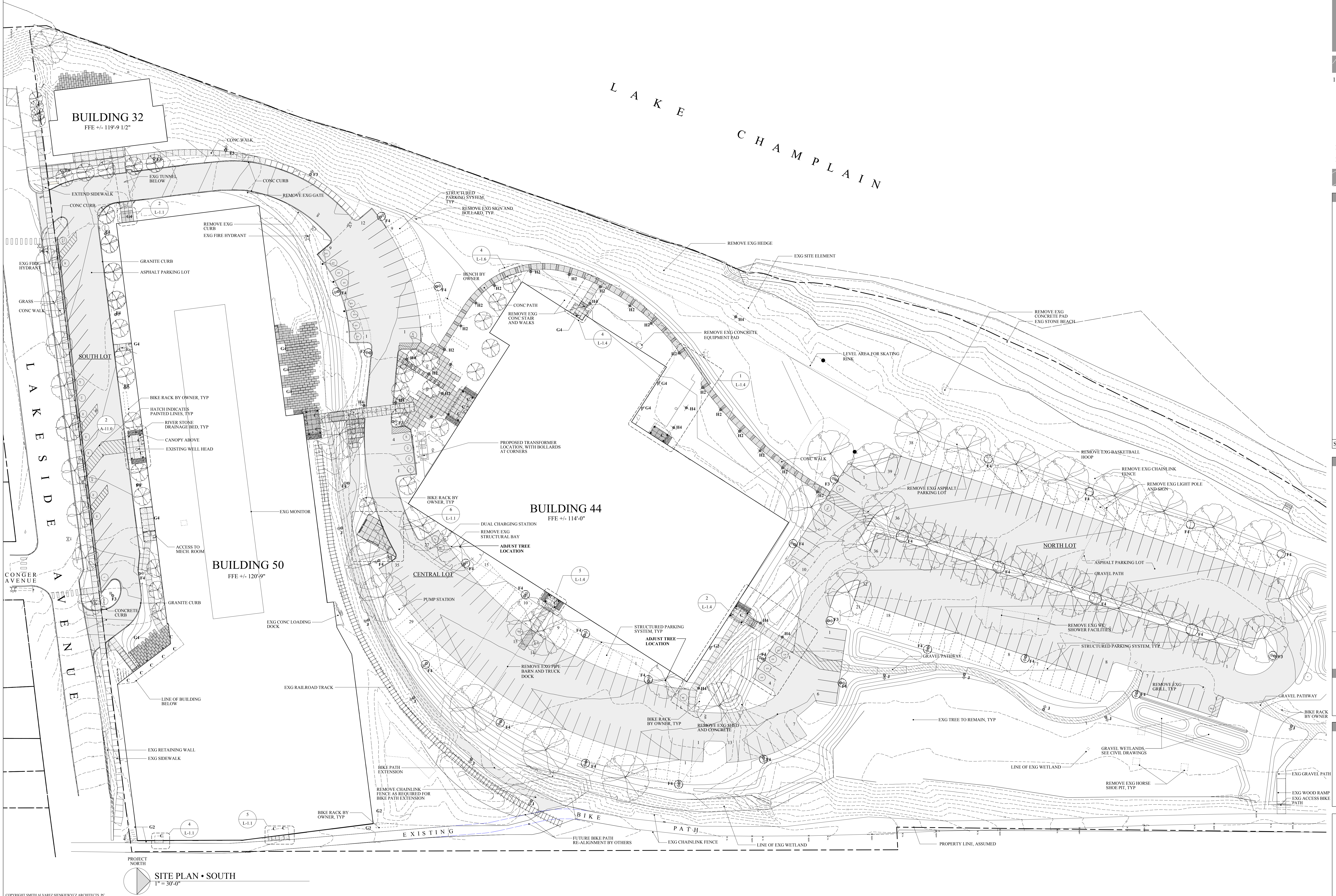
DATE: 06/12/2020
SCALE: AS NOTED
CHECKED: SS
DRAWN BY: SAL, JM, OS

REVISIONS

PHASE

HULA CAMPUS
OVERALL SITE PLAN

L-1.1



PERMIT
SET
06/12/2020

SMITH
ALVAREZ
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PROJECT

HULA

BUILDING 32

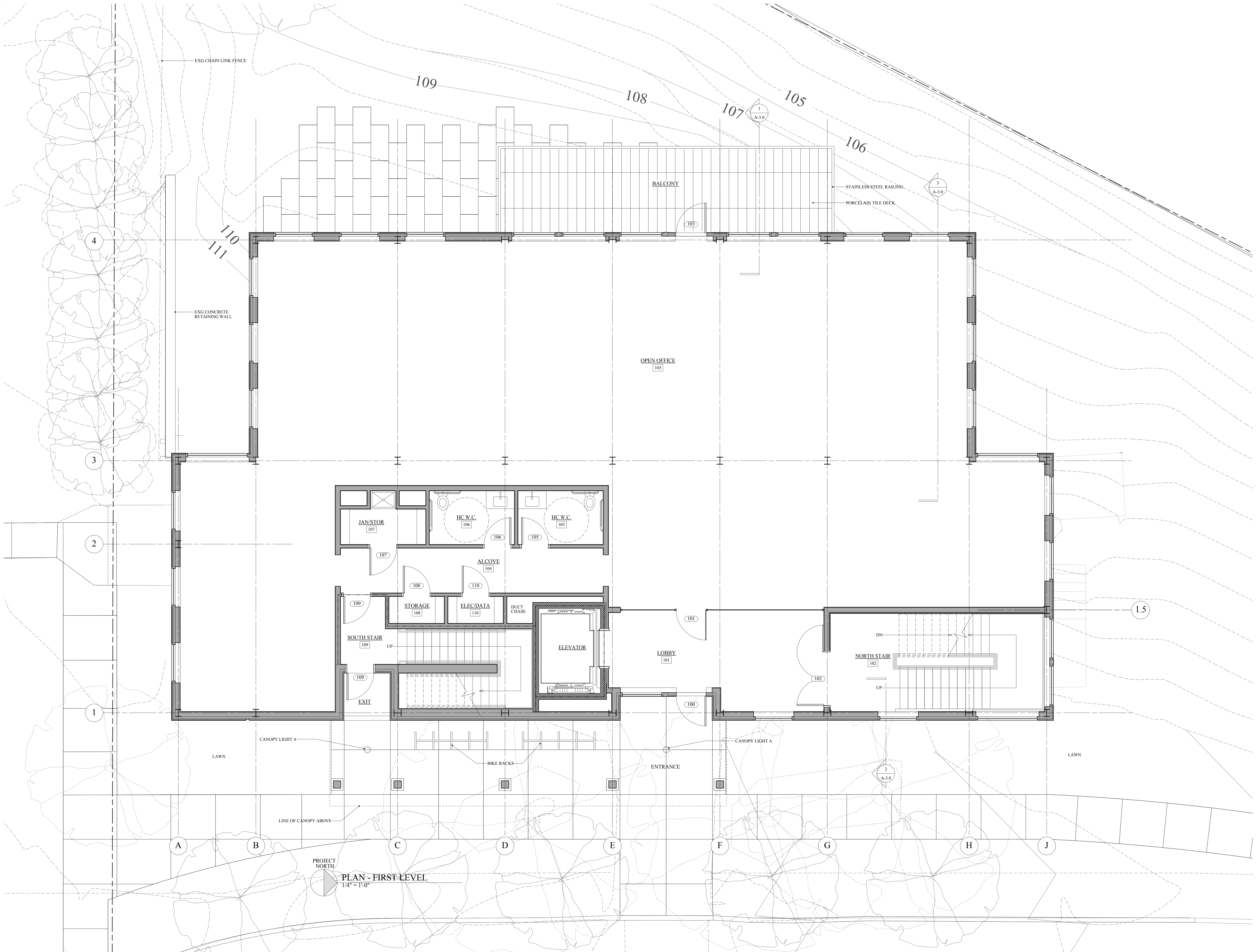
32 LAKESIDE AVE
BURLINGTON, VT

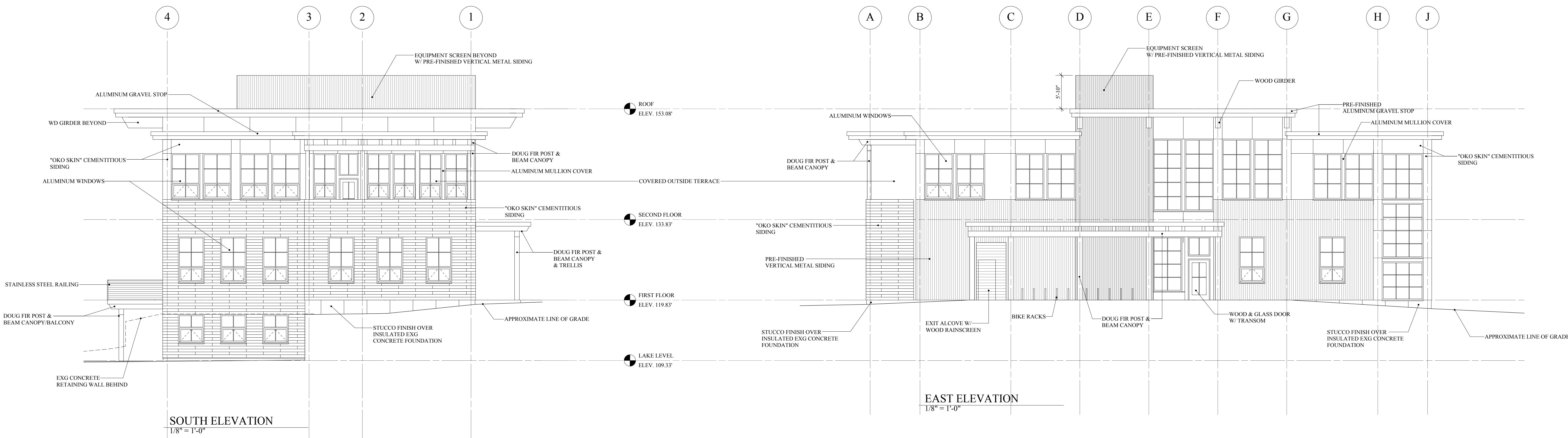
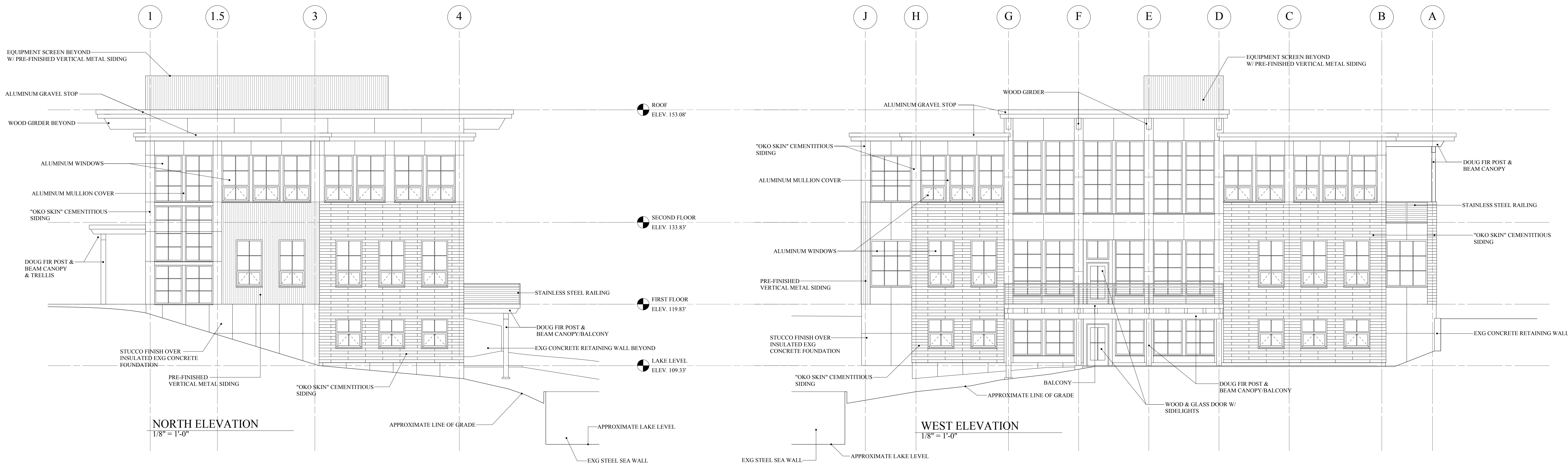
DATE: 06/12/2020
SCALE: AS NOTED
CHECKED: SHS
DRAWN: OBS, SAL

REVISIONS

PLAN
FIRST LEVEL

A-1.0





SMITH
ALVAR E Z
SIENKIEWYCZ

17 St. Paul Street
3rd Floor
Burlington, VT
05401

CONSULTANTS

PROJECT

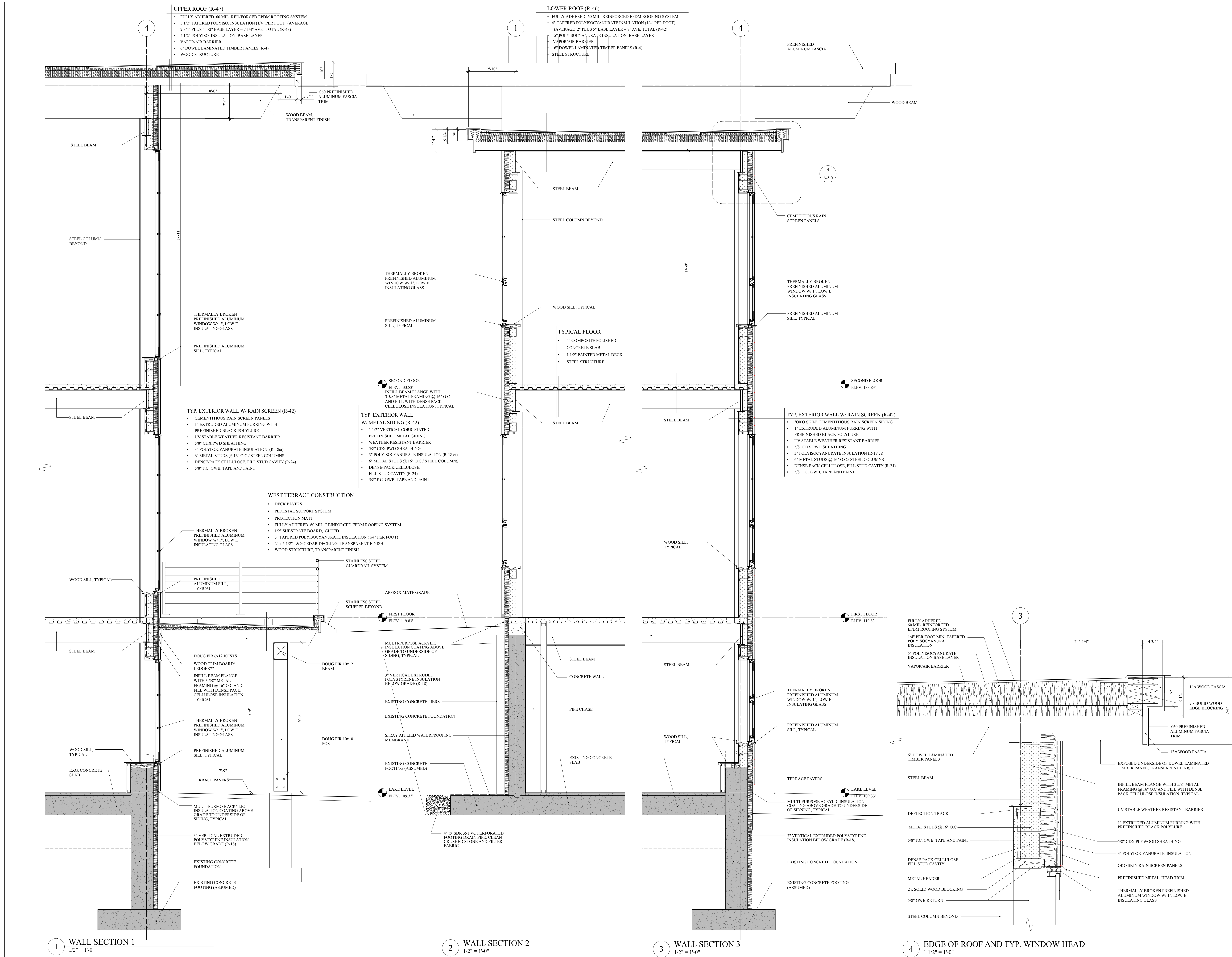
HULA
•
BUILDING 32
•
32 LAKESIDE AVE
BURLINGTON VT

DATE: 06/12/2020
SCALE: AS NOTED
CHECKED: SHS
DRAWN: OBS

REVISIONS

SECTIONS

A-3.0





VIEW FROM WEST



VIEW FROM SOUTHEAST



VIEW FROM SOUTHWEST



VIEW FROM NORTHEAST

6/22/20
10 April 2020

Ms. Mary O'Neil, Principal Planner
Mr. Scott Gustin, Principal Planner
Permitting and Inspections
645 Pine Street – Suite A
Burlington, VT 05401

RE: HULA – 32 Lakeside Avenue
Demolition of Existing Building and Reconstruction on Existing Foundation

Dear Mary and Scott:

Per previous discussions regarding the proposed above-referenced Project, I enclose the following information for your review:

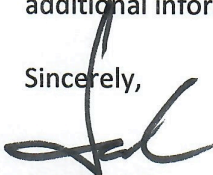
- Completed Application Form
- Zoning Permit Fee of \$32,290.00
- Site and architectural plans for proposed structure

In general, the proposed zoning permit application contemplates the demolition of the existing two-level, 9,200 square foot office building, and the new construction of a three-level office building utilizing the existing foundation. The proposed design of the building uses a contemporary palette of exterior materials that complements the traditional materials used at 44 and 50 LSA. The gross floor area of the new building will be approximately 14,450 square feet, and the maximum height of the building, as measured per Section 5.2.6 of the CDO, will be 35'9" feet.

The use will not result in any substantial changes to the site plan previously approved under Permit #19-0202CA/MA. The parking count approved by the DRB under Permit #19-0202CA/MA is just under the 125% of the permitted maximum. While the increased office space will create an additional parking demand of eleven (11) vehicles, there are adequate parking assets to accommodate the expansion.

I trust this description provides the needed context for you to review and process this application. However, if additional information is required, please advise. Thank you.

Sincerely,

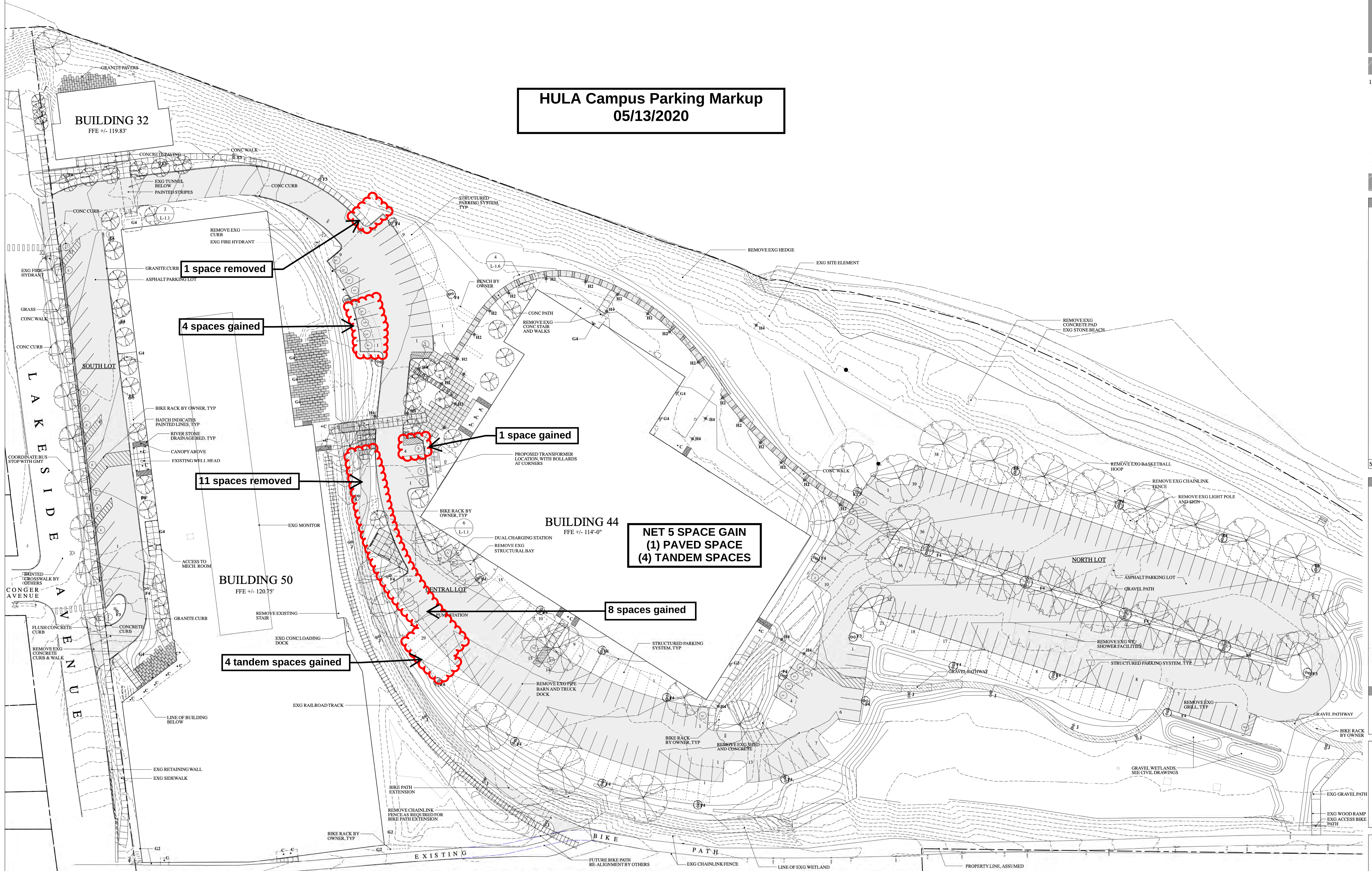


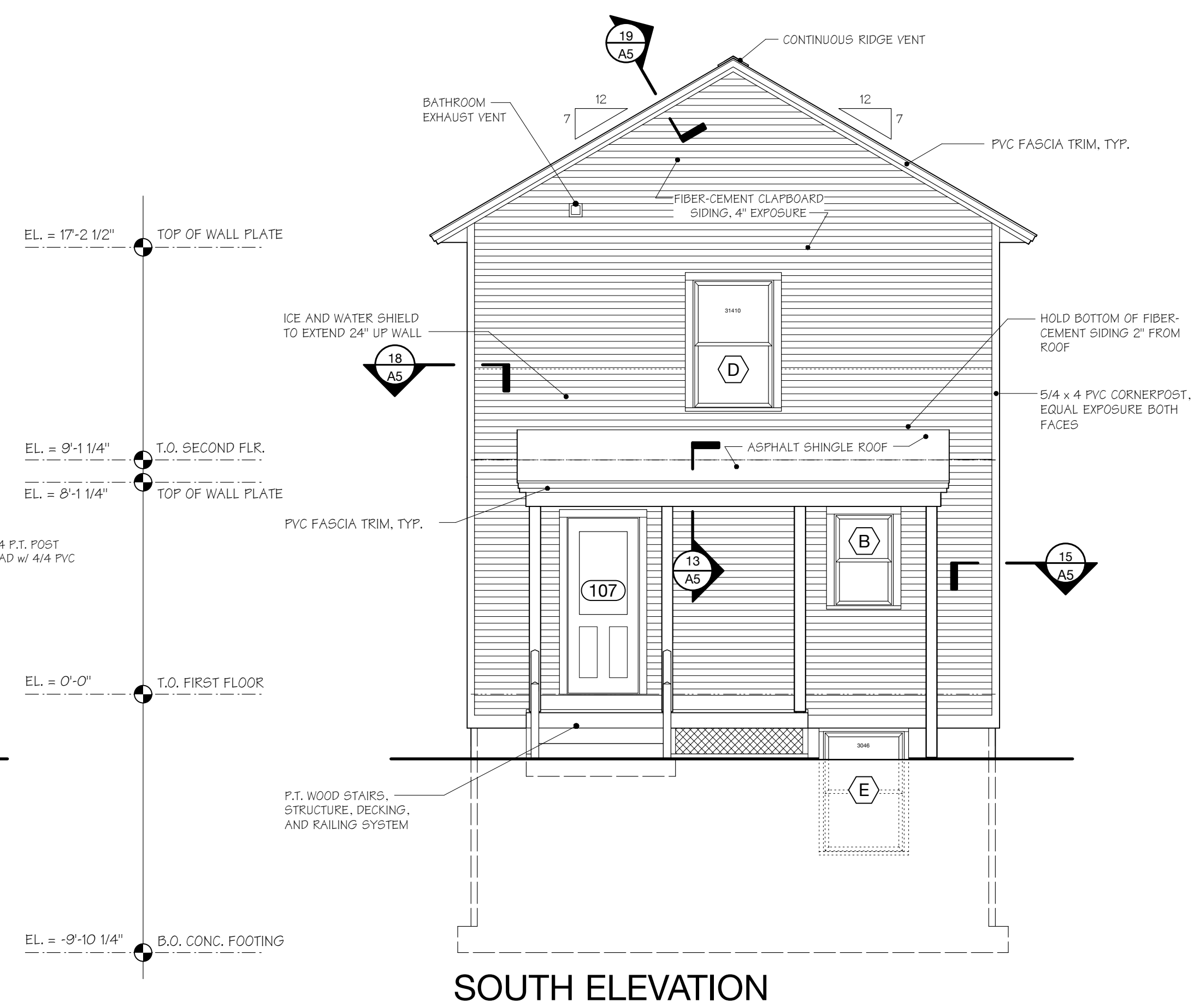
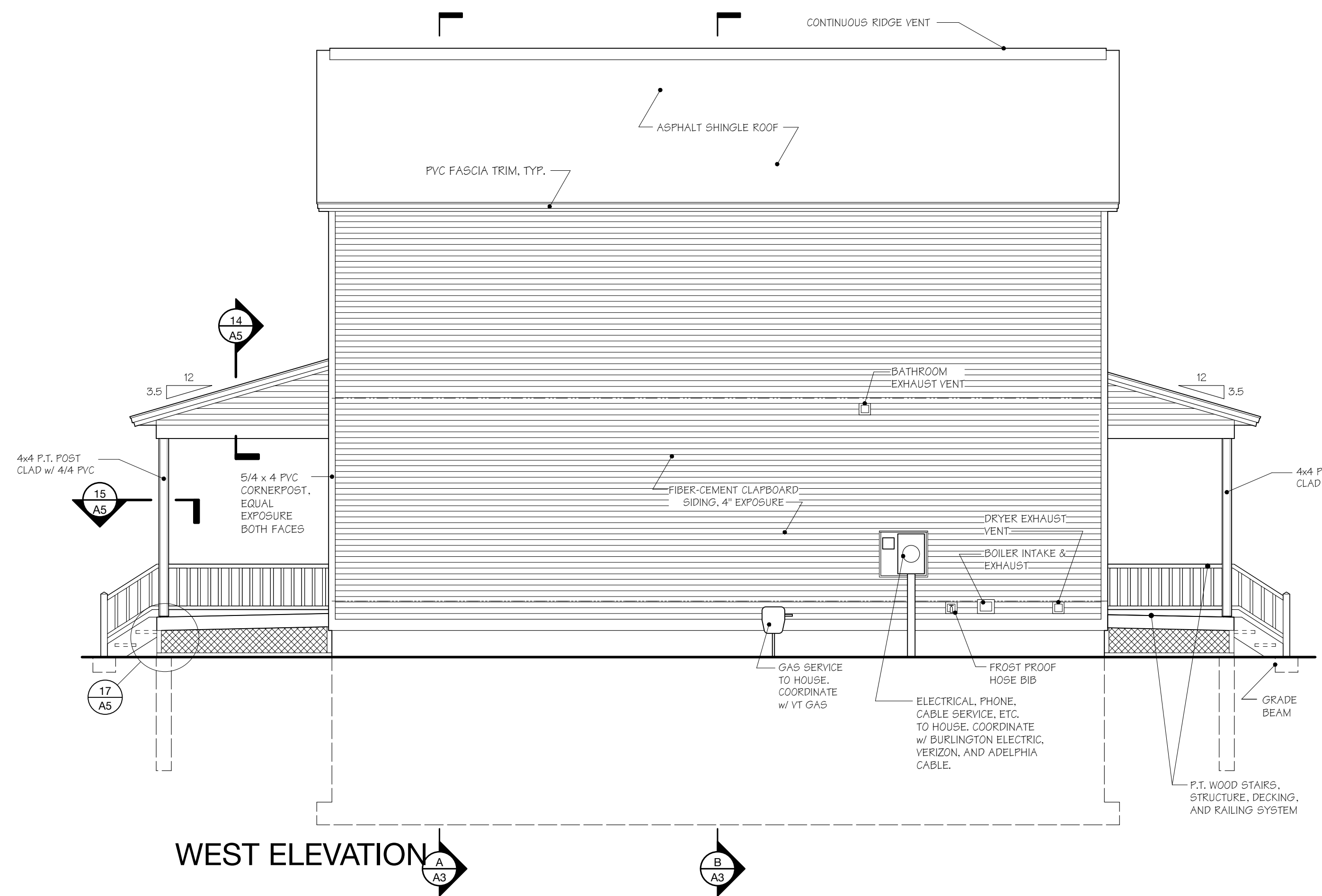
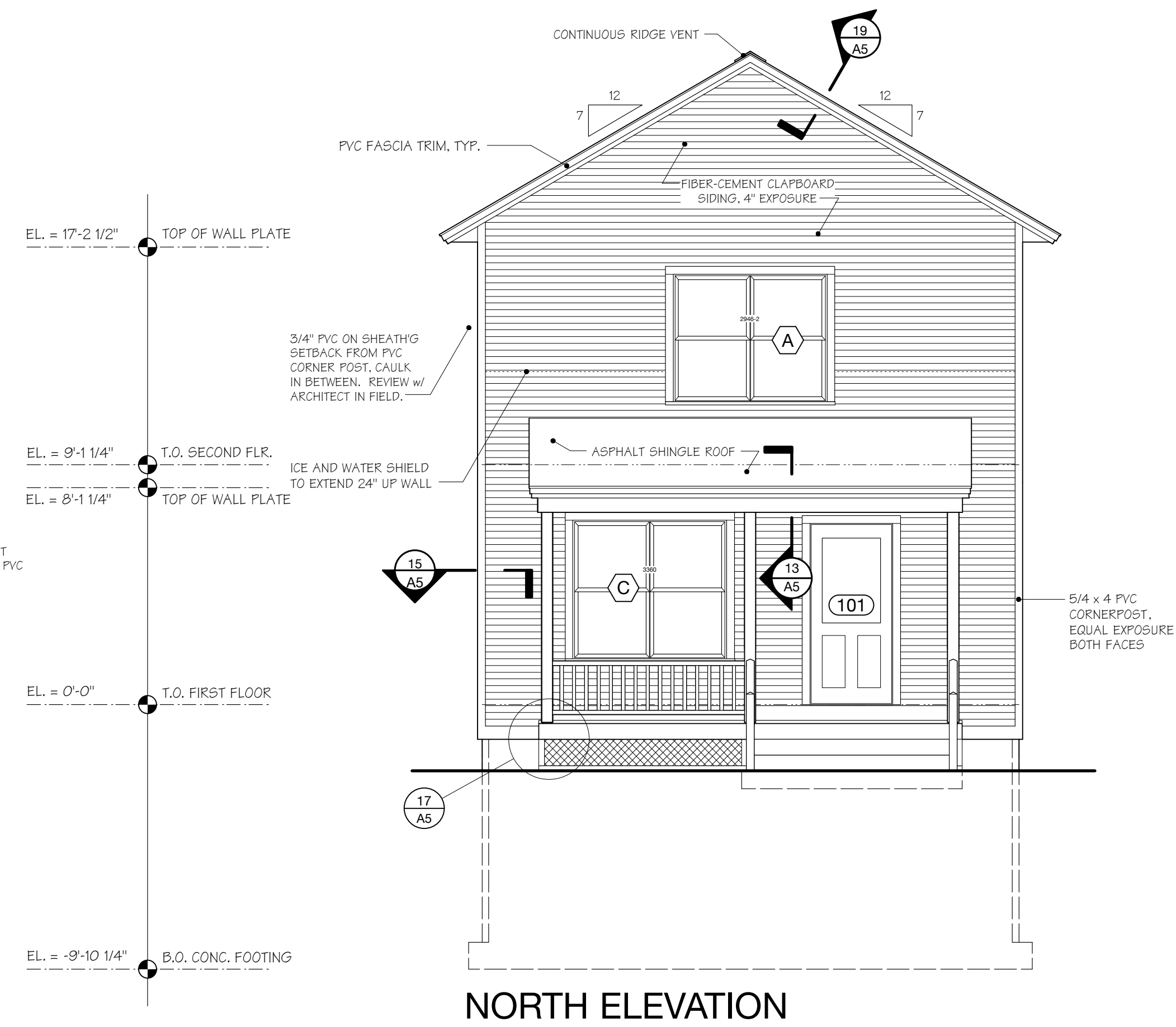
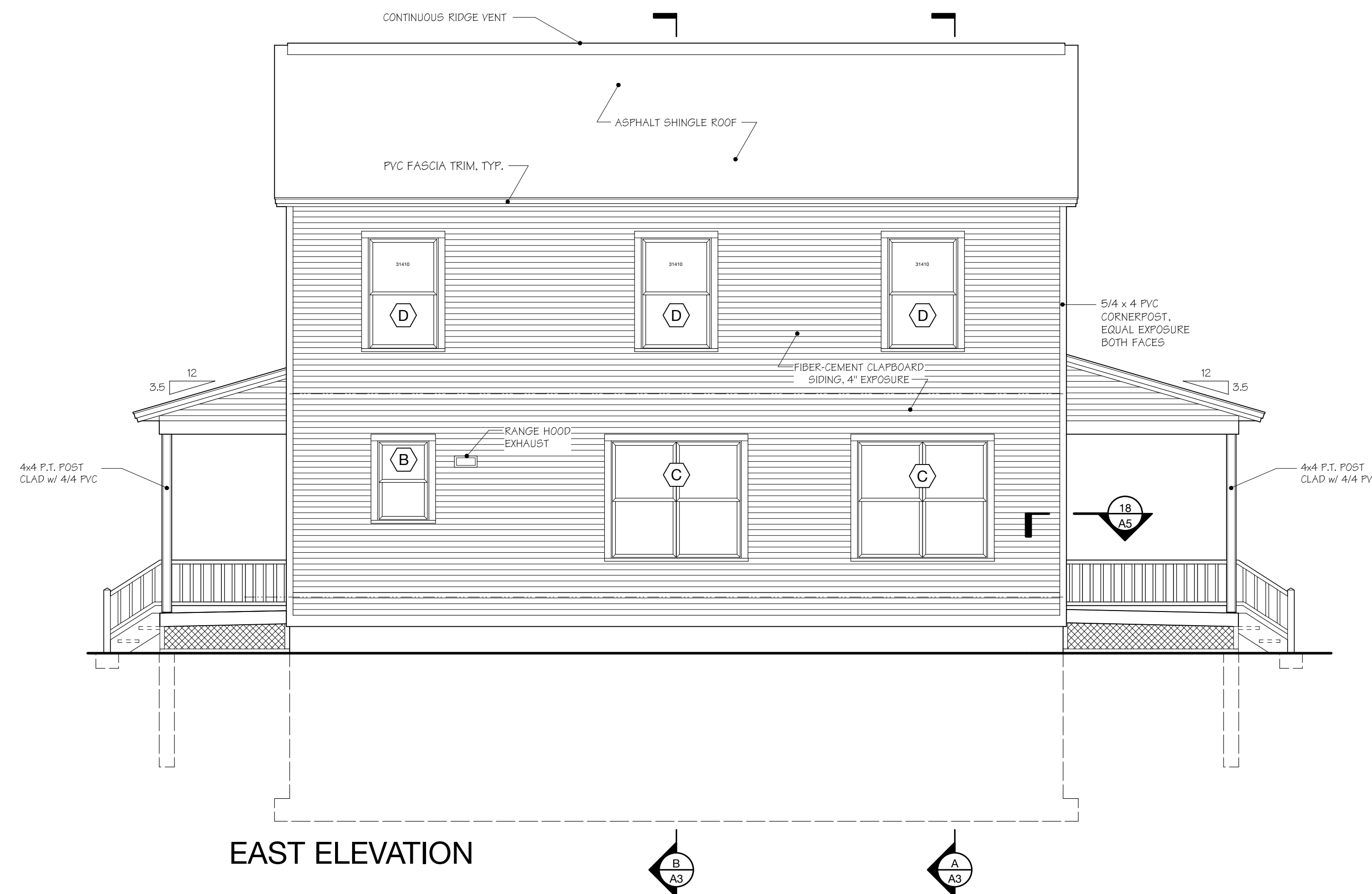
LANDPLAN
John Caulo

Attachments as noted

cc. Russ Scully, Hula Lakeside

HULA Campus Parking Markup
05/13/2020





HABITAT for HUMANITY - 225 ELMWOOD AVENUE

BURLINGTON, VERMONT

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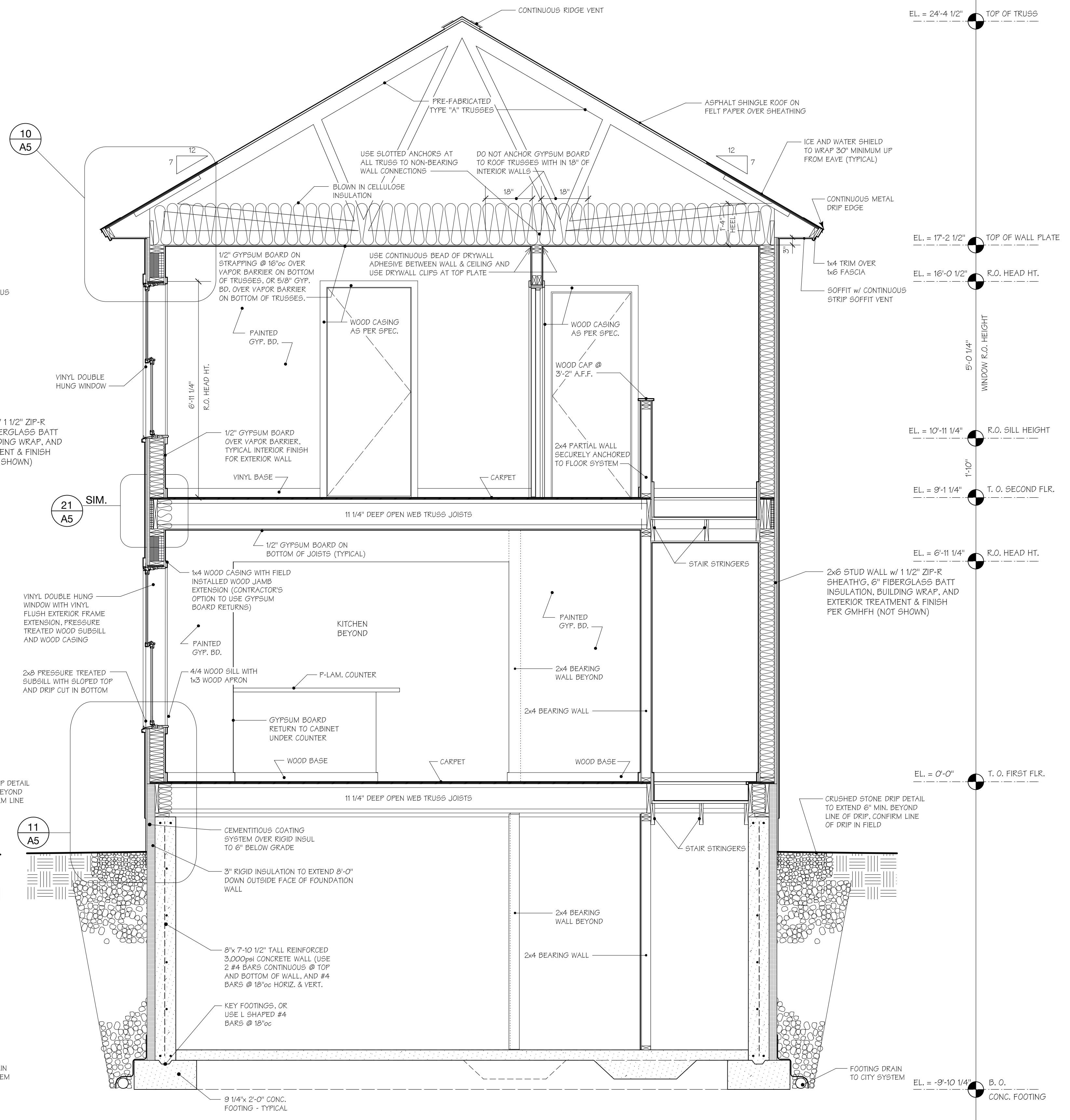
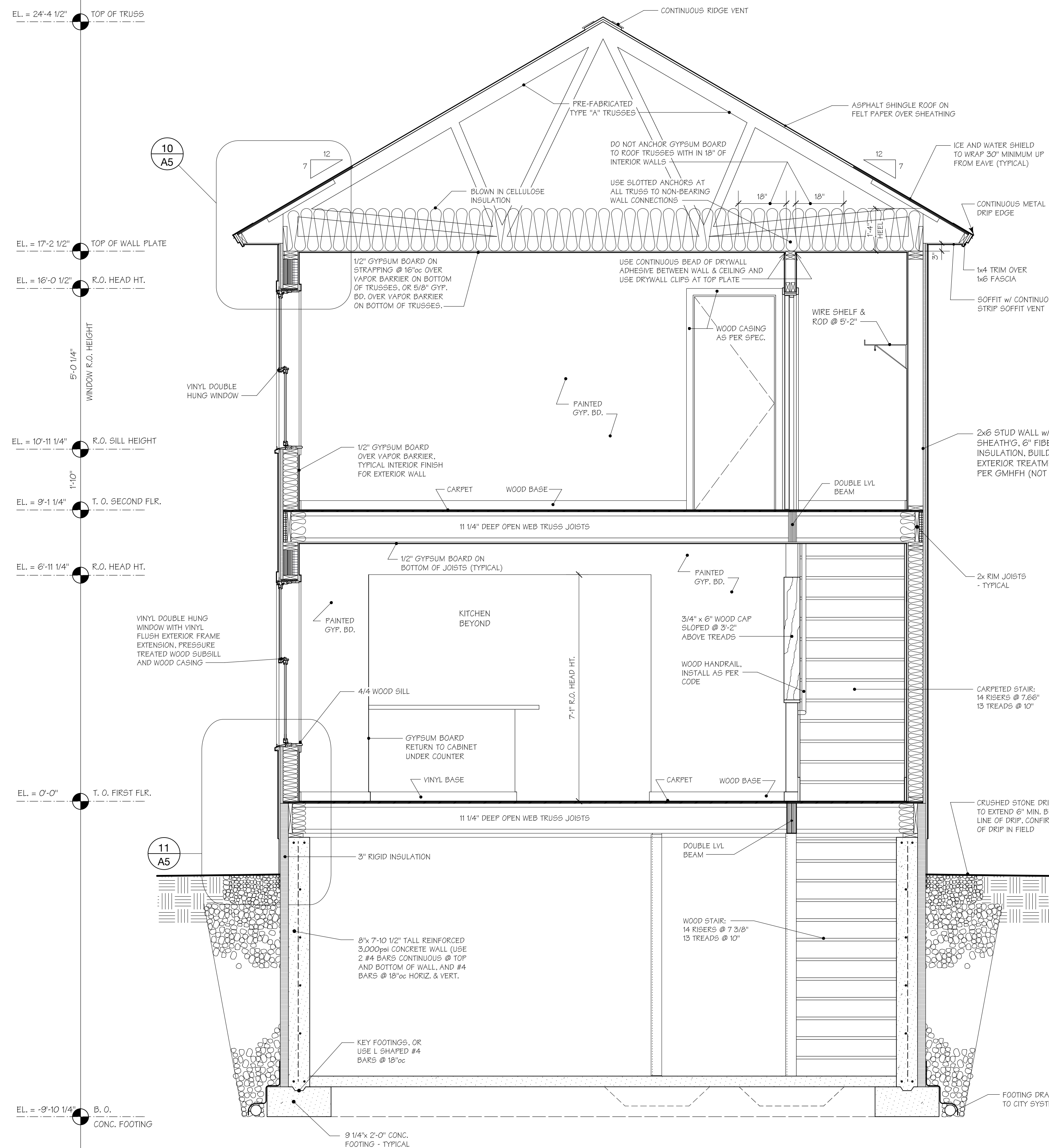
PROGRESS PRINT

Duncan
Wisniewski
ARCHITECTURE

255 SOUTH CHAMPLAIN STREET
BURLINGTON, VERMONT 05401
T: 802.864.6693

DATE: 06.08.2020
DRAWN: PJC

A2-1.0



HABITAT for HUMANITY - 225 ELMWOOD AVENUE

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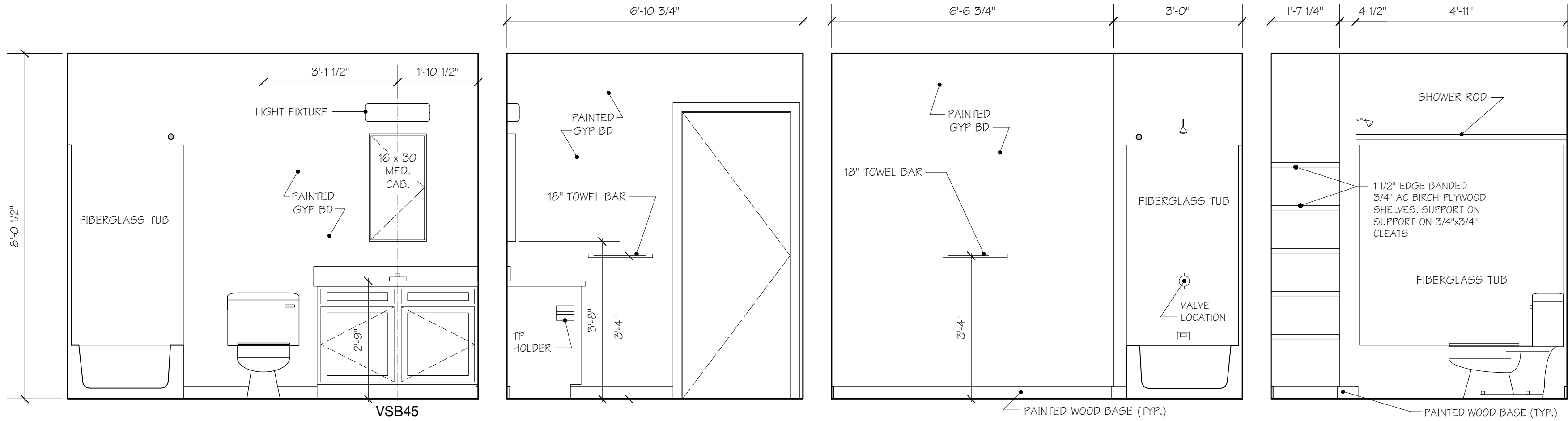
PROGRESS PRINT

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ARCHITECTURE

255 SOUTH CHAMPLAIN STREET
BURLINGTON, VERMONT 05401
T: 802.864.6693

DATE: 06.08.2020
DRAWN: PJC

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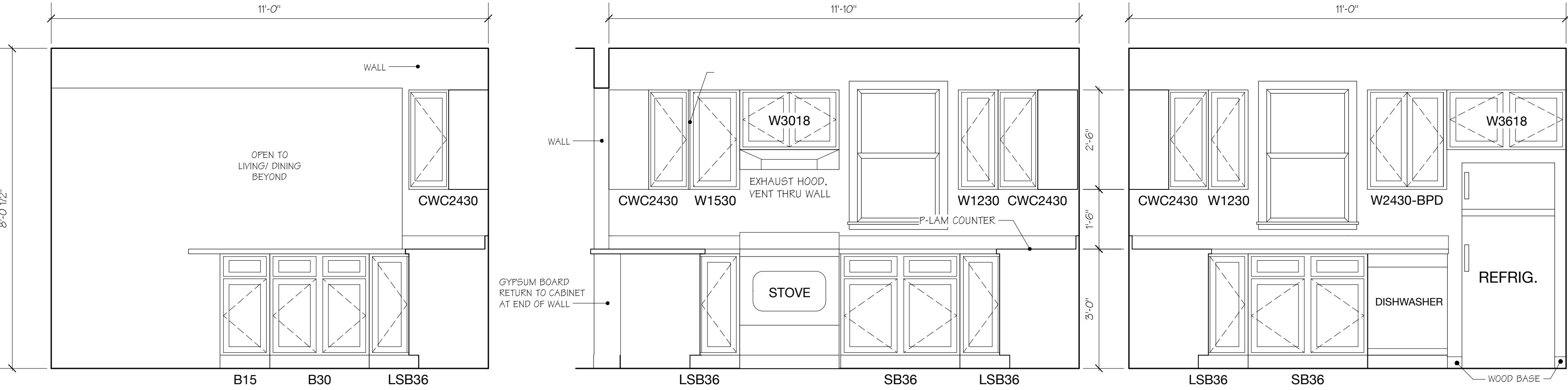


BATH: 205

BATH: 205

BATH: 205

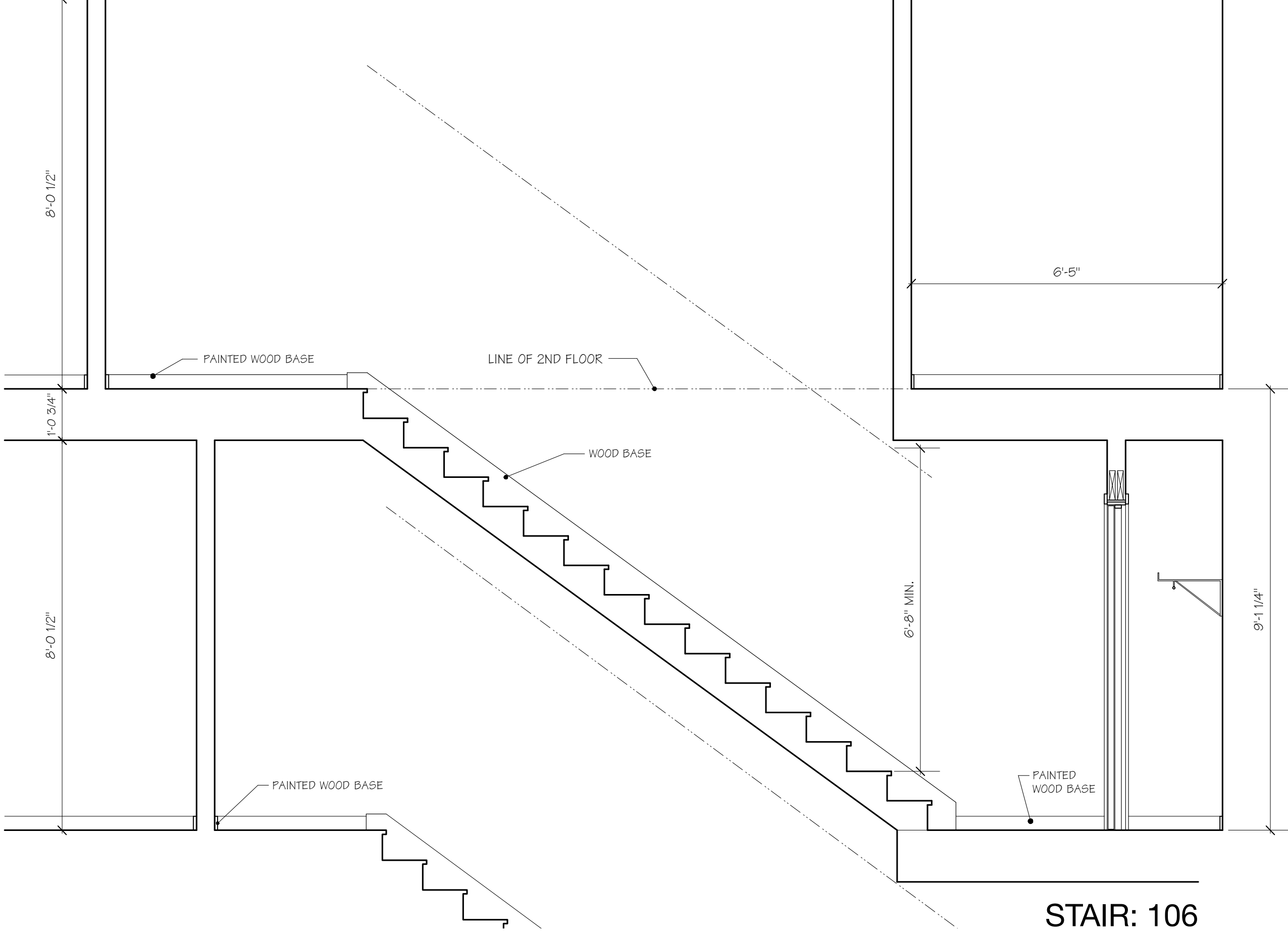
BATH: 205



KITCHEN: 102

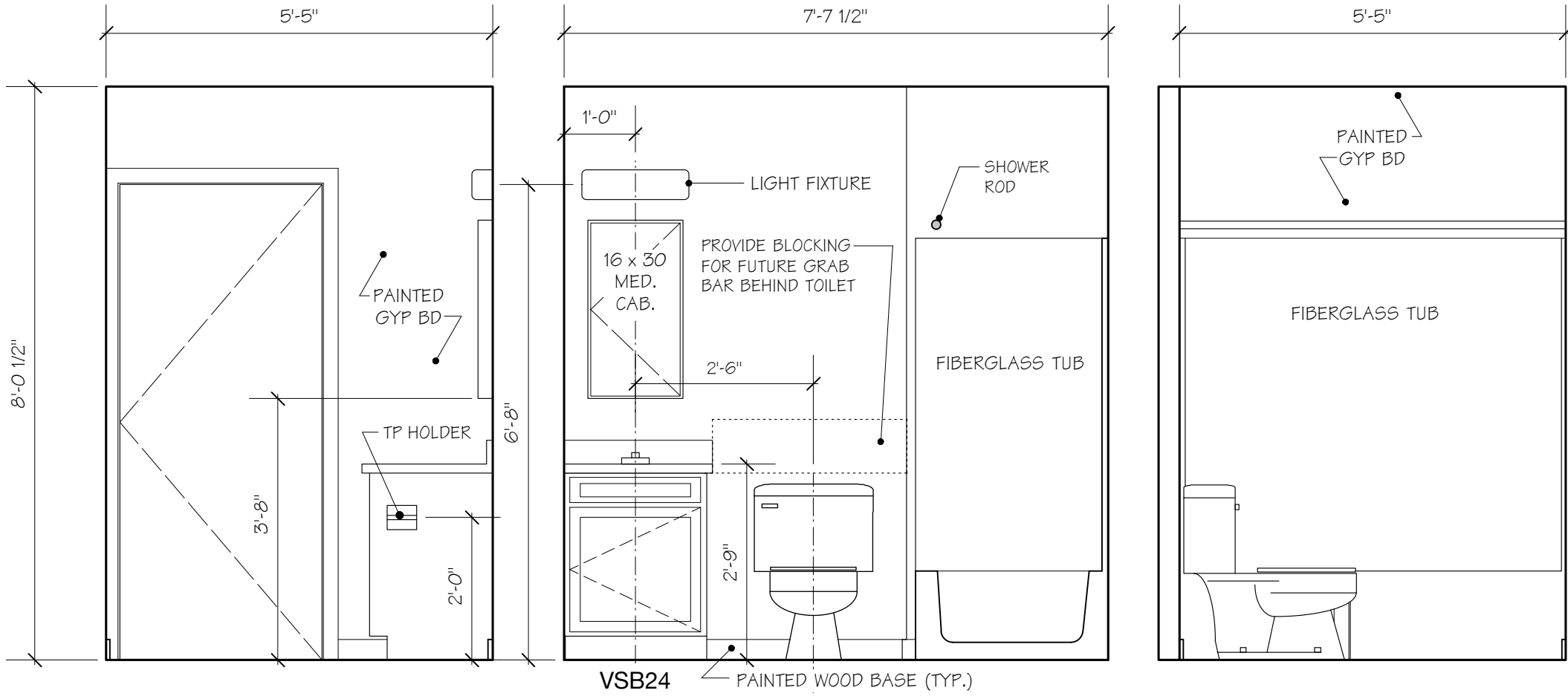
KITCHEN: 102

KITCHEN: 102



STAIR: 106

NOTES: SCALE OF INTERIOR ELEVATIONS ARE: 1/2" = 1'-0".
ALL DIMENSIONS ON THIS SHEET ARE FINISHED DIMENSIONS.
ALL WALL CABINETS ARE 12" DEEP UNLESS OTHERWISE NOTED.



BATH: 103

BATH: 103

BATH: 103

FINISH SCHEDULE

MARK	ROOM NAME	FLOOR	BASE	WALLS	CEILING	REMARKS
-	-	-	-	-	-	-
100	PORCH	PRESSURE TREATED DECKING	-	-	VINYL	
101	LIVING/ DINING	CARPET	PTD WOOD	PTD GYPSUM BOARD	PTD GYPSUM BOARD	
102	KITCHEN	SHEET VINYL	PTD WOOD	PTD GYPSUM BOARD	PTD GYPSUM BOARD	
103	BATH	SHEET VINYL	PTD WOOD	PTD MR GYPSUM BOARD	PTD MR GYPSUM BOARD	
104	MUD ROOM	SHEET VINYL	PTD WOOD	PTD GYPSUM BOARD	PTD GYPSUM BOARD	
105	STAIR	CARPET	PTD WOOD	PTD GYPSUM BOARD	PTD GYPSUM BOARD	
106	BACK PORCH	PRESSURE TREATED DECKING	-	-	VINYL	
201	HALL	CARPET	PTD WOOD	PTD GYPSUM BOARD	PTD GYPSUM BOARD	
202	BEDROOM 1	CARPET	PTD WOOD	PTD GYPSUM BOARD	PTD GYPSUM BOARD	
203	BEDROOM 2	CARPET	PTD WOOD	PTD GYPSUM BOARD	PTD GYPSUM BOARD	
204	BEDROOM 3	CARPET	PTD WOOD	PTD GYPSUM BOARD	PTD GYPSUM BOARD	
205	BATH	SHEET VINYL	PTD WOOD	PTD MR GYPSUM BOARD	PTD MR GYPSUM BOARD	
B01	STAIR	UNFINISHED WOOD	WOOD	PTD GYPSUM BOARD	PTD GYPSUM BOARD	
B02	OPEN BASEMENT	SEALED CONCRETE	-	EXPOSED CONCRETE	OPEN FRAMING	

- FINISH SCHEDULE NOTES:**
1. PTD GYP BD IS PAINTED GYPSUM BOARD.
 2. PTD MR GYP BD IS PAINTED MOISTURE RESISTANT GYPSUM BOARD. BATH CEILINGS MAY BE FINISHED IN REGULAR GYPSUM BOARD ONLY IF ALKYD BASED EXTERIOR PRIMER IS USED INSTEAD OF INTERIOR LATEX BASED PRIMER.
 3. FT GYP BD IS FIRE TAPED GYPSUM BOARD, WHICH IS DEFINED AS ONE ADDITIONAL COAT OF COMPOUND AFTER EMBEDMENT OF PAPER TAPE.
 4. UNDERLAYMENT PLYWOOD IS REQUIRED UNDER ALL SHEET VINYL FINISH FLOORS, EXCEPT WHEN BEING PLACED ON CONCRETE SLAB.
 5. ALL CLOSETS SHALL BE FINISHED TO MATCH THE ROOMS THEY ADJOIN UNLESS OTHERWISE NOTED.
 6. PTD WOOD IS PAINTED WOOD

WINDOW SCHEDULE

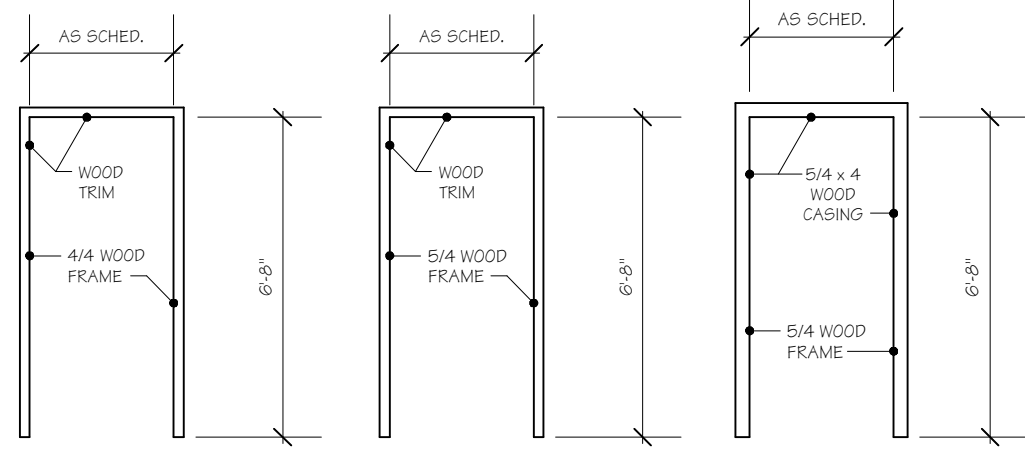
MARK	DESCRIPTION/ ROUGH OPN'G (WxH)	R.O. HEAD HEIGHT	REMARKS
A	2346-2 (63 1/4" x 57 1/2")	6'11 1/4", OR AS NOTED	FIELD INSTALLED EXTENSION JAMBS
B	24210 (30" x 37 1/2")	6'11 1/4", OR AS NOTED	FIELD INSTALLED EXTENSION JAMBS
C	28410-2 (66 1/4" x 61 1/2")	6'11 1/4"	FIELD INSTALLED EXTENSION JAMBS
D	31410 (38" x 61 1/2")	6'11 1/4"	FIELD INSTALLED EXTENSION JAMBS
E	3046 (38" x 57 1/2")	UNDER SILL PLATE	PROVIDE P.T. BUCKS ON ALL SIDES - CAST IN FOUNDATION WALL. PROVIDE WITH DILCO SCAPEWEL.
-	-	-	-
-	-	-	-
-	-	-	-

- WINDOW SCHEDULE NOTES:**
1. ALL NEW WINDOW DESCRIPTIONS REFER TO HARVEY-CLASSIC DESIGNATIONS, UNLESS OTHERWISE NOTED.

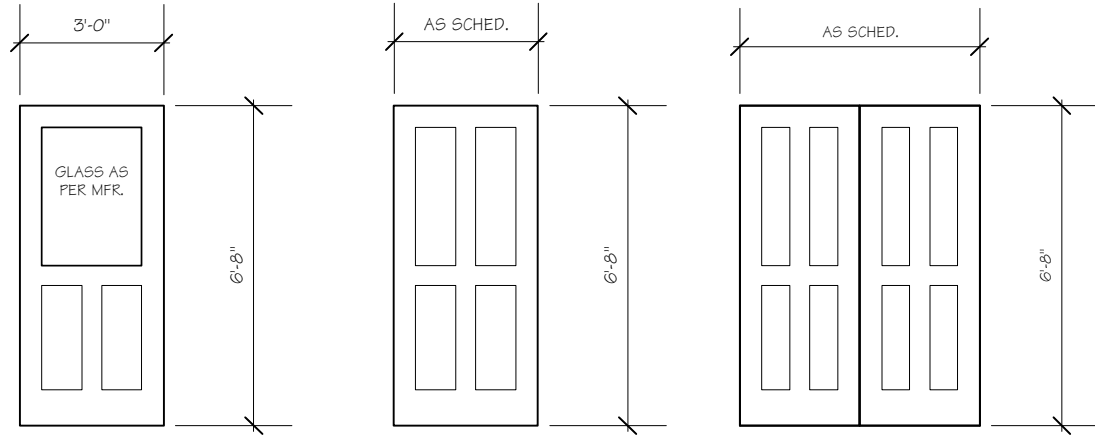
DOOR SCHEDULE

MARK	SIZE	DOOR ELEV	MATERIAL	FRAME ELEV	MATERIAL	DETAILS	HARDWARE	REMARKS
-	-	-	-	-	-	-	-	-
101	1 3/4"x3'-0"x6'-8"	1	INS. FIBERGLASS	2 INTR/ 3 EXTR	WOOD/ PVC EXTR	1 & 3	ENTRY	THERMA-TRU, SMOOTH STAR 5104. KEYED TO MATCH 107.
102	1 3/8"x2'-10"x6'-8"	2	SC COMPOSITE	1	WOOD	6	PASSAGE	
103	1 3/8"x2'-10"x6'-8"	2	SC COMPOSITE	1	WOOD	6	PRIVACY	
104	NOT USED	-	-	-	-	-	-	
105	2'-10"x6'-8" CASED OPNG	-	-	1	WOOD	6 SIM.	-	
106	1 3/8"x2'-8"x6'-8"	2	SC COMPOSITE	1	WOOD	6	PASSAGE	
107	1 3/4"x3'-0"x6'-8"	1	INS. FIBERGLASS	2 INTR/ 3 EXTR	WOOD/ PVC EXTR	1 & 3	ENTRY	THERMA-TRU, SMOOTH STAR 5104. KEYED TO MATCH 101
201	1 3/8"x2'-6"x6'-8"	2	SC COMPOSITE	1	WOOD	6	PASSAGE	
202	1 3/8"x2'-4"x6'-8" (PAIR)	3	SC COMPOSITE	1	WOOD	6	PULL	PROVIDE MAGNETIC CATCH.
203	1 3/8"x2'-6"x6'-8"	2	SC COMPOSITE	1	WOOD	6	PASSAGE	
204	1 3/8"x 2'-6"x6'-8"	2	SC COMPOSITE	1	WOOD	6	PASSAGE	
205	NOT USED	-	-	-	-	-	-	
206	1 3/8"x2'-6"x6'-8"	2	SC COMPOSITE	1	WOOD	6	PASSAGE	
207	1 3/8"x2'-6"x6'-8"	2	SC COMPOSITE	1	WOOD	6	PASSAGE	
208	1 3/8"x2'-6"x6'-8"	2	SC COMPOSITE	1	WOOD	5 & 6	PRIVACY	
-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	

- DOOR SCHEDULE NOTES:**
1. ALL INTERIOR DOORS ARE TO HAVE 11/16" x 2 1/2" CONTEMPORARY CASING.
 2. REFER TO DOOR DETAILS ON SHEET A5.



FRAME ELEVATIONS (REFER TO DOOR SCHEDULE/ SPECIFICATIONS FOR MATERIALS)
1/4"=1'0"



DOOR ELEVATIONS (REFER TO DOOR SCHEDULE/ SPECIFICATIONS FOR MATERIALS)
1/4"=1'0"

HABITAT for HUMANITY - 225 ELMWOOD AVENUE

BURLINGTON, VERMONT

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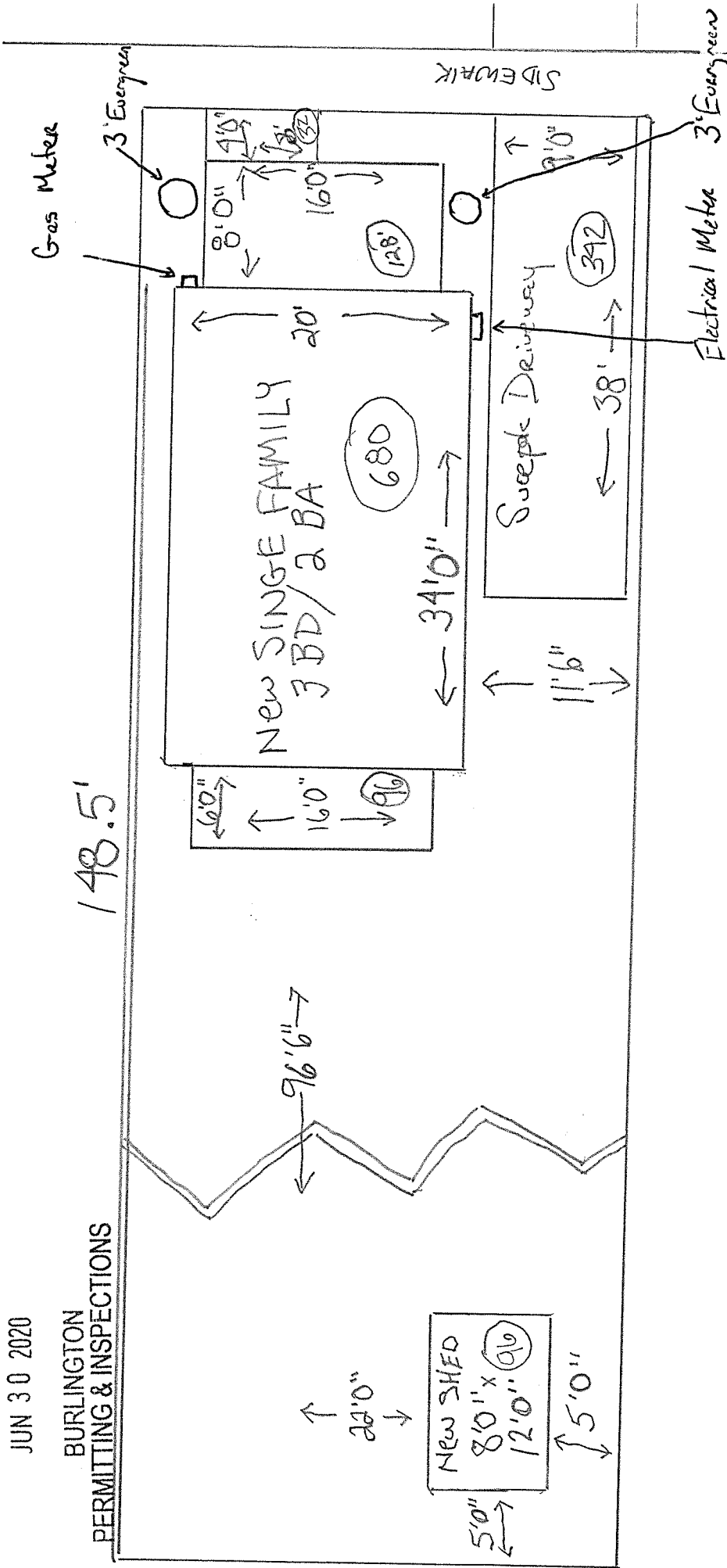
A5-1.0

RECEIVED

JUN 30 2020

BURLINGTON
PERMITTING & INSPECTIONS

148.5'



$$1374 / 5049 = 27.21\%$$

Department of Permitting and Inspections

Zoning Division
149 Church Street
Burlington, VT 05401
<http://www.burlingtonvt.gov/PZ/>
Telephone: (802) 865-7188
(802) 865-7195 (FAX)

William Ward, Director
Charlene Orton, Code Compliance Officer
Theodore Miles, Interim Code Compliance Officer
Scott Gustin, AICP, CFM, Principal Planner
Mary O'Neil, AICP, Principal Planner
Ryan Morrison, Associate Planner
Layne Darfler, Planning Technician
Alison Davis, Zoning Clerk



MEMORANDUM

To: Development Review Board
From: Mary O'Neil, AICP, Principal Planner
Date: July 7, 2020
RE: 225 Elmwood Avenue; ZP20-0858CA

Note: These are staff comments only. Decisions on projects are made by the Development Review Board, which may approve, deny, table or modify any project. THE APPLICANT OR REPRESENTATIVE MUST ATTEND THE MEETING.

File: ZP20-0858CA
Location: 225 Elmwood Avenue
Zone: RM **Ward:** 3C
Parking District: Shared Use
Date application accepted: May 6, 2020
Revised Plans submitted: June 29, 2020
Applicant/ Owner: Green Mountain Habitat for Humanity
Request: Demolish existing single family home, rebuild new single family home.



Background:

- Zoning Permit 10-1086NA; replace roof. June 2010.

Overview:

225 Elmwood Avenue is a small dwelling, estimated to be constructed prior to 1869 (it appears on the Beers Atlas Map of 1869, at right). The application submission gives detail of material and structural failure. Asbestos analysis and abatement have been completed. A replacement single family, two story home is proposed.

As there is documentation of human remains discovered in the immediate vicinity, (215 Elmwood), the applicant has been informed that the potential for human remains (potentially associated with the 1812 burial ground) extends into this neighborhood.

The **Design Advisory Board** reviewed the application at their May 26, 2020 meeting, and voted unanimously to move the project forward to the DRB with a recommendation for approval.

An entirely new plan set was submitted June 29 and 30, 2020.



Applicable Regulations:

The programs and services of the City of Burlington are accessible to people with disabilities. For accessibility information call 865-7188 (for TTY users 865-7142).

Article 4 (Zoning Maps & Districts), Article 5 (Citywide General Regulations), Article 6 (Development Review Standards), Article 8 (Parking), and Article 9 (Inclusionary and Replacement Housing.)

Recommended motion: Certificate of Appropriateness **Consent Approval**, per the following finding and conditions:

I. Findings

Article 4: Zoning Maps and Districts

Section 4.4.5 Residential Districts

(a) Purpose

3. The Residential Medium Density (RM)) district is intended primarily for medium density residential development in the form of single-family detached dwellings and attached multi-family apartments.

The application, to replace an existing single family home with the same, is in concert with the purpose of the zoning district. **Affirmative finding.**

(b) Dimensional Standards and Density

There will be no change in density. The existing single family home will be replaced with another single unit. The existing home is conforming to lot frontage but non-conforming to setbacks, which may be continued subject to provisions of **Section 5.3.5, Non-conformities**. The front yard setback will be adjusted in the new construction to be consistent with the calculations for the average of two adjoining parcels on each side and become conforming.

Existing lot coverage is 30.38% (including what is now overgrown driveway area); proposed is 27.21%; compliant for the zoning district.* (40% allowable.)

*IF the DRB approves a driveway to accommodate 2 spaces in tandem (Section 4.4.5 (d) 1. A). If the DRB only recognizes one existing parking space, the coverage will be adjusted. **Affirmative finding.**

(c) Permitted and Conditional Uses:

The principal land uses that may be permitted, or conditionally permitted pursuant to the requirements of Article 3, within the Residential districts shall be as defined in Appendix A – Use Table.

A single family home is a permitted use in the RM zoning district. **Affirmative finding.**

(d) District Specific Regulations:

The following regulations are district-specific exceptions, bonuses, and standards unique to the residential districts. They are in addition to, or may modify, city-wide standards as provided in Article 5 of this ordinance and district standards as provided above.

1. Setbacks

A. Encroachment for Residential Driveways

*For purposes of allowing existing, developed, nonconforming lots containing single family homes to create a driveway and provide a maximum of two tandem parking spaces, driveways may encroach into a required sideyard setback up to the property line **with DRB approval.***

Such approval shall be based on demonstrated necessity on the part of the property owner as well as unique physical circumstances of the lot, conditional use criteria and findings that there shall be no undue adverse impact on all of the following items of concern: drainage, safety, protection of neighboring side yard, light and air. In addition, the lot shall be found to have dimensions that are smaller than the existing standards for lot size or frontage. The maximum relief from the 5' minimum setback shall be the minimum necessary for the purposes of creating such a driveway and parking spaces and shall be allowed only after a finding that driveway and parking configuration cannot be otherwise located on the lot. With such approval by the DRB, the lot shall not be considered nonconforming due to the decreased setback for the creation of the driveway and parking spaces.

The lot is narrow at 34', with no other place to locate parking with access to the street. The existing conditions and ortho photographs suggest the earlier use of the south yard as parking, but is now overgrown. The applicant has provided a revised site plan illustrating two tandem parking spaces; permissible under this standard with DRB approval. The additional coverage for providing a second parking space, if approved, is still within allowable limits for the zoning district. (26% vs 27.21%) **Affirmative finding.**

B. Encroachment into the Waterfront Setback.

2. Height

Not applicable.

A. Exceptions in the Waterfront RM District.

Not applicable.

3. Lot Coverage

A. Exceptions for Accessory Residential Features.

The applicant is not seeking any bonus provisions, as the proposed calculation is within the coverage limitations of Table 4.4.5-3. **Affirmative finding.**

4. Accessory Residential Structures and Uses

The application includes the removal of existing accessory structures and installation of a shed, meeting the minimum required setback from property lines. **Affirmative finding.**

5. Residential Density

A. Additional Unit to Multi-Family.

Not applicable.

B. Additions to Existing Residential Structures.

No request for an addition to an existing structure shall be considered or imply approval of an additional unit, unless requested specifically on the zoning permit application form.

No additional units are requested. The property will remain a single family home. **Affirmative finding.**

C. Residential Occupancy Limits.

In all residential districts, the occupancy of any dwelling unit is limited to members of a family as defined in Article 13.

This will be a condition of approval. **Affirmative finding as conditioned.**

6. Uses

A. Exception for Existing Neighborhood Commercial Uses.

Not applicable.

7. Residential Development Bonuses.

Not applicable.

Article 5: Citywide General Regulations

Section 5.2.1 Existing Small Lots.

This existing, developed lot is proposed for redevelopment to the same intensity. **Affirmative finding.**

Section 5.2.2 Required Frontage or Access

The lot has a frontage of 34', greater than the minimum 30' frontage requirement for the zoning district. **Affirmative finding.**

Section 5.2.3 Lot Coverage Requirements

See 4.4.5 (b), above.

Section 5.2.4 Buildable Area Calculation

Not applicable.

Section 5.2.5 Setbacks

See 4.4.5 (b), above.

Section 5.2.6 Building Height Limits

The proposed building will be two story, 24' 4 ½ "to the ridgeline and therefore compliant to the 35' height limitation of the zoning district. **Affirmative finding.**

Section 5.2.7 Density and Intensity of Development Calculations

The replacement will be consistent with the previously existing density (1 unit) on the parcel. **Affirmative finding.**

Part 3: Non Conformities

Sec. 5.3.3 Continuation

Except as otherwise specified in this Article, any nonconformity which lawfully existed at the time of passage of the applicable provisions of this or any prior ordinance or any amendment thereto may be continued subject to the provisions of this Part.

Sec. 5.3.5 Nonconforming Structures

(a) Changes and Modifications:

Nothing in this Part shall be deemed to prevent normal maintenance and repair or structural repair, or moving of a non-complying structure pursuant to any applicable provisions of this Ordinance.

Any change or modification to a nonconforming structure, other than to full conformity under this Ordinance, shall only be allowed subject to the following:

- 1. Such a change or modification may reduce the degree of nonconformity and shall not increase the nonconformity except as provided below.*

*Within the residential districts, and subject to Development Review Board approval, **existing nonconforming single-family homes** and community centers (existing enclosed spaces only) that project into side and/or rear yard setbacks **may be vertically expanded so long as the expansion does not encroach further into the setback than the existing structure.** Such expansion shall be of the existing nonconformity (i.e. setback) and shall:*

- i) Be subject to conformance with all other dimensional requirements (i.e. height, lot coverage, density and intensity of development);*
- ii) Not have an undue adverse impact on adjoining properties or any public interest that would be protected by maintaining the existing setbacks; and,*
- iii) Be compatible with the character and scale of surrounding structures.*

Existing accessory buildings of 15 feet in height or less shall not exceed 15 feet tall as expanded.

- 2. Such a change or modification shall not create any new nonconformity; and,*
- 3. Such a change or modification shall be subject to review and approval under the Design Review provisions of Article 3, Part 4.*

When any portion of a nonconforming structure has been made conforming, it shall not be made nonconforming again except as provided for historic building features pursuant to Sec. 5.2.6(b) (3).

The replacement building will change the existing nonconformity to front yard setback to conforming; and continue the existing non-conforming setback on the north with a vertical expansion not to exceed the existing degree of non-conformity. The replacement shed will conform to required setbacks. **Affirmative finding as conditioned.**

(b) Demolition:

A nonconforming structure may be replaced by a new structure retaining the same degree of nonconformity as the original structure. This provision is limited to the

existing dimensional nonconformity (i.e. setback, lot coverage, or height), and shall not expand the degree of nonconformity except as provided for in (a) above. The new structure shall be subject to conformance with all other dimensional requirements (i.e. setback, lot coverage, and height). Zoning permit application for the replacement structure shall be completed within 1 year of demolition of the nonconforming structure; failure to do so shall result in the loss of the ability to retain the nonconformity.

In all other cases, a nonconforming structure that has been demolished or moved shall not be re-built or relocated in any way other than in full conformance with the provisions of this ordinance. Structures or any portion thereof that are structurally unsound, and are required to be removed by order of the building inspector, may be replaced within the original footprint provided both the requirement to demolish the building is not the result of demolition by neglect and the replacement shall not expand the degree of nonconformity.

The existing structure is non-conforming to setback on both the north, south, and east. The Front Yard setback will be brought into conformity; however the existing setback on the north and south are proposed to be retained to the same level as existing. Vertical expansion of the single-family home within a required setback is allowable with DRB approval per Section 5.3.5 (a), above. Expansion of the driveway is permissible per Section 4.4.5 (d) 1. A, above.

Affirmative finding as conditioned.

Sec. 5.4.8 Historic Buildings and Sites

Not applicable.

Section 5.4.9 Brownfield Remediation

225 Elmwood Avenue is not listed on the DEC website for known Brownfields. Not applicable.

Part 5: Performance Standards

Section 5.5.2 Outdoor Lighting

The proposal includes installation of low intensity can lights within the porches. As proposed, they are acceptable for this application. **Affirmative finding.**

Section 5.5.3 Stormwater and Erosion Control

The application shall be subject to review and approval of an Erosion Prevention and Sediment Control Plan by the Stormwater Engineering Division. **Affirmative finding as conditioned.**

Section 5.5.4 Tree Removal

Zoning permit requests for tree removal are subject to DRB review per the following criteria.

(a) Review criteria for zoning permit requests for tree removal.

1. Grounds for Approval

Tree removal involving six (6) or more trees, each of ten (10) inches or greater in caliper or the removal of ten (10) or more trees, each of which is three (3) inches or

greater in caliper during any consecutive twelve (12) month period may be permitted for any of the following reasons:

- A. Removal of dead, diseased, or infested trees*
- B. Thinning of trees for the health of remaining trees according to recognized accepted forestry practices*
- C. Removal of trees that are a danger to life or property; or*
- D. As part of a development with an approved zoning permit*

A large Pine tree on the north property line, as well as three trees < 8" caliper are proposed to be removed from the back yard. Their removal is part of this overall application, and therefore allowable. **Affirmative finding.**

2. Grounds for Denial

Tree removal involving six (6) or more trees, each of ten (10) inches or greater in caliper or the removal of ten (10) or more trees, each of which is three (3) inches or greater in caliper during any consecutive twelve (12) month period may be denied if existing healthy trees are known to be:

- A. Providing a significant privacy or aesthetic buffer or barrier between properties*
- B. Providing stabilization on slopes vulnerable to erosion*
- C. Located within a riparian or littoral buffer*
- D. Provide unique wildlife habitat*
- E. A rare northern Vermont tree species as listed by the Vermont Natural Heritage Program; or*
- F. A significant element of, or significantly enhances, an historic site*

The application does not include the number or caliper of trees that trigger this review; the remainder of these criteria do not apply to this application. Not applicable.

Article 6: Development Review Standards

Part 1: Land Division Design Standards

No land division is proposed. Not applicable.

Part 2: Site Plan Design Standards

Sec. 6.2.2 Review Standards

(a)Protection of Important Natural Features:

The site is relatively flat. A pine tree along the northeast corner of the property and three in the back yard are proposed to be removed as part of this redevelopment. **Affirmative finding.**

(b) Topographical Alterations:

None proposed. **Affirmative finding.**

(c) Protection of Important Public Views:

There are no protected views from or through this property. Not applicable.

(d) Protection of Important Cultural Resources:

Burlington's architectural and cultural heritage shall be protected through sensitive and respectful redevelopment, rehabilitation, and infill.

Archeological sites likely to yield information important to the city's or the region's pre-history or history shall be evaluated, documented, and avoided whenever feasible. Where the proposed development involves sites listed or eligible for listing on a state or national register of historic places, the applicant shall meet the applicable development and design standards pursuant to Sec. 5.4.8(b).

225 Elmwood Avenue is not listed on the State of Vermont or National Register of Historic Resources.

Recent review of a neighboring property raised an important concern with this area of Elmwood Avenue. There is the potential for discovery of human remains, likely associated with a burial ground for soldiers and hospital staff during the War of 1812. The Consulting Archaeology Program at UVM (CAP) has previously determined that there were some war burials, presumably of soldiers of color in the neighborhood of Spring Street, near their detached encampment site. The 1937 discovery of human remains at a neighboring property underlines the unknown nature of the boundaries of any burial sites, raising the potential for additional, unmarked interments. The applicant is therefore informed that should any archaeological resources be uncovered during excavation, appropriate authorities shall be contacted to make an assessment, determine suitable treatment and ultimate disposition. **Affirmative finding as conditioned.**

(e) Supporting the Use of Renewable Energy Resources:

No part of this application will preclude use of wind, solar, water, geothermal or other renewable energy resource. If geothermal is desired, the same concerns for ground disturbance will apply. **Affirmative finding as conditioned.**



(f) Brownfield Sites:

None identified at this location. Not applicable.

(g) Provide for nature's events:

Special attention shall be accorded to stormwater runoff so that neighboring properties and/or the public stormwater drainage system are not adversely affected. All development and site disturbance shall follow applicable city and state erosion and stormwater management guidelines in accordance with the requirements of Art 5, Sec 5.5.3.

Design features which address the effects of rain, snow, and ice at building entrances, and to provisions for snow and ice removal or storage from circulation areas shall also be incorporated.

The plan provides for both a front and back porch; both satisfactory for sheltering residents and visitors from inclement weather. There is adequate room for snow storage at the end of the driveway.

An Erosion Prevention and Sediment Control Plan will be required subject to review and approval by the Stormwater Engineering Program. **Affirmative finding as conditioned.**

(h) Building Location and Orientation:

The replacement home is oriented toward the street and situated to replicate the street setback of neighboring properties. Moving the replacement building closer to the street will bring the home within the required front yard setback as calculated based on neighboring properties. **Affirmative finding.**

(i) Vehicular Access:

There is an existing curb cut and (mostly grown over) driveway south of the residence. This is in close proximity to the property line. The applicant has originally only requested a single parking space, but 2 spaces in tandem may be allowed with DRB approval per Section 4.4.5 (d) 1. A. the revised site plan submitted 6.30.2020 reflects an area for 2 cars in tandem. **Affirmative finding.**

(j) Pedestrian Access:

There is a public sidewalk along the west side of Elmwood Avenue. The site plan has been revised to illustrate a walkway connecting the sidewalk to the new residence. **Affirmative finding.**

(k) Accessibility for the Handicapped:

ADA access is administered by the building inspector's office. Although not required, access is encouraged, even if only by Vermont Visitability Standards. **Affirmative finding.**

(l) Parking and Circulation:

Two parking spaces are required for a single family home. While only one was originally requested, two may be permitted by the DRB under 4.4.5 (d) 1. A. As the driveway is

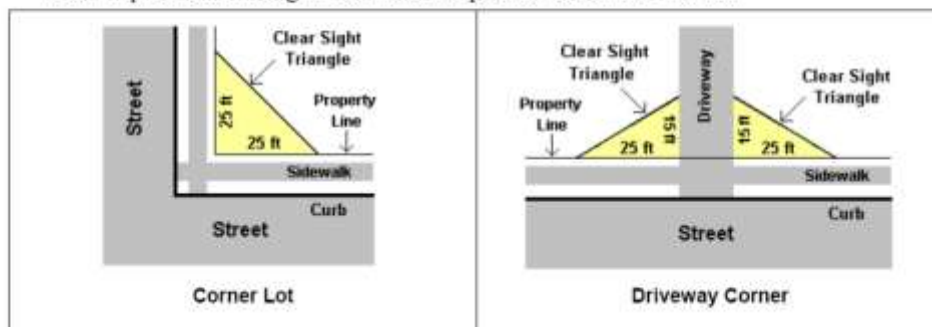
overgrown, it is not clear what the previous conditions were. The site plan of 6.30.2020 illustrates the desire for two spaces; discretionary by the DRB under Section 4.4.5 (d) 1. A. **Affirmative finding.**

(m) Landscaping and Fences:

A 6' stockade fence will be installed along the northerly property boundary. The Clear Site Triangle must be observed.

(c) Clear Sight Triangle

1. Fences placed within a clear sight triangle along driveways and at street intersections, or between an existing building and the front property line, whichever is less, shall be limited to 3-feet in height above the curb in order to provide safe sight distances for pedestrians and vehicles.



Affirmative finding as conditioned.

(n) Public Plazas and Open Space:

Not applicable.

(o) Outdoor Lighting:

Where exterior lighting is proposed the applicant shall meet the lighting performance standards as per Sec 5.5.2.

Can lights are proposed for both the front and back porches. The light is of small, domestic intensity and acceptable for the application. **Affirmative finding.**

(p) Integrate infrastructure into the design:

Exterior storage areas, machinery and equipment installations, service and loading areas, utility meters and structures, mailboxes, and similar accessory structures shall utilize setbacks, plantings, enclosures and other mitigation or screening methods to minimize their auditory and visual impact on the public street and neighboring properties to the extent practicable.

Utility and service enclosures and screening shall be coordinated with the design of the principal building, and should be grouped in a service court away from public view. On-site utilities shall be place underground whenever practicable. Trash and recycling bins and dumpsters shall be located, within preferably, or behind buildings, enclosed on all four (4) sides to prevent blowing trash, and screened from public view.

Any development involving the installation of machinery or equipment which emits heat, vapor, fumes, vibration, or noise shall minimize, insofar as practicable, any adverse impact on neighboring properties and the environment pursuant to the requirements of Article 5, Part 4 Performance Standards.

Electrical and cable conduit will be undergrounded. The electric meter and gas service will be introduced on the south (secondary) elevation. A shed is proposed in the southwesterly corner of the rear yard. A minimum 5' setback is required and met. **Affirmative finding as conditioned.**

Part 3: Architectural Design Standards

Sec. 6.3.2 Review Standards

(a) Relate development to its environment:

1. Massing, Height and Scale:

As a two story, gable front residence with attached open porches is consistent with the immediately neighborhood. **Affirmative finding.**

2. Roofs and Rooflines.

The gable front structure will feature shed roofed porches; a common combination on Elmwood Avenue. **Affirmative finding.**

3. Building Openings

The new home will feature both single and paired double hung windows. Entries are available at both the east and west elevations. **Affirmative finding.**

(b) Protection of Important Architectural Resources:

Not applicable.

(c) Protection of Important Public Views:

There are no protected public views from or through this property. Not applicable.

(d) Provide an active and inviting street edge:

The open front porch, with an illuminated entry will provide a welcoming introduction to the street. A walkway has been included to connect the front entry to the public sidewalk. **Affirmative finding.**

(e) Quality of materials:

All development shall maximize the use of highly durable building materials that extend the life cycle of the building, and reduce maintenance, waste, and environmental impacts. Such materials are particularly important in certain highly trafficked locations such as along major streets, sidewalks, loading areas, and driveways. Efforts to incorporate the use of recycled content materials and building materials and products that are extracted and/or manufactured within the region are highly encouraged.

Vinyl siding and windows, with an asphalt shingle roof are proposed. The shed sheathing is similarly proposed.

All are acceptable for new construction. **Affirmative finding.**

(f) Reduce energy utilization:

The replacement home will be built to meet Efficiency Vermont standards.

All new construction shall meet the Guidelines for Energy Efficient Construction pursuant to the requirements of Article VI. Energy Conservation, Section 8 of the City of Burlington Code of Ordinances. **Affirmative finding as conditioned.**

(g) Make advertising features complementary to the site:

Any signage will require a separate zoning permit. **Affirmative finding as conditioned.**

(h) Integrate infrastructure into the building design:

See Section 6.2.2. (p), above.

(i) Make spaces secure and safe:

Redevelopment is subject to all applicable building and life safety codes as defined by the Burlington's Building Inspector and the Fire Marshal. **Affirmative finding as conditioned.**

Article 8: Parking

The existing parking area is overgrown; however, the driveway apron demonstrates encroachment within a required setback. Section 4.4.5 (d) 1. A. allows two parking spaces in tandem within a required setback with DRB approval. The project will then be able to meet the 2 parking space requirement for a single family home. **Affirmative finding.**

Article 9: Inclusionary and Replacement Housing

Part 2: Housing Preservation and Replacement/Demolition and Conversion

The application proposes replacing the existing single-family home with another single family home. There will be no net loss of housing. **Affirmative finding.**

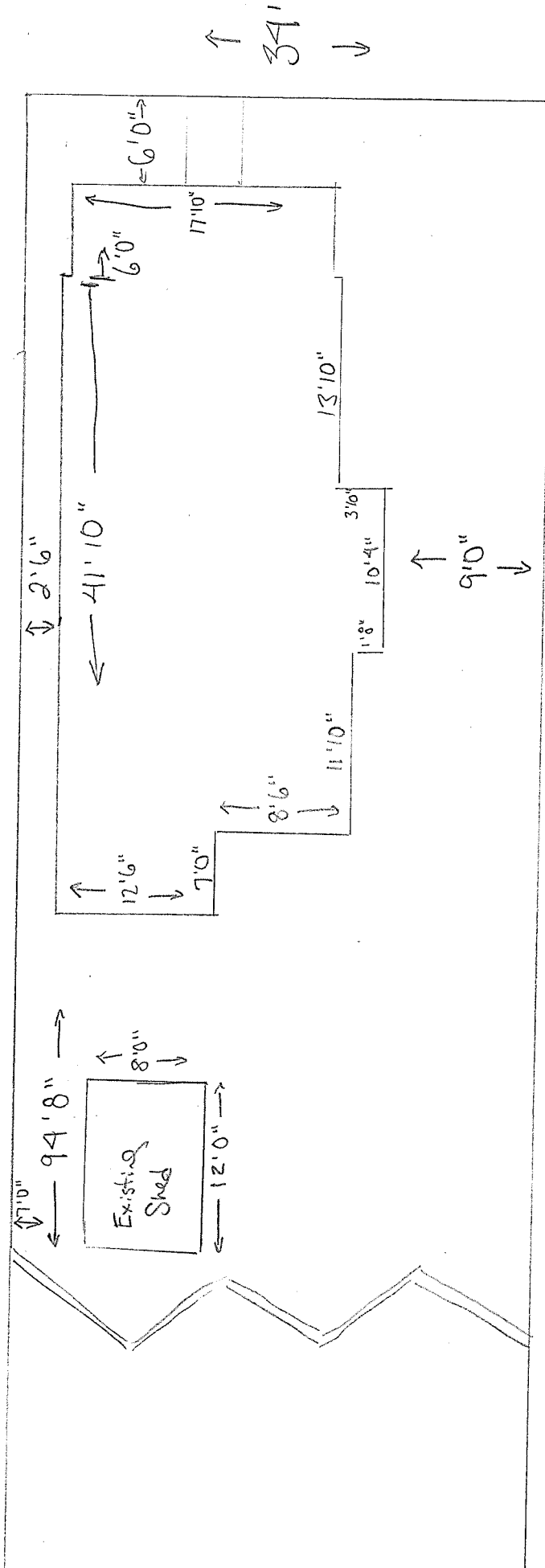
II. Conditions of Approval

1. The provisions of Section 5.3.5, Non-conformities, apply to this project. There shall be no introduction of any new non-conformity in the replacement dwelling. Vertical encroachment into a required setback is allowed per Section 5.3.5. (a) 1. And (b).
2. The replacement dwelling shall be completed within 1 year of demolition of the nonconforming structure; failure to do so shall result in the loss of the ability to retain any nonconformities.
3. Residential occupancy limits apply. The occupancy of any dwelling unit is limited to members of a family as defined in Article 13. Not more than four unrelated adults may occupy the residential unit.

4. With DRB approval, the driveway may be expanded to provide 2 parking spaces in tandem as allowed by Section 4.4.5 (d) 1. A: *Encroachment for Residential Driveways*.
5. The fence shall meet the Clear Site Triangle.
6. The shed shall be set back a minimum of 5' from the property line.
7. If any archaeological resources are discovered during excavation, work shall immediately stop until appropriate authorities are notified allowing for identification, assessment, and appropriate disposition of the resources.
8. All new construction shall meet the Guidelines for Energy Efficient Construction pursuant to the requirements of Article VI. Energy Conservation, Section 8 of the City of Burlington Code of Ordinances.
9. Any signs, if proposed, will require a separate zoning permit.
10. **Prior to release of the zoning permit**, the "small project erosion control" plan shall be approved by the Stormwater Program Manager.
11. Construction hours shall be limited to Monday – Friday from 7:00 AM – 5:00 PM. Saturday construction may be allowed upon request to the Development Review Board. No work on Sunday.
12. It is the applicant's responsibility to work with the Vermont Department of Environmental Conservation either to determine exemption from the Waterwater Program Rule, or to secure the appropriate Wasterwater permit for the replacement dwelling.
13. Vermont Residential Building Energy Standards apply to this project. Compliance with the standards is the Owner's responsibility. Prior to requesting a Certificate of Occupancy, a copy of a completed Vermont Residential Building Energy Standards Certificate shall be submitted with a Certificate of Occupancy (final or temporary) request, and filed in the Land Records located at the Clerk/Treasurers office in City Hall (149 Church Street). For more information, see http://publicservice.vermont.gov/topics/energy_efficiency.
14. Standard Permit Conditions 1-15.

NOTE: These are staff comments only. The Development Review Board, who may approve, table, modify, or deny projects, makes decisions.

148.50'



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225 Elmwood Ave. Burlington Vermont

Existing structure-20' X 20' patched stone foundation with one level living above. Additional rooms added on back with no cellar access. Presumably on slab. Dry rot throughout basement. Existing bathroom floor completely rotted through. Asbestos report from October 2, 2019 from KD associates. (KDAI Project No: 07057-0004) is attached. Materials found to be containing asbestos were remediated from the property by Levaggi Environmental Contracting (LEC) in January 2020. Documentation attached.

Site Plan- GMHH is looking to demolish existing 2 bedroom, 1 bath structure due to structural failures and extensive rot, replacing structure with a 3 bedroom, 1.5 bath single family home. New structure will be two stories 20' X 38' with 8' front porch and 6' rear porch. Large pine tree off north east corner on property side of sidewalk will be removed to meet neighborhood setback requirements. Three additional trees < 8" diameter will be removed from back yard.

New structure-New structure is 20' X 38' two story single family home. 3 bedroom, 1.5 bath. Built to meet Efficiency Vermont standards. Home will have concrete exterior siding, asphalt shingle roof, vinyl windows, pressure treated rear deck (6' X 12' with roof, 4:12 pitch 16' wide extending over basement egress), composite front deck (8' X 16') with roof and vinyl railing. Interior of home will have egress window in basement, hardwood and ceramic tile flooring, sheetrocked interior walls and 1 hour fire burn wall on north side of structure. High efficiency boiler with air exchanger system.

Setbacks-	North side	30"	Location of current structure	
	East side	48"	#217 & #219 Elmwood =	48" off sidewalk
			#227-229 Elmwood =	48" off sidewalk
			#237 Elmwood =	42" off sidewalk
	South side	<6"	Driveway material to match city curb cut	
	West side	60"	New shed installed 60" of west fence	

*46" average
+/- 5 = 1-8
Needs to meet
min .5' setback*

Utilities- Conduit installed under sidewalk to move cable and electric to underground service.

Fence- Existing rusted metal fence will be replaced with 6' stockade fence along north boundary line. Fence will start 10' from edge of sidewalk and run the length of property to west boundary line

Needs to meet Clear. Setback

Shed- Existing Shed is going to be removed from property and replace with 8' X 12' shed positioned in SW corner of lot

Driveway- Stone driveway installed along south boundary line extending 16' X 9' wide

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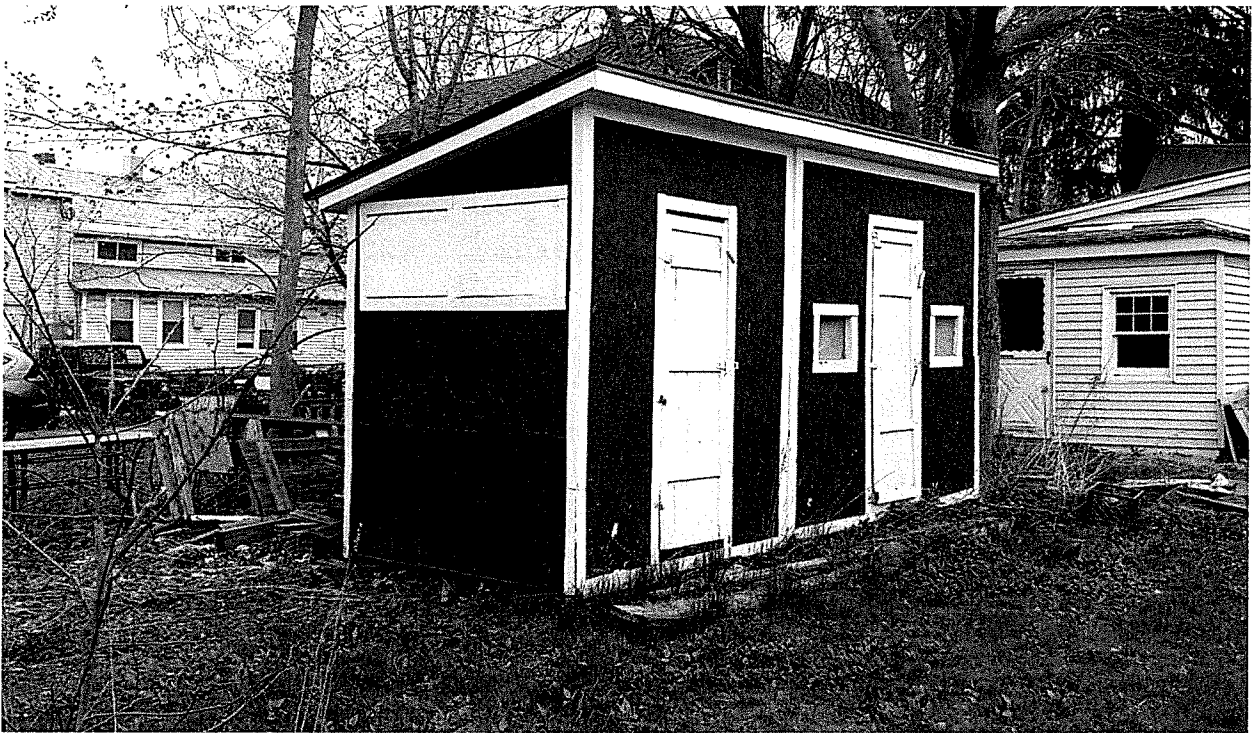
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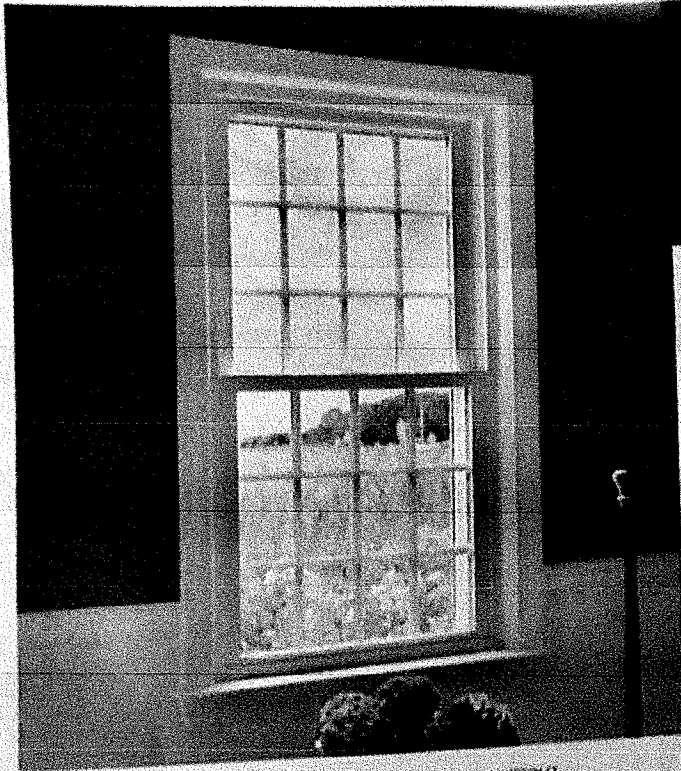






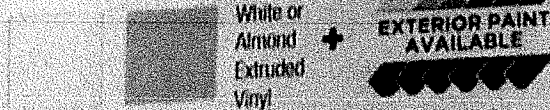
Classic Vinyl Double Hung Window

Vinyl Windows



UNIT/BUCK SIZE LIMITATIONS*		WIDTH	HEIGHT
	Min.	16-1/4"	24"
Max. U.I 124"	Max.	47-3/4"	84"

COLORS



HARDWARE

Cam Lock

Standard

Premium



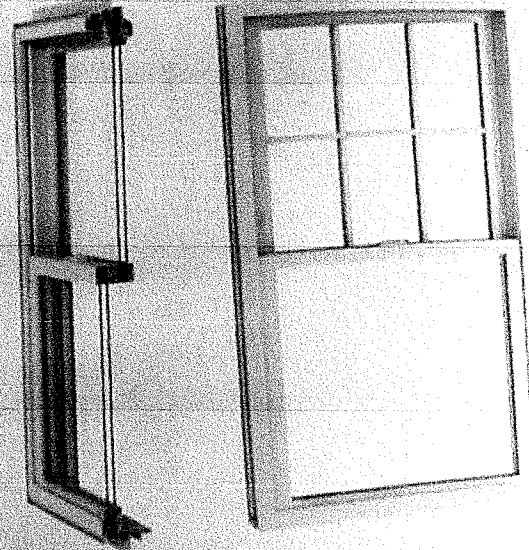
White Almond

Premium finishes available. Call for pricing.

ADDITIONAL OPTIONS

- ✓ GRIDS: 1" and 5/8" - GBG, Exterior Applied & SDL, Colonial, Prairie & Custom configurations
- ✓ Exterior Factory Applied Casing; Flat & 90° Brickmould, with or without sill nose
- ✓ Interior Trim Kits Available
- ✓ SCREENS: Full and half sizes; FlexScreen or Aluminum frame; VIEWS or fiberglass screen wire

Our most popular window, the Classic offers a variety of color, grid and hardware options to match the style of any home. The Classic's sleek fully welded sash and frame provides better performance than ordinary vinyl windows, with an air-tight seal that keeps wind and water where they belong — outside.



GLAZING & PERFORMANCE

- Optional ThermaLock glazing surpasses ENERGY STAR criteria (U-Value 0.25)
- DP50 upgrade & Sound-reducing options available
- Double locks are standard on widths of $\geq 30"$
- Aluminum reinforcing in meeting rail widths of $\geq 30"$

REPLACEMENT APPLICATION

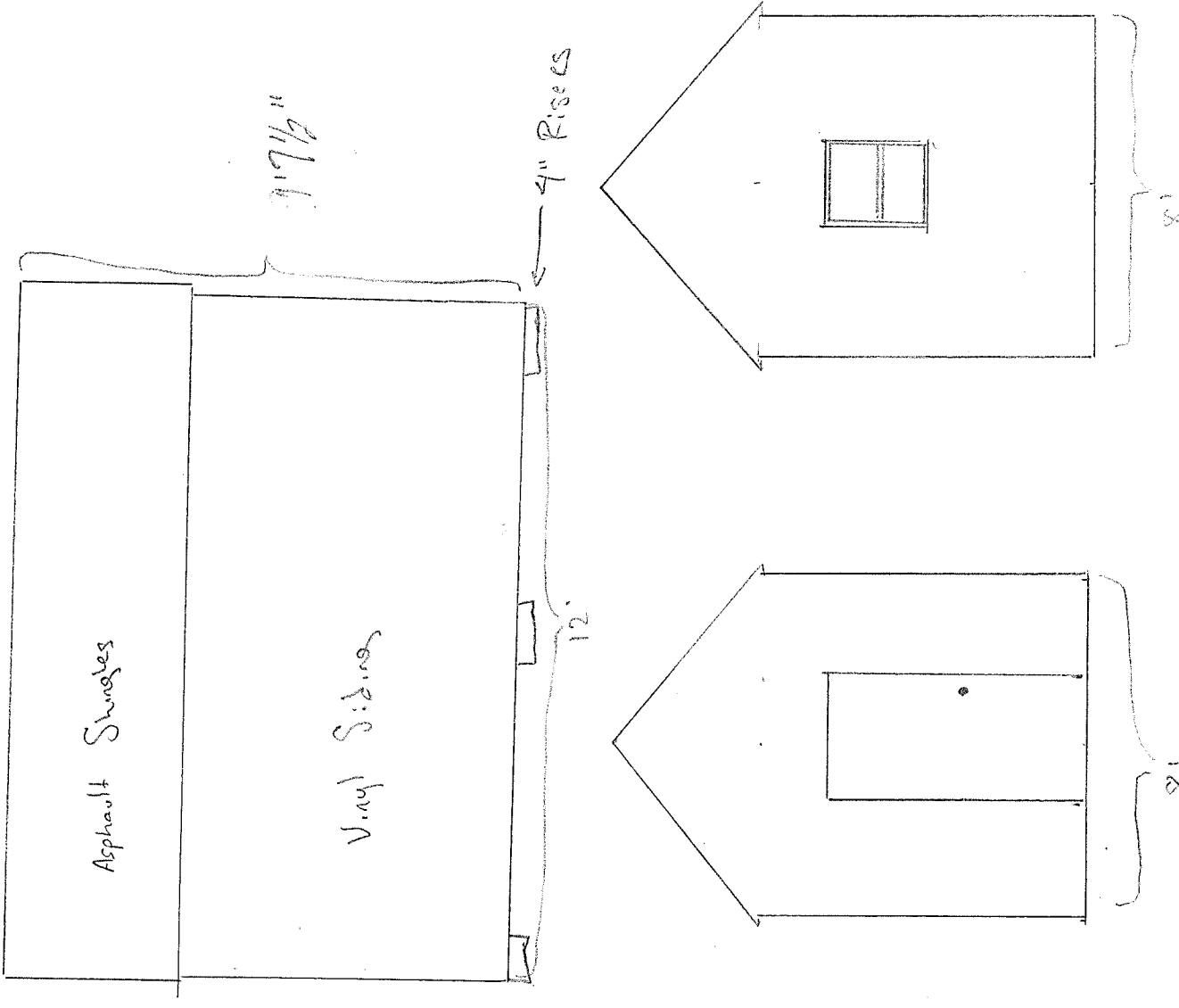
- 3-1/4" jamb depth
- Adjustable vinyl sill extender and head expansion

NEW CONSTRUCTION APPLICATION

- Extension jambs available for 4-9/16" and wider depths; custom sizes available
- Integral L or J fin available

SHED

$\frac{1}{4}" = 1'$



225 Elmwood Ave

Burlington Development Review Board

645 Pine Street
Permitting & Inspections
Burlington, VT 05401
www.burlingtonvt.gov/DPI/DRB
Telephone: (802) 865-7188
Fax (802) 863-0466

Brad Rabinowitz
AJ LaRosa
Springer Harris
Geoff Hand
Brooks McArthur
Kienan Christianson
vacant
Sean McKenzie, (Alternate)
Ravi Venkataraman, (Alternate)



BURLINGTON DEVELOPMENT REVIEW BOARD

Tuesday July 7, 2020, 5:00 PM

Remote Meeting

Zoom: <https://us02web.zoom.us/j/85200949242?pwd=V1EzNmhqeUk0YUJvNUpSbFVzQTBFQT09>

Webinar ID: 852 0094 9242

Password: 842557

Call in telephone: US: +1 301 715 8592 or +1 312 626 6799 or +1 929 205 6099 or +1 253 215 8782 or +1 346 248 7799 or +1 669 900 6833

Agenda

- I. Agenda
- II. Communications
- III. Minutes
- IV. Consent
 1. **20-0820CA; 44 Lakeside Ave (ELM, Ward 5S) Lakeside Ovens, LLC**
Demolish existing office building and replace with new 4-story office building on existing foundation. Add five parking spaces to overall parking count (Project Manager: Mary O'Neil)
 2. **20-0858CA; 225 Elmwood Ave (RM, Ward 3C) Green Mountain Habitat for Humanity**
Demolish existing single family home and build replacement single family home (Project Manager: Mary O'Neil)
- V. **Public Hearing** (*Public comment may be limited to 3 minutes per speaker*)
 1. **20-0792CA; 291 Appletree Point Rd (RL-W, Ward 4N) Gordon M. Maher**
Appeal of an administrative denial for an after-the-fact patio removal and replacement with deck on different footprint (Project Manager: Ryan Morrison)
 2. **20-0794SN; 66 North Ave (RM, Ward 3C) Sarah M. Holbrook Community Center**
Appeal of an administrative denial for a proposed new sign (Project Manager: Ryan Morrison)
 3. **20-0854CA/CU; 266 Queen City Park Rd (ELM, Ward 5S) Burton Corporation**
Conditional use application to create 11,560 SF Performing Arts Center use within an existing 85,000+ SF structure; proposed façade improvements to existing building exterior (Project Manager: Scott Gustin)
- VI. Adjournment

Plans may be viewed upon request by contacting the Department of Permitting & Inspections between the hours of 8:00 a.m. and 4:30 p.m. Participation in the DRB proceeding is a prerequisite to the right to take any subsequent appeal. Please note that ANYTHING submitted to the Zoning office is considered public and cannot be kept confidential. This may not be the final order in which items will be heard. Please view final Agenda, at www.burlingtonvt.gov/dpi/drb/agendas or the office notice board, one week before the hearing for the order in which items will be heard.

The City of Burlington will not tolerate unlawful harassment or discrimination on the basis of political or religious affiliation, race, color, national origin, place of birth, ancestry, age, sex, sexual orientation, gender identity, marital status, veteran status, disability, HIV positive status, crime victim status or genetic information. The City is also committed to providing proper access to services, facilities, and employment opportunities. For accessibility information or alternative formats, please contact Human Resources Department at (802) 540-2505.

BRIAN P. HEHIR
HEHIR LAW OFFICE, PLLC
239 SOUTH UNION ST.
P.O. BOX 1052
BURLINGTON, VT 05402-1052

Brian@hehirlaw.com
www.hehirlaw.com

TEL 802-862-2006
FAX 802-862-2301

December 15, 2020

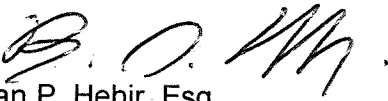
William Ward
Zoning Administrator Officer
Permitting and Inspection
City of Burlington
645 Pine Street, Suite A
P. O. Box 849
Burlington, VT 05402-0849

Re: 110 Riverside Ave., Burlington, NOV 380795.

Dear Mr. Ward:

Please find enclosed for filing with the Development Review Board a Notice of Appeal, a copy of the Notice of Zoning Violation, and the filing fee in the amount of \$250.

Very truly yours,


Brian P. Hehir, Esq.

cc: Chairman, Development Review Board
Joe Handy

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CITY OF BURLINGTON

DEVELOPMENT REVIEW BOARD

IN RE: 110 RIVERSIDE AVENUE
NOV 380795

NOTICE OF APPEAL

NOW COMES Sisters and Brothers Investment Group, LLP, owners of 110 Riverside Avenue, by and through their attorney, Brian P. Hehir, Esq., and pursuant to Articles 2 and 12 of the Burlington Zoning Ordinance, hereby appeal to the Burlington Development Review Board a Notice of Zoning Violation dated December 3, 2020 (attached hereto).

In support of their appeal, appellant states as follows:

- 1) The regulatory provisions which apply to this appeal are contained in the Burlington Zoning Ordinance; the Notice of Zoning Violation fails to state which specific sections of the Ordinance appellants' property is alleged to violate.
- 2) Appellants request that the Notice of Violation be dismissed because the property is not used as an "automobile / salvage yard" as stated in the NOV.
- 3) The use of the property is a pre-existing nonconforming use, and the alleged uses complained of, have, upon information and belief, existed continuously for over 15 years; enforcement is thus prohibited.
- 4) Appellants request that the Board dismiss the Notice of Violation.

Dated at Burlington, Vermont this 15th day of December, 2020.

By:

B. P. Hehir
Brian P. Hehir, Esq., for Sisters
and Brothers Investment Group, LLP

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PERMITTING & INSPECTION



PERMITTING & INSPECTIONS

645 Pine Street, Ste. A | PO Box 849
Burlington, VT 05402-0849

Housing: (802) 863-0442
Trades: (802) 863-9094
Zoning: (802) 865-7188

NOTICE OF ZONING VIOLATION (NOV 380795)

December 3, 2020

Mailed Certified Mail 70190140000108390939
And FIRST CLASS MAIL

SISTERS & BROTHERS INVESTMENT
GROUP, LLP
75 SOUTH WINOOSKI AVENUE
BURLINGTON VT 05401

NOTICE OF VIOLATION AT:
110 RIVERSIDE AVENUE, BURLINGTON, VT
TAX LOT #046-3-081-000

Zoning Violation# 380795

Dear Owners,

It has come to the attention of this office that a zoning violation exists at 110 Riverside Avenue.

Description of Violation: Operation of an automobile/vehicle salvage yard without a zoning permit. Occupation without Unified Certificate of Occupancy

Burlington Comprehensive Development Ordinance (CDO) Article(s): 2, 3, 5, 8, 12, and 24 VSA §4451.

Please be advised that violations of the CDO are subject to fines of up to two hundred dollars (\$200.00) for each day that a violation continues. You may submit an application to attempt correction of the violation, however, be advised application and filing fees are subject to a fee increase for permits required to correct a violation.

This correspondence serves as a formal notice of a zoning violation pursuant to 24 V.S.A §4451. You have seven (7) days from receipt of this notice to cure the referenced violation. Additional warnings for the violation are not required and will not be forthcoming. In the event that the violation is not cured or remedied as provided for in this notice, the City will pursue enforcement of the violation as provided for by law.

This Notice of Violation (NOV) may be appealed to the Burlington Development Review Board in accordance with the provisions of CDO Sections 2.7.12 and 12.2.2 provided that such appeal is filed within fifteen (15) days of the date of this NOV December 3, 2020, and accompanied by the appropriate fee in accordance with Sec. 3.2.4(a) of the CDO. Appeal fee and complete application shall be filed with the City's Zoning Office (645 Pine Street) by 4 pm on December 18, 2020; an appeal shall not be perfected until the fee is received.

If you have any questions, please call Ted Miles or William Ward at (802) 863-0442.

Sincerely,

Sincerely,

William Ward
Zoning Administrative Officer

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DEC 18 2020

BURLINGTON
PERMITTING & INSPECTIONS

Theodore Miles
Code Compliance Officer

Enclosures: Violation Details

Cc: Land Records for Tax Lot # 046-3-081-000

VIOLATION DETAILS

LOCATION: 110 RIVERSIDE AVENUE

DECISION DATE: December 3, 2020

VIOLATION DESCRIPTION: Operation of an automobile/vehicle salvage yard without a zoning permit. Occupation without a Unified Certificate of Occupancy

FINDINGS: Numerous vehicles, more than three, being stored at property in various stages of repair. Some of the vehicles do not have registration plates on them and some have been in accidents with severe damage. Last permitted use was for car sales and auto repair for 6 vehicles and a lot for selling of 45 vehicles under zoning permit 04-314. Occupying property without obtaining Unified Certificate of Occupancy. There are multiple, six, open zoning permits, Zoning permits 97-274, 97-460, 99-362, 01-318, 04-314 and ZP13-0650CA/MA that are in a Permit Indeterminate status and need to be closed.

REMEDY OPTIONS: Within seven (7) days from receipt of this notice you may cure the violation by:

1) - Removing the violation noted above, **restoring the Premises to its prior permitted state, remove unregistered and inoperable vehicles and informing the Code Enforcement Office that the violation has been removed so our office may verify compliance; or**

2) - **Entering into an Agreement with the City of Burlington to extend deadlines in which to come into compliance with the City's ordinance (administrative fees required).**

APPEAL RIGHTS: You have the right to appeal the enforcement officer's decision that a zoning violation exists on your property to the Development Review Board in accordance with the provisions of Articles 2.7.12 and 12.2.2 of the CDO within fifteen (15) days from the date of this notice. **The deadline for filing an appeal is 4 pm on December 18, 2020.** Submit a complete application with ZV# and appropriate fee to the City's Zoning Office, accompanied by a memo stating the ZV#, the owner's name and address, a brief description of the property with respect to which the appeal is taken, a reference to the regulatory provisions applicable to that appeal, the relief you are requesting, and the alleged grounds why such relief is believed proper under the circumstances. *Failure to appeal constitutes admission that the violation exists, and the decision of the enforcement officer shall be binding 24 V.S.A §4472(d).*

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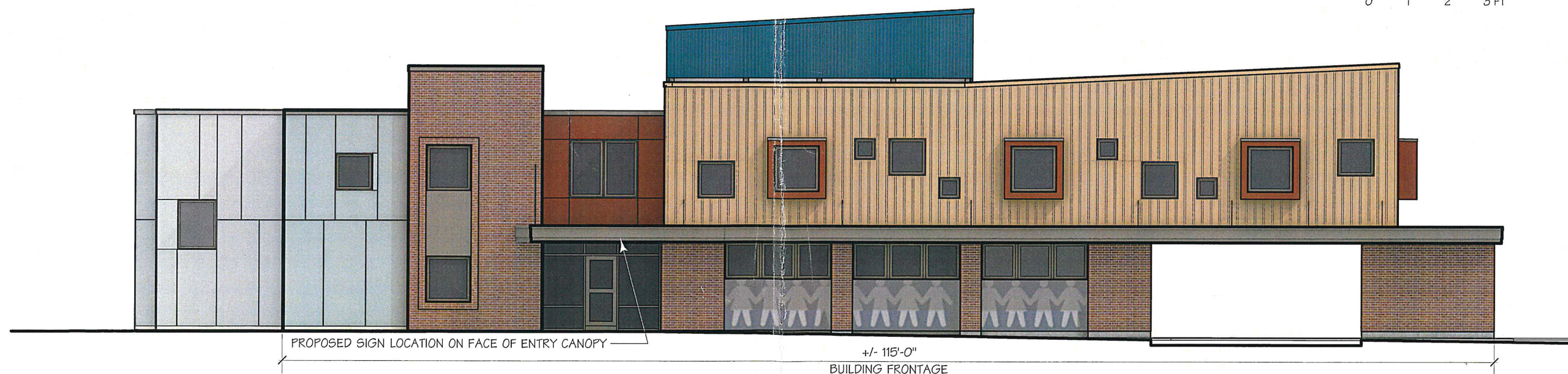
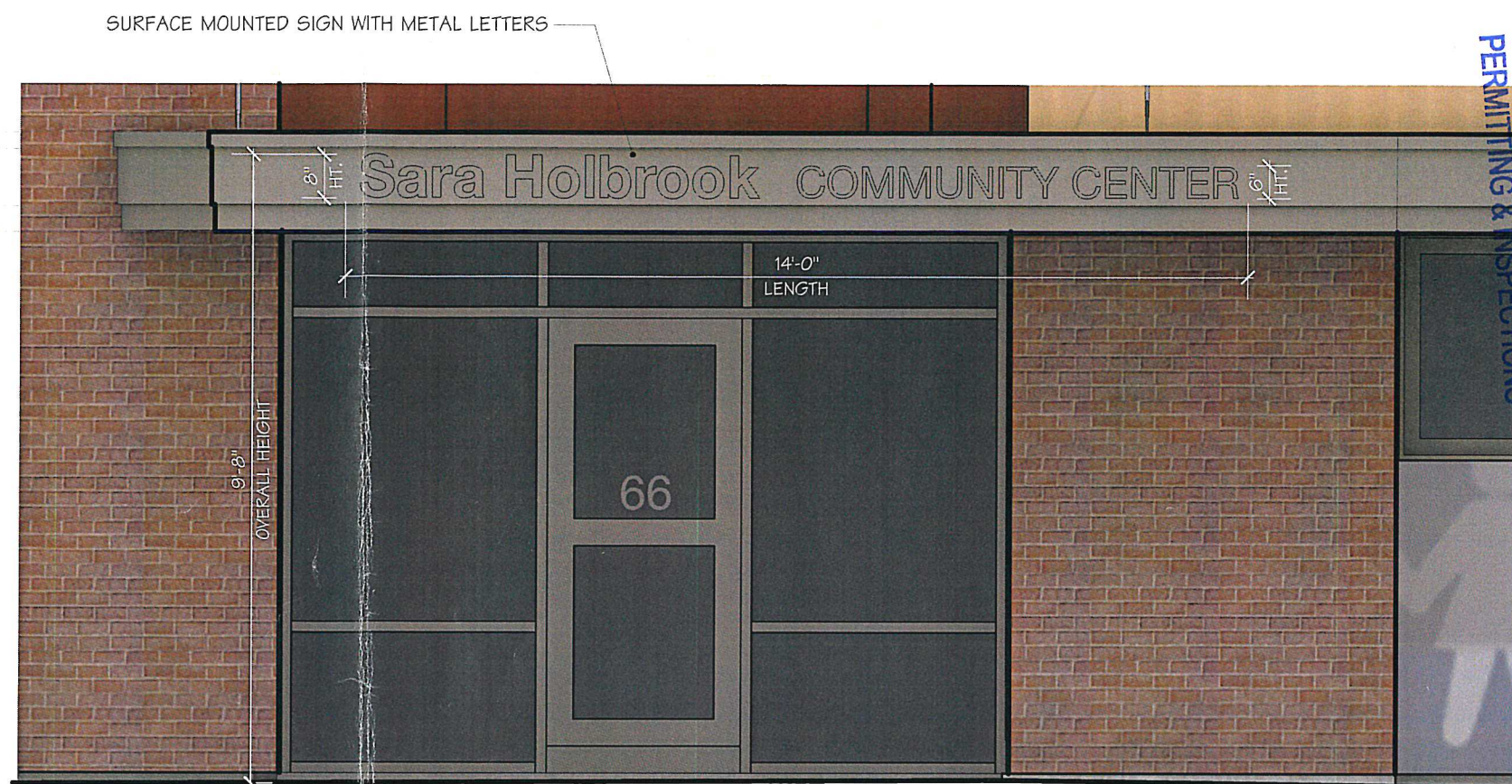
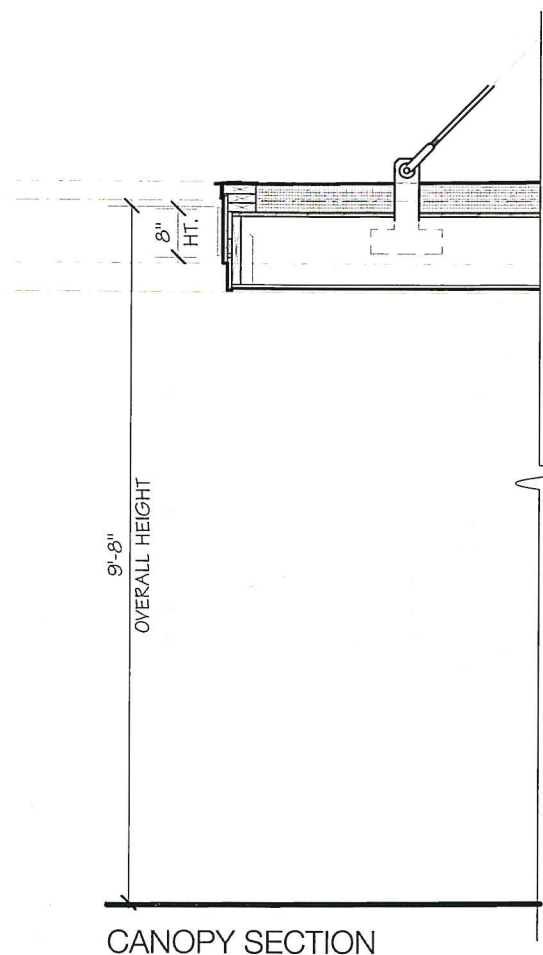
DEC 18 2020

BURLINGTON
PERMITTING & INSPECTION

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MAR 17 2020

BURLINGTON
PERMITTING & INSPECTIONS



SARA HOLBROOK COMMUNITY CENTER

BURLINGTON, VERMONT

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DUNCAN - WISNIEWSKI ARCHITECTURE
A Professional Corporation

SIGN PERMIT APPLICATION

Duncan
Wisniewski
ARCHITECTURE
255 SOUTH CHAMPLAIN STREET
BURLINGTON, VERMONT 05401
T: 802.864.6693

DATE: 03.1

SIG

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 or PO Box No. 1104 NORTH WILLARD ST
 City, State, ZIP+4 BTV 05401

See Reverse for Instructions
 PS Form 3800, July 2014

ZONING DENIAL
 City of Burlington, Vermont
 Department of Permitting and Inspections
 5 Pine Street Burlington, Vermont 05401

Appeal Period Expiration Date: May 21

District

Tax ID: 045-1-09

Project Type: Residential - Site Imp/Landscaping/Parking/Fence

Project Description: Install fence and related gates.

Construction Cost: \$1,500

Lot Size (Sq Ft): 8,052

Net New Habitable Sq Ft:

Net New Number of Residential
Units:

Existing % Lot Coverage:

Existing Number of Parking Spaces:

Proposed % Lot Coverage:

Proposed Number of Parking
Spaces:

Net New % Lot Coverage:

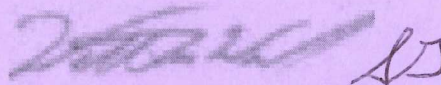
Required Number of Parking Spaces:

Zoning #: 21-275

Decision By: Administrative

Level of Review: FC

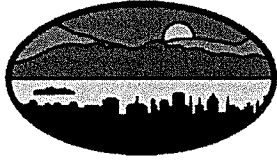
Decision: DENIED


 Zoning Administrative Officer

Decision Date: May 6, 2021

An Administrative decision may be appealed by an interested person within 15 days from the Decision.
 Please contact the Zoning Division for more information.

Balance Due: \$0



City of
Burlington, Vermont
645 Pine Street

Zoning Application Denial – Reasons for Denial

ZP #: 21-275

Tax ID: 045-1-091-000

Issue Date: May 6, 2021

Decision: Denied

Property Address: 164 North Willard Street

Description: Install fence and related gates.

Reasons for Denial:

1. Per Sec. 2.7.8, *Withhold Permit*, of the Comprehensive Development Ordinance, existence of a continuing zoning violation on the property precludes approval of this zoning application. Specifically, the gravel parking area to the south of the paved driveway was found to be an enforceable zoning violation by the Development Review Board and in related court decisions relative to 15-0797AP and 19-0474DT. Lacking remedy of this continuing zoning violation, the application cannot be approved.



Department of Planning and Zoning

149 Church Street, City Hall

Burlington, VT 05401-8415

Phone: (802) 865-7188

Fax: (802) 865-7195

www.burlingtonvt.gov/pz

Zoning Permit Application

Use this form for ALL zoning permit applications. See the relevant checklist for specific requirements.

PROJECT LOCATION ADDRESS: 164 North Willard

PROPERTY OWNER*: Luke Purvis

*If condominium unit, written approval from the Association is also required

POSTAL ADDRESS: 164 North Willard, #1

CITY, ST, ZIP: Burlington VT 05401

DAY PHONE: 609-235-5792

EMAIL: l.purvis78@yahoo.com

SIGNATURE: Luke Purvis

I am the owner. In addition, I duly authorize the applicant (if noted) to act on my behalf for all matters pertaining to this zoning permit application.

APPLICANT: _____

POSTAL ADDRESS: RECEIVED

CITY, ST, ZIP: MAR 09 2021

DAY PHONE: BURLINGTON PERMITTING & INSPECTIONS

EMAIL: _____

SIGNATURE: _____

Description of Proposed Project: Install fence along northern & eastern boundaries & driveway gate

Existing Use of Property: ☐ Single Family ☒ Multi Family: # 3 Units ☐ Other: _____

Proposed Use of Property: ☐ Single Family ☒ Multi Family: # 3 Units ☐ Other: _____

• **Does your project involve new construction, addition, alteration, renovation, or repair to a structure that is heated or cooled?** Yes ☐ No ☒

(If yes, the Vermont Residential Building Energy Standards (VRBES) apply. Visit the P&Z Office, Public Service Board or PSB website for details.)

• **Will 400 sq ft or more of land be disturbed, exposed and/or developed?** Yes ☐ No ☒

(If yes, you will need to submit the 'Erosion Prevention and Sediment Control Plan' questionnaire, with a site plan)

• **For Single Family & Duplex, will total impervious area be 2500 sq ft or more?** Yes ☐ No ☒

(If yes, you will need to submit the 'Stormwater Management Plan' questionnaire, with a site plan)

• **Are you proposing any work within or above the public right of way?** Yes ☐ No ☒

(If yes, you will need to receive prior approval from the Department of Public Works)

Estimated Construction Cost (value)*: \$ 1500

(*Estimated cost a typical contractor would charge for all materials and labor, regardless of who physically completes the work)

Within 30 days of submission, the permit application will be reviewed for completeness, and, if complete, will be processed administratively or referred to a board for review. All permit approvals or denials are subject to an appeal period (15 days for administrative permit; 30 days for board permit). A building (and/or electrical, mechanical, plumbing, curb cut) permit will also be required. Contact the Department of Public Works at 802-863-9094 to inquire. Please ask for assistance if you have any questions about filling out this form. Call the Planning and Zoning at 802-865-7188, or visit the office in the lower level of City Hall, 149 Church Street.

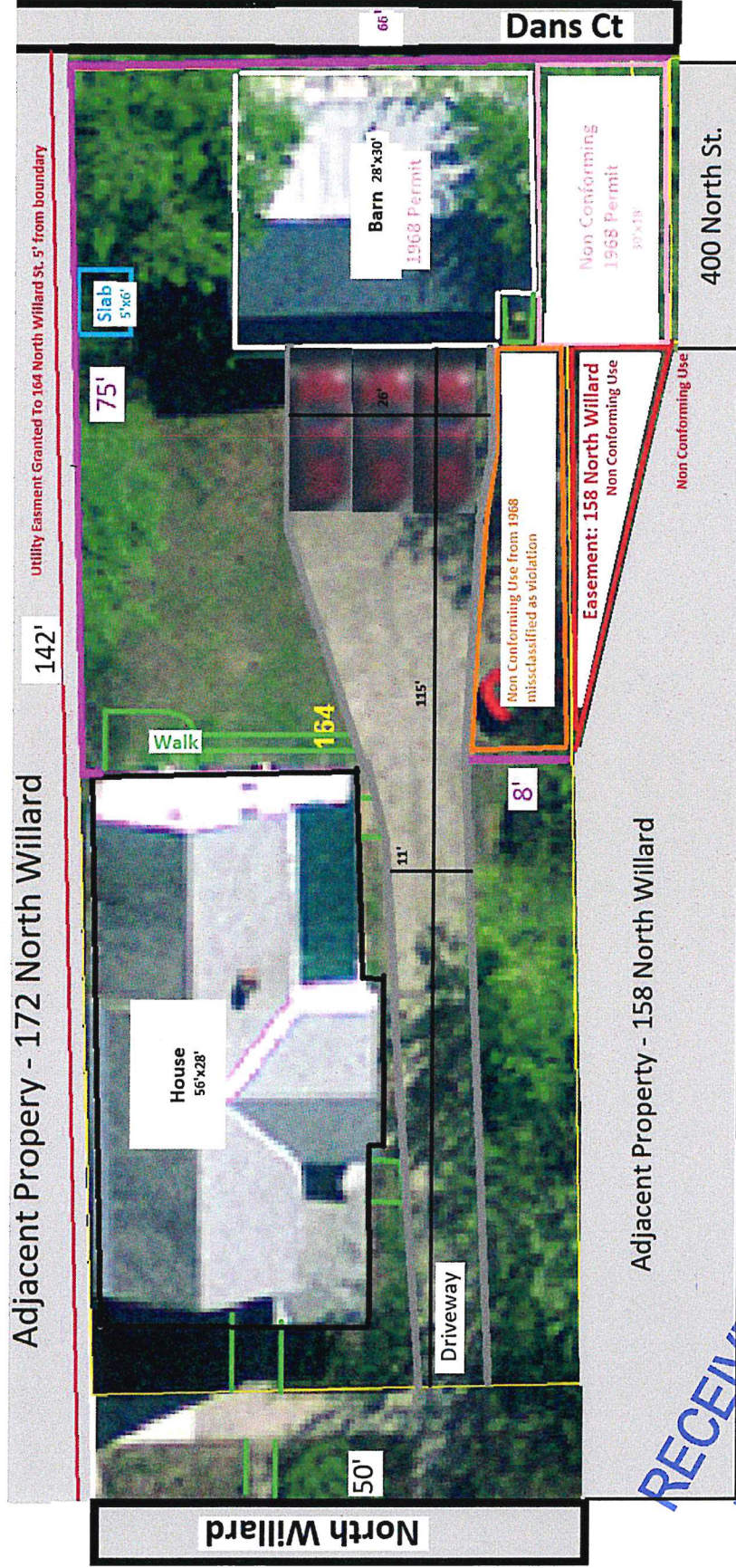
Office Use Only: Zone: RL Eligible for Design Review? Y Age of House 1885 (32) Lot Size 8052

Type: SN ☐ AW ☐ FC ☒ BA ☐ COA 1 ☐ COA 2 ☐ COA 3 ☐ CU ☐ MA ☐ VR ☐ HO ☐ SP ☐ DT ☐ MP ☐

Check No. 792 Amount Paid \$122 Zoning Permit # 21-0749FC

164 North Willard St. - Proposed Fence Project

Site Plan



164 North Willard St.
Burlington VT 05401

Prepared By: Luke Purvis
On: 2/28/2021



Scale: 1cm = 3.4 ft

Proposed
Fence Line

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164 North Willard St. - Proposed Fence Project

Installation Plan and Materials

Install an 8' foot tall horizontal cedar fence on the eastern boundary along Dans Court. Good side will face Dans Ct. The bottom of the fence panel will begin at the curb height of Dans Ct. There will be a gate on the south side of the barn to allow continued access to Dans Court.

- 6"x6" and 4"x6" pressure treated posts
- 1x3, 1x6 Eastern White Cedar for horizontals
- Concrete footings
- Gate – to the south of the barn

Install horizontal cedar fence along the current fence line between 164 and 172 North Willard St. This fence will be good both sides. The Fence will have 8' height where it meets Dans Ct. and taper down to 4' height for most of the run and then increase up to 8' at the house for privacy entering and exiting back doors.

- 4"x4" pressure treated posts, cedar clad
- 1x3 and 1x6 Eastern White Cedar for horizontals
- Compact gravel footings

Install perpendicular fence spur from the 158 North Willard border with horizontal cedar planks, 6' tall, with driveway gate at the easterly line of the main 164 North Willard house to complete a fenced enclosure for 164 North Willard back yard.

- 4"x4" pressure treated posts
- 1x3 and 1x6 Eastern White Cedar for horizontals
- Concrete footings
- Gate to cross driveway

3/7/2021 – 164 North Willard - Fence Plan – No changes to existing uses, structures, boundaries proposed.

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164 North Willard St. - Proposed Fence Project

Materials and Style Representation

The fence shall be constructed of pressure treated posts and eastern white cedar boards with a gap for airflow and focus on privacy. This picture was chosen to show how the fence would taper from full height for privacy on Dan's Ct, to a shorter height for most of the run along the boundary to 172 North Willard.



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164 North Willard St. - Proposed Fence Project

Current View / Proposed View of Dans Ct. - North Side



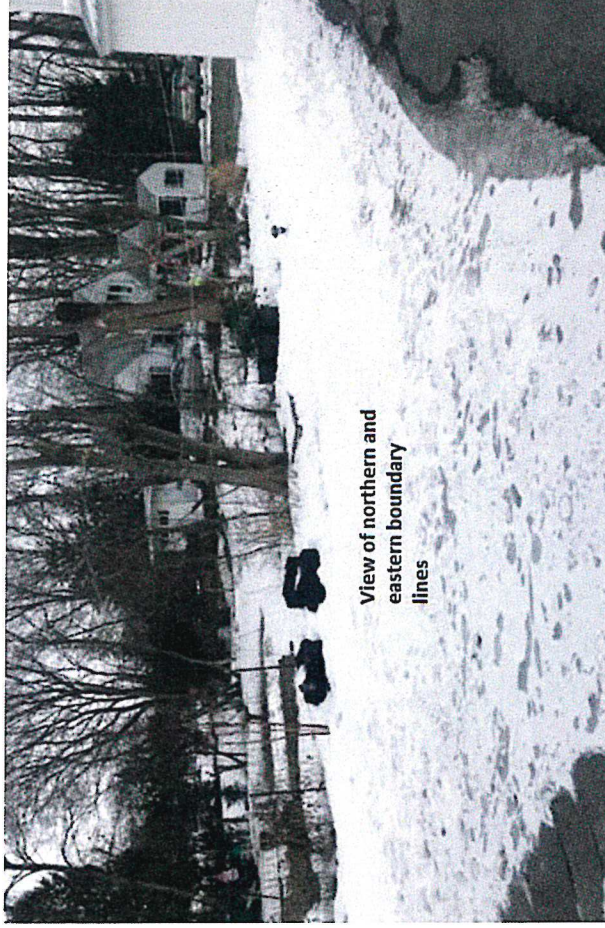
This is a likeness of the fence to show the privacy from the adjacent parking area gained.

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164 North Willard St. - Proposed Fence Project

Current Views of Proposed Fence Lines

The Eastern boundary
along Dans Ct - view to
the south



View of northern and
eastern boundary
lines

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Along the 172 North Willard (Northern) boundary, the fence will follow the line of the current metal fence and be good both sides.

Along the Dan's court boundary, the fence will be placed close to the wall boundary to replace a fence that had been built into the top of the curb of the Dan's Court Retaining wall that had gotten into disrepair and was recently removed. This configuration will continue to allow access behind the barn to 164 North Willard Owners for maintenance.

164 North Willard St. - Proposed Fence Project

Current Views of Proposed Fence Lines



The barn along the easterly boundary and the Dans Ct. boundary wall to the south of the barn.



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PERMITTING & INSPECTIONS

This is where the fence spur for the driveway gate will go

Scott Gustin

From: Scott Gustin
Sent: Monday, March 29, 2021 9:46 AM
To: Luke Purvis
Subject: 164 North Willard Street fence application
Attachments: 164 North Willard Parking 2021.jpg

Good morning Luke,

I've reviewed your zoning application for a fence at 164 North Willard Street. The proposed fence looks as though it could be permitted. There are a couple of items that need to be addressed.

- The unpermitted "south" parking space remains in place and in use. Sec. 2.7.8, Withhold Permit, of the Comprehensive Development Ordinance precludes issuance of a zoning for properties that have ongoing violations – unless the permit is to remedy the violation. Such is not the case here.
- The site plan notes a few "nonconformities" that are not legitimately nonconforming. The site plan cannot be approved.

A fence application may be approvable if the parking violation is remedied and is reflected on the application site plan. The application as presently submitted cannot be approved. You may choose to keep your application as is or revise it to be acceptable. A denial can, of course, be appealed to the Development Review Board. A revised, acceptable application could be approved within a matter of days. Please let me know by April 1, 2021 how you'd like to proceed.

Scott

Scott Gustin, AICP, CFM
Principal Planner & Asst. Administrative Officer
Dept. of Permitting & Inspections
645 Pine Street
Burlington, VT 05401
(802) 865-7189

Scott Gustin

From: Luke Purvis <lpurvis78@yahoo.com>
Sent: Thursday, April 01, 2021 3:23 PM
To: Scott Gustin
Subject: Fwd: Fence Permit Revision 164 North Willard St.

[WARNING]: This email was sent from someone outside of the City of Burlington.

Hi Scott, here the revisions. Thanks for talking it through.
Luke

Sent from my iPhone

Begin forwarded message:

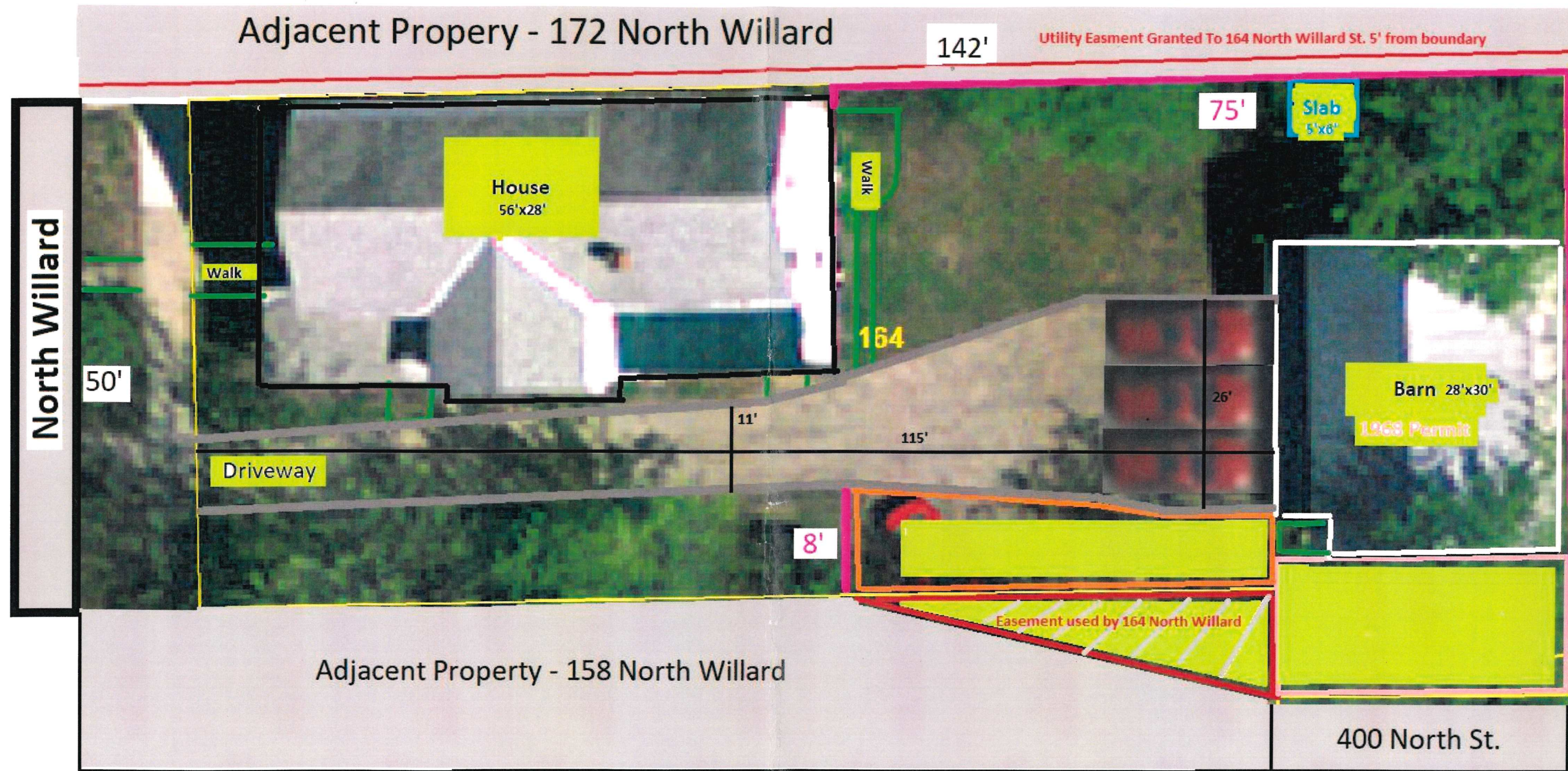
From: "Purvis, Luke" <Luke.Purvis@uvmhealth.org>
Date: April 1, 2021 at 3:20:29 PM EDT
To: lpurvis78@yahoo.com
Subject: Fence Permit Revision 164 North Willard St.

Luke Purvis

Business Intelligence Developer
UVMHN Data Management Office
Luke.Purvis@uvmhealth.org

The University of Vermont Health Network
UVMHealth.org

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Scale: 1cm = 3.4 ft

164 North Willard St.
Burlington VT 05401

Prepared By: Luke Purvis
On: 2/28/2021

Proposed
Fence Line
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APR 02 2021

BURLINGTON
PERMITTING & INSPECTIONS

Department of Permitting & Inspections

Zoning Division
645 Pine Street
Burlington, VT 05401
Telephone: (802) 865-7188

William Ward, Director
Scott Gustin, AICP, CFM, Principal Planner
Mary O'Neil, AICP, Principal Planner
Ryan Morrison, Associate Planner
Layne Darfler, Planning Technician
Ted Miles, Zoning Specialist
Charlene Orton, Permitting & Inspections Administrator



TO: Development Review Board
FROM: Scott Gustin
DATE: July 7, 2020
RE: 20-0854CA/CU; 266 Queen City Park Road

=====

Note: These are staff comments only; decisions on projects are made by the Development Review Board, which may approve, deny, table or modify any project. THE APPLICANT OR REPRESENTATIVE MUST ATTEND THE MEETING.

Zone: ELM Ward: 5S

Owner/Applicant: Burton Corporation / LandPlan Development Associates

Request: Conditional use and certificate of appropriateness review of performing arts center within an existing mixed use commercial building. Associated building façade and rooftop mechanical alterations included.

Applicable Regulations:

Article 3 (Applications, Permits, & Project Reviews), Article 4 (Zoning Maps & Districts), Article 5 (Citywide General Regulations), Article 6 (Development Review Standards), Article 8 (Parking)

Background Information:

The applicant is seeking approval to convert 11,560 sf of vacant interior commercial space to a performing arts center. An additional 2,380 sf outdoor plaza is also associated with the proposed performing arts center. Maximum capacity for attendees is 1,500. Burton's primary industrial use of the building will remain. Additional non-industrial uses are contemplated but not included in this application.

Façade renovations are included in this proposal as are additional rooftop mechanical units. The site remains largely unchanged. The application indicates only minor building footprint changes associated with entryway renovations.

Previous zoning actions for this property are as follows:

- 11/19/20, Approval for stormwater enhancements and parking layout revisions (appealed)
- 5/10/19, Approval for interior skate park
- 6/21/16, Approval for 3 exterior signs
- 11/3/15, Approval to relocate sculpture
- 5/16/14, Approval to install HVAC unit on rooftop
- 9/26/12, Approval to enclose footbridge
- 5/7/12, Approval of parking lot reconfiguration and landscaping improvements
- 8/25/11, Approval to establish showroom and construct façade improvements
- 3/18/11, Approval to install exhaust stack

- 10/29/10, Approval of façade and entryway alterations
- 6/7/10, Approval of new entry, windows, doors, and rooftop mechanical unit
- 11/2/01, Approval of new doors and demolish garage
- 8/13/98, Approval to heighten exhaust stack
- 6/11/98, Approval to install temporary office trailer

Recommendation: **Initial review and continuation** to address the outstanding items noted in the findings below.

I. Findings

Article 3: Applications and Reviews

Part 5, Conditional Use & Major Impact Review:

Section 3.5.6 (a) Conditional Use Review Standards

Approval shall be granted only if the DRB, after public notice and public hearing, determines that the proposed conditional use and associated development shall not result in an undue adverse effect on each of the following general standards:

1. *Existing or planned public utilities, facilities or services are capable of supporting the proposed use in addition to the existing uses in the area;*

The applicant has secured ability to serve letters from Burlington's Electric, Fire, and Police Departments. The Police Department endorsement is predicated on implementation of the proposed operational management plan for the performing arts center. This operational management plan will be incorporated into permit conditions.

Sufficient water and sewer service are available. A State of Vermont wastewater permit will be required for the new use. A capacity letter has been issued to the applicant by the Dept. of Public Works.

Impact fees will be due for the converted space included in this application and will be used to help offset impacts on city facilities. **(Affirmative finding if conditioned)**

2. *The character of the area affected as defined by the purpose or purposes of the zoning district(s) within which the project is located, and specifically stated policies and standards of the municipal development plan;*

The subject property is located within the Enterprise – Light Manufacturing zone. This zone is intended primarily for manufacturing, distribution, processing and the like. The existing Burton facility is consistent with this intent.

In June 2019, the City Council adopted a zoning amendment (ZA-19-07) to allow additional non-traditional commercial uses in the E-LM zone. The intent of the amendment was three-fold: 1) to prioritize industrial and art production uses in the southern portion of the E-LM zone; 2) to leverage market-rate commercial uses to support more traditional industrial uses; and 3) to expand the allowable area of performing arts centers within the district. The proposed performing arts center is consistent with this intent. It is a newly allowable use of an acceptable size and serves to make Burton's primary industrial use more viable. **(Affirmative finding)**

3. *The proposed use will not have nuisance impacts from noise, odor, dust, heat, and vibrations greater than typically generated by other permitted uses in the same zoning district;*

The proposed performing arts center is not expected to generate nuisance impacts from odor, dust, heat and vibrations that may be more typically associated with industrial uses. Noise impacts are a concern. Therefore, the applicant has provided a professional noise assessment to address anticipated noise impacts associated with the proposed use.

The noise assessment, performed by RSG, is comprehensive and evaluates anticipated noise associated with interior public concert events and exterior events, including new mechanical equipment, folks in the outdoor plaza, and the post-concert exit of attendees. Evaluation is performed in light of local noise ordinances in both Burlington and South Burlington. Although daytime use of the venue by private parties is anticipated, the noise study does not address it. Reasoning should be provided.

Projected noise impacts are compared to existing conditions. As public concert events at the venue will be exclusively during the evening hours, projected noise impacts are compared to existing background noise levels during the evening hours. Background noise levels during the overnight hours (10:00 PM – 7:00 AM) typically ranges from 40 -45 dBA. The noise assessment projects that noise levels will remain within this range at the nearest residences both during concert events (42 dBA) and during crowd departure (44 dBA) once the show is over.

The noise assessment notes generally the distinction between constant noises and intermittent noises – constant noises are less perceptible than intermittent ones. There's no apparent discussion of how this distinction may, or may not, be significant in the perception of noise associated with events at the performing arts center.

The operational management plan addresses pre-concert queuing of folks outside the venue to limit crowd size and duration outside. No tailgating will be permitted. Provisions are made for quick and orderly departure following events with specific parameters for events of various sizes. As noted previously, Burlington Police Department support of the project is contingent on implementation of this operational management plan to limit off-site impacts related to the proposed use.

It is important to note that the projected noise impacts assume implementation of proposed mitigation measures. These measures include sheet-rocking the ceiling and insulating a bare metal exterior wall within the venue. Additional insulation could improve these sound-deadening efforts to further offset impacts in the nearby neighborhoods. **(Affirmative finding if conditioned)**

4. *The transportation system is capable of supporting the proposed use in addition to the existing uses in the area. Evaluation factors include street designations and capacity; level of service and other performance measures; access to arterial roadways; connectivity; transit availability; parking and access; impacts on pedestrian, bicycle and transit circulation; safety for all modes; and adequate transportation demand management strategies;*

A traffic analysis and related addendum have been provided. The analysis includes the standard items as to anticipated trip generation, high crash location identification, and intersection level of

service (LOS) in build and no-build scenarios. Baseline traffic conditions are compared with and without the performing arts center, with and without the Champlain Parkway, now and in 2028.

While not central to the traffic study, note that the study cites onsite parking numbers that are inconsistent with the zoning permit records for the property and with the site plan included in the application. Additional parking detail is included under Article 8.

Anticipated trip generation is significant in the PM peak hour (net increase of 222) but much less so during the AM peak hour (net increase of 6). Impacts on nearby intersections vary. Some experience virtually no change while others, in particular the Shelburne Street/I-189 Ramp C, experience a drop in level of service from E to F. The unsignalized intersection at Pine Street and Home Avenue is also markedly impacted under a no-build Champlain Parkway scenario. Hosting events in the evening hours serves to lessen potential traffic impacts on the PM peak hour, though impacts remain significant. To address concerns of nearby residents, specific provision is included in the operational management plan to preclude accidental use of nearby Central Avenue in South Burlington by departing attendees.

Written comments from the Department of Public Works have been provided and will be incorporated into permit conditions. Public Works concurs with the findings in the traffic study and makes a number of recommendations. In an effort to reduce PM peak hour traffic impacts, events at the proposed venue are not to draw traffic until after 6:00 PM Monday through Friday. Such could be accomplished by limiting event times to 6:30 PM or later. Public Works also recommends follow-up traffic analyses post-construction of the performing arts center and of the Champlain Parkway. Depending on results, additional traffic mitigation measures may be required by Public Works. **(Affirmative finding if conditioned)**

and,

5. *The utilization of renewable energy resources;*

There is an existing solar array next door at Burton's 180 Queen City Park Road property, and the applicants will install an empty conduit line at 266 Queen City Park Road to support a possible future installation at this property. The application notes that at least 10 onsite parking spaces will be dedicated for electrical vehicles with charging station capabilities. Parking spaces will also be provided for carpool vehicles. **(Affirmative finding)**

and,

6. *Any standards or factors set forth in existing City bylaws and city and state ordinances;*

As conditioned.

(b) Major Impact Review Standards
Not applicable.

(c) Conditions of Approval:

In addition to imposing conditions of approval necessary to satisfy the General Standards specified in (a) or (b) above, the DRB may also impose additional conditions of approval relative to any of the following:

1. Mitigation measures, including but not limited to screening, landscaping, where necessary to reduce noise and glare and to maintain the property in a character in keeping with the surrounding area.

Noise mitigation measures are proposed in order to decrease off-site noise impacts related to the proposed venue. See criterion (a) 3 above. **(Affirmative finding)**

2. Time limits for construction.

No construction timeline or phasing are included in the project plans. The standard 3-year timeframe for zoning permits will apply. **(Affirmative finding)**

3. Hours of operation and/or construction to reduce the impacts on surrounding properties.

The application notes a maximum range of evening operating hours for public events to be 7:00 PM – 2:00 AM. It also notes the performing arts center will open one hour prior to the published start time of the event. Will the venue be open at 6:00 PM for a 7:00 PM show start, or is 7:00 PM the earliest the venue would open? The traffic assessment implies the former, but clarification is needed. Days of the week are not specified. Will the venue potentially be operational on any given evening?

The application notes that the proposed venue will be available to host private and community events in addition to concerts. Daytime operation is noted as a possibility, but details are lacking. Any daytime activity seems to conflict with Burlington Public Works' recommendation to limit traffic generation to after 6:00 PM on weekdays. Improved clarity and detail is needed as to proposed days and hours of operation. The traffic and noise assessments focus on the anticipated evening concert events. Significant daytime operation could warrant additional analysis of those, and other, items to more fully understand potential impacts related to the proposed use. **(No finding possible)**

4. That any future enlargement or alteration of the use return for review to the DRB to permit the specifying of new conditions; and,

Any future enlargement or alteration will be reviewed under the zoning regulations in effect at that time.

5. Such additional reasonable performance standards, conditions and safeguards, as it may deem necessary to implement the purposes of this chapter and the zoning regulations.

See the recommended conditions.

Article 4: Maps & Districts

Sec. 4.4.3, Enterprise Districts:

(a) Purpose

(1) Light Manufacturing (E-LM)

The subject property is located in the E-LM zone which is intended as the primary commercial/industrial center of Burlington. Burton's primary industrial use is consistent with this intent. As noted previously, the applicable use standards in the E-LM zone have been opened up to allow non-traditional commercial uses to basically support the traditional industrial uses in the district. Performing arts centers are one such use. **(Affirmative finding)**

(b) Dimensional Standards & Density

Building FAR remains essentially unchanged.

Lot coverage will increase from 60.2% to 63.6%. Site changes are not noted in the application narrative; however, comparison between the site plan in this application and that approved as part of prior zoning permit 20-0514CA shows some differences in parking and stormwater facility layout. Clarification is needed as to what site changes are actually proposed. The proposed lot coverage is under the maximum allowable 80% coverage. Note that the site plan depicts changes and a resultant change in lot coverage for neighboring 180 Queen City Park Road. No changes to that property are included in this application.

Side setbacks remain unchanged. As a corner lot, there is no rear setback. The front yard setback is 5' minimum from the front property line. Apparent new parking spaces comply with this minimum front yard setback.

Building height remains unchanged. **(No finding possible)**

(c) Permitted & Conditional Uses

Subsection 2 of this criterion enables uses unrelated to industrial or art production on E-LM zone properties south of Home Avenue only when one or more industrial or art production uses exist on the lot and that the combined gross floor area of the unrelated uses does not exceed 49% of the GFA on the lot. Uses limited by this provision are identified in Footnote 27 of Appendix A – Use Table. A performing arts center is one such use included in Footnote 27. The performing arts center will be 11,560 sf (13.6% of the total 85,036 sf GFA). Note that floor plans depict the already-permitted 8,298 sf skateboard park (9.8% GFA) and a not-yet-permitted “food court” (~6,400). Combined, the non-industrial areas would total ~ 30% of total GFA within the building. The “food court” is not included in this application; however, it bears mentioning that the application asserts it will serve employees and will be open to the public. Cafes are allowable within this zone; however, they are limited in size to 1,500 sf.

Performing arts centers in the ELM zone are further limited by Footnote 32 that limits size to 15,000 square feet along Queen City Park Road (formerly Industrial Parkway). The proposed 11,560 sf performing arts center fits within this limitation, even if including the 2,380 sf outdoor plaza. **(Affirmative finding)**

(d) District Specific Regulations

Not applicable.

Article 5: Citywide General Regulations

Sec. 5.2.3, Lot Coverage Requirements

See Sec. 4.4.6 (b) above.

Sec. 5.2.4, Buildable Area Calculation

Not applicable.

Sec. 5.2.5, Setbacks

See Sec. 4.4.6 (b) above.

Sec. 5.2.6, Building Height Limits

See Sec. 4.4.6 (b) above.

Sec. 5.2.7, Density and Intensity of Development Calculations

See Sec. 4.4.6 (b) above.

Sec. 5.5.1, Nuisance Regulations

See Sec. 3.5.6 (a) 3.

Sec. 5.5.2, Outdoor Lighting

New lighting will illuminate the walkway beneath the proposed steel tube canopy structure along the building's west elevation. No details are provided. Fixture cut sheets and illumination levels are needed. If any other outdoor lighting is proposed, the same details are needed for those fixtures as well. **(No finding possible)**

Article 6: Development Review Standards

Part 1, Land Division Design Standards

Not applicable.

Part 2, Site Plan Design Standards

Sec. 6.2.2, Review Standards

As noted previously, clarification is needed as to whether site changes are, in fact, included in this application or not. The application site plan depicts minor parking and stormwater facility reconfiguration that results in a slight increase in lot coverage but no net increase in onsite parking spaces. **(No finding possible)**

Part 3, Architectural Design Standards

Sec. 6.3.2, Review Standards

(a) Relate development to its environment

1. Massing, Height, and Scale

The massing, height, and scale of the building remain unchanged. **(Affirmative finding)**

2. Roofs and Rooflines

Except for some minor revisions associated with revamped building entries, building roof and rooflines remain unchanged. **(Affirmative finding)**

3. Building Openings

Much of the façade renovations consist of new windows and doorways. New glazing is focused on the west building elevation; however, the north elevation receives additional glazing as well. The main entry into the building (on the west elevation) is significantly reworked to include a row of glass doors and a fixed canopy with storefront glazing above. New north-facing windows under the roofline of the venue space will introduce natural light into the space. Other alterations to the north elevation include additional windows along the northwest end and an embellished north building entry. Alterations to the south elevation are limited to reworking some of the private entries. **(Affirmative finding)**

(b) Protection of important architectural resources

The existing building is not historic, nor is it eligible for listing on an historic register. The proposed façade renovations will have no adverse impact on Burlington’s architectural resources. **(Affirmative finding)**

(c) Protection of important public views

No identified public view corridors are adversely affected by the proposed renovations. **(Affirmative finding)**

(d) Provide an active and inviting street edge

The building as it exists today is largely industrial and appears that way from the street. The proposed façade renovations provide well-identified building entries that provide a more welcoming presence along the street. Existing walkways connect the parking areas to these revamped public building entries. The changes transform the building from one that appears largely closed to the public to one that is open and more inviting. **(Affirmative finding)**

(e) Quality of materials

Much of the building exterior will remain unchanged as metal siding. The west building elevation will be redone with glass fiber reinforced cement siding in horizontal and vertical arrangements. A small section of new metal siding will be installed over brick on the north elevation. The outdoor plaza will be enclosed with solid wood and metal fencing. Fiberglass windows will be installed throughout, except for aluminum-frame windows atop the performance space. A new steel canopy will be constructed alongside the west building elevation, presumably to provide shelter for patrons waiting to enter the building. The proposed materials are consistent with the commercial nature of the building and are of acceptable quality. **(Affirmative finding)**

(f) Reduce energy utilization

Applicable commercial energy codes pertain to the building renovations. The introduction of new windows will allow natural sunlight to illuminate the interior of the building during daylight hours. **(Affirmative finding)**

(g) Make advertising features complimentary to the site

Elevation drawings depict several new sign locations. No signage is included in this application and will be handled by way of separate zoning permit. **(Affirmative finding if conditioned)**

(h) Integrate infrastructure into the building design

Several new rooftop mechanical units are proposed. Some are depicted on elevation drawings; however a roof plan is needed and has not yet been provided. Screening will be required to hide the units from street view. **(No finding possible)**

(i) Make spaces safe and secure

Emergency vehicle access to the building appears to remain essentially unchanged. Adherence to applicable building codes will be required. **(Affirmative finding if conditioned)**

Article 8: Parking

Sec. 8.1.8, Minimum Off-Street Parking Requirements

Under present conditions, the building has a total onsite parking requirement of 99 spaces (based on the manufacturing and skate park uses). Prior zoning permit 20-0514CA (which remains under appeal in court) revised the parking count from 180 existing spaces to 172 spaces. The proposed

performing arts center will require 375 spaces (1 space per 4 seats – 1,500 proposed maximum capacity). Accounting for the existing manufacturing parking requirement for the 11,560 sf space, the net increase in required onsite parking is 360 spaces.

Parking information within the traffic analysis is inconsistent with parking information above and within the application site plan. The parking number noted above (172 onsite spaces) is consistent with the permit records and with the application site plan. The parking analysis refers to 181 spaces at the property in combination with 276 at 180 Queen City Park Road (the zoning permit records show 244 spaces at 180 Queen City Park Road). Assuming the site plan is correct and that no additional parking is proposed, there is a combined availability of 416 parking spaces between both properties. Just 266 Queen City Park Road will require 459 parking spaces. A parking waiver is needed and is predicated on a parking management plan. The discrepancies among the parking numbers need to be corrected and clarified. **(No finding possible)**

Sec. 8.1.15, Waivers from Parking Requirements/Parking Management Plans

Notwithstanding the discrepancies among the parking numbers noted in Sec. 8.1.8, the application proposes a parking management plan centered on shared use. Concert events open to the public will occur only in the evenings, after the daytime uses at the property have largely closed for the day. This shared-use parking arrangement is common and makes efficient use of a shared parking resource. Given that the parking plan is predicated on use of parking at both 180 Queen City Park Road and 266 Queen City Park Road, the shared parking at 180 Queen City Park Road will need to be secured by way of deed or easement for the duration of the performing arts center use at 266 Queen City Park Road. Such deed or easement will be subject to review and approval by the City Attorney's Office.

Even with shared use, the total available parking (416 spaces) is less than required (459 spaces). The application asserts that alternative modes of transportation will be encouraged and that dedicated carpool spaces will be provided. It is unclear the degree to which these measures will actually reduce onsite parking demand. No mention is made as to how daytime parking demand associated with daytime use of the performing arts center will be handled. Daytime use is contemplated in the application and must be accounted for in the parking management plan. **(No finding possible)**

Sec. 8.2.5, Bicycle Parking Requirements

There is no specific bicycle parking requirement for performing arts centers. The closest approximation appears to be community centers which require 1 long term space per 20,000 sf and 1 short term space per 1,500 sf. The application materials include reference to bike parking; however, details are lacking. As proposed, the performing arts center will require 1 long term bike parking space and 8 short term spaces. The long term space must be enclosed and secure. The short term spaces make take the form of bike racks and must be close to the public building entry. **(No finding yet possible)**

II. Conditions of Approval

Conditions of approval are proposed in the event that the outstanding items noted above are sufficiently addressed.

1. **Prior to release of the zoning permit**, revised project plans addressing the following shall be submitted, subject to staff review and approval:

- a. Outdoor lighting information consistent with the standards of Sec. 5.5.2 (if any is proposed);
 - b. Erosion prevention and sediment control plan and stormwater screening form approved by the Stormwater Program; and,
 - c. Proposed extent of tree clearing.
2. Prior to issuance of a building permit for the project-related construction, impact fees based on the square footage of the converted space shall be paid to the Zoning Division at the Department of Permitting & Inspections.
3. This zoning permit requires installation of the Planned Mitigation measures noted in the Burton Snowboards & Higher Ground HUB Project Noise Assessment dated April 20, 2020.
4. This zoning permit requires consistent implementation of the Burton Hub – Performing Arts Center (PAC) Operational Management Plan dated April 23, 2020.
5. This zoning permit requires execution of Department of Public Works’ recommendations in their June 26, 2020 letter from Susan Molzon, P.E.
6. No exterior signs are included in this zoning permit. All exterior signs are subject to separate zoning permit(s).
7. The Applicant/Property Owner is responsible for obtaining all necessary Zoning Permits and Building Permits through the Department of Permitting & Inspections as well as city and state energy code compliance and other permit(s) as may be required.
8. Standard permit conditions 1-15.

LANDPLAN
61 Central Avenue
Burlington, Vermont 05401
802/233-6640 john.caulo@gmail.com

24 April 2020

Ms. Mary O'Neil, Principal Planner
Mr. Scott Gustin, Principal Planner
Department of Permitting and Inspections
645 Pine Street
Burlington, VT 05401

RE: Burton: Conditional Use Application for *Performing Arts Center* Use
 266 Queen City Park Road

Dear Mary and Scott:

Per our previous discussions regarding the proposed above-referenced Project, I enclose the following information:

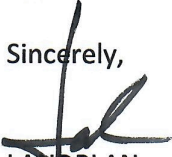
- Completed Application Form
- \$470 Permit Fee (\$155+115+\$200 based on \$100K exterior cost)
- Supporting Documentation as required under Conditional Use criteria (CDO: Section 3.5.6.a)

In general, the proposed zoning permit application contemplates the use of approximately 11,560 square-feet of space within an existing 85,000+SF building as a *Performing Arts Center (PAC)*, as defined in the CDO. The proposed Project also contemplates façade improvements to the building exterior.

If approved, the *PAC* would join other uses, either existing on-site or proposed, including core Burton functions such as an R&D/prototype center, walk-up warranty service, retail store and multiple product innovation and testing labs. Other uses to be operated by 3rd party entities would include an indoor skate park and proposed food court. Per the CDO, all land uses described above are "permitted" under existing zoning bylaws except for the proposed *Performing Arts Center* which is the subject of this application (note: the skatepark received conditional use permit approval in 2019 and is operation).

I trust this description provides the needed context for you to initiate your review and process this application. However, if additional information is required, please advise. Thank you.

Sincerely,


LANDPLAN
John Caulo

Attachments as noted

cc. Justin Worthley; Mike Fialko-Casey - Burton
 Alan Newman; Alex Crothers – Higher Ground



**BURTON MIXED-USE HUB
CONDITIONAL USE APPLICATION
April 30, 2020**

INTRODUCTION AND BACKGROUND

Burton, a locally owned company with global reach, is headquartered on Queen City Park Road (QCPR) in Burlington, encompassing over 150,000 square feet of floor area in two buildings. In addition to its BTV headquarters, Burton maintains regional offices in:

- Innsbruck, Austria;
- Tokyo, Japan;
- Beijing, China;
- Sydney, Australia; and
- Seoul, Korea.

Currently, Burton employs over 1,100 people globally, including 400 people in Burlington and 300 additional employees across North America. In addition, Burton has 63 retail locations across the globe, plus *Channel Islands*, a wholly owned subsidiary based in Carpinteria, California.

Burton first moved to Burlington from Southern Vermont in 1991, acquiring and occupying 69,000 SF of space at 180 QCPR. In 2007, following almost two decades of continuous growth, Burton purchased the adjacent property at 266 QCPR, providing an additional 84,380 SF of space to accommodate the anticipated future expansion of the company.

In 2008 the Great Recession dramatically altered Burton's business and future space needs in the local market. Between 2010 and 2013, modest growth allowed Burton to occupy portions of 266 QCPR, however, about 33% of the building was leased to the former owner, *General Dynamics*. This leasing arrangement continued until 2014, when *General Dynamics* left the property and the local area for good. Since 2014, Burton has diligently attempted to lease the space vacated by *General Dynamics* to a traditional "manufacturing/warehouse" use, including an initiative in 2018 by the City Community and Economic Development (CEDO) team to assist Burton in leasing the space. All efforts to find a traditional manufacturing tenant were unsuccessful.

Our challenge finding an industrial tenant is consistent with a larger market trend and condition which has had a dramatic impact on Burlington's South End. Over the past 10-15 years changing market trends for manufacturing and light industrial uses have caused a significant change in local land use patterns. Many traditional manufacturers have departed Burlington's South End, including:

- Queen City Cotton Co. and General Dynamics (now the Innovation Center);
- Specialty Filaments (now Dealer.Com); and most recently,
- Blodgett Ovens (relocating from Lakeside Avenue to Essex Junction).

In sum, Burlington has lost hundreds of thousands of square feet of manufacturing/industrial space in the South End which has been transformed into other various non-residential uses.

THE HUB CONCEPT

Following the failed leasing efforts by Burton and CEDO between 2014 and 2018, Burton initiated a concept to repurpose unused warehouse space into a mixed-use facility consistent with the other land use dynamics occurring throughout the burgeoning South End Arts District. The mixed-used (“Hub”) concept was born to introduce new uses to the campus, including a food hall, indoor skate park, and performing arts venue, combined with core Burton functions already on site, including an R&D/prototype center, walk-up warranty service, retail store and multiple product innovation and testing labs. With regards to local land use standards, all land uses contained in the proposed Hub concept are “permitted” under existing zoning bylaws except for the proposed *Performing Arts Center* (note the skatepark received conditional use permit approval in 2019) which is the subject of this application.

THE HUB: BURTON GOALS AND OBJECTIVES

Burton’s vision for the ‘Community Hub’ is to anchor / surround / sustain existing manufacturing and R&D functions with a complement of mixed uses which will benefit a broad cross section of Burton’s customer-base, and the community at large. The activities proposed at the Hub include a *Performing Arts* venue which is the subject of this Conditional Use application. Other uses are not subject to the Conditional Use permit requirements and not included in the scope of this application, and they are mentioned here because the project goals are achieved as a whole, and not through the individual component parts. Burton’s Community Hub goals are:

- **Create** a year-round physical space with a mixture of uses that creates a place for Burton customers and community members to connect and enjoy a variety of activities.
- **Drive** collaboration and engagement with Burton customers and the community.
- **Modernize** an underutilized and aging former military armament facility into a vibrant and relevant multi-purpose community center to showcase Burton’s and Burlington’s culture.
- **Recoup** required capital investment for facility/site improvements within 10 years.

We will achieve our goals by:

- Creating something new and unique in Burlington that combines research and development, food, recreation, retail, and entertainment that is compelling for locals and visitors alike.
- Partnering with and hosting long-established local brands to co-develop a sustainable business model. These partners include:
 - The Chill Foundation – a 501(c)3 non-profit organization
 - Talent Skatepark – a 501(c)3 non-profit organization
 - Higher Ground (HG) – a local concert venue and event production company
 - Mad Taco and Misery Loves Company – two local eateries

THE HUB: PUBLIC PROCESS TO DATE

In advance of filing this permit application, Burton has engaged in an extended public process which started in November 2018. Various public engagements have included:

- NPA Ward 5 meetings:
 - Burton has presented updates on the project at two (2) NPA Ward 5 meetings, most recently on October 17, 2019.
- Consultation and coordination with professional staff from cities of Burlington and South Burlington including Public Works, Police and Planning.
- Voluntary Outreach: Burton has initiated voluntary outreach to neighbors and community members including:
 - over 25 tours, and over 10 info/Q+A sessions;
 - a public meeting/info session at Queen City Brewing on September 30, 2019;
 - interviews with many local media outlets (Seven Days, VT Digger, Burlington Free Press, WCAX, WPTZ, Vermont Public Radio);
 - ongoing in-person and zoom meetings with representatives of the Citizens for Responsible Zoning (CRZ), a self-named group made up of residents in adjoining Burlington and South Burlington neighborhoods, including on February 12, March 13, April 3 and April 28 or 29 (scheduled) 2020;
 - and many phone, in-person and email conversations.

CONDITIONAL USE APPLICATION: PROJECT METRICS

This Conditional Use application contemplates the conversion of approximately 11,560 square feet of vacant, high-bay manufacturing space in the 266 QCPR facility into a *Performing Arts Center*. This is within the 15,000 square foot limit for such use as outlined in the Burlington Zoning Ordinance. See Figure 1.

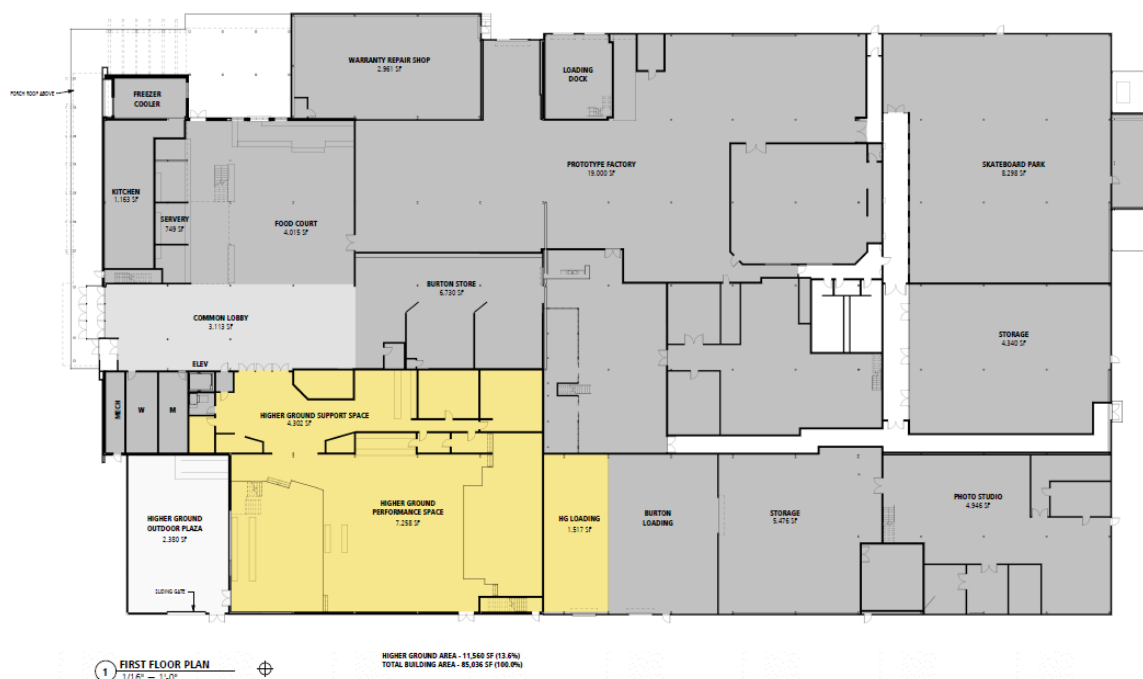


FIGURE 1 – PLANNED LAYOUT OF 266 QUEEN CITY PARK ROAD – YELLOW SHADED AREA IS PROPOSED PERFORMING ARTS CENTER SPACE

The *Performing Arts Center* area represents 13.6% of the total square footage of the 266 QCPR facility (85,036 total square feet), which is less than the 49% limit for non-manufacturing uses as outlined in the Burlington Zoning Ordinance. Salient features of the proposed *Performing Arts Center* use include:

- Size: Approximately 11,560 square feet. This represents approximately 13.6% of the 266 QCPR Building Floor Area.
- Operator: Burton has signed a letter of intent with an operator for the *Performing Arts Center*. The operator is Higher Ground (HG) which has significant experience and a 20+ year track record operating similar venues and events in the local area.
- Capacity: The *Performing Arts Center* venue will be designed to accommodate a maximum of 1,500 people. Notes regarding capacity and facility design:
 - The operator of the *Performing Arts Center* is seeking a facility that can accommodate a maximum of 1,500 people but can be easily scaled down for smaller performances, given the limiting size of the Burlington market and relatively small number of performances requiring a 1,500 person capacity.
 - Because a limited number of shows are expected to approach maximum capacity, the proposed venue will feature a flexible, accordion-like design which will allow for alternate viewing configurations to create a smaller, more intimate atmosphere.
 - The ability to offer group, cabaret-style and reservable seating options to an aging customer demographic is a key requirement of the operator for the new location, a feature they are unable to offer at their current location.
 - Maximum capacity will be a function of the final design and occupancy limits established by the City of Burlington Fire Marshall.
- Additional Community and Private Events. The operator expects to rent the *Performing Arts Center* venue for private and community events produced by the operator or by 3rd party entities, for example:
 - daytime and evening corporate events hosted by Burton;
 - community and neighborhood meetings/events;
 - afternoon/weekend children's programming; and
 - range of other private or public events such as
 - Discover Jazz Festival,
 - Burlington Choral Society events,
 - Burlington Ballet Company performances, etc.).

Regarding these other uses, many are already underway as Burton hosts a wide range of groups in existing space at 266 QCPR, Higher Ground rents their current space for various private and community events, and Burton has received strong interest from multiple local groups about potential use of the space including The Discover Jazz Festival, Burlington Choral Society, and others. Therefore, it is anticipated that the *Performing Arts Center* venue will accommodate a broad range of public and private community events.

- Expected Daily Evening Hours of Operation (when open) for public concert events: In general, for ticketed concert events, the *Performing Arts Center* will open one hour before the published showtime, and close no later than the 2AM closing hour dictated by local ordinance.

As noted in the City of Burlington Zoning Ordinance regarding Conditional Use Criteria, “Approval shall be granted only if the DRB, after public notice and public hearing, determines that the proposed conditional use and associated development shall not result in an undue adverse effect on each of the following general standards.” As such, the project has been designed to meet/exceed all elements of this section of the Zoning Ordinance as outlined below:

1. **CRITERIA 1:** *“Existing or planned public utilities, facilities or services are capable of supporting the proposed use in addition to the existing uses in the area”*
 - a. Response: See attached “Letters of Service” from the following BTV line agencies and/or utilities servicing the proposed *Performing Arts Center* use.
 - i. Burlington Police Department: Note that the Burlington Police Department service letter identifies expectations regarding the management of events, and the requirement for coordination between the operator and the BPD as necessary. These expectations are addressed in the Operational Management Plan which has been submitted as an addendum to this application.
 - ii. Burlington Fire Department
 - iii. Burlington Water Department
 - iv. Burlington Department of Public Works
 - v. Burlington Electric Department
2. **CRITERIA 2:** *“The character of the area affected as defined by the purpose or purposes of the zoning district(s) within which the project is located, and specifically stated policies and standards of the municipal development plan”*
 - a. Response:
 - i. The physical character of the Project Site and surrounding environs will be unchanged as a result of this Project. As stated above, Burton owns and occupies more than 150,000 square feet of space in two structures (with related parking) located at 180 and 266 QCPR.
 1. Other than cosmetic improvements proposed for the façade of 266 QCPR, the scale and mass of Burton’s building improvements will remain unchanged.
 2. Other than separately permitted stormwater improvements required by State Law (Act 64), the existing parking lot will continue to function adequately for Burton and the *Performing Arts Center* use.
 - ii. The proposed project is consistent with the stated planning policies and the Zoning Ordinance of the City of Burlington. The Planning Commission, by unanimous vote, approved a zoning amendment on January 29, 2019 conditionally permitting *Performing Arts Centers* as a supporting use in additional areas of the E-LM zone beyond Pine Street. Subsequently, the City Council, by 10-1 vote on June 17, 2019, formally approved a zoning ordinance amendment allowing *Performing Arts Centers* on QCPR as an allowable Conditional Use, so long as at least 51% of the full building remains for industrial/manufacturing uses.
 - iii. As stated by the City of Burlington Planning staff in a memo written to the City Council in May 2019 (see attached memo from Burlington Planning Department

staff Meaghan Tuttle): “The purpose of the proposed amendment is to permit additional commercial uses in certain parts of the E-LM zoning district in a way that is consistent with the vision for the South End articulated in planBTV: South End Master plan. This includes creating definitions for Industrial and Art Production, expanding the geographic and size limit for *Performing Arts Centers* south of Home Avenue, creating new R&D and Technical Office uses, and establishing a requirement that limits the gross floor area (GFA) of uses not related to Industrial and/or Art Production uses on a lot south of Home Avenue to 49%.”

- iv. As stated in the same memo, the intent of the adopted zoning ordinance language is to: “Leverage market-rate commercial uses to support industrial uses.” It goes on to state that “*planBTV South End* recognizes the challenge of preserving Industrial uses, given the market realities of the South End, and identifies the need to come up with creative solutions to support these uses. To do so, this amendment leverages traditional commercial uses to subsidize space for Industrial and Art purposes.” This is the essence of our application and overall plans for the Hub project. The specific layout of the project is well within the specific requirements of the municipal plan, as reflected in the specific language of the zoning ordinance:

1. The floor area of the proposed *Performing Arts Center* is less than 14% of the building area. Industrial/manufacturing/technical uses shall remain above 50% of the total floor space of the 266 QCPR building.
2. The *Performing Arts Center* use will effectively help to sustain Burton’s existing various manufacturing, technical office, R&D and arts/maker uses of the E-LM zone. Referring back to the memo from Planning Department staff: “As such, a critical element of the proposed amendment is the new provision which places an emphasis on and creates a protection for these types of uses. This creates a mechanism by which a variety of general commercial uses are permitted in this area only when they are on a lot with an industrial use. PlanBTV: South End does not identify an exhaustive list of commercial uses which should be permitted or not, but rather indicates that commercial uses not related to Industrial and maker enterprises should be limited, and not be stand-alone uses. Therefore, the proposed amendment is consistent with planBTV: South End Master Plan.”

3. **CRITERIA 3:** “*The proposed use will not have nuisance impacts from noise, odor, dust, heat, and vibrations greater than typically generated by other permitted uses in the same zoning district*”

a. Response:

- i. The proposed *Performing Arts Center* use will not result in greater impacts typical of other uses in the area and along QCPR.
 1. The Project Site is located within an Enterprise Light Manufacturing (E-LM) Zone which anticipates a variety of land uses and accompanying traffic / odor / noise impacts which are permitted by right.
- ii. Nuisance Impacts:

1. Noise: Burton has retained Resource Systems Group (RSG) to prepare a Noise Assessment of the sonic impacts of the *Performing Arts Center* as part of this conditional use application (see attached). In addition, *HG* is working with Technological Design Studies, an acoustic and noise control consultant, as a member of the venue design team to ensure concert noise will remain in the building. Major conclusions of the RSG study include:
 - a. Overall sound levels will be comparable to existing background sound levels.
 - b. Sound levels will comply with World Health Organization Community Noise Guidelines.
 - c. Sound levels will be consistent/compatible with urban/suburban residential areas.
 - d. Sound levels will not exceed allowable levels based on the City of South Burlington noise ordinance.
2. Odor: The Project will not result in any impacts associated with odors greater than what is typical for the area.
3. Dust: The Project will not result in any impacts associated with dust that is typical for the area. All parking areas at the Project Site, and public streets in the vicinity have paved surfaces which do not generate traffic-related dust.
4. Heat: The Project does not involve any heat-generating manufacturing processes.
5. Vibration: The Project will not result in any vibration that will cause an undo impact on adjacent properties.
6. Behavior: During the multiple meetings Burton has held with residential neighbors, one consistent concern expressed by neighbors relates to behavioral noise outside the venue, either when patrons are arriving, or when the performances have concluded, and patrons are leaving the venue. In responding to these concerns, the applicant agrees to:
 - a. Parking/Site Management Plan. In coordination with the operator, Burton has developed and will implement a parking management plan for all public concerts that will include:
 - i. No “tailgating” policy to be enforced before, during and after all concert events.
 - ii. Staffing plan to facilitate orderly exit after concert events.
 - iii. Staff to have required training regarding crowd/behavior control, coordination with the Vermont Department of Liquor Control, coordination with law enforcement, and traffic control.
 - iv. Requirements based on the expected size of the event, with more staff required for larger events.
 - v. Specific controls will be put in place regarding traffic exiting on Queen City Park Road to include:

1. Use of one-way bridge. See attached memo from traffic consultant VHB.
 2. Deterring traffic from turning onto Central Avenue at the end of events.
 - vi. Staff will monitor deter pedestrians from entering Red Rocks Park at the end of events, and will coordinate with law enforcement if required.
 - b. Promote/Incentivize multi-modal transportation to Venue
 - i. Burton is committed to utilizing local public transportation to service the *Performing Arts Center*. The 266 QCPR location is on the GMT bus line, and customers can arrive to the site by the bus. GMT route schedules end before the anticipated end time of concert events, so we have discussed the potential for dedicated GMT buses at the end of shows. More detailed planning regarding routes, schedules and costs would be required upon receiving Conditional Use permit approval.
 - ii. Burton has approached the University of Vermont and Champlain College regarding the potential for students from those respective schools to access the site using existing local shuttles. Further discussion would be required upon receiving Conditional Use permit approval.
 - iii. Burton is committed to implementing incentives for car-pooling/ride sharing that could include preferred, dedicated high-occupancy vehicle parking on-site.
4. **CRITERIA 4:** *“The transportation system is capable of supporting the proposed use in addition to the existing uses in the area. Evaluation factors include street designations and capacity; level of service and other performance measures; access to arterial roadways; connectivity; transit availability; parking and access; impacts on pedestrian, bicycle and transit circulation; safety for all modes; and adequate transportation demand management strategies”*
- a. Response: Burton has retained VHB to prepare a Traffic Impact Study (TIS) assessing the impacts of the *Performing Arts Center* use on the existing and proposed traffic network in the vicinity of the Project Site (see attached). In preparing the TIS, VHB worked closely with the Burlington Department of Public Works (DPW) to develop a scope of work that would provide DPW with the information required to make an informed assessment of the anticipated traffic impacts. The resultant TIS scope includes:
 - i. Description of site and existing transportation network in the study area
 - ii. Summary of safety and crash data within study area
 - iii. Description of the proposed development program
 - iv. Trip generation and distribution estimate for the proposed redevelopment
 - v. Parking demand evaluation
 - vi. Evaluation of traffic operations at the intersections in Study area

While not required by the Burlington Zoning Ordinance, VHB also worked with the South Burlington Department of Public Works and has addressed traffic impacts as it pertains to the City of South Burlington in a separate memo included with the application.

- b. TIS Conclusion. The TIS reviewed the existing design, operations and safety of the existing transportation network. Although other uses at the Burton Hub will largely be daytime uses generating traffic during daytime hours, with spikes during morning and evening commuter periods, and the *Performing Arts Center* will be busy later in the evening, the TIS considered an overlapping of the traffic associated with various uses during the evening commuter hour (5 – 6 pm) to present a worst-case scenario. Based on input from Burlington DPW, conditions were analyzed using the Champlain Parkway *No Build* and *Build* traffic volumes to be consistent with recent traffic analysis in the area. The analysis indicates that, with the Champlain Parkway in place, the Project will increase the average delay signalized intersection (QCPR/Shelburne Road, and Home Avenue/Shelburne Road) by less than eight seconds per vehicle, and all locations will operate at acceptable levels of service, even in 2028 with the redevelopment in place.

As presented in the TIS, even with a conservatively high estimate of *Performing Arts Center* traffic overlapping with the Burton peak hour trips, the project is not expected to affect the operation of area intersections significantly.

5. CRITERIA 5: “The utilization of renewable energy resources”

Responses:

- a. Burton currently utilizes renewable energy at its facilities including a rooftop solar array on the 180 QCPR location. Burton agrees to place an empty conduit between the roof and Electrical Room in order to facilitate the installation of an additional rooftop solar array on the 266 QCPR road at some point in the future.
- b. Burton will provide at least (10) dedicated parking spaces for electric vehicles with charging station capabilities, which will increase based on future demand.
- c. Burton will provide preferred dedicated parking for High Occupancy Vehicles for *Performing Arts Center* events.
- d. Burton will provide covered bike parking facilities.
- e. Burton is making significant investments to improve and upgrade on-site stormwater infrastructure.
- f. Burton and Project partners will be actively promoting alternative and low emission transportation options in marketing messages.

ATTACHMENTS:	Submitted as hardcopy	Available electronically*:
1. May 22, 2019 memo from Meaghan Tuttle to City Council regarding zoning amendment ZA-19-07A	Yes	Yes
2. Architectural renderings and drawings by TXC Architects dated November 15, 2019, and by Engineering Ventures dated November 4, 2019	Yes	Yes
3. Traffic Impact Study (TIS) by VHB dated April 23, 2020 (this is a revision to original October 2, 2019 version, and has been submitted separately to DPW)	No	Yes
4. South Burlington Traffic Impact Memo by VHB dated April 23, 2020 (this has been submitted separately to DPW)	No	Yes
5. Noise Assessment by RSG dated April 20, 2020	Yes	Yes
6. Operational Management Plan by Burton and Higher Ground	Yes	Yes
7. Ability To Serve Letters:		
• Burlington Police Department (4/17/20 and 4/30/20)	Yes	Yes
• Burlington Fire Department (11/26/19)	Yes	Yes
• Burlington Electric Department (10/29/19)	Yes	Yes
• Department of Public Works - Water & Wastewater (11/26/19)	Yes	Yes
• Department of Public Works – Traffic (not received from DPW as of submission date)	Pending	Pending

*Electronic versions of documents available at:

https://www.dropbox.com/sh/0ijjq757u5np94f/AAAZVEEk80ggmn20R5_jKMxga?dl=0

Respectfully Submitted by:

John Caulo, LandPlan, an authorized representative of The Burton Corporation, and
Justin Worthley, Senior Vice President, Burton Corporation
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justinw@burton.com
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BURTON

Burton Hub – Performing Arts Center (PAC) Operational Management Plan

April 23, 2020

Pre-event Management:

- No tailgating is permitted.
- Organized queueing in advance of doors opening will occur indoors in the shared Hub lobby, as supervised by HG security staff. This indoor lobby space is significantly larger than the indoor queue space at Higher Ground's current Williston Road venue, and based on experience the significantly larger indoor lobby area is expected to accommodate guests for most shows. Based on experience, a few shows per year are expected to overflow to the exterior of the building, with security staff supervision. Any outdoor queue will clear as soon as doors open, typically by/before 7 pm.
- Security will coordinate with Cities of Burlington and South Burlington to ensure applicable on-street parking rules are followed.
- Event staff in the lots will direct traffic, ensure orderly parking, direct pedestrians into the Hub lobby, and oversee the arrival of bicyclists and rideshares.
- Prior to large events, Higher Ground will coordinate with BPD and SBPD as needed.
- Contact information for on-duty Higher Ground event management staff will be made available to any interested business and residential neighbors to facilitate contact before, during or after any concert event with questions or concerns.
- Prior to large events (750 patrons or more), Higher Ground will place a partial barrier at the end of Central Avenue that indicates *Dead End No Event Parking* (pending approval and coordination with the City of South Burlington).

Event Management:

- Ingress security screening policies will be followed based on industry standards followed at HG's Williston Road venue and other comparable venues (State Theater in Portland, ME).
- Higher Ground will comply with all applicable Vermont Liquor Control laws and licenses. HG will coordinate with the Vermont Department of Liquor Control (DLC) and local law enforcement regarding enforcement of state laws and regulations, as well as expected use of the facility for DLC agent training (DLC currently uses the HG Williston Road location as a staff training site, due to a strong track record of HG meeting DLC requirements).
- Once admitted, customers will not be allowed to exit and reenter the PAC venue for any reason.
- A minimum of three security guards will monitor the lobby and parking areas during the show.
- Inside the PAC venue, security staff will monitor customer behavior continuously and intervene as necessary following long-established security policies and procedures. Key HG staff have completed ALICE training and certification.

Post-event Management:

The post-event management objectives are to:

- (1) prevent any alcoholic beverages, or cups of any kind (water included) from leaving the licensed premise;
- (2) supervise the crowd to deter any visibly intoxicated individuals from attempting to operate a motor vehicle; and
- (3) ensure all guests exit the site as efficiently, rapidly, and quietly as possible, minimizing any disruption to residential neighbors.

At the conclusion of the show, available 'float' security guards will re-deploy to the primary egress route from the building. The doors to the lobby are opened, lights come on, and all ingress staff along with floats form a two-tiered ring to supervise guests as they exit - one group (lobby staff) inside the PAC lobby, and one group (patio egress staff) covering the shared Hub lobby and outdoor patio. Depending on the size of the crowd, there should be more staff focused on the external perimeter ring outside – see deployment details below. All egress happens through the lobby to ensure that all exiting guests must pass through this heavily supervised area. Here are specific staffing protocols based on the size of the show:

Capacity	Protocol
Up to 750	Lobby staff (3-4 guards - IDer, Ticketing, Pat Down staff) will greet guests as they exit through the lobby, scanning for drinks, handing out fliers (if applicable) and thanking guests for coming to the show. Staff inside the lobby should be scanning for drinks and scanning for visibly intoxicated guests. Any guests that clearly should not drive should be described (via radio) to patio egress staff for deterrence techniques to be applied. Patio egress staff (3-4 guards - Floats, Patio, Parking/Lot Patrol) will form a ring around the parking lot side of the front patio in the fire line, doing a second wave of checks for drinks and intoxicated guests, and supervising any groups of people waiting for taxis or rideshares.
750 to 1,000	Same as above. And add additional floats, security lead(s), and Managers on Duty (MOD). Lobby staff can include the back of house MOD, and patio egress staff can include the front of house MOD, bringing headcounts for each team to 5+ (10-12 total). Second ring staff will place a temporary bollard with a sign at the end of Central Avenue indicating <i>Dead End No Event Parking</i> . This will be taken down once the majority of guests have exited the site.
1,000 +	Same as above. And add additional staff to form a third, wider perimeter ring extending out into the parking lots to ensure complete and thorough coverage. All available floats, plus production staff (with security training/background), and MODs to support - bringing total headcount for large scale event egress to 14-15. Third ring staff will direct/assist with any issues (e.g. excessive intoxication, excessive noise, etc.) in the parking lots as the site is emptied. This staffing would include a dedicated position that would be posted near the parking lot exit in the southwest corner of the 266 QCPR property, to monitor and direct vehicle and pedestrian traffic to exit the area smoothly, including discouraging pedestrians from leaving the venue to go into Red Rocks Park.

Additional Traffic Flow and Safety Considerations:

- Bike and pedestrian traffic to and from the site will be encouraged/directed to come/go from the north on Queen City Park Road to avoid use of the one-way bridge.

- Signage will be developed and installed on site to support the egress process. Specific sign wording and locations to be determined based on identifying any issues by venue operators and/or cities of Burlington and South Burlington, pinch points experienced during the egress process, feedback from guests/neighbors, etc. This may include signage to clearly mark drop off/pick up locations for rideshare and taxi services, directly in front of the 266 building.
- Pending discussions with the City of South Burlington, assist in the installation of MUTCD W14-1a or W14-2a signage (Dead End, No Outlet) on Central Ave. if desired/required by South Burlington.



To: John Caulo

Date: April 23, 2020

Memorandum

Project #: 58237.00

From: Jenn Conley, PE
Karen Sentoff, EIT

Re: Burton Hub
Traffic Impact Study
Burlington, VT

VHB has conducted a Traffic Impact Study (TIS) for the proposed redevelopment of the Burton Hub properties located at 180 and 266 Queen City Park Road (formerly 80 and 152 Industrial Parkway) in Burlington, Vermont. The site occupies the eastern frontage of Queen City Park Road where it follows a north south alignment. The primary access to the site is from US 7 via Queen City Park Road or Home Avenue.

The site encapsulates the Burton main office and retail property at 180 Queen City Park Road as well as the partially vacant adjacent facility at 266 Queen City Park Road, which currently serves as prototyping, storage, and office space for Burton. The proposed redevelopment program of the site includes the following elements:

- 180 Queen City Park Road will be adapted to serve as 66,300 square feet of office space with 2,750 square feet of storage;
- 266 Queen City Park Road will be renovated to serve multiple purposes, including:
 - o 10,275 square feet of office space;
 - o 8,745 square feet of research and development;
 - o 18,425 square feet of manufacturing;
 - o 12,545 square feet of storage and warehousing;
 - o 7,825 square feet of retail;
 - o 6,835 square feet of restaurant;
 - o 12,265 square feet of performing arts space; and,
 - o 7,465 square feet of indoor recreation space;
- Parking will be reconfigured from the current 276 spaces at 180 Queen City Park Road and 181 spaces at 266 Queen City Park Road to be a combined 496 spaces.

The Traffic Impact Study is summarized within this document, which contains:

- a description of the site and existing transportation network in the study area;
- a summary of the safety and crash data within the study area;
- a description of the proposed redevelopment program for the site;
- a trip generation and distribution estimate for the proposed redevelopment;
- a parking demand evaluation;

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Suite 200

South Burlington, Vermont 05403

- an evaluation of traffic operations at the intersections identified in Figure 1; and,
- a set of conclusions and recommendations to support the project.

Existing Conditions

A review of existing conditions focused on the project site and transportation network access to and from the site as depicted in Figure 1. The project site and network in the study area were summarized by the roadway characteristics, current land use and trip generation, permitted land use, and safety assessment.

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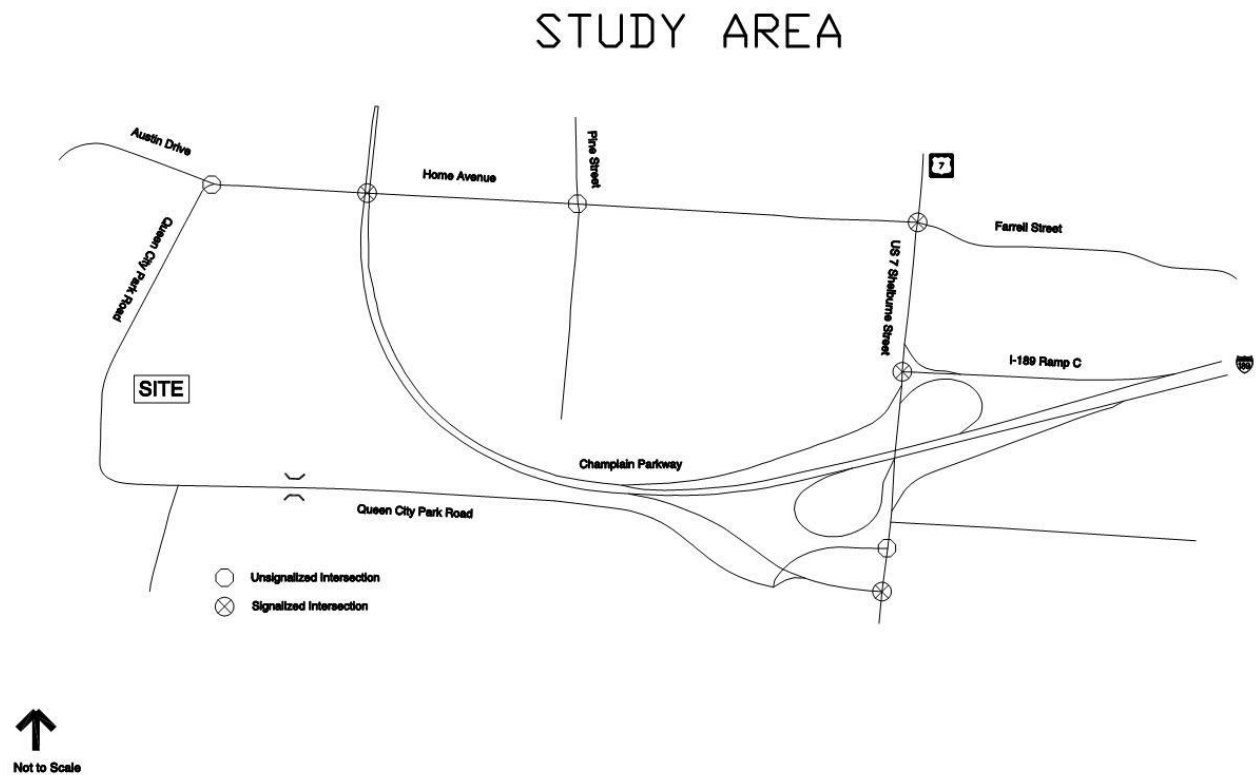



Figure 1
Study Area
Burton Redevelopment

Roadway Characteristics

Queen City Park Road

Queen City Park Road is a Class 2 Town Highway situated at the southernmost edge of Burlington, Vermont, crossing over to South Burlington before reaching its eastern terminus at US-7 / Shelburne Road. On July 1st, 2019, the name of Industrial Parkway, from its southern terminus at Queen City Park Road to its northern terminus at Home Avenue, was changed to Queen City Park Road. With the name change came the renumbering of the locations along the new section of Queen City Park Road, including 180 and 266 Queen City Park Road, where Burton's proposed headquarter expansion is located.

The posted speed limit in Burlington is 25 miles per hour unless otherwise posted. Queen City Park Road at the southern origin is posted as 25 miles per hour and is otherwise assumed to be 25 mph. In the immediate vicinity of the Burton site, Queen City Park Road has 28-feet of pavement width to facilitate two-way traffic. South of the project site, Queen City Park Road crosses a single lane bridge with no traffic control.

There are no formalized bicycle or pedestrian facilities along Queen City Park Road in the immediate vicinity of the project site, with the exception of approximately 130 feet of sidewalk and a bus transit shelter in front of GMT's facility and approximately 400 feet of side path from Central Avenue to a pedestrian bridge adjacent to the single lane bridge south of the project site. These two short facilities are not connected to other active transportation facilities or the broader network like the sidewalks further east along Queen City Park Road, the sidewalks to the north on Home Avenue or Austin Drive, or the bike path that runs along the proposed Champlain Parkway corridor.

Although Queen City Park Road is not under construction, there is construction happening in the vicinity of the project site that is likely affecting traffic patterns in the study area. Pine Street from Home Avenue to Flynn Avenue is under construction and is generally limited to one-way traffic southbound. In addition, the dead end of Queen City Park Road into the former K-Mart parking lot – a very popular bypass to go south on Shelburne Road – is under construction. The parking lot and bypass road are currently closed to traffic. These significant disruptions to the typical traffic patterns, especially for more local traffic, are likely affecting volumes at the intersections within the study area.

Home Avenue

Home Avenue is similarly a 25-mph facility with a Class 3 Town Highway classification. Home Avenue is an east-west connection between Queen City Park Road and US-7, intersecting Pine Street and, in the future, the proposed Champlain Parkway in between. Currently Home Avenue is affected by construction at the intersection with Pine Street.

Pine Street

Pine Street is a 25-mph facility and a north-south connection from Queen City Park Road at its southern terminus through to the downtown core of Burlington at Bank Street. Currently Pine Street is under construction from Flynn Avenue to Home Avenue, where significant construction activities limit the traffic to one-way southbound.

Current Land Use and Trip Generation

At 69,053 total square feet, 180 Queen City Park Road currently houses the Burton office space (60,767 square feet) and the Burton Flagship retail store (8,286 square feet). At 84,380 total square feet, 266 Queen City Park Road houses some manufacturing and prototyping (20,250 square feet), storage and warehousing (16,000 square feet), and general office space (18,000 square feet), with the remaining approximately 30,130 square feet laying vacant.

According to the ITE Trip Generation Manual 10th Edition, current uses of the Burton Hub site (encapsulating the occupied square footage at both the 180 and 266 properties) should generate 115 AM peak hour trips and 141 PM peak hour trips. Peak period observations of the six site driveways on Wednesday, July 31, 2019 indicated that the current uses generate slightly more trips than expected based on ITE estimates, with 150 trips in the AM peak hour and 169 in the PM peak hour observed. A comparison of the ITE and observed trip generation for the site is summarized in **Table 1**.

Table 1. Peak Hour Trip Generation ITE vs. Observed

		ITE	Observed
AM	Enter	97	137
	Exit	18	13
	Total	115	150
PM	Enter	37	9
	Exit	104	160
	Total	141	169

Permitted Land Use

With a combined total of 153,433 square feet, 180 and 266 Queen City Park Road are located in an Enterprise – Light Manufacturing zoning district, which primarily serves commercial and industrial uses appropriate for the close proximity to residential use. The zoning allows for uses of manufacturing, warehousing, research and development, office space – technical, photo studio, general merchandise/retail, and restaurant – take-out and conditional uses of performing arts center, recreational facility – indoor, and café. The most intense of these land uses would be office space. Should the existing buildings be redeveloped into office spaces, the total trips visiting the site would be 178 in the AM peak hour and 176 in the PM peak hour, or approximately 25 to 55 percent higher than the ITE estimates for the existing site.

Safety Assessment

A review of the High Crash Location Report (2012-2016) revealed three segments and one intersection within the study area that are designated high crash locations. These high crash locations are all along the US-7 corridor, where

primary access to the project site on Queen City Park Road is facilitated. These locations include the segment of US 7 from Laurel Hill Drive through the Queen City Park Road intersections, the segment of US 7 from I-189 Ramp C (off-ramp) to north of Scarff Avenue (through the intersection with Home Avenue), the segment of I-189 from the merge of Ramp E through the merge of Ramp A, and the intersection of US 7 with the I-189 Ramp A (on-ramp) and Swift Street.

A desktop review of crash data for the most recent 5 years of data (2014-2018) revealed a total of 454 crashes in the project study area. Data were pulled from the Crash Query Tool and selected for only the segments and intersections of interest to this project. Of the 454, only 51 were attributed Queen City Park Road or Home Avenue. Six of the 51 crashes resulted in injury, with the majority of crashes occurring at intersections and the most common crash type of rear-ends. The remaining 403 crashes were attributed to the US 7 corridor from Lindenwood Drive to north of Home Avenue and the I-189 interchange including the ramp merges. Of these crashes on the major roadways that provide access to the project site, there was one fatality and 36 injury crashes. Again, the most common crash type was rear-ending with the majority of crashes occurring at intersections or on-/off-ramps.

Future Conditions

The future conditions for the project site and study area focused on anticipated Champlain Parkway traffic patterns, proposed Burton Hub development, other considerations for development on Queen City Park Road, and the future condition traffic networks for evaluating the Burton Hub project development.

Champlain Parkway Traffic

The Champlain Parkway is a proposed transportation link that will connect from I-189 and US Route 7 and the City Center District passing through, and providing better access to, the Burton project area. The final alignment is anticipated to continue along the I-189 alignment at US Route 7 providing a full access interchange at US Route 7. The Champlain Parkway will change in character at this point to a single lane in each direction widening out at intersection points. The first intersection will occur at Home Avenue just north of where Home currently intersects with Batchelder Street which is currently a local roadway between Queen City Park Road and Pine Street. With the Champlain Parkway in place, Batchelder Street will become a dead-end roadway accessed via Morse Place and the Champlain Parkway will intersect with Home Avenue at a four-way signalized intersection providing more direct access from I-189 and I-89 beyond into this area that includes the Burton property.

The Champlain Parkway underwent significant review, traffic analysis, roadway design and is anticipated to be constructed in upcoming years. The traffic analysis for the Champlain Parkway includes the following intersections that the City of Burlington has identified as intersections for study as a part of the Burton project:

- US Route 7 at Home and Farrell
- US Route 7 at I-189 westbound ramps
- US Route 7 at I-189 eastbound ramps
- US Route 7 at Queen City Park Road
- Home Avenue at Pine Street
- Home Avenue at Queen City Park Road and Austin Drive

The Champlain Parkway traffic analysis evaluated 2008 traffic volume operations both without and with the Champlain Parkway in place. In addition, the traffic analysis evaluated 2028 traffic volume operations both without and with the Champlain Parkway.

VHB has reviewed historic VTrans traffic volume data at area intersections and found that traffic volumes have not reached the levels anticipated as a part of the 2008 projections included in the Champlain Parkway traffic analysis. VTrans traffic volume data along Home Avenue that was collected in 2014 and 2018 was found to be approximately 10 to 25 percent lower than the 2008 conditions without the Champlain Parkway in that study. Because existing traffic volume data is impacted by the existing construction projects near the Burton site, City of Burlington officials have requested that the Burton project use the 2008 conditions from the Champlain Parkway as the equivalent of an existing network for the Burton project.

The Champlain Parkway traffic analysis also evaluated 2028 conditions without and with the Champlain Parkway in place. The City of Burlington has requested that the project evaluate the impact of the Burton project on the future year 2028 traffic volume conditions as evaluated in the Champlain Parkway traffic analysis – both without and with the Champlain Parkway infrastructure in place. The 2008 and 2028 traffic volume networks without and with the Champlain Parkway in place are provided in the Appendix.

Proposed Development

As outlined above, 180 Queen City Park Road will be adapted to serve as 66,300 square feet of office space with 2,750 square feet of storage. 266 Queen City Park Road will be renovated to serve multiple purposes, including: 10,275 square feet of office space; 8,745 square feet of research and development; 18,425 square feet of manufacturing; 12,545 square feet of storage and warehousing; 7,825 square feet of retail; 6,835 square feet of restaurant; 12,265 square feet of performing arts space; and, 7,465 square feet of indoor recreation space.

Trip Generation

Trip estimates for the proposed redevelopment were calculated based on rates published by the Institute of Transportation Engineers (ITE) in the 10th edition of the Trip Generation Manual for the weekday AM and PM peak hours. These time periods are typically the highest volume times on the adjacent roadway network and are used for this analysis.

The following ITE land use codes (LUCs) were used to estimate peak hour trips of the proposed development:

- LUC 710 – General Office Building
- LUC 760 – Research and Development
- LUC 140 – Manufacturing
- LUC 876 – Retail
- LUC 150 – Warehousing
- LUC 930 – Fast Casual Restaurant
- LUC 435 – Multipurpose Recreational Facility

In addition, because there is not an applicable ITE LUC for the Performing Arts Center, VHB obtained information from the Higher Ground who will be occupying the site. Based on information from Higher Ground's website, the facility

hosts an average of four to five events per week with typical showtimes of 7:30 or 8:30 PM with door opening an hour earlier. The existing Higher Ground parking lot accommodates 350 vehicles which accommodates even sold out nights (1050 attendees). Applying the one vehicle trip per three attendees' rate to the proposed site occupancy of 1500 people results in a peak vehicular demand of 500 trips per show. Although shows start significantly after the peak hour, a conservatively high estimate of approximately 30 percent of those trips may occur during the commuter peak hour.

Because the restaurant space is expected to serve employees of Burton as well as concert goers (and the public), it was conservatively estimated that 50 percent of the trips to the restaurant space will be internally captured from use by Burton employees and concertgoers on a Higher Ground full occupancy night.

The total trip generation of the site is anticipated to be 121 AM peak hour trips (101 in and 20 out) and 363 PM peak hour trips (211 in and 153 out). As indicated above, the current site is generating 115 AM peak hour trips (97 in and 18 out) and 141 PM peak hour trips (37 in and 104 out). Therefore, the net trip generation anticipated at the site will be 6 trips during the weekday AM peak hour (4 in and 2 out) and 222 trips during the PM peak hour (174 in and 48 out). The trip generation data is provided in **Table 2** below.

Table 2. Trip Generation

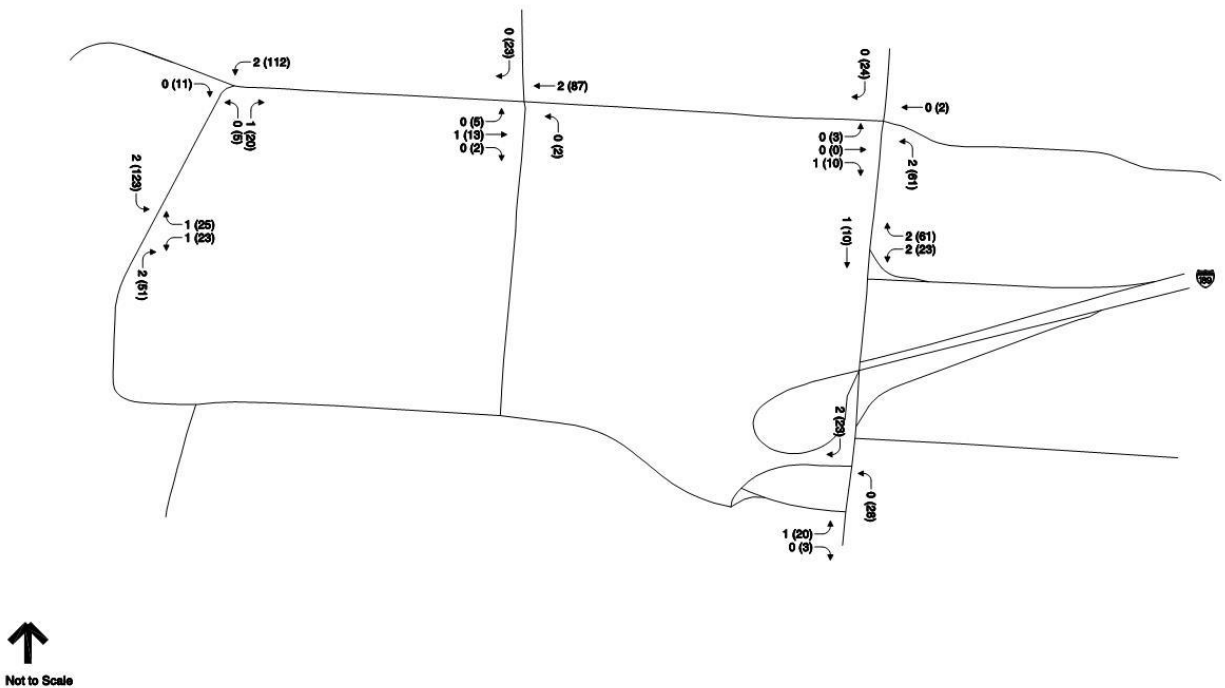
		Existing	Burton Hub	Net Trips
AM	Enter	97	101	4
	Exit	18	20	2
	Total	115	121	6
PM	Enter	37	211	174
	Exit	104	153	48
	Total	141	363	222

Trip Distribution

The trips generated by the proposed redevelopment were assigned to area roadways based on likely trip patterns associated with those trips, as depicted in Figure 2 and Figure 3. For employees and visitors to Burton, the trips were assigned following existing traffic patterns to and from the site. The trip distribution for Higher Ground patrons was developed using credit card data for the past year. Based on that data, approximately 30 percent of Higher Ground patrons will approach locally from the north, approximately 20 percent will approach locally from the south, and 50 percent will approach more regionally via I-189. Therefore, the Higher Ground trips were assigned separately to reflect different travel patterns.

For the condition with the Champlain Parkway in place, the trip distribution considered how the presence of that roadway would influence travelers when making route choices. Some trips may use the Champlain Parkway to avoid congestion on US Route 7 when accessing the site, however, a significant amount of trips will continue to access the site via the existing routing as most Burlington related trips will not see reduced travel times associated with the addition of Champlain Parkway to the infrastructure. A review of the Champlain Parkway traffic volume networks indicates that peak hour trips to and from Burton and surrounding businesses were not expected to divert from current travel routes. However, the Champlain Parkway did not anticipate the redevelopment to include a more regional generator such as Higher Ground. The Higher Ground trips that are expected to originate more regionally were diverted to Champlain Parkway for the condition with that infrastructure in place.

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Legend

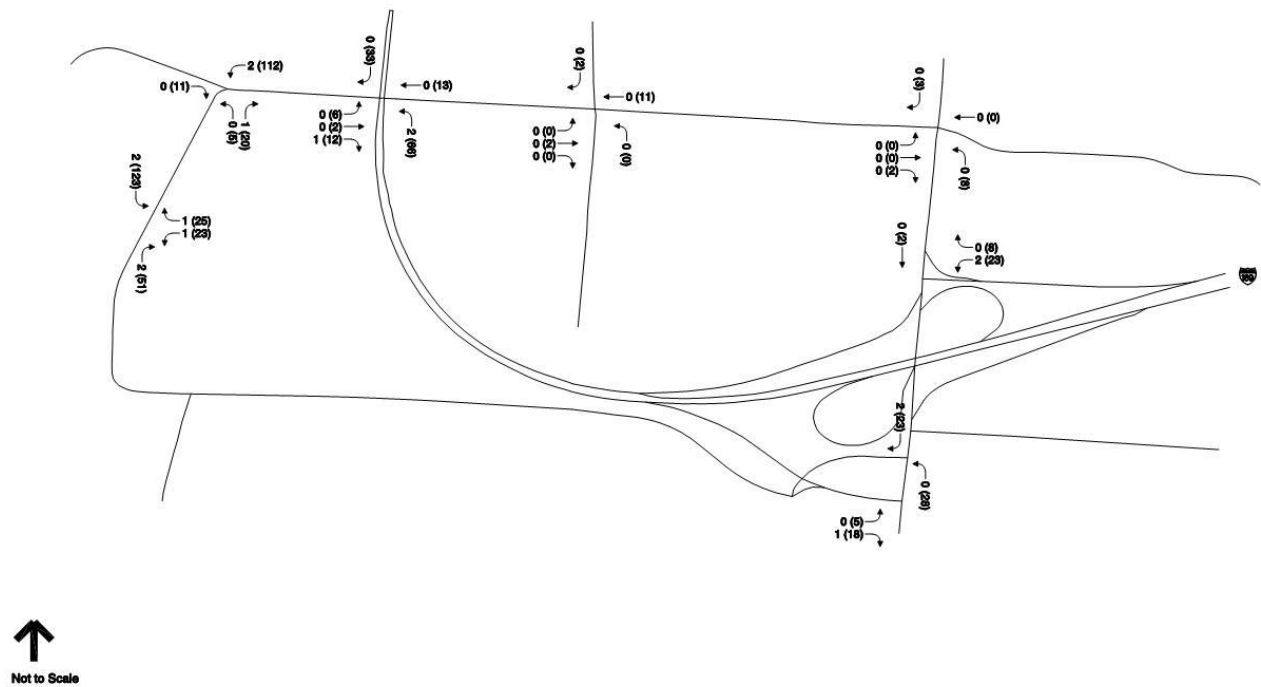
AM Peak Hour Volume
 (PM Peak Hour Volume)



Figure 2

Burton Net Trip Generation
 Without Champlain Parkway
 Peak Hour Traffic Volumes

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↑
 Not to Scale

Legend
 AM Peak Hour Volume
 (PM Peak Hour Volume)

vhb
 Figure 3
 Burton Net Trip Generation
 With Champlain Parkway
 Peak Hour Traffic Volumes

Potential Reuse Development

The calculation of trip generation for the proposed site redevelopment included information associated with the Higher Ground tenant. The City of Burlington has requested an analysis of the other uses that could occupy the Higher Ground square footage in the event that the Higher Ground does not remain at this site. Based on allowable land uses in this zoning district, the highest generating use of the Higher Ground site (without a special permit), would be office. VHB conducted an analysis of the spaces associated with the Higher Ground portion of the redevelopment instead being office space and found that as office space the site would generate 21 additional trips during the AM peak hour and 134 fewer trips during the PM peak hour.

Parking Evaluation

A review of the potential parking requirements for the Burton Hub redevelopment was conducted according to the Burlington Comprehensive Development Ordinance Article 8 and the ITE Parking Generation Manual, 5th Edition. Burlington parking requirements for the Shared Use District, within which the Burton site exists, dictate that a total of 239 spaces are required for the multiple uses of the proposed Burton Hub without Higher Ground included in the calculation. More conservatively, the ITE Parking Generation Manual specifies that 313 spaces would accommodate the multiple uses of the Burton site, without considering Higher Ground.

It is anticipated that the primary use of the Burton parking spaces will shift from the multiple uses during the day (i.e. office, research and development, manufacturing, retail, warehouse, recreation, restaurant) to Higher Ground use during the evening. According to Burlington's ordinance, Higher Ground adds a requirement of 375 spaces based on an estimated maximum occupancy of 1500 patrons. ITE does not have a parking generation rate for performing arts space or an equivalent, so the Burlington parking requirements were assumed to apply. The 496 parking spaces in the proposed conceptual plans for the site would more than accommodate the 313 spaces needed during the day and the 375 spaces necessary to accommodate a show or event at Higher Ground in the evening.

Other Queen City Park Road Development

101 Queen City Park Road is home to the Green Mountain Transit (GMT) main offices and bus service garage, which serves as the non-revenue start and end to all bus routes. The buses are currently routed via Queen City Park Road to access the facility, avoiding the residential areas along Home Avenue. With the Champlain Parkway, this may change to route buses through the Queen City Park Road and Home Avenue intersection and onto Champlain Parkway at Home Avenue. The modification of the bus routing is not expected to impact the traffic volumes during the AM and PM peak hours as the busses are in service during those times.

Like the GMT office and garage, Rhino Foods and Edlund Company are also accessed from the western side of Queen City Park Road at address 179 and 319, respectively. As outlined above, the Champlain Parkway traffic volume networks did not redistribute trips from Queen City Park Road once the new roadway connection was in place. However, even prior to consideration of the Champlain Parkway infrastructure, the traffic volumes analyzed as a part of that study accounted for likely land use changes in the area.

Traffic Networks

Based on the traffic volume comparisons above, and discussions with Burlington Public Works staff, for the Burton project, the 2008 conditions without and with the Champlain Parkway will serve as Existing/Opening Year Traffic Volumes without and with the Champlain Parkway. The trips associated with the redevelopment were added to those volumes to result in Existing/Opening Year Traffic Volumes without and with the Champlain Parkway.

2028 conditions without and with the Champlain Parkway are being used as the Burton project 2028 No Build traffic volumes without and with the Champlain Parkway. The trips associated with the Burton redevelopment were added to the 2028 No Build traffic volumes without and with the Champlain Parkway to develop the 2028 Build traffic volumes without and with the Champlain Parkway.

Traffic Analyses

Intersection capacity analyses were performed for the study area intersections. Levels of Service (LOS) were calculated based on the criteria published in the *2000 Highway Capacity Manual*.¹ Level of Service is the term that defines the conditions that may occur on a given roadway or at an intersection when accommodating various traffic volume loads. Levels of service range from A to F with LOS A representing generally free flowing operating conditions and LOS F representing generally congested conditions. Copies of the LOS calculations are provided in the Appendix.

Signalized Intersections

Table 3 summarizes the operational analysis at the *signalized* study area intersections during the Existing and 2028 AM and PM peak hours under No Build and Build conditions. As shown in the table, signalized intersections along US Route 7 currently operate at LOS C or better in the peak hour, with the exception of the I-189 Ramp C intersection which operates at LOS E in the PM peak hour. The analysis is consistent with observations of the corridor. Without construction of the Champlain Parkway, the addition of traffic associated with the Burton redevelopment will result in changes in delay of less than 4 seconds per vehicle during the weekday PM peak hour and drop to LOS F for a single intersection, US Route 7 and I-189 Ramp C.

The Champlain Parkway is anticipated to alleviate some of the existing delays along US Route 7 (Shelburne Street) as traffic diverts from the US Route 7 corridor to the Champlain Parkway. For instance, construction of the Champlain Parkway is anticipated to reduce the current LOS E to LOS C at the US Route 7 and I-189 Ramp C intersection in the PM peak hour, and with the Burton redevelopment would alleviate the anticipated LOS F to LOS C in the current year and LOS D in the future year. The newly signalized intersection of Home Avenue at the Champlain Parkway is anticipated to operate at LOS C in the AM peak hour and LOS E in the PM peak hour. With the Champlain Parkway constructed, the addition of the traffic associated with the Burton redevelopment will result in changes in delay of less than 19 seconds per vehicle during the weekday PM peak hour.

¹ Highway Capacity Manual, Federal Highway Administration, Transportation Research Board, 2000.

Table 3: Signalized Intersection Capacity Analysis Summary

Intersection Movement	Champlain Parkway No Build						Champlain Parkway Build					
	Burton No Build			Burton Build			Burton No Build			Burton Build		
	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **
2008												
US 7 / Home Ave												
AM Peak Hour	0.62	14.5	B	0.62	14.5	B	0.47	11.9	B	0.47	11.9	B
PM Peak Hour	0.73	19.7	B	0.83	22.0	C	0.59	14.0	B	0.59	14.0	B
US 7 / Queen City Park (north)												
AM Peak Hour	0.59	7.0	A	0.59	7.1	A	0.65	14.2	B	0.65	14.2	B
PM Peak Hour	0.88	20.0	C	0.90	23.0	C	0.87	20.6	C	0.88	22.1	C
Champlain Parkway / Home Ave												
AM Peak Hour							0.68	25.3	C	0.68	25.4	C
PM Peak Hour							0.89	38.8	D	0.98	57.5	E
I-189 Ramp C / US 7												
AM Peak Hour	0.83	28.6	C	0.84	28.6	C	0.75	25.6	C	0.75	25.6	C
PM Peak Hour	1.03	76.2	E	1.04	80.1	F	0.89	30.8	C	0.88	31.0	C
Intersection Movement	Champlain Parkway No Build						Champlain Parkway Build					
	Burton No Build			Burton Build			Burton No Build			Burton Build		
	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **
2028												
US 7 / Home Ave												
AM Peak Hour	0.72	16.5	B	0.72	16.5	B	0.47	12.4	B	0.47	12.4	B
PM Peak Hour	0.80	21.6	C	0.92	25.9	C	0.59	14.1	B	0.59	14.2	B
US 7 / Queen City Park (north)												
AM Peak Hour	0.62	7.5	A	0.62	7.5	A	0.69	15.0	B	0.69	15.0	B
PM Peak Hour	1.03	30.8	C	1.04	34.1	C	1.01	28.2	C	1.01	29.8	C
Champlain Parkway / Home Ave												
AM Peak Hour							0.74	28.9	C	0.74	29.0	C
PM Peak Hour							0.92	45.4	D	1.01	64.4	E
I-189 Ramp C / US 7												
AM Peak Hour	0.84	29.2	C	0.84	29.3	C	0.77	25.8	C	0.77	25.8	C
PM Peak Hour	1.10	99.2	F	1.11	101.4	F	0.94	35.8	D	0.94	36.9	D

⁺ Volume to capacity ratio

* Delay expressed in seconds per vehicle

** Level of Service

Unsignalized Intersections

Table 4 summarizes the operational analysis at the *unsignalized* study area intersections during the Existing and 2028 AM and PM peak hours under No Build and Build conditions. As shown in the table, all intersection approaches are expected to operate at LOS C or better, except at the intersection of Pine Street and Home Avenue without the

Champlain Parkway. Construction of the Champlain Parkway would alleviate any current or potential issues at Pine Street and Home Avenue, providing LOS A for all approaches regardless of Burton redevelopment. Once the Champlain Parkway is in place, traffic volumes at unsignalized locations would change, resulting in delay decreases as much as 350 seconds at the southbound Pine Street approach to the intersection with Home Avenue. For all intersection approaches, changes related to the trips generated from the proposed Burton redevelopment result in delay increases of less than 4 seconds once the Champlain Parkway is constructed.

Table 4: Unsignalized Intersection Capacity Summary

Intersection Movement		Champlain Parkway No Build						Champlain Parkway Build					
		Burton No Build			Burton Build			Burton No Build			Burton Build		
		v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **
2008													
AM	Queen City Park / Home Ave / Austin Dr												
	WB from Home Ave	0.09	5.2	A	0.09	5.2	A	0.09	5.2	A	0.09	5.2	A
	NB from Queen City Park Rd	0.08	10.6	B	0.08	10.6	B	0.08	10.6	B	0.08	10.6	B
	Pine St / Home Ave												
	EB from Home Ave	0.59	22.5	C	0.58	21.8	C	0.18	8.7	A	0.18	8.7	A
	WB from Home Ave	0.93	52.7	F	0.92	50.0	E	0.15	7.9	A	0.15	7.9	A
	NB from Pine St	0.49	19.3	C	0.48	18.8	C	0.10	8.2	A	0.10	8.2	A
	SB from Pine St	1.01	70.3	F	1.01	71.2	F	0.20	8.9	A	0.20	8.9	A
	US 7 / Queen City Park (north)												
	NB left onto Queen City Park Rd	0.08	15.8	C	0.08	15.9	C	0.08	15.8	C	0.08	15.9	C
PM	Queen City Park / Home Ave / Austin Dr												
	WB from Home Ave	0.03	1.7	A	0.11	4.4	A	0.03	1.7	A	0.11	4.5	A
	NB from Queen City Park Rd	0.14	10.5	B	0.21	12.2	B	0.14	10.5	B	0.21	12.2	B
	Pine St / Home Ave												
	EB from Home Ave	0.62	22.8	C	0.73	30.7	D	0.11	8.3	A	0.11	8.3	A
	WB from Home Ave	0.76	29.7	D	1.00	69.7	F	0.25	8.8	A	0.27	9.0	A
	NB from Pine St	0.51	18.8	C	0.57	22.8	C	0.06	7.9	A	0.06	8.0	A
	SB from Pine St	1.47	241.8	F	1.69	341.9	F	0.24	9.3	A	0.25	9.4	A
	US 7 / Queen City Park (north)												
	NB left onto Queen City Park Rd	0.02	16.4	C	0.12	18.2	C	0.02	16.4	C	0.12	18.2	C
Intersection Movement		Champlain Parkway No Build						Champlain Parkway Build					
		Burton No Build			Burton Build			Burton No Build			Burton Build		
		v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **
2028													
AM	Queen City Park / Home Ave / Austin Dr												
	WB left from Home Ave	0.11	5.4	A	0.12	5.4	A	0.11	5.4	A	0.12	5.4	A
	NB from Queen City Park Rd	0.09	11.0	B	0.09	11.0	B	0.09	11.0	B	0.09	11.0	B
	Pine St / Home Ave												
	EB from Home Ave	0.69	28.0	D	0.69	28.1	D	0.20	8.9	A	0.20	8.9	A
	WB from Home Ave	1.06	84.6	F	1.06	86.2	F	0.16	8.1	A	0.16	8.1	A
	NB from Pine St	0.55	22.0	C	0.55	22.1	C	0.10	8.2	A	0.10	8.2	A
	SB from Pine St	1.20	135.5	F	1.20	135.9	F	0.22	9.2	A	0.22	9.2	A
	US 7 / Queen City Park (north)												
	NB left onto Queen City Park Rd	0.09	17.2	C	0.09	17.2	C	0.09	17.2	C	0.09	17.2	C
PM	Queen City Park / Home Ave / Austin Dr												
	WB left from Home Ave	0.03	1.7	A	0.12	4.3	A	0.03	1.7	A	0.12	4.3	A
	NB from Queen City Park Rd	0.16	10.9	B	0.24	12.9	B	0.16	10.9	B	0.24	12.9	B
	Pine St / Home Ave												
	EB from Home Ave	0.76	33.5	D	0.84	43.0	E	0.12	8.4	A	0.12	8.4	A
	WB from Home Ave	0.91	50.8	F	1.16	120.3	F	0.27	9.0	A	0.29	9.2	A
	NB from Pine St	0.59	23.5	C	0.62	26.0	D	0.06	8.0	A	0.06	8.1	A
	SB from Pine St	1.74	361.2	F	1.85	410.2	F	0.26	9.6	A	0.27	9.6	A
	US 7 / Queen City Park (north)												
	NB left onto Queen City Park Rd	0.02	22.6	C	0.18	26.6	D	0.02	22.6	C	0.18	26.6	D

⁺ Volume to capacity ratio

* Delay expressed in seconds per vehicle

** Level of Service

Other Analysis – One Lane Bridge

The one lane bridge on Queen City Park Road currently operates as a yield control unsignalized intersection with vehicles yielding in the event there is a vehicle operating in the opposing direction on the bridge. Anecdotally, when project team members have traveled over the one lane bridge, they have typically not encountered another vehicle and have experienced little delay as they have only hesitated to verify no one is coming from the other direction before proceeding.

The City of Burlington has expressed a concern regarding the operation of the bridge in the future. Based on the traffic volumes presented in the Champlain Parkway traffic analysis, traffic volumes along Queen City Park Road are anticipated to change very little with the addition of the new roadway infrastructure to the network, so it is likely that the bridge will continue to operate in a similar fashion in the future.

The Burton redevelopment will increase traffic volumes during the PM peak hour, however, based on the origins of the traffic and the routes provided by mapping software and smartphone apps to reach the site, the PM peak hour traffic entering the Higher Ground portion of the site is more likely to use Home Avenue to reach the site. During the late evening hours, when Higher Ground traffic will be exiting and mapping software and smartphone apps are more likely to route traffic toward the one lane bridge, the typical traffic volumes on the bridge will be significantly lower than during the peak hour with little to no opposing traffic, and therefore able to accommodate the exiting eastbound traffic.

As directed by the City's peer review consultant, VHB has simulated the one lane bridge operation using SimTraffic. The bridge was simulated as series of closely spaced, signalized, split phase intersections representative of the alternating, two-way operation in the real-world. Consistent with operations in the field, where most vehicles hesitate before proceeding, the simulation shows most vehicles have little delay before proceeding and travel across the bridge one at a time in alternating directions. The delay for the existing operation of the one lane bridge was estimated to be less than 8 seconds. Additional simulations of Burton build and late evening Higher Ground show release scenarios operated with similar delays. The addition of project related traffic resulted in no more than one additional second of delay for the build conditions. At times in the simulation, as in the field, traffic on the same approach will travel one after the other when no other vehicles are waiting. The outputs from the simulation are included in the Appendix.

Other Analysis - Parking Requirements

A review of the potential parking requirements for the Burton Hub redevelopment was conducted according to the Burlington Comprehensive Development Ordinance Article 8 and the ITE Parking Generation Manual, 5th Edition. Burlington parking requirements for the Shared Use District, within which the Burton site exists, dictate that a total of 239 spaces are required for the multiple uses of the proposed Burton Hub without Higher Ground included in the calculation. More conservatively, the ITE Parking Generation Manual specifies that 313 spaces would accommodate the multiple uses of the Burton site, without considering Higher Ground.

It is anticipated that the primary use of the Burton parking spaces will shift from the multiple uses during the day (i.e. office, research and development, manufacturing, retail, warehouse, recreation, restaurant) to Higher Ground use during the evening. According to Burlington's ordinance, Higher Ground adds a requirement of 375 spaces for an occupancy of 1500 patrons. ITE does not have a parking generation rate for performing arts space or an equivalent,

so the Burlington parking requirements were assumed to apply. The 496 parking spaces in the proposed conceptual plans for the site would more than accommodate the 313 spaces needed during the day and the 375 spaces necessary to accommodate a show or event at Higher Ground in the evening.

Conclusions

The redevelopment of the Burton site will accommodate a new mix of land uses including a performing arts space. As outlined above, conservatively high trip generation estimates are anticipated to increase site trips by 6 trips during the AM peak hour and 222 trips during the PM peak hour. As shown, the delay increases associated with the project at the study area intersections are anticipated to be minor, except at the intersection of Pine Street and Home Avenue when the Champlain Parkway is not constructed.

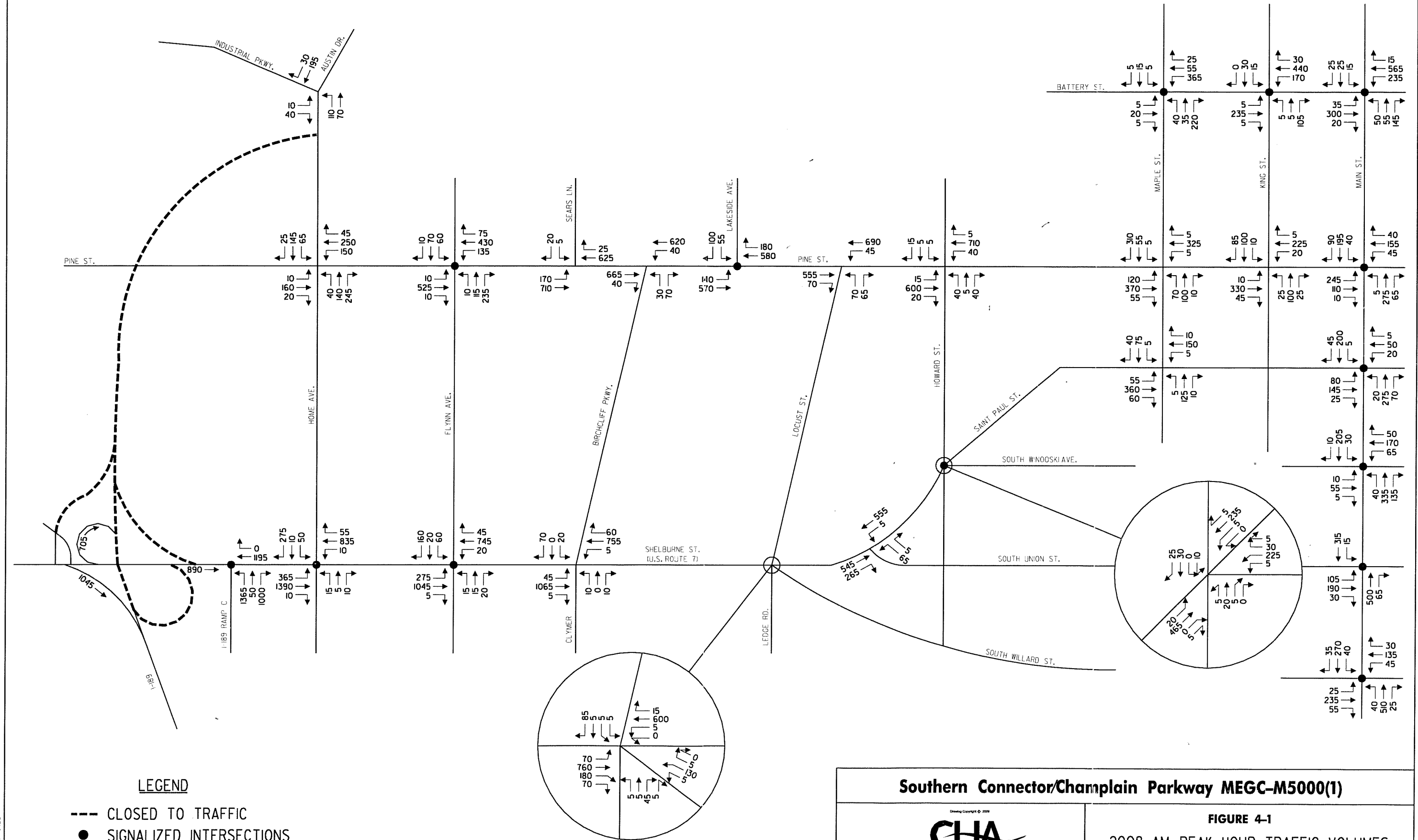


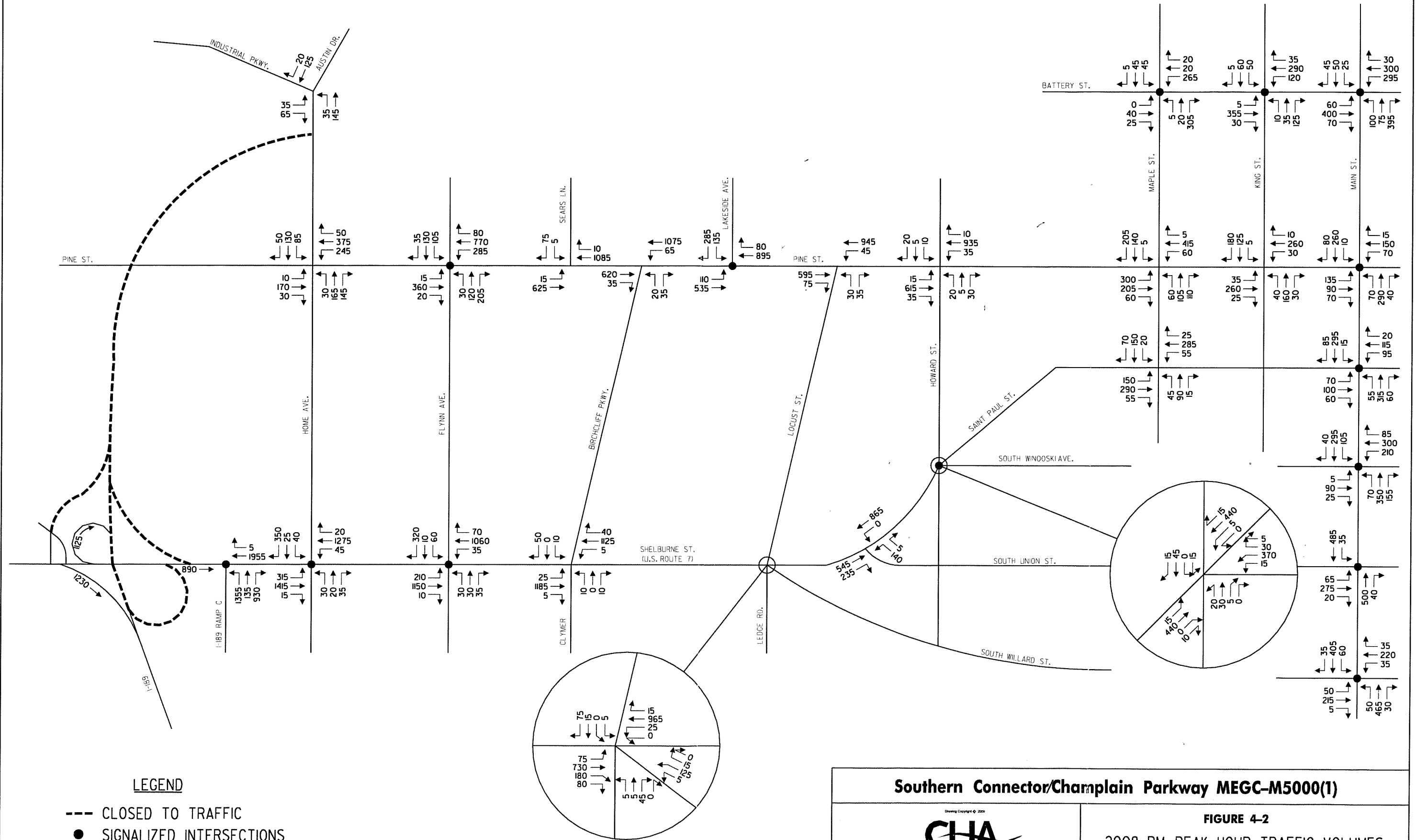
Technical Appendix Traffic

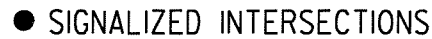
- Traffic Data & Trip Generation
 - Champlain Parkway Study Volumes
 - Burton Hub Redevelopment Build Volumes
 - Trip Generation
- Intersection Capacity Analyses
 - Signalized Intersections Burton Hub No Build
 - Unsignalized Intersections Burton Hub No Build
 - Signalized Intersections Burton Hub Build
 - Unsignalized Intersections Burton Hub Build
- Safety Assessment Data
 - High Crash Locations
 - Crash Review Data
- Single Lane Bridge
 - Simulation Queueing Report



Traffic Data & Trip Generation







NOT TO SCALE

Southern Connector/Champlain Parkway MEGC-M5000(1)

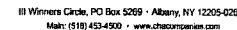
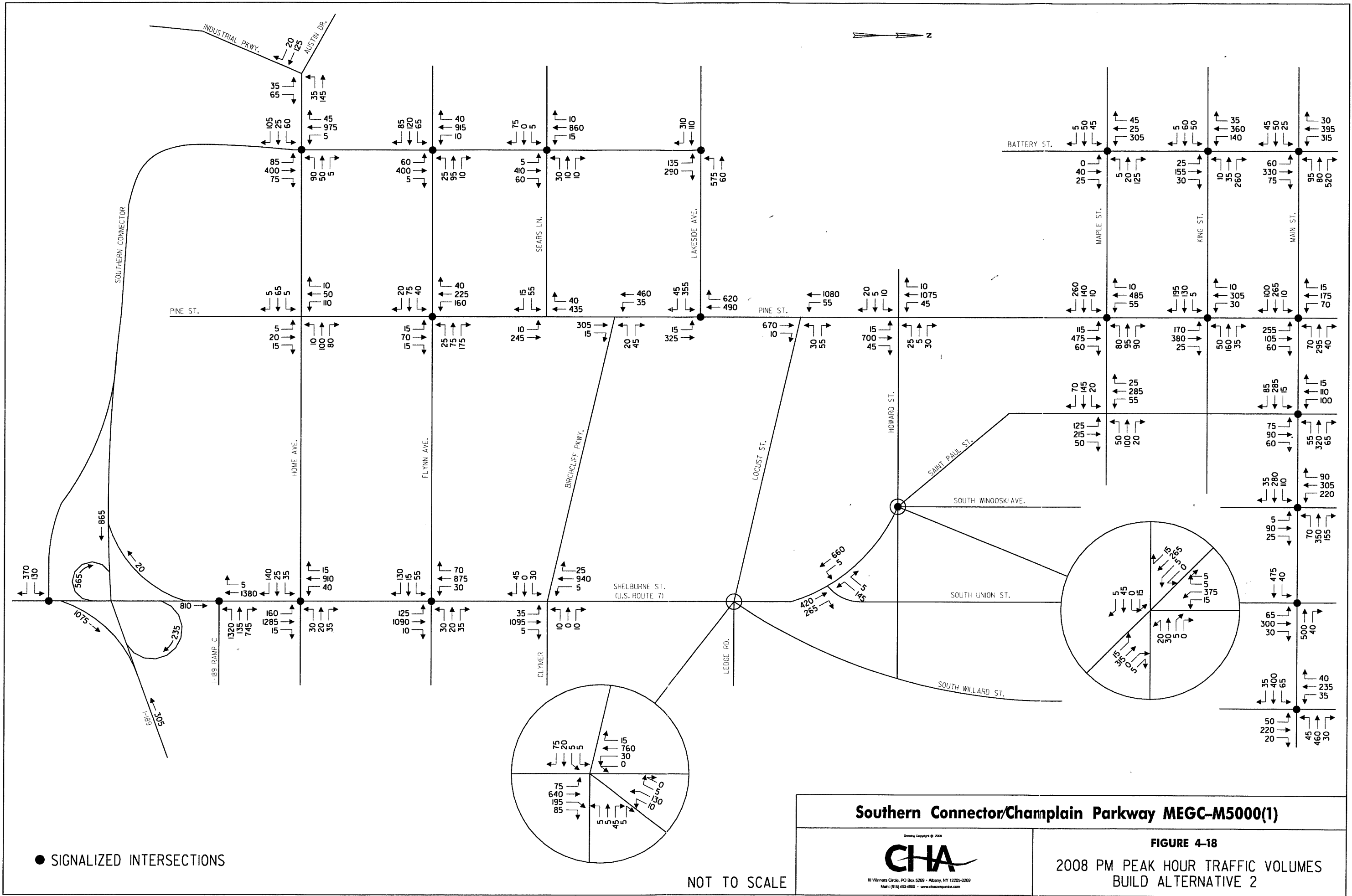


FIGURE 4-17
2008 AM PEAK HOUR TRAFFIC VOLUMES
BUILD ALTERNATIVE 2



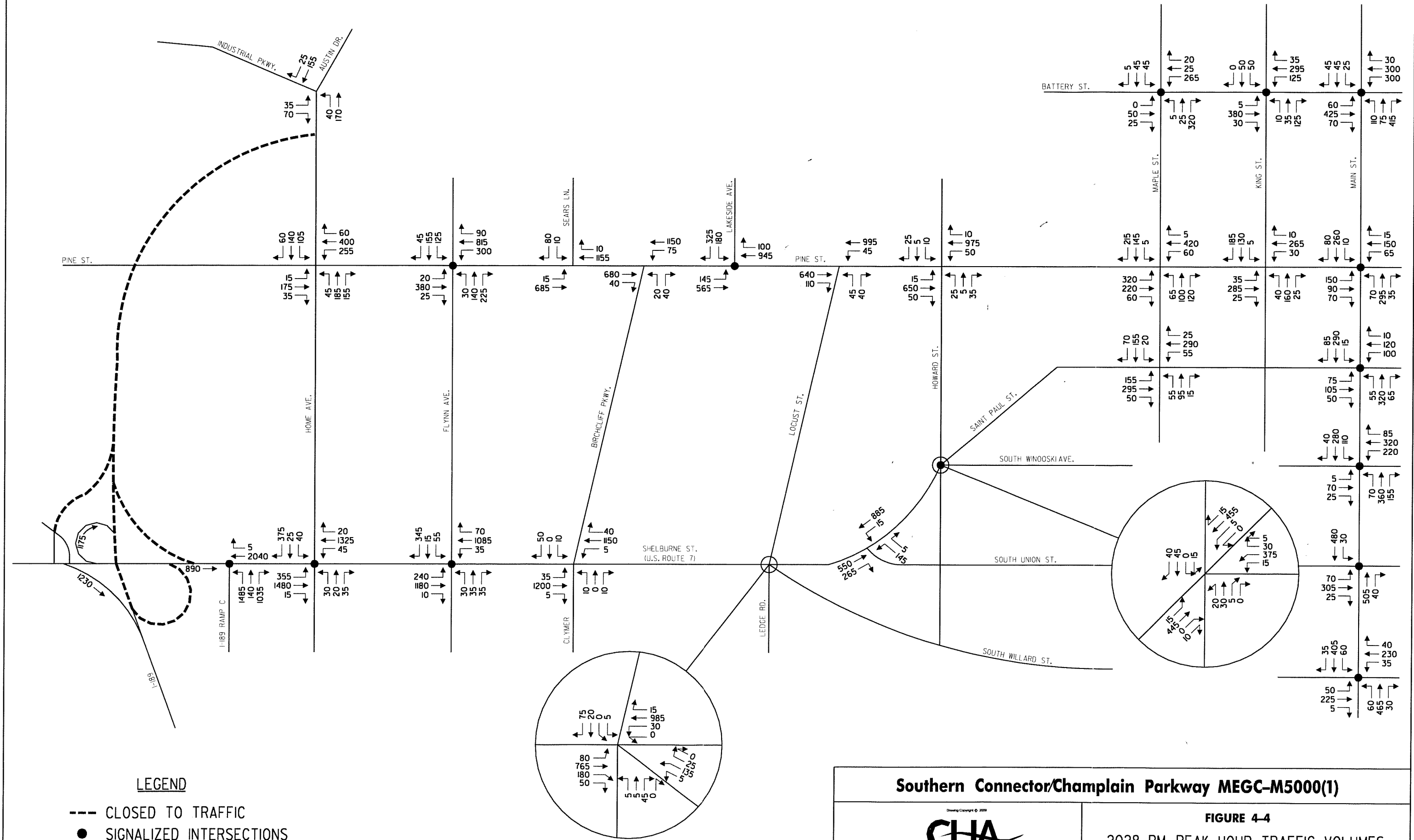
--- CLOSED TO TRAFFIC
● SIGNALIZED INTERSECTIONS

Drawing Copyright © 2009

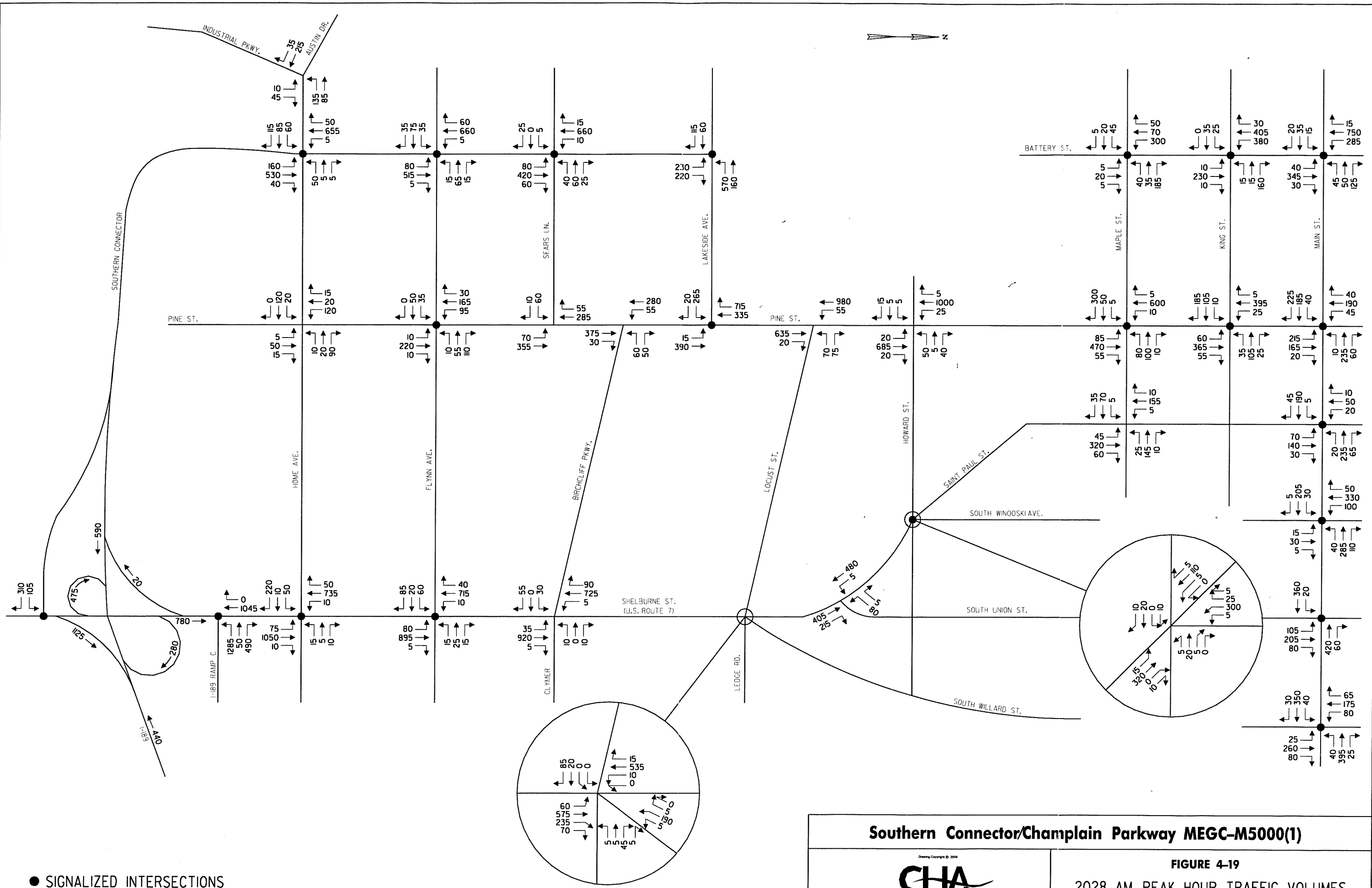
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Page 4-5



FILE NAME: H:\B559\BPT\SE\SE\display\traffic\2008\2008am.SHIFT.ctb
DATE/TIME: 8/16/2009
USER: 1933



Southern Connector/Champlain Parkway MEGC-M5000(1)

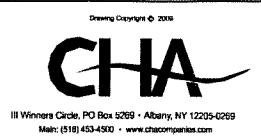
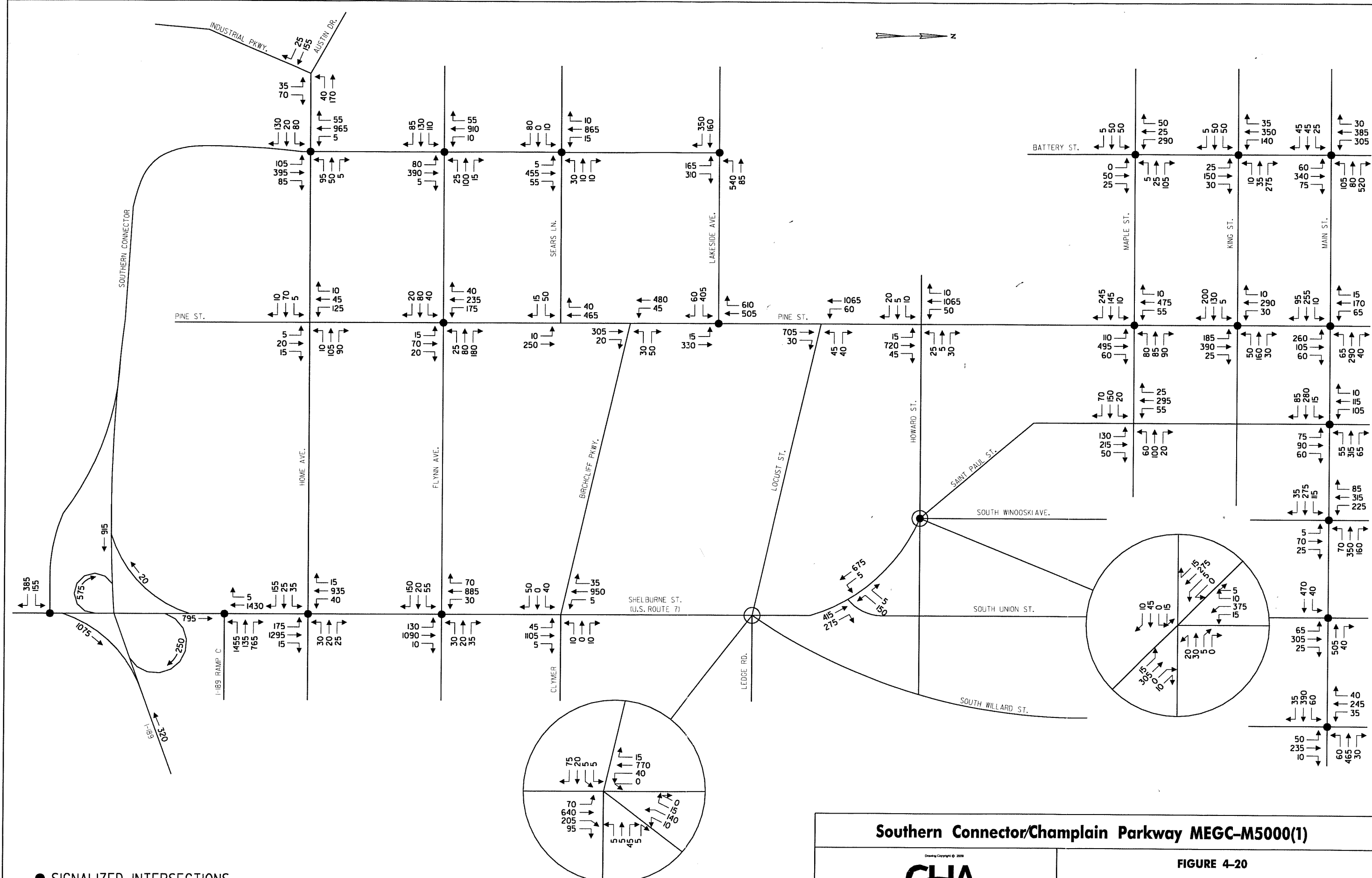


FIGURE 4-19
2028 AM PEAK HOUR TRAFFIC VOLUMES
BUILD ALTERNATIVE 2



● SIGNALIZED INTERSECTIONS

NOT TO SCALE

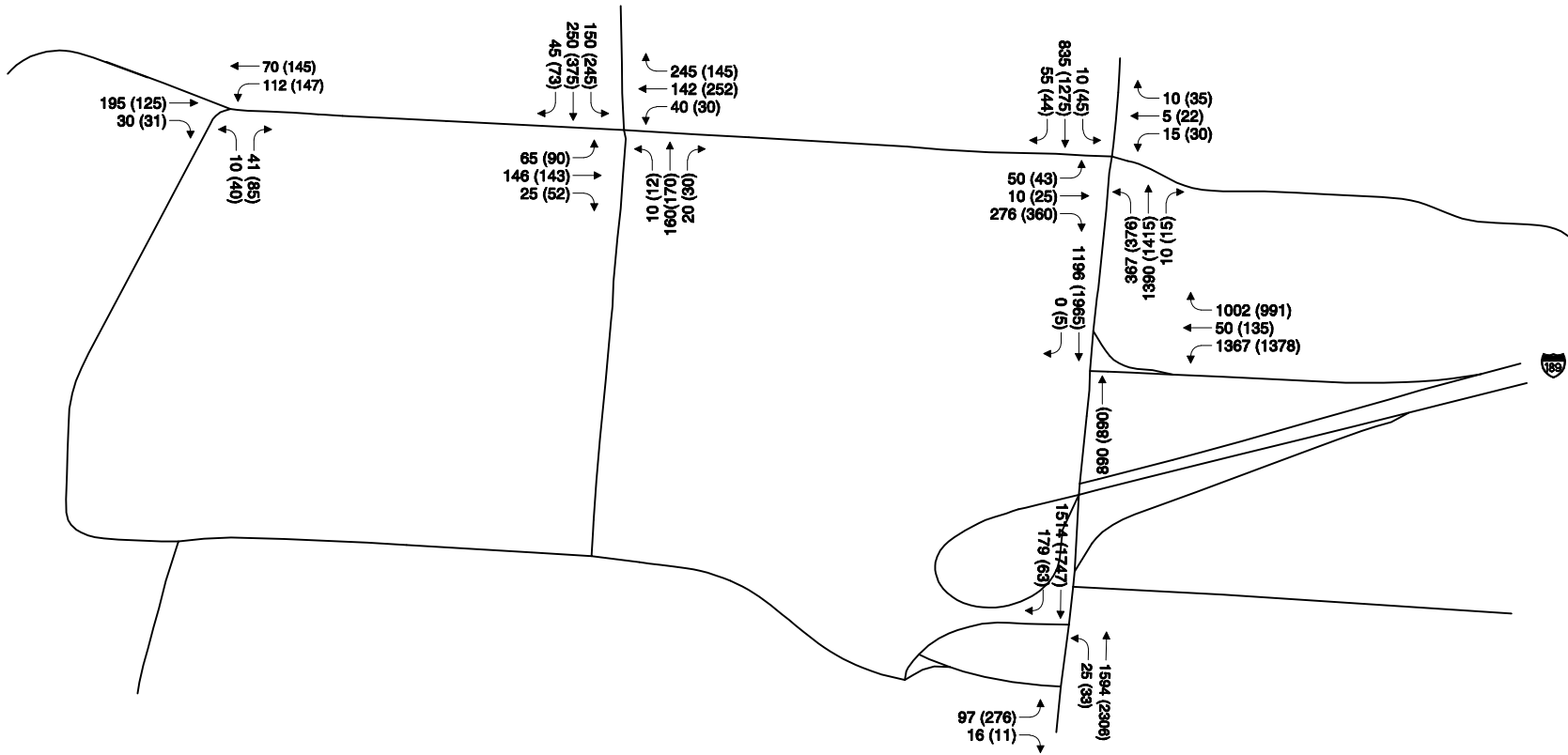
Southern Connector/Champlain Parkway MEGC-M5000(1)



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FIGURE 4-20

2028 PM PEAK HOUR TRAFFIC VOLUMES
 BUILD ALTERNATIVE 2



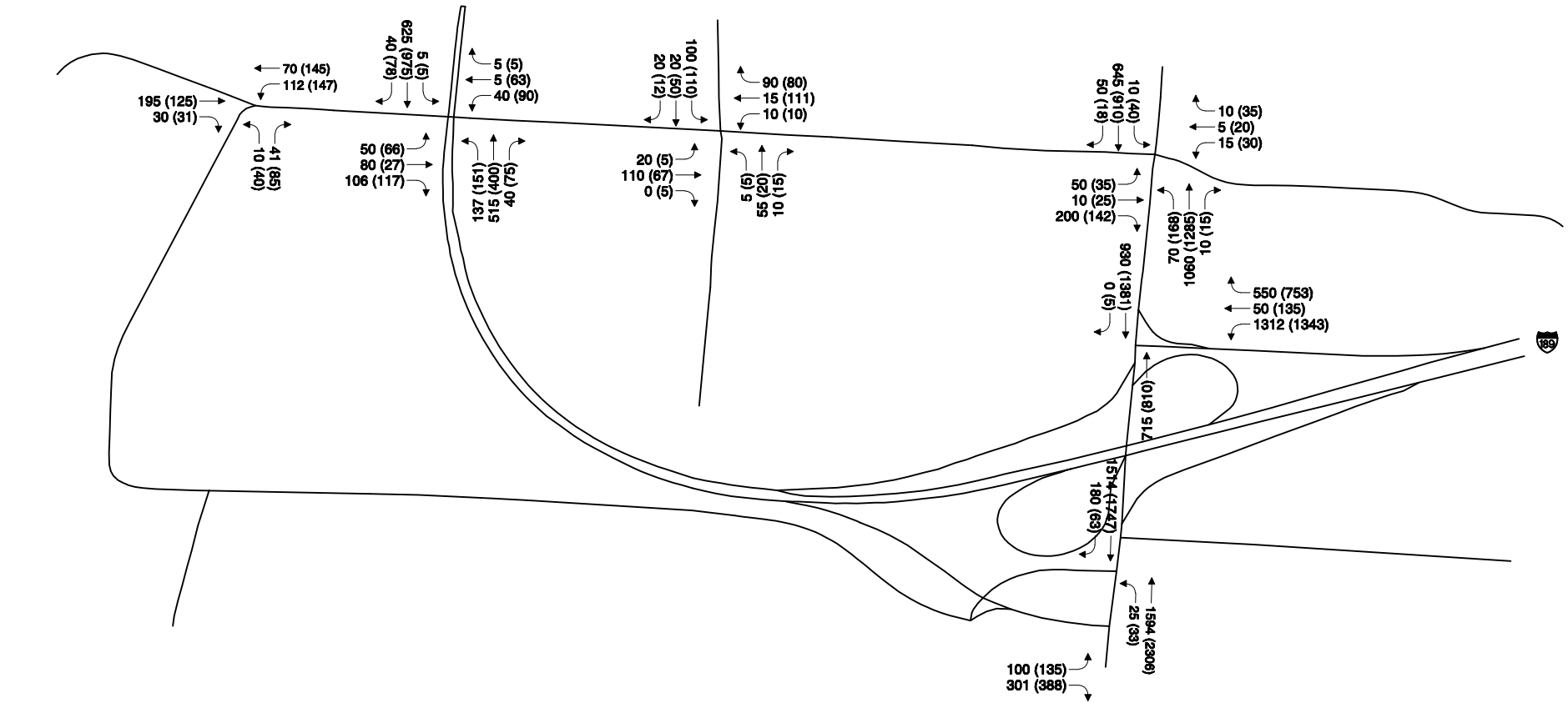
Not to Scale

Legend

AM Peak Hour Volume
(PM Peak Hour Volume)



Figure 4
Burton 2008 Build Scenario
Without Champlain Parkway
Peak Hour Traffic Volumes



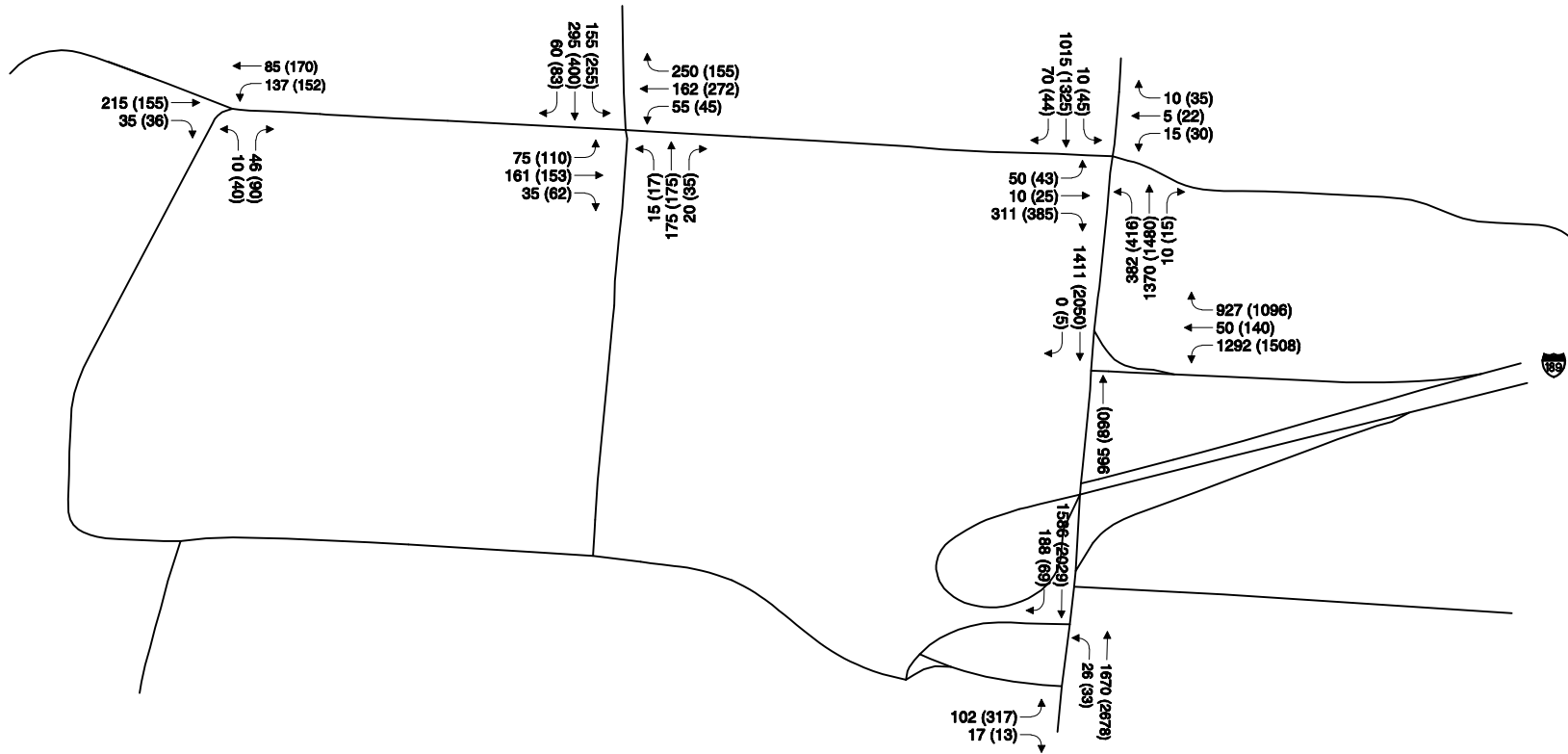
Not to Scale

Legend

AM Peak Hour Volume
(PM Peak Hour Volume)



Figure 5
Burton 2008 Build Scenario
With Champlain Parkway
Peak Hour Traffic Volumes



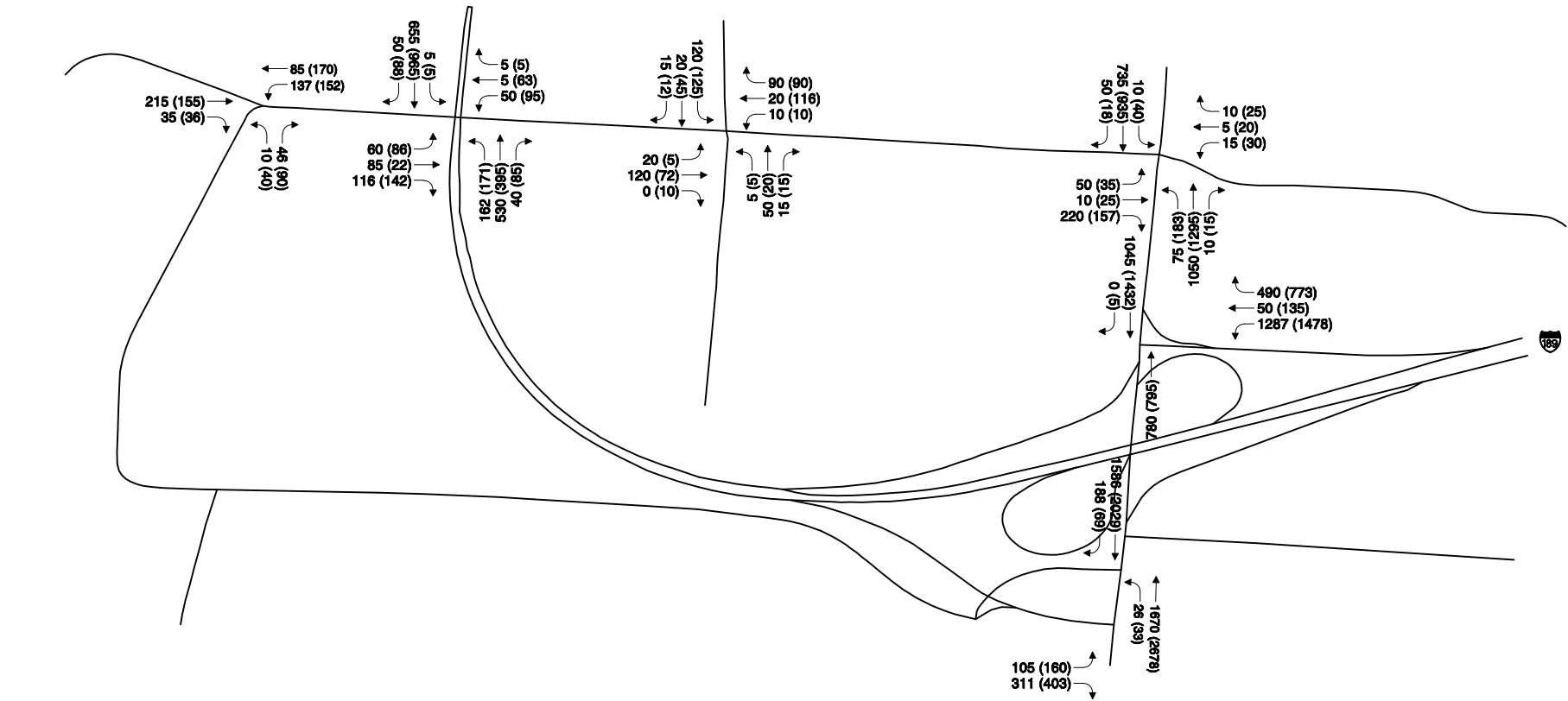
Not to Scale

Legend

AM Peak Hour Volume
(PM Peak Hour Volume)



Figure 6
Burton 2028 Build Scenario
Without Champlain Parkway
Peak Hour Traffic Volumes



Not to Scale

Legend

AM Peak Hour Volume

(PM Peak Hour Volume)



Figure 7

Burton 2028 Build Scenario

With Champlain Parkway

Peak Hour Traffic Volumes

Trip Generation - Project Specific

Total Site generated trips (not accounting for internal, pass-by, or diverted trips)

Site Land Uses and Descriptions				AM PK HR OF ADJACENT STREET TRAFFIC												PM PK HR OF ADJACENT STREET TRAFFIC											
Code	Land Use	Size	Unit	directional dist.		average			regression		# trips				directional dist.	average			regression		# trips						
				% enter	% exit	# studies	Avg Rate	Std Dev.	Total by Avg	r ²	total by Eq'n	Method Chosen	Total Trips	Entering	Exiting	% enter	% exit	# studies	Avg Rate	Std Dev.	Total by Avg	r ²	total by Eq'n	Method Chosen	Total Trips	Entering	Exiting
1	2	3	4	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!			#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!		
710	General Office Building	10.275	1000 sq ft gfa	86%	14%	35	1.16	0.47	12	0.85	36	avg rate	12	10	2	16%	84%	32	1.15	0.42	12			avg rate	12	2	10
760	Research and Development Ctr	8.745	1000 sq ft gfa	75%	25%	11	0.42	0.41	4			avg rate	4	3	1	15%	85%	5	0.49	0.28	4	0.65	23	avg rate	4	1	4
140	Manufacturing	18.425	1000 sq ft gfa	77%	23%	45	0.62	1.03	11			avg rate	11	9	3	31%	69%	52	0.67	0.94	12			avg rate	12	4	9
876	Retail (Apparel Store)	7.825	1000 sq ft gfa	80%	20%	1	1.00		8			avg rate	8	6	2	51%	49%	9	4.12	2.18	32			avg rate	32	16	16
150	Warehousing	12.545	1000 sq ft gfa	77%	23%	34	0.17	0.20	2			avg rate	2	2	0	27%	73%	47	0.19	0.18	2			avg rate	2	1	2
930	Fast Casual Restaurant (Café)	6.835	1000 sq ft gfa	67%	33%	1	2.07		14			avg rate	14	9	5	55%	45%	15	14.13	7.72	97			avg rate	97	53	43
	Performing Arts Center	1500	occupants						0				0	0	0	90%	10%		0.10		149			avg rate	149	134	15
435	Multipurpose Recreational Facility	7.465	1000 sq ft gfa						0				0	0	0	55%	45%	3	3.58	0.55	27			avg rate	27	15	12
710	General Office Building	66.3	1000 sq ft gfa	86%	14%	35	1.16	0.47	77	0.85	89	avg rate	77	66	11	16%	84%	32	1.15	0.42	76			avg rate	76	12	64
150	Warehousing	2.75	1000 sq ft gfa	77%	23%	34	0.17	0.20	0			avg rate	0	0	0	27%	73%	47	0.19	0.18	1			avg rate	1	0	0



Intersection Capacity Analysis

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	10	275	15	5	10	365	1390	10	10	835	55
Future Volume (vph)	50	10	275	15	5	10	365	1390	10	10	835	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.897			0.999			0.991	
Flt Protected		0.960		0.950			0.950			0.950		
Satd. Flow (prot)	0	1788	1583	1770	1671	0	1770	3536	0	1770	3507	0
Flt Permitted		0.751		0.715			0.249			0.950		
Satd. Flow (perm)	0	1399	1583	1332	1671	0	464	3536	0	1770	3507	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			299		11			1			8	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	299	16	5	11	397	1511	11	11	908	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	299	16	16	0	397	1522	0	11	968	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effect Green (s)		10.3	10.3	10.3	10.3		68.4	68.4		6.2	48.7	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.76	0.76		0.07	0.54	
v/c Ratio		0.41	0.67	0.11	0.08		0.66	0.57		0.09	0.51	
Control Delay		42.9	12.3	34.5	20.8		20.8	7.1		40.5	14.9	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		42.9	12.3	34.5	20.8		20.8	7.1		40.5	14.9	
LOS		D	B	C	C		C	A		D	B	
Approach Delay		17.8			27.7			10.0			15.2	
Approach LOS		B			C			A			B	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 12.5

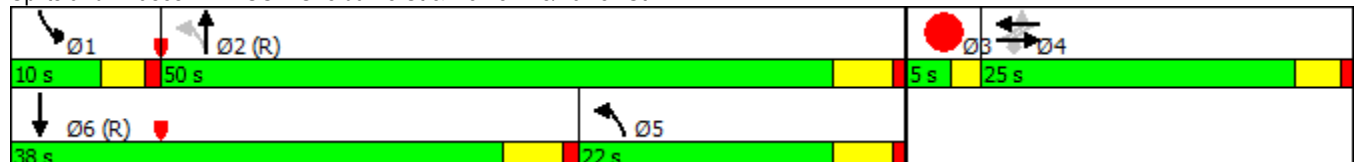
Intersection LOS: B

Intersection Capacity Utilization 66.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lanes, Volumes, Timings
4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	10	275	15	5	10	365	1390	10	10	835	55
Future Volume (vph)	50	10	275	15	5	10	365	1390	10	10	835	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583	1770	1671		1770	3535		1770	3506	
Flt Permitted		0.75	1.00	0.71	1.00		0.25	1.00		0.95	1.00	
Satd. Flow (perm)		1399	1583	1331	1671		465	3535		1770	3506	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	299	16	5	11	397	1511	11	11	908	60
RTOR Reduction (vph)	0	0	265	0	10	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	65	34	16	6	0	397	1522	0	11	964	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		10.3	10.3	10.3	10.3		65.2	65.2		1.5	45.5	
Effective Green, g (s)		10.3	10.3	10.3	10.3		65.2	65.2		1.5	45.5	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.72	0.72		0.02	0.51	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		160	181	152	191		629	2560		29	1772	
v/s Ratio Prot					0.00		0.14	c0.43		0.01	c0.27	
v/s Ratio Perm		c0.05	0.02	0.01			c0.32					
v/c Ratio		0.41	0.19	0.11	0.03		0.63	0.59		0.38	0.54	
Uniform Delay, d1		37.0	36.1	35.7	35.4		13.0	6.0		43.8	15.2	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.7	0.5	0.3	0.1		2.1	1.0		8.1	1.2	
Delay (s)		38.7	36.6	36.0	35.5		15.1	7.0		51.9	16.4	
Level of Service		D	D	D	D		B	A		D	B	
Approach Delay (s)		37.0			35.8			8.7			16.8	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			14.5				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			66.7%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	96	16	0	1523	1514	0	
Future Volume (vph)	96	16	0	1523	1514	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.997	0.850					
Flt Protected	0.953						
Satd. Flow (prot)	1770	1504	0	3539	3539	0	
Flt Permitted	0.953						
Satd. Flow (perm)	1770	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	1	15					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	104	17	0	1655	1646	0	
Shared Lane Traffic (%)		10%					
Lane Group Flow (vph)	106	15	0	1655	1646	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Number of Detectors	1	1		2	2		
Detector Template	Left	Right		Thru	Thru		
Leading Detector (ft)	20	20		100	100		
Trailing Detector (ft)	0	0		0	0		
Detector 1 Position(ft)	0	0		0	0		
Detector 1 Size(ft)	20	20		6	6		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		
Detector 2 Position(ft)				94	94		
Detector 2 Size(ft)				6	6		
Detector 2 Type				Cl+Ex	Cl+Ex		
Detector 2 Channel							
Detector 2 Extend (s)				0.0	0.0		
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2		3
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0		1.0

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0
Total Split (s)	24.0	24.0		82.0	82.0		24.0
Total Split (%)	18.5%	18.5%		63.1%	63.1%		18%
Maximum Green (s)	18.0	18.0		76.0	76.0		22.0
Yellow Time (s)	4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead					Lag
Lead-Lag Optimize?	Yes	Yes					Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		0.2
Recall Mode	None	None		C-Max	C-Max		None
Walk Time (s)	0.0	0.0		0.0	0.0		5.0
Flash Dont Walk (s)	0.0	0.0		17.0	17.0		17.0
Pedestrian Calls (#/hr)	0	0		0	0		0
Act Effect Green (s)	12.1	12.1		105.9	105.9		
Actuated g/C Ratio	0.09	0.09		0.81	0.81		
v/c Ratio	0.64	0.10		0.57	0.57		
Control Delay	73.3	23.0		5.5	5.4		
Queue Delay	0.0	0.0		0.0	3.3		
Total Delay	73.3	23.0		5.5	8.7		
LOS	E	C		A	A		
Approach Delay	67.1			5.5	8.7		
Approach LOS	E			A	A		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 9.2

Intersection LOS: A

Intersection Capacity Utilization 57.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

Ø2 (R)	Ø4	Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	96	16	0	1523	1514	0
Future Volume (vph)	96	16	0	1523	1514	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1771	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1771	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	104	17	0	1655	1646	0
RTOR Reduction (vph)	1	14	0	0	0	0
Lane Group Flow (vph)	105	1	0	1655	1646	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	12.1	12.1		105.9	105.9	
Effective Green, g (s)	12.1	12.1		105.9	105.9	
Actuated g/C Ratio	0.09	0.09		0.81	0.81	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	164	139		2882	2882	
v/s Ratio Prot	c0.06	0.00		c0.47	0.47	
v/s Ratio Perm						
v/c Ratio	0.64	0.01		0.57	0.57	
Uniform Delay, d1	56.9	53.5		4.2	4.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.3	0.0		0.8	0.8	
Delay (s)	63.1	53.5		5.0	5.0	
Level of Service	E	D		A	A	
Approach Delay (s)	61.9			5.0	5.0	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	7.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1365	50	0	0	890	0	0	1195	0
Future Volume (vph)	0	0	0	1365	50	0	0	890	0	0	1195	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frnt												
Flt Protected				0.950	0.956							
Satd. Flow (prot)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.956							
Satd. Flow (perm)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1484	54	0	0	967	0	0	1299	0
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	0	0	772	766	0	0	967	0	0	1299	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2			2			2	
Detector Template				Left	Thru			Thru			Thru	
Leading Detector (ft)				20	100			100			100	
Trailing Detector (ft)				0	0			0			0	
Detector 1 Position(ft)				0	0			0			0	
Detector 1 Size(ft)				20	6			6			6	
Detector 1 Type				Cl+Ex	Cl+Ex			Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0			0.0			0.0	
Detector 1 Queue (s)				0.0	0.0			0.0			0.0	
Detector 1 Delay (s)				0.0	0.0			0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				47.2	47.2			31.8			31.8	
Actuated g/C Ratio				0.52	0.52			0.35			0.35	
v/c Ratio				0.88	0.86			0.77			0.72	
Control Delay				31.4	30.1			31.8			28.6	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				31.4	30.1			31.8			28.6	
LOS				C	C			C			C	
Approach Delay					30.8			31.8			28.6	
Approach LOS					C			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 30.3

Intersection LOS: C

Intersection Capacity Utilization 73.3%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↱			↱			↱	
Traffic Volume (vph)	0	0	0	1365	50	0	0	890	0	0	1195	0
Future Volume (vph)	0	0	0	1365	50	0	0	890	0	0	1195	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1691			3539			5085	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1691			3539			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1484	54	0	0	967	0	0	1299	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	772	766	0	0	967	0	0	1299	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				47.2	47.2			31.8			31.8	
Effective Green, g (s)				47.2	47.2			31.8			31.8	
Actuated g/C Ratio				0.52	0.52			0.35			0.35	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				881	886			1250			1796	
v/s Ratio Prot				c0.46	0.45			c0.27			0.26	
v/s Ratio Perm												
v/c Ratio				0.88	0.86			0.77			0.72	
Uniform Delay, d1				18.8	18.6			25.9			25.3	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				9.8	8.8			4.7			2.6	
Delay (s)				28.6	27.4			30.6			27.8	
Level of Service				C	C			C			C	
Approach Delay (s)		0.0			28.0			30.6			27.8	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			28.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			73.3%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗		↖	↖↗		↖	↖↗	
Traffic Volume (vph)	40	25	350	30	20	35	315	1415	15	45	1275	20
Future Volume (vph)	40	25	350	30	20	35	315	1415	15	45	1275	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.905			0.998			0.998	
Flt Protected		0.970		0.950			0.950			0.950		
Satd. Flow (prot)	0	1807	1583	1770	1686	0	1770	3532	0	1770	3532	0
Flt Permitted		0.789		0.711			0.116			0.950		
Satd. Flow (perm)	0	1470	1583	1324	1686	0	216	3532	0	1770	3532	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			380		38			2			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	27	380	33	22	38	342	1538	16	49	1386	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	70	380	33	60	0	342	1554	0	49	1408	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effect Green (s)		11.3	11.3	11.3	11.3		61.8	61.8		7.9	47.7	
Actuated g/C Ratio		0.13	0.13	0.13	0.13		0.69	0.69		0.09	0.53	
v/c Ratio		0.38	0.72	0.20	0.24		0.78	0.64		0.31	0.75	
Control Delay		40.0	11.9	35.4	18.5		39.3	12.2		43.1	21.2	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		40.0	11.9	35.4	18.5		39.3	12.2		43.1	21.2	
LOS		D	B	D	B		D	B		D	C	
Approach Delay		16.2			24.5			17.1			21.9	
Approach LOS		B			C			B			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 19.0

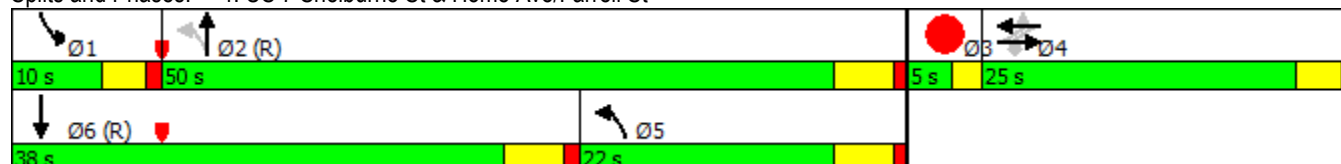
Intersection LOS: B

Intersection Capacity Utilization 75.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lanes, Volumes, Timings
4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↩	↩	↩	↩		↩	↩↩		↩	↩↩	
Traffic Volume (vph)	40	25	350	30	20	35	315	1415	15	45	1275	20
Future Volume (vph)	40	25	350	30	20	35	315	1415	15	45	1275	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.91		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1807	1583	1770	1686		1770	3534		1770	3531	
Flt Permitted		0.79	1.00	0.71	1.00		0.12	1.00		0.95	1.00	
Satd. Flow (perm)		1470	1583	1325	1686		216	3534		1770	3531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	27	380	33	22	38	342	1538	16	49	1386	22
RTOR Reduction (vph)	0	0	332	0	33	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	70	48	33	27	0	342	1553	0	49	1407	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		11.3	11.3	11.3	11.3		60.2	60.2		5.5	46.1	
Effective Green, g (s)		11.3	11.3	11.3	11.3		60.2	60.2		5.5	46.1	
Actuated g/C Ratio		0.13	0.13	0.13	0.13		0.67	0.67		0.06	0.51	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		184	198	166	211		465	2363		108	1808	
v/s Ratio Prot					0.02		c0.15	0.44		0.03	c0.40	
v/s Ratio Perm		c0.05	0.03	0.02			0.34					
v/c Ratio		0.38	0.24	0.20	0.13		0.74	0.66		0.45	0.78	
Uniform Delay, d1		36.1	35.5	35.3	35.0		21.1	8.8		40.8	17.8	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3	0.6	0.6	0.3		6.0	1.4		3.0	3.4	
Delay (s)		37.5	36.1	35.9	35.2		27.1	10.3		43.8	21.2	
Level of Service		D	D	D	D		C	B		D	C	
Approach Delay (s)		36.3			35.5			13.3			21.9	
Approach LOS		D			D			B			C	
Intersection Summary												
HCM 2000 Control Delay			19.7				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			75.2%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	256	8	0	2055	1747	0	
Future Volume (vph)	256	8	0	2055	1747	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.999	0.850					
Flt Protected	0.953						
Satd. Flow (prot)	1773	1504	0	3539	3539	0	
Flt Permitted	0.953						
Satd. Flow (perm)	1773	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)		8					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	278	9	0	2234	1899	0	
Shared Lane Traffic (%)		10%					
Lane Group Flow (vph)	279	8	0	2234	1899	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Number of Detectors	1	1		2	2		
Detector Template	Left	Right		Thru	Thru		
Leading Detector (ft)	20	20		100	100		
Trailing Detector (ft)	0	0		0	0		
Detector 1 Position(ft)	0	0		0	0		
Detector 1 Size(ft)	20	20		6	6		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		
Detector 2 Position(ft)				94	94		
Detector 2 Size(ft)				6	6		
Detector 2 Type				Cl+Ex	Cl+Ex		
Detector 2 Channel							
Detector 2 Extend (s)				0.0	0.0		
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2		3
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0		1.0

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0
Total Split (s)	24.0	24.0		82.0	82.0		24.0
Total Split (%)	18.5%	18.5%		63.1%	63.1%		18%
Maximum Green (s)	18.0	18.0		76.0	76.0		22.0
Yellow Time (s)	4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead					Lag
Lead-Lag Optimize?	Yes	Yes					Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		0.2
Recall Mode	None	None		C-Max	C-Max		None
Walk Time (s)	0.0	0.0		0.0	0.0		5.0
Flash Dont Walk (s)	0.0	0.0		17.0	17.0		17.0
Pedestrian Calls (#/hr)	0	0		0	0		0
Act Effect Green (s)	18.0	18.0		100.0	100.0		
Actuated g/C Ratio	0.14	0.14		0.77	0.77		
v/c Ratio	1.14	0.04		0.82	0.70		
Control Delay	149.5	26.1		12.7	9.2		
Queue Delay	0.0	0.0		0.0	23.6		
Total Delay	149.5	26.1		12.7	32.7		
LOS	F	C		B	C		
Approach Delay	146.1			12.7	32.7		
Approach LOS	F			B	C		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.14

Intersection Signal Delay: 30.0

Intersection LOS: C

Intersection Capacity Utilization 81.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

Ø2 (R)	Ø4	Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	256	8	0	2055	1747	0
Future Volume (vph)	256	8	0	2055	1747	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1773	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1773	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	278	9	0	2234	1899	0
RTOR Reduction (vph)	0	7	0	0	0	0
Lane Group Flow (vph)	279	1	0	2234	1899	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	245	208		2722	2722	
v/s Ratio Prot	c0.16	0.00		c0.63	0.54	
v/s Ratio Perm						
v/c Ratio	1.14	0.01		0.82	0.70	
Uniform Delay, d1	56.0	48.3		9.4	7.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	100.1	0.0		2.9	1.5	
Delay (s)	156.1	48.3		12.3	9.0	
Level of Service	F	D		B	A	
Approach Delay (s)	153.1			12.3	9.0	
Approach LOS	F			B	A	

Intersection Summary

HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1355	135	0	0	890	0	0	1955	5
Future Volume (vph)	0	0	0	1355	135	0	0	890	0	0	1955	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Fr t												
Flt Protected				0.950	0.961							
Satd. Flow (prot)	0	0	0	1681	1701	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.961							
Satd. Flow (perm)	0	0	0	1681	1701	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1473	147	0	0	967	0	0	2125	5
Shared Lane Traffic (%)				45%								
Lane Group Flow (vph)	0	0	0	810	810	0	0	967	0	0	2130	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2			2			2	
Detector Template				Left	Thru			Thru			Thru	
Leading Detector (ft)				20	100			100			100	
Trailing Detector (ft)				0	0			0			0	
Detector 1 Position(ft)				0	0			0			0	
Detector 1 Size(ft)				20	6			6			6	
Detector 1 Type				Cl+Ex	Cl+Ex			Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0			0.0			0.0	
Detector 1 Queue (s)				0.0	0.0			0.0			0.0	
Detector 1 Delay (s)				0.0	0.0			0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				47.9	47.9			31.1			31.1	
Actuated g/C Ratio				0.53	0.53			0.35			0.35	
v/c Ratio				0.91	0.90			0.79			1.21	
Control Delay				34.5	33.1			32.7			130.1	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				34.5	33.1			32.7			130.1	
LOS				C	C			C			F	
Approach Delay					33.8			32.7			130.1	
Approach LOS					C			C			F	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.21

Intersection Signal Delay: 77.0

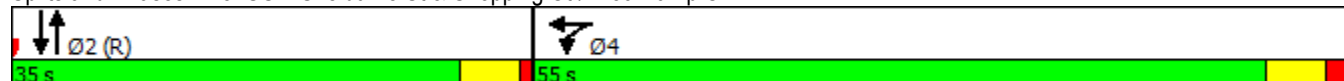
Intersection LOS: E

Intersection Capacity Utilization 88.1%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1355	135	0	0	890	0	0	1955	5
Future Volume (vph)	0	0	0	1355	135	0	0	890	0	0	1955	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1700			3539			5084	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1700			3539			5084	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1473	147	0	0	967	0	0	2125	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	810	810	0	0	967	0	0	2130	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				47.9	47.9			31.1			31.1	
Effective Green, g (s)				47.9	47.9			31.1			31.1	
Actuated g/C Ratio				0.53	0.53			0.35			0.35	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				894	904			1222			1756	
v/s Ratio Prot				c0.48	0.48			0.27			c0.42	
v/s Ratio Perm												
v/c Ratio				0.91	0.90			0.79			1.21	
Uniform Delay, d1				19.0	18.8			26.5			29.4	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				12.6	11.4			5.3			101.4	
Delay (s)				31.6	30.2			31.8			130.8	
Level of Service				C	C			C			F	
Approach Delay (s)		0.0			30.9			31.8			130.8	
Approach LOS		A			C			C			F	
Intersection Summary												
HCM 2000 Control Delay			76.2			HCM 2000 Level of Service				E		
HCM 2000 Volume to Capacity ratio			1.03									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			88.1%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗		↖	↗		↖	↗	
Traffic Volume (vph)	50	10	310	15	5	10	380	1370	10	10	1015	70
Future Volume (vph)	50	10	310	15	5	10	380	1370	10	10	1015	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.897			0.999			0.990	
Flt Protected		0.960		0.950			0.950			0.950		
Satd. Flow (prot)	0	1788	1583	1770	1671	0	1770	3536	0	1770	3504	0
Flt Permitted		0.751		0.715			0.170			0.950		
Satd. Flow (perm)	0	1399	1583	1332	1671	0	317	3536	0	1770	3504	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			337		11			1			9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	337	16	5	11	413	1489	11	11	1103	76
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	337	16	16	0	413	1500	0	11	1179	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effect Green (s)		10.5	10.5	10.5	10.5		68.2	68.2		6.2	48.5	
Actuated g/C Ratio		0.12	0.12	0.12	0.12		0.76	0.76		0.07	0.54	
v/c Ratio		0.40	0.70	0.10	0.08		0.80	0.56		0.09	0.62	
Control Delay		42.3	12.4	34.1	20.5		34.6	7.2		40.5	17.0	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		42.3	12.4	34.1	20.5		34.6	7.2		40.5	17.0	
LOS		D	B	C	C		C	A		D	B	
Approach Delay		17.2			27.3			13.1			17.2	
Approach LOS		B			C			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 15.1

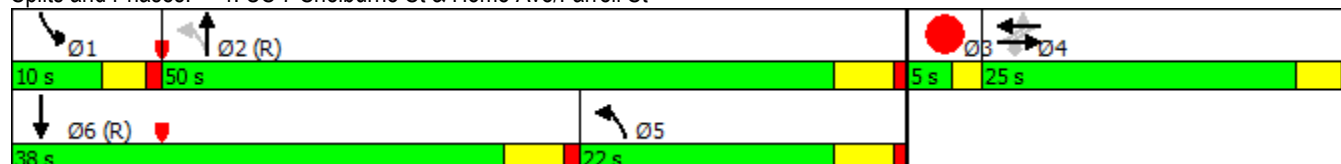
Intersection LOS: B

Intersection Capacity Utilization 73.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lanes, Volumes, Timings
4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	10	310	15	5	10	380	1370	10	10	1015	70
Future Volume (vph)	50	10	310	15	5	10	380	1370	10	10	1015	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583	1770	1671		1770	3535		1770	3505	
Flt Permitted		0.75	1.00	0.71	1.00		0.17	1.00		0.95	1.00	
Satd. Flow (perm)		1399	1583	1331	1671		317	3535		1770	3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	337	16	5	11	413	1489	11	11	1103	76
RTOR Reduction (vph)	0	0	298	0	10	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	65	39	16	6	0	413	1500	0	11	1175	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		10.5	10.5	10.5	10.5		65.0	65.0		1.5	45.3	
Effective Green, g (s)		10.5	10.5	10.5	10.5		65.0	65.0		1.5	45.3	
Actuated g/C Ratio		0.12	0.12	0.12	0.12		0.72	0.72		0.02	0.50	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		163	184	155	194		555	2553		29	1764	
v/s Ratio Prot					0.00		c0.17	0.42		0.01	c0.34	
v/s Ratio Perm		c0.05	0.02	0.01			c0.37					
v/c Ratio		0.40	0.21	0.10	0.03		0.74	0.59		0.38	0.67	
Uniform Delay, d1		36.8	36.0	35.5	35.2		17.0	6.0		43.8	16.7	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6	0.6	0.3	0.1		5.4	1.0		8.1	2.0	
Delay (s)		38.4	36.6	35.8	35.3		22.4	7.0		51.9	18.7	
Level of Service		D	D	D	D		C	A		D	B	
Approach Delay (s)		36.9			35.6			10.4			19.0	
Approach LOS		D			D			B			B	
Intersection Summary												
HCM 2000 Control Delay			16.5				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			73.0%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	101	17	0	1596	1586	0	
Future Volume (vph)	101	17	0	1596	1586	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.997	0.850					
Flt Protected	0.953						
Satd. Flow (prot)	1770	1504	0	3539	3539	0	
Flt Permitted	0.953						
Satd. Flow (perm)	1770	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	1	16					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	110	18	0	1735	1724	0	
Shared Lane Traffic (%)		10%					
Lane Group Flow (vph)	112	16	0	1735	1724	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Number of Detectors	1	1		2	2		
Detector Template	Left	Right		Thru	Thru		
Leading Detector (ft)	20	20		100	100		
Trailing Detector (ft)	0	0		0	0		
Detector 1 Position(ft)	0	0		0	0		
Detector 1 Size(ft)	20	20		6	6		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		
Detector 2 Position(ft)				94	94		
Detector 2 Size(ft)				6	6		
Detector 2 Type				Cl+Ex	Cl+Ex		
Detector 2 Channel							
Detector 2 Extend (s)				0.0	0.0		
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2	3	
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0	1.0	

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0
Total Split (s)	24.0	24.0		82.0	82.0		24.0
Total Split (%)	18.5%	18.5%		63.1%	63.1%		18%
Maximum Green (s)	18.0	18.0		76.0	76.0		22.0
Yellow Time (s)	4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead					Lag
Lead-Lag Optimize?	Yes	Yes					Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		0.2
Recall Mode	None	None		C-Max	C-Max		None
Walk Time (s)	0.0	0.0		0.0	0.0		5.0
Flash Dont Walk (s)	0.0	0.0		17.0	17.0		17.0
Pedestrian Calls (#/hr)	0	0		0	0		0
Act Effect Green (s)	12.5	12.5		105.5	105.5		
Actuated g/C Ratio	0.10	0.10		0.81	0.81		
v/c Ratio	0.65	0.10		0.60	0.60		
Control Delay	73.4	22.2		6.0	5.9		
Queue Delay	0.0	0.0		0.0	4.2		
Total Delay	73.4	22.2		6.0	10.2		
LOS	E	C		A	B		
Approach Delay	67.0			6.0	10.2		
Approach LOS	E			A	B		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 10.2

Intersection LOS: B

Intersection Capacity Utilization 60.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

Ø2 (R)	Ø4	Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	101	17	0	1596	1586	0
Future Volume (vph)	101	17	0	1596	1586	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1771	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1771	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	110	18	0	1735	1724	0
RTOR Reduction (vph)	1	14	0	0	0	0
Lane Group Flow (vph)	111	2	0	1735	1724	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	12.5	12.5		105.5	105.5	
Effective Green, g (s)	12.5	12.5		105.5	105.5	
Actuated g/C Ratio	0.10	0.10		0.81	0.81	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	170	144		2872	2872	
v/s Ratio Prot	c0.06	0.00		c0.49	0.49	
v/s Ratio Perm						
v/c Ratio	0.65	0.01		0.60	0.60	
Uniform Delay, d1	56.7	53.2		4.5	4.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.7	0.0		1.0	0.9	
Delay (s)	63.4	53.2		5.5	5.4	
Level of Service	E	D		A	A	
Approach Delay (s)	62.1			5.5	5.4	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	7.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1290	50	0	0	965	0	0	1410	0
Future Volume (vph)	0	0	0	1290	50	0	0	965	0	0	1410	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Fr t												
Flt Protected				0.950	0.956							
Satd. Flow (prot)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.956							
Satd. Flow (perm)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1402	54	0	0	1049	0	0	1533	0
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	0	0	729	727	0	0	1049	0	0	1533	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2			2			2	
Detector Template				Left	Thru			Thru			Thru	
Leading Detector (ft)				20	100			100			100	
Trailing Detector (ft)				0	0			0			0	
Detector 1 Position(ft)				0	0			0			0	
Detector 1 Size(ft)				20	6			6			6	
Detector 1 Type				Cl+Ex	Cl+Ex			Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0			0.0			0.0	
Detector 1 Queue (s)				0.0	0.0			0.0			0.0	
Detector 1 Delay (s)				0.0	0.0			0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				46.2	46.2			32.8			32.8	
Actuated g/C Ratio				0.51	0.51			0.36			0.36	
v/c Ratio				0.84	0.84			0.81			0.83	
Control Delay				29.0	28.3			33.2			31.8	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				29.0	28.3			33.2			31.8	
LOS				C	C			C			C	
Approach Delay					28.7			33.2			31.8	
Approach LOS					C			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 31.0

Intersection LOS: C

Intersection Capacity Utilization 73.5%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1290	50	0	0	965	0	0	1410	0
Future Volume (vph)	0	0	0	1290	50	0	0	965	0	0	1410	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1691			3539			5085	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1691			3539			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1402	54	0	0	1049	0	0	1533	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	729	727	0	0	1049	0	0	1533	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				46.2	46.2			32.8			32.8	
Effective Green, g (s)				46.2	46.2			32.8			32.8	
Actuated g/C Ratio				0.51	0.51			0.36			0.36	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				862	868			1289			1853	
v/s Ratio Prot				c0.43	0.43			0.30			c0.30	
v/s Ratio Perm												
v/c Ratio				0.85	0.84			0.81			0.83	
Uniform Delay, d1				18.8	18.7			25.8			26.0	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				7.7	7.1			5.7			4.4	
Delay (s)				26.5	25.8			31.6			30.4	
Level of Service				C	C			C			C	
Approach Delay (s)		0.0			26.1			31.6			30.4	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			29.2									
HCM 2000 Level of Service											C	
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			90.0								11.0	
Intersection Capacity Utilization			73.5%								D	
ICU Level of Service												
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱	↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	40	25	375	30	20	35	355	1480	15	45	1325	20
Future Volume (vph)	40	25	375	30	20	35	355	1480	15	45	1325	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.905			0.999			0.998	
Flt Protected		0.970		0.950			0.950			0.950		
Satd. Flow (prot)	0	1807	1583	1770	1686	0	1770	3536	0	1770	3532	0
Flt Permitted		0.791		0.711			0.099			0.950		
Satd. Flow (perm)	0	1473	1583	1324	1686	0	184	3536	0	1770	3532	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			408		38			2			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	27	408	33	22	38	386	1609	16	49	1440	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	70	408	33	60	0	386	1625	0	49	1462	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

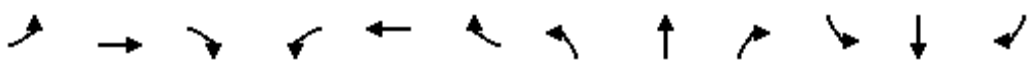
02/28/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effect Green (s)		11.6	11.6	11.6	11.6		61.5	61.5		7.9	47.4	
Actuated g/C Ratio		0.13	0.13	0.13	0.13		0.68	0.68		0.09	0.53	
v/c Ratio		0.37	0.73	0.19	0.24		0.91	0.67		0.31	0.79	
Control Delay		39.1	11.8	34.7	18.1		56.5	13.4		43.1	22.7	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		39.1	11.8	34.7	18.1		56.5	13.4		43.1	22.7	
LOS		D	B	C	B		E	B		D	C	
Approach Delay		15.8			24.0			21.6			23.4	
Approach LOS		B			C			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 21.6

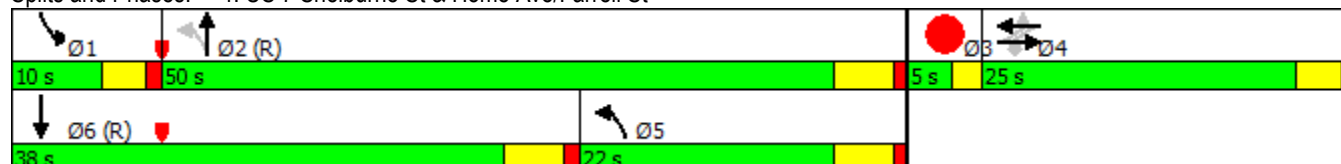
Intersection LOS: C

Intersection Capacity Utilization 78.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lanes, Volumes, Timings
4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	↔	↔		↔	↔		↔	↔	
Traffic Volume (vph)	40	25	375	30	20	35	355	1480	15	45	1325	20
Future Volume (vph)	40	25	375	30	20	35	355	1480	15	45	1325	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.91		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1807	1583	1770	1686		1770	3534		1770	3531	
Flt Permitted		0.79	1.00	0.71	1.00		0.10	1.00		0.95	1.00	
Satd. Flow (perm)		1474	1583	1325	1686		185	3534		1770	3531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	27	408	33	22	38	386	1609	16	49	1440	22
RTOR Reduction (vph)	0	0	355	0	33	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	70	53	33	27	0	386	1624	0	49	1461	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		11.6	11.6	11.6	11.6		59.9	59.9		5.5	45.8	
Effective Green, g (s)		11.6	11.6	11.6	11.6		59.9	59.9		5.5	45.8	
Actuated g/C Ratio		0.13	0.13	0.13	0.13		0.67	0.67		0.06	0.51	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		189	204	170	217		450	2352		108	1796	
v/s Ratio Prot					0.02		c0.18	0.46		0.03	c0.41	
v/s Ratio Perm		c0.05	0.03	0.02			c0.39					
v/c Ratio		0.37	0.26	0.19	0.12		0.86	0.69		0.45	0.81	
Uniform Delay, d1		35.9	35.3	35.0	34.7		23.5	9.3		40.8	18.5	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.2	0.7	0.6	0.3		14.9	1.7		3.0	4.2	
Delay (s)		37.1	36.0	35.6	35.0		38.4	11.0		43.8	22.7	
Level of Service		D	D	D	C		D	B		D	C	
Approach Delay (s)		36.2			35.2			16.3			23.4	
Approach LOS		D			D			B			C	
Intersection Summary												
HCM 2000 Control Delay			21.6				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			78.8%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	297	9	0	2386	2029	0	
Future Volume (vph)	297	9	0	2386	2029	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.850						
Flt Protected	0.953						
Satd. Flow (prot)	1775	1504	0	3539	3539	0	
Flt Permitted	0.953						
Satd. Flow (perm)	1775	1504	0	3539	3539	0	
Right Turn on Red	Yes		Yes				
Satd. Flow (RTOR)	9						
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	323	10	0	2593	2205	0	
Shared Lane Traffic (%)	10%						
Lane Group Flow (vph)	324	9	0	2593	2205	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15	9			
Number of Detectors	1	1	2		2		
Detector Template	Left	Right	Thru		Thru		
Leading Detector (ft)	20	20	100		100		
Trailing Detector (ft)	0	0	0		0		
Detector 1 Position(ft)	0	0	0		0		
Detector 1 Size(ft)	20	20	6		6		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0		0.0		
Detector 1 Queue (s)	0.0	0.0	0.0		0.0		
Detector 1 Delay (s)	0.0	0.0	0.0		0.0		
Detector 2 Position(ft)			94		94		
Detector 2 Size(ft)			6		6		
Detector 2 Type			Cl+Ex		Cl+Ex		
Detector 2 Channel							
Detector 2 Extend (s)			0.0		0.0		
Turn Type	Prot	Prot	NA		NA		
Protected Phases	4	4	2		2	3	
Permitted Phases							
Detector Phase	4	4	2		2		
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0		5.0	1.0	

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0
Total Split (s)	24.0	24.0		82.0	82.0		24.0
Total Split (%)	18.5%	18.5%		63.1%	63.1%		18%
Maximum Green (s)	18.0	18.0		76.0	76.0		22.0
Yellow Time (s)	4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead					Lag
Lead-Lag Optimize?	Yes	Yes					Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		0.2
Recall Mode	None	None		C-Max	C-Max		None
Walk Time (s)	0.0	0.0		0.0	0.0		5.0
Flash Dont Walk (s)	0.0	0.0		17.0	17.0		17.0
Pedestrian Calls (#/hr)	0	0		0	0		0
Act Effect Green (s)	18.0	18.0		100.0	100.0		
Actuated g/C Ratio	0.14	0.14		0.77	0.77		
v/c Ratio	1.32	0.04		0.95	0.81		
Control Delay	213.7	24.8		23.0	12.3		
Queue Delay	0.0	0.0		0.0	46.1		
Total Delay	213.7	24.8		23.0	58.5		
LOS	F	C		C	E		
Approach Delay	208.6			23.0	58.5		
Approach LOS	F			C	E		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 50.3

Intersection LOS: D

Intersection Capacity Utilization 152.0%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

Ø2 (R)	Ø4	Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	297	9	0	2386	2029	0
Future Volume (vph)	297	9	0	2386	2029	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1773	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1773	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	323	10	0	2593	2205	0
RTOR Reduction (vph)	0	8	0	0	0	0
Lane Group Flow (vph)	324	1	0	2593	2205	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	245	208		2722	2722	
v/s Ratio Prot	c0.18	0.00		c0.73	0.62	
v/s Ratio Perm						
v/c Ratio	1.32	0.01		0.95	0.81	
Uniform Delay, d1	56.0	48.3		13.0	9.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	170.7	0.0		9.3	2.7	
Delay (s)	226.7	48.3		22.2	11.9	
Level of Service	F	D		C	B	
Approach Delay (s)	221.9			22.2	11.9	
Approach LOS	F			C	B	

Intersection Summary

HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	152.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1485	140	0	0	890	0	0	2040	5
Future Volume (vph)	0	0	0	1485	140	0	0	890	0	0	2040	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Frnt												
Flt Protected				0.950	0.960							
Satd. Flow (prot)	0	0	0	1681	1699	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.960							
Satd. Flow (perm)	0	0	0	1681	1699	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1614	152	0	0	967	0	0	2217	5
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	0	0	872	894	0	0	967	0	0	2222	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2			2			2	
Detector Template				Left	Thru			Thru			Thru	
Leading Detector (ft)				20	100			100			100	
Trailing Detector (ft)				0	0			0			0	
Detector 1 Position(ft)				0	0			0			0	
Detector 1 Size(ft)				20	6			6			6	
Detector 1 Type				Cl+Ex	Cl+Ex			Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0			0.0			0.0	
Detector 1 Queue (s)				0.0	0.0			0.0			0.0	
Detector 1 Delay (s)				0.0	0.0			0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				49.0	49.0			30.0			30.0	
Actuated g/C Ratio				0.54	0.54			0.33			0.33	
v/c Ratio				0.95	0.97			0.82			1.31	
Control Delay				41.5	44.0			34.5			172.6	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				41.5	44.0			34.5			172.6	
LOS				D	D			C			F	
Approach Delay					42.8			34.5			172.6	
Approach LOS					D			C			F	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 130

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.31

Intersection Signal Delay: 99.4

Intersection LOS: F

Intersection Capacity Utilization 93.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1485	140	0	0	890	0	0	2040	5
Future Volume (vph)	0	0	0	1485	140	0	0	890	0	0	2040	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1699			3539			5084	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1699			3539			5084	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1614	152	0	0	967	0	0	2217	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	872	894	0	0	967	0	0	2222	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				49.0	49.0			30.0			30.0	
Effective Green, g (s)				49.0	49.0			30.0			30.0	
Actuated g/C Ratio				0.54	0.54			0.33			0.33	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				915	925			1179			1694	
v/s Ratio Prot				0.52	c0.53			0.27			c0.44	
v/s Ratio Perm												
v/c Ratio				0.95	0.97			0.82			1.31	
Uniform Delay, d1				19.4	19.7			27.5			30.0	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				19.2	21.6			6.4			144.6	
Delay (s)				38.6	41.3			34.0			174.6	
Level of Service				D	D			C			F	
Approach Delay (s)		0.0			40.0			34.0			174.6	
Approach LOS		A			D			C			F	
Intersection Summary												
HCM 2000 Control Delay			99.2			HCM 2000 Level of Service				F		
HCM 2000 Volume to Capacity ratio			1.10									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			93.5%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱	↰	↱		↰	↰↱		↰	↰↱	
Traffic Volume (vph)	50	10	200	15	5	10	70	1060	10	10	645	50
Future Volume (vph)	50	10	200	15	5	10	70	1060	10	10	645	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.897			0.999			0.989	
Flt Protected		0.960		0.950			0.950			0.950		
Satd. Flow (prot)	0	1788	1583	1770	1671	0	1770	3536	0	1770	3500	0
Flt Permitted		0.751		0.715			0.360			0.950		
Satd. Flow (perm)	0	1399	1583	1332	1671	0	671	3536	0	1770	3500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			217		11			1			10	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	217	16	5	11	76	1152	11	11	701	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	217	16	16	0	76	1163	0	11	755	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)		9.6	9.6	9.6	9.6		69.1	69.1		6.2	53.8	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.77	0.77		0.07	0.60	
v/c Ratio		0.44	0.60	0.11	0.09		0.11	0.43		0.09	0.36	
Control Delay		45.8	12.6	36.2	22.0		4.9	5.2		40.5	11.6	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		45.8	12.6	36.2	22.0		4.9	5.2		40.5	11.6	
LOS		D	B	D	C		A	A		D	B	
Approach Delay		20.2			29.1			5.2			12.0	
Approach LOS		C			C			A			B	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 9.6

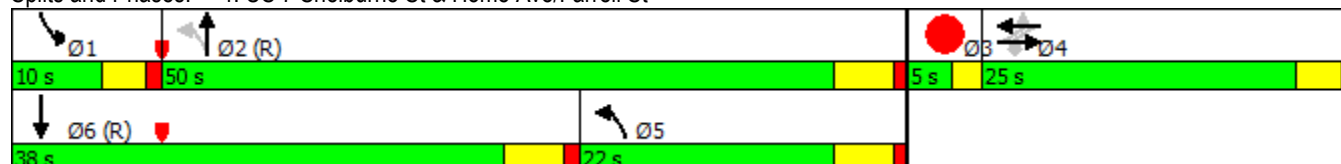
Intersection LOS: A

Intersection Capacity Utilization 53.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lanes, Volumes, Timings
4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	10	200	15	5	10	70	1060	10	10	645	50
Future Volume (vph)	50	10	200	15	5	10	70	1060	10	10	645	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583	1770	1671		1770	3534		1770	3501	
Flt Permitted		0.75	1.00	0.71	1.00		0.36	1.00		0.95	1.00	
Satd. Flow (perm)		1399	1583	1331	1671		671	3534		1770	3501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	217	16	5	11	76	1152	11	11	701	54
RTOR Reduction (vph)	0	0	194	0	10	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	65	23	16	6	0	76	1163	0	11	751	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		9.6	9.6	9.6	9.6		65.9	65.9		1.5	50.6	
Effective Green, g (s)		9.6	9.6	9.6	9.6		65.9	65.9		1.5	50.6	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.73	0.73		0.02	0.56	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		149	168	141	178		684	2587		29	1968	
v/s Ratio Prot					0.00		0.02	c0.33		0.01	c0.21	
v/s Ratio Perm		c0.05	0.01	0.01			0.06					
v/c Ratio		0.44	0.14	0.11	0.03		0.11	0.45		0.38	0.38	
Uniform Delay, d1		37.7	36.4	36.4	36.0		3.8	4.8		43.8	11.0	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.0	0.4	0.4	0.1		0.1	0.6		8.1	0.6	
Delay (s)		39.7	36.8	36.7	36.1		3.9	5.4		51.9	11.5	
Level of Service		D	D	D	D		A	A		D	B	
Approach Delay (s)		37.5			36.4			5.3			12.1	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			11.9				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			53.7%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	100	300	0	1523	1514	0	
Future Volume (vph)	100	300	0	1523	1514	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.923	0.850					
Flt Protected	0.976						
Satd. Flow (prot)	1678	1504	0	3539	3539	0	
Flt Permitted	0.976						
Satd. Flow (perm)	1678	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	34	212					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	109	326	0	1655	1646	0	
Shared Lane Traffic (%)		35%					
Lane Group Flow (vph)	223	212	0	1655	1646	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Number of Detectors	1	1		2	2		
Detector Template	Left	Right		Thru	Thru		
Leading Detector (ft)	20	20		100	100		
Trailing Detector (ft)	0	0		0	0		
Detector 1 Position(ft)	0	0		0	0		
Detector 1 Size(ft)	20	20		6	6		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		
Detector 2 Position(ft)				94	94		
Detector 2 Size(ft)				6	6		
Detector 2 Type				Cl+Ex	Cl+Ex		
Detector 2 Channel							
Detector 2 Extend (s)				0.0	0.0		
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2		3
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0		1.0

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0
Total Split (s)	24.0	24.0		82.0	82.0		24.0
Total Split (%)	18.5%	18.5%		63.1%	63.1%		18%
Maximum Green (s)	18.0	18.0		76.0	76.0		22.0
Yellow Time (s)	4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead					Lag
Lead-Lag Optimize?	Yes	Yes					Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		0.2
Recall Mode	None	None		C-Max	C-Max		None
Walk Time (s)	0.0	0.0		0.0	0.0		5.0
Flash Dont Walk (s)	0.0	0.0		17.0	17.0		17.0
Pedestrian Calls (#/hr)	0	0		0	0		0
Act Effect Green (s)	17.0	17.0		101.0	101.0		
Actuated g/C Ratio	0.13	0.13		0.78	0.78		
v/c Ratio	0.90	0.56		0.60	0.60		
Control Delay	83.2	12.5		7.3	7.3		
Queue Delay	0.0	0.0		0.0	6.2		
Total Delay	83.2	12.5		7.3	13.5		
LOS	F	B		A	B		
Approach Delay	48.8			7.3	13.5		
Approach LOS	D			A	B		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 14.8

Intersection LOS: B

Intersection Capacity Utilization 64.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

 Ø2 (R)	 Ø4	 Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	100	300	0	1523	1514	0
Future Volume (vph)	100	300	0	1523	1514	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	0.92	0.85		1.00	1.00	
Flt Protected	0.98	1.00		1.00	1.00	
Satd. Flow (prot)	1679	1504		3539	3539	
Flt Permitted	0.98	1.00		1.00	1.00	
Satd. Flow (perm)	1679	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	326	0	1655	1646	0
RTOR Reduction (vph)	30	184	0	0	0	0
Lane Group Flow (vph)	193	28	0	1655	1646	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	17.0	17.0		101.0	101.0	
Effective Green, g (s)	17.0	17.0		101.0	101.0	
Actuated g/C Ratio	0.13	0.13		0.78	0.78	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	219	196		2749	2749	
v/s Ratio Prot	c0.12	0.02		c0.47	0.47	
v/s Ratio Perm						
v/c Ratio	0.88	0.14		0.60	0.60	
Uniform Delay, d1	55.5	50.0		6.1	6.0	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	30.8	0.1		1.0	1.0	
Delay (s)	86.3	50.2		7.1	7.0	
Level of Service	F	D		A	A	
Approach Delay (s)	68.7			7.1	7.0	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	80	105	40	5	5	135	515	40	5	625	40
Future Volume (vph)	50	80	105	40	5	5	135	515	40	5	625	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	125		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.987			0.989			0.991	
Flt Protected		0.981			0.961		0.950			0.950		
Satd. Flow (prot)	0	1827	1583	0	1767	0	1770	1842	0	1770	1846	0
Flt Permitted		0.874			0.516		0.950			0.950		
Satd. Flow (perm)	0	1628	1583	0	949	0	1770	1842	0	1770	1846	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			109		4			4			4	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		335			128			357			349	
Travel Time (s)		7.6			2.9			8.1			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	87	114	43	5	5	147	560	43	5	679	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	141	114	0	53	0	147	603	0	5	722	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9
Permitted Phases	

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	15.0		5.0	15.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		11.0	20.0		11.0	20.5	
Total Split (s)	18.0	18.0	18.0	18.0	18.0		17.0	60.0		17.0	60.0	
Total Split (%)	15.0%	15.0%	15.0%	15.0%	15.0%		14.2%	50.0%		14.2%	50.0%	
Maximum Green (s)	13.0	13.0	13.0	13.0	13.0		12.0	55.0		12.0	55.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Max		None	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		12.4	12.4		12.4		11.7	70.3		5.9	55.6	
Actuated g/C Ratio		0.13	0.13		0.13		0.12	0.71		0.06	0.56	
v/c Ratio		0.69	0.39		0.43		0.71	0.46		0.05	0.70	
Control Delay		61.7	14.0		52.2		62.8	10.6		49.4	22.2	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		61.7	14.0		52.2		62.8	10.6		49.4	22.2	
LOS		E	B		D		E	B		D	C	
Approach Delay		40.4			52.2			20.9			22.4	
Approach LOS		D			D			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 98.9

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 25.2

Intersection LOS: C

Intersection Capacity Utilization 64.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 7: Champlain Pkwy & Home Ave

 Ø1	 Ø2	 Ø4	 Ø9
17 s	60 s	18 s	25 s
 Ø5	 Ø6	 Ø8	
17 s	60 s	18 s	

Lane Group	Ø9
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	21%
Maximum Green (s)	22.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

7: Champlain Pkwy & Home Ave

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↱		↰	↱	
Traffic Volume (vph)	50	80	105	40	5	5	135	515	40	5	625	40
Future Volume (vph)	50	80	105	40	5	5	135	515	40	5	625	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.99		1.00	0.99		1.00	0.99	
Flt Protected		0.98	1.00		0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1828	1583		1767		1770	1843		1770	1846	
Flt Permitted		0.87	1.00		0.52		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1629	1583		949		1770	1843		1770	1846	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	87	114	43	5	5	147	560	43	5	679	43
RTOR Reduction (vph)	0	0	96	0	4	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	141	18	0	49	0	147	602	0	5	720	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		12.4	12.4		12.4		11.7	70.3		1.1	59.7	
Effective Green, g (s)		12.4	12.4		12.4		11.7	70.3		1.1	59.7	
Actuated g/C Ratio		0.12	0.12		0.12		0.11	0.67		0.01	0.57	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		191	186		111		196	1229		18	1045	
v/s Ratio Prot							c0.08	0.33		0.00	c0.39	
v/s Ratio Perm		c0.09	0.01		0.05							
v/c Ratio		0.74	0.10		0.45		0.75	0.49		0.28	0.69	
Uniform Delay, d1		44.9	41.5		43.3		45.4	8.7		51.8	16.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		13.8	0.2		2.8		14.8	1.4		8.3	3.7	
Delay (s)		58.8	41.7		46.1		60.3	10.1		60.0	20.0	
Level of Service		E	D		D		E	B		E	B	
Approach Delay (s)		51.2			46.1			19.9			20.2	
Approach LOS		D			D			B			C	
Intersection Summary												
HCM 2000 Control Delay			25.3				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			105.4				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			64.7%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1310	50	0	0	715	0	0	930	0
Future Volume (vph)	0	0	0	1310	50	0	0	715	0	0	930	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frnt												
Flt Protected				0.950	0.956							
Satd. Flow (prot)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.956							
Satd. Flow (perm)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1424	54	0	0	777	0	0	1011	0
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	0	0	740	738	0	0	777	0	0	1011	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2			2			2	
Detector Template				Left	Thru			Thru			Thru	
Leading Detector (ft)				20	100			100			100	
Trailing Detector (ft)				0	0			0			0	
Detector 1 Position(ft)				0	0			0			0	
Detector 1 Size(ft)				20	6			6			6	
Detector 1 Type				Cl+Ex	Cl+Ex			Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0			0.0			0.0	
Detector 1 Queue (s)				0.0	0.0			0.0			0.0	
Detector 1 Delay (s)				0.0	0.0			0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				46.5	46.5			32.5			32.5	
Actuated g/C Ratio				0.52	0.52			0.36			0.36	
v/c Ratio				0.85	0.85			0.61			0.55	
Control Delay				29.7	28.9			26.7			24.9	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				29.7	28.9			26.7			24.9	
LOS				C	C			C			C	
Approach Delay					29.3			26.7			24.9	
Approach LOS					C			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 27.3

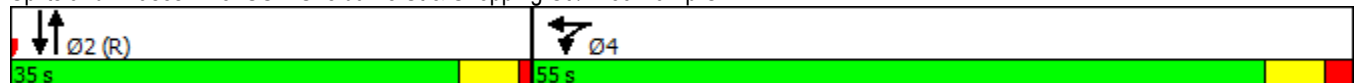
Intersection LOS: C

Intersection Capacity Utilization 71.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1310	50	0	0	715	0	0	930	0
Future Volume (vph)	0	0	0	1310	50	0	0	715	0	0	930	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1691			3539			5085	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1691			3539			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1424	54	0	0	777	0	0	1011	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	740	738	0	0	777	0	0	1011	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				46.5	46.5			32.5			32.5	
Effective Green, g (s)				46.5	46.5			32.5			32.5	
Actuated g/C Ratio				0.52	0.52			0.36			0.36	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				868	873			1277			1836	
v/s Ratio Prot				c0.44	0.44			c0.22			0.20	
v/s Ratio Perm												
v/c Ratio				0.85	0.85			0.61			0.55	
Uniform Delay, d1				18.8	18.7			23.5			22.9	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				8.1	7.6			2.2			1.2	
Delay (s)				26.9	26.2			25.7			24.1	
Level of Service				C	C			C			C	
Approach Delay (s)		0.0			26.6			25.7			24.1	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			25.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			71.8%			ICU Level of Service				C		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	25	140	30	20	35	160	1285	15	40	910	15
Future Volume (vph)	35	25	140	30	20	35	160	1285	15	40	910	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.905			0.998			0.998	
Flt Protected		0.972		0.950			0.950			0.950		
Satd. Flow (prot)	0	1811	1583	1770	1686	0	1770	3532	0	1770	3532	0
Flt Permitted		0.788		0.715			0.264			0.950		
Satd. Flow (perm)	0	1468	1583	1332	1686	0	492	3532	0	1770	3532	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			158		38			2			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	27	152	33	22	38	174	1397	16	43	989	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	152	33	60	0	174	1413	0	43	1005	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effect Green (s)		9.4	9.4	9.4	9.4		63.9	63.9		7.7	49.6	
Actuated g/C Ratio		0.10	0.10	0.10	0.10		0.71	0.71		0.09	0.55	
v/c Ratio		0.42	0.50	0.24	0.29		0.29	0.56		0.28	0.52	
Control Delay		45.4	11.6	39.8	21.3		11.3	9.1		42.7	14.3	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		45.4	11.6	39.8	21.3		11.3	9.1		42.7	14.3	
LOS		D	B	D	C		B	A		D	B	
Approach Delay		21.7			27.9			9.3			15.5	
Approach LOS		C			C			A			B	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 13.0

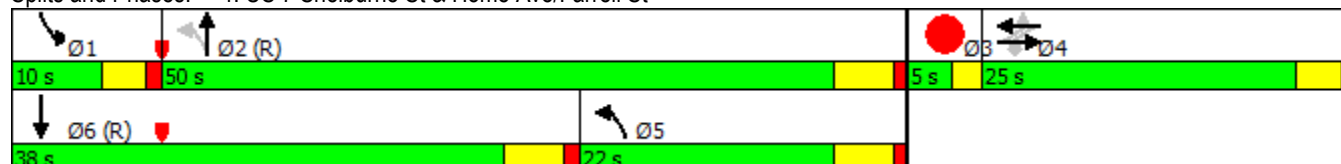
Intersection LOS: B

Intersection Capacity Utilization 60.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lanes, Volumes, Timings
4: US 7 Shelburne St & Home Ave/Farrell St

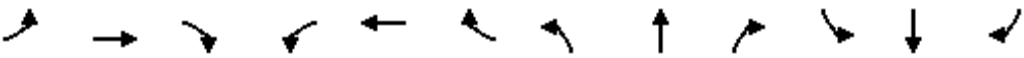
04/23/2020

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↩	↩	↩	↩		↩	↩		↩	↩	
Traffic Volume (vph)	35	25	140	30	20	35	160	1285	15	40	910	15
Future Volume (vph)	35	25	140	30	20	35	160	1285	15	40	910	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.91		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1810	1583	1770	1686		1770	3533		1770	3531	
Flt Permitted		0.79	1.00	0.71	1.00		0.26	1.00		0.95	1.00	
Satd. Flow (perm)		1467	1583	1331	1686		493	3533		1770	3531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	27	152	33	22	38	174	1397	16	43	989	16
RTOR Reduction (vph)	0	0	136	0	34	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	65	16	33	26	0	174	1412	0	43	1004	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		9.4	9.4	9.4	9.4		62.3	62.3		5.3	48.0	
Effective Green, g (s)		9.4	9.4	9.4	9.4		62.3	62.3		5.3	48.0	
Actuated g/C Ratio		0.10	0.10	0.10	0.10		0.69	0.69		0.06	0.53	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		153	165	139	176		605	2445		104	1883	
v/s Ratio Prot					0.02		0.06	c0.40		0.02	c0.28	
v/s Ratio Perm		c0.04	0.01	0.02			0.14					
v/c Ratio		0.42	0.10	0.24	0.15		0.29	0.58		0.41	0.53	
Uniform Delay, d1		37.8	36.5	37.0	36.7		7.9	7.1		40.9	13.7	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.9	0.3	0.9	0.4		0.3	1.0		2.7	1.1	
Delay (s)		39.7	36.7	37.9	37.0		8.1	8.1		43.5	14.8	
Level of Service		D	D	D	D		A	A		D	B	
Approach Delay (s)		37.6			37.3			8.1			16.0	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			14.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			60.1%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	130	370	0	2055	1747	0	
Future Volume (vph)	130	370	0	2055	1747	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.926	0.850					
Flt Protected	0.975						
Satd. Flow (prot)	1682	1504	0	3539	3539	0	
Flt Permitted	0.975						
Satd. Flow (perm)	1682	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	31	255					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	141	402	0	2234	1899	0	
Shared Lane Traffic (%)		34%					
Lane Group Flow (vph)	278	265	0	2234	1899	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Number of Detectors	1	1		2	2		
Detector Template	Left	Right		Thru	Thru		
Leading Detector (ft)	20	20		100	100		
Trailing Detector (ft)	0	0		0	0		
Detector 1 Position(ft)	0	0		0	0		
Detector 1 Size(ft)	20	20		6	6		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		
Detector 2 Position(ft)				94	94		
Detector 2 Size(ft)				6	6		
Detector 2 Type				Cl+Ex	Cl+Ex		
Detector 2 Channel							
Detector 2 Extend (s)				0.0	0.0		
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2	3	
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0	1.0	

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0
Total Split (s)	24.0	24.0		82.0	82.0		24.0
Total Split (%)	18.5%	18.5%		63.1%	63.1%		18%
Maximum Green (s)	18.0	18.0		76.0	76.0		22.0
Yellow Time (s)	4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead					Lag
Lead-Lag Optimize?	Yes	Yes					Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		0.2
Recall Mode	None	None		C-Max	C-Max		None
Walk Time (s)	0.0	0.0		0.0	0.0		5.0
Flash Dont Walk (s)	0.0	0.0		17.0	17.0		17.0
Pedestrian Calls (#/hr)	0	0		0	0		0
Act Effect Green (s)	18.0	18.0		100.0	100.0		
Actuated g/C Ratio	0.14	0.14		0.77	0.77		
v/c Ratio	1.07	0.62		0.82	0.70		
Control Delay	123.2	13.9		12.7	9.2		
Queue Delay	0.0	0.0		0.0	23.6		
Total Delay	123.2	13.9		12.7	32.7		
LOS	F	B		B	C		
Approach Delay	69.9			12.7	32.7		
Approach LOS	E			B	C		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 27.5

Intersection LOS: C

Intersection Capacity Utilization 81.6%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

Ø2 (R)	Ø4	Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	130	370	0	2055	1747	0
Future Volume (vph)	130	370	0	2055	1747	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	0.93	0.85		1.00	1.00	
Flt Protected	0.98	1.00		1.00	1.00	
Satd. Flow (prot)	1682	1504		3539	3539	
Flt Permitted	0.98	1.00		1.00	1.00	
Satd. Flow (perm)	1682	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	402	0	2234	1899	0
RTOR Reduction (vph)	27	220	0	0	0	0
Lane Group Flow (vph)	251	45	0	2234	1899	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	232	208		2722	2722	
v/s Ratio Prot	c0.15	0.03		c0.63	0.54	
v/s Ratio Perm						
v/c Ratio	1.08	0.22		0.82	0.70	
Uniform Delay, d1	56.0	49.7		9.4	7.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	83.0	0.2		2.9	1.5	
Delay (s)	139.0	49.9		12.3	9.0	
Level of Service	F	D		B	A	
Approach Delay (s)	95.5			12.3	9.0	
Approach LOS	F			B	A	

Intersection Summary

HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	25	105	90	50	5	85	400	75	5	975	45
Future Volume (vph)	60	25	105	90	50	5	85	400	75	5	975	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	125		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.996			0.976			0.993	
Flt Protected		0.966			0.970		0.950			0.950		
Satd. Flow (prot)	0	1799	1583	0	1800	0	1770	1818	0	1770	1850	0
Flt Permitted		0.700			0.700		0.950			0.950		
Satd. Flow (perm)	0	1304	1583	0	1299	0	1770	1818	0	1770	1850	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			114		1			10			3	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		335			128			357			349	
Travel Time (s)		7.6			2.9			8.1			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	27	114	98	54	5	92	435	82	5	1060	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	92	114	0	157	0	92	517	0	5	1109	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9
Permitted Phases	

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	15.0		5.0	15.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		11.0	20.0		11.0	20.5	
Total Split (s)	23.0	23.0	23.0	23.0	23.0		13.0	89.0		13.0	89.0	
Total Split (%)	15.3%	15.3%	15.3%	15.3%	15.3%		8.7%	59.3%		8.7%	59.3%	
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0		8.0	84.0		9.0	84.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		1.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		4.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Max		None	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		18.1	18.1		18.1		8.0	95.6		6.0	84.4	
Actuated g/C Ratio		0.14	0.14		0.14		0.06	0.74		0.05	0.65	
v/c Ratio		0.51	0.36		0.87		0.84	0.39		0.06	0.92	
Control Delay		64.6	12.8		94.5		111.9	9.3		64.8	34.4	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		64.6	12.8		94.5		111.9	9.3		64.8	34.4	
LOS		E	B		F		F	A		E	C	
Approach Delay		36.0			94.5			24.8			34.6	
Approach LOS		D			F			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 150

Actuated Cycle Length: 130

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 36.4

Intersection LOS: D

Intersection Capacity Utilization 85.8%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 7: Champlain Pkwy & Home Ave

 Ø1	 Ø2	 Ø4	 Ø9
13 s	89 s	23 s	25 s
 Ø5	 Ø6	 Ø8	
13 s	89 s	23 s	

Lane Group	Ø9
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	17%
Maximum Green (s)	22.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

7: Champlain Pkwy & Home Ave

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↱		↰	↱	
Traffic Volume (vph)	60	25	105	90	50	5	85	400	75	5	975	45
Future Volume (vph)	60	25	105	90	50	5	85	400	75	5	975	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00		1.00	0.98		1.00	0.99	
Flt Protected		0.97	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1799	1583		1799		1770	1818		1770	1850	
Flt Permitted		0.70	1.00		0.70		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1304	1583		1299		1770	1818		1770	1850	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	27	114	98	54	5	92	435	82	5	1060	49
RTOR Reduction (vph)	0	0	99	0	1	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	92	15	0	156	0	92	514	0	5	1108	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		18.1	18.1		18.1		8.0	95.6		1.2	87.8	
Effective Green, g (s)		18.1	18.1		18.1		8.0	95.6		1.2	87.8	
Actuated g/C Ratio		0.13	0.13		0.13		0.06	0.70		0.01	0.65	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		173	211		173		104	1280		15	1196	
v/s Ratio Prot							c0.05	0.28		0.00	c0.60	
v/s Ratio Perm		0.07	0.01		c0.12							
v/c Ratio		0.53	0.07		0.90		0.88	0.40		0.33	0.93	
Uniform Delay, d1		54.8	51.5		57.9		63.4	8.3		66.9	21.1	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		3.1	0.1		41.6		53.0	0.9		12.7	13.5	
Delay (s)		58.0	51.6		99.5		116.4	9.2		79.5	34.6	
Level of Service		E	D		F		F	A		E	C	
Approach Delay (s)		54.4			99.5			25.4			34.8	
Approach LOS		D			F			C			C	
Intersection Summary												
HCM 2000 Control Delay			38.8				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			135.7				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			85.8%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1320	135	0	0	810	0	0	1380	5
Future Volume (vph)	0	0	0	1320	135	0	0	810	0	0	1380	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Frnt												
Flt Protected				0.950	0.961							
Satd. Flow (prot)	0	0	0	1681	1701	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.961							
Satd. Flow (perm)	0	0	0	1681	1701	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											1	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1435	147	0	0	880	0	0	1500	5
Shared Lane Traffic (%)				45%								
Lane Group Flow (vph)	0	0	0	789	793	0	0	880	0	0	1505	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2			2			2	
Detector Template				Left	Thru			Thru			Thru	
Leading Detector (ft)				20	100			100			100	
Trailing Detector (ft)				0	0			0			0	
Detector 1 Position(ft)				0	0			0			0	
Detector 1 Size(ft)				20	6			6			6	
Detector 1 Type				Cl+Ex	Cl+Ex			Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0			0.0			0.0	
Detector 1 Queue (s)				0.0	0.0			0.0			0.0	
Detector 1 Delay (s)				0.0	0.0			0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				47.6	47.6			31.4			31.4	
Actuated g/C Ratio				0.53	0.53			0.35			0.35	
v/c Ratio				0.89	0.88			0.71			0.85	
Control Delay				32.5	31.7			29.8			33.3	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				32.5	31.7			29.8			33.3	
LOS				C	C			C			C	
Approach Delay					32.1			29.8			33.3	
Approach LOS					C			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 32.0

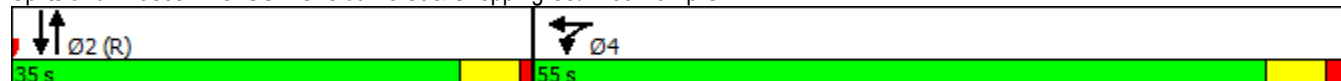
Intersection LOS: C

Intersection Capacity Utilization 76.1%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1320	135	0	0	810	0	0	1380	5
Future Volume (vph)	0	0	0	1320	135	0	0	810	0	0	1380	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1700			3539			5083	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1700			3539			5083	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1435	147	0	0	880	0	0	1500	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	0	0	789	793	0	0	880	0	0	1504	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				47.6	47.6			31.4			31.4	
Effective Green, g (s)				47.6	47.6			31.4			31.4	
Actuated g/C Ratio				0.53	0.53			0.35			0.35	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				889	899			1234			1773	
v/s Ratio Prot				c0.47	0.47			0.25			c0.30	
v/s Ratio Perm												
v/c Ratio				0.89	0.88			0.71			0.85	
Uniform Delay, d1				18.8	18.7			25.4			27.1	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				10.7	10.2			3.5			5.3	
Delay (s)				29.5	28.9			28.9			32.4	
Level of Service				C	C			C			C	
Approach Delay (s)		0.0			29.2			28.9			32.4	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			30.3			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			76.1%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	10	220	15	5	10	75	1050	10	10	735	50
Future Volume (vph)	50	10	220	15	5	10	75	1050	10	10	735	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.897			0.999			0.991	
Flt Protected		0.960		0.950			0.950			0.950		
Satd. Flow (prot)	0	1788	1583	1770	1671	0	1770	3536	0	1770	3507	0
Flt Permitted		0.751		0.715			0.314			0.950		
Satd. Flow (perm)	0	1399	1583	1332	1671	0	585	3536	0	1770	3507	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			239		11			1			9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	239	16	5	11	82	1141	11	11	799	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	239	16	16	0	82	1152	0	11	853	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effect Green (s)		9.7	9.7	9.7	9.7		69.1	69.1		6.2	53.7	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.77	0.77		0.07	0.60	
v/c Ratio		0.43	0.62	0.11	0.08		0.13	0.42		0.09	0.41	
Control Delay		45.5	12.7	36.0	21.8		5.3	5.2		40.5	12.2	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		45.5	12.7	36.0	21.8		5.3	5.2		40.5	12.2	
LOS		D	B	D	C		A	A		D	B	
Approach Delay		19.7			28.9			5.2			12.5	
Approach LOS		B			C			A			B	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 9.9

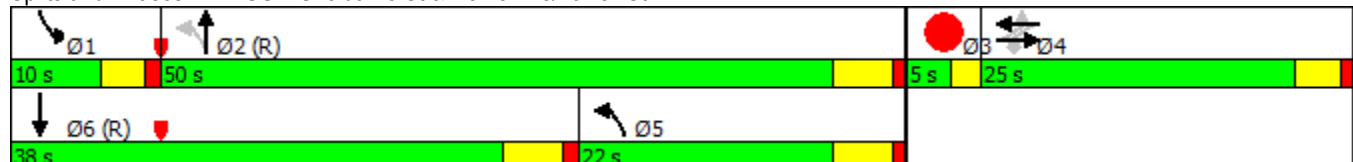
Intersection LOS: A

Intersection Capacity Utilization 53.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lanes, Volumes, Timings
4: US 7 Shelburne St & Home Ave/Farrell St

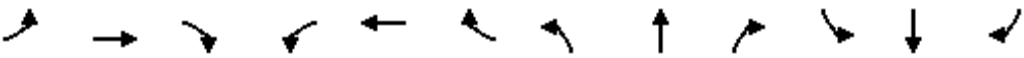
04/23/2020

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱	↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	50	10	220	15	5	10	75	1050	10	10	735	50
Future Volume (vph)	50	10	220	15	5	10	75	1050	10	10	735	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583	1770	1671		1770	3534		1770	3506	
Flt Permitted		0.75	1.00	0.71	1.00		0.31	1.00		0.95	1.00	
Satd. Flow (perm)		1399	1583	1331	1671		585	3534		1770	3506	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	239	16	5	11	82	1141	11	11	799	54
RTOR Reduction (vph)	0	0	213	0	10	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	65	26	16	6	0	82	1152	0	11	849	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		9.7	9.7	9.7	9.7		65.8	65.8		1.5	50.4	
Effective Green, g (s)		9.7	9.7	9.7	9.7		65.8	65.8		1.5	50.4	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.73	0.73		0.02	0.56	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		150	170	143	180		637	2583		29	1963	
v/s Ratio Prot					0.00		0.02	c0.33		0.01	c0.24	
v/s Ratio Perm		c0.05	0.02	0.01			0.07					
v/c Ratio		0.43	0.15	0.11	0.03		0.13	0.45		0.38	0.43	
Uniform Delay, d1		37.6	36.4	36.3	36.0		4.6	4.8		43.8	11.5	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.0	0.4	0.3	0.1		0.1	0.6		8.1	0.7	
Delay (s)		39.6	36.8	36.6	36.0		4.7	5.4		51.9	12.2	
Level of Service		D	D	D	D		A	A		D	B	
Approach Delay (s)		37.4			36.3			5.3			12.7	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			12.4				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			53.5%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	105	310	0	1596	1586	0	
Future Volume (vph)	105	310	0	1596	1586	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.924	0.850					
Flt Protected	0.976						
Satd. Flow (prot)	1680	1504	0	3539	3539	0	
Flt Permitted	0.976						
Satd. Flow (perm)	1680	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	33	219					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	114	337	0	1735	1724	0	
Shared Lane Traffic (%)		35%					
Lane Group Flow (vph)	232	219	0	1735	1724	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Number of Detectors	1	1		2	2		
Detector Template	Left	Right		Thru	Thru		
Leading Detector (ft)	20	20		100	100		
Trailing Detector (ft)	0	0		0	0		
Detector 1 Position(ft)	0	0		0	0		
Detector 1 Size(ft)	20	20		6	6		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		
Detector 2 Position(ft)				94	94		
Detector 2 Size(ft)				6	6		
Detector 2 Type				Cl+Ex	Cl+Ex		
Detector 2 Channel							
Detector 2 Extend (s)				0.0	0.0		
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2	3	
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0	1.0	

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0
Total Split (s)	24.0	24.0		82.0	82.0		24.0
Total Split (%)	18.5%	18.5%		63.1%	63.1%		18%
Maximum Green (s)	18.0	18.0		76.0	76.0		22.0
Yellow Time (s)	4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead					Lag
Lead-Lag Optimize?	Yes	Yes					Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		0.2
Recall Mode	None	None		C-Max	C-Max		None
Walk Time (s)	0.0	0.0		0.0	0.0		5.0
Flash Dont Walk (s)	0.0	0.0		17.0	17.0		17.0
Pedestrian Calls (#/hr)	0	0		0	0		0
Act Effect Green (s)	17.2	17.2		100.8	100.8		
Actuated g/C Ratio	0.13	0.13		0.78	0.78		
v/c Ratio	0.92	0.56		0.63	0.63		
Control Delay	87.7	12.5		7.8	7.8		
Queue Delay	0.0	0.0		0.0	9.3		
Total Delay	87.7	12.5		7.8	17.1		
LOS	F	B		A	B		
Approach Delay	51.1			7.8	17.1		
Approach LOS	D			A	B		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 16.9

Intersection LOS: B

Intersection Capacity Utilization 66.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

Ø2 (R)	Ø4	Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	105	310	0	1596	1586	0
Future Volume (vph)	105	310	0	1596	1586	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	0.92	0.85		1.00	1.00	
Flt Protected	0.98	1.00		1.00	1.00	
Satd. Flow (prot)	1679	1504		3539	3539	
Flt Permitted	0.98	1.00		1.00	1.00	
Satd. Flow (perm)	1679	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	337	0	1735	1724	0
RTOR Reduction (vph)	29	190	0	0	0	0
Lane Group Flow (vph)	203	29	0	1735	1724	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	17.2	17.2		100.8	100.8	
Effective Green, g (s)	17.2	17.2		100.8	100.8	
Actuated g/C Ratio	0.13	0.13		0.78	0.78	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	222	198		2744	2744	
v/s Ratio Prot	c0.12	0.02		c0.49	0.49	
v/s Ratio Perm						
v/c Ratio	0.92	0.15		0.63	0.63	
Uniform Delay, d1	55.7	49.9		6.4	6.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	37.3	0.1		1.1	1.1	
Delay (s)	93.0	50.0		7.6	7.5	
Level of Service	F	D		A	A	
Approach Delay (s)	72.1			7.6	7.5	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	85	115	50	5	5	160	530	40	5	655	50
Future Volume (vph)	60	85	115	50	5	5	160	530	40	5	655	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	125		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.989			0.990			0.989	
Flt Protected		0.980			0.960		0.950			0.950		
Satd. Flow (prot)	0	1825	1583	0	1769	0	1770	1844	0	1770	1842	0
Flt Permitted		0.862			0.456		0.950			0.950		
Satd. Flow (perm)	0	1606	1583	0	840	0	1770	1844	0	1770	1842	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			107		3			4			4	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		335			128			357			349	
Travel Time (s)		7.6			2.9			8.1			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	92	125	54	5	5	174	576	43	5	712	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	157	125	0	64	0	174	619	0	5	766	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9
Permitted Phases	

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	15.0		5.0	15.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		11.0	20.0		11.0	20.5	
Total Split (s)	18.0	18.0	18.0	18.0	18.0		18.0	59.0		18.0	59.0	
Total Split (%)	15.0%	15.0%	15.0%	15.0%	15.0%		15.0%	49.2%		15.0%	49.2%	
Maximum Green (s)	13.0	13.0	13.0	13.0	13.0		13.0	54.0		13.0	54.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Max		None	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		12.9	12.9		12.9		13.0	70.6		5.9	54.5	
Actuated g/C Ratio		0.13	0.13		0.13		0.13	0.71		0.06	0.55	
v/c Ratio		0.75	0.42		0.58		0.76	0.47		0.05	0.76	
Control Delay		66.6	16.6		63.2		64.6	10.9		49.4	25.4	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		66.6	16.6		63.2		64.6	10.9		49.4	25.4	
LOS		E	B		E		E	B		D	C	
Approach Delay		44.5			63.2			22.7			25.6	
Approach LOS		D			E			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 99.7

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 28.4

Intersection LOS: C

Intersection Capacity Utilization 68.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 7: Champlain Pkwy & Home Ave

			
18 s	59 s	18 s	25 s
			
18 s	59 s	18 s	

Lane Group	Ø9
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	21%
Maximum Green (s)	22.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

7: Champlain Pkwy & Home Ave

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	85	115	50	5	5	160	530	40	5	655	50
Future Volume (vph)	60	85	115	50	5	5	160	530	40	5	655	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.99		1.00	0.99		1.00	0.99	
Flt Protected		0.98	1.00		0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1825	1583		1768		1770	1843		1770	1843	
Flt Permitted		0.86	1.00		0.46		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1605	1583		841		1770	1843		1770	1843	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	92	125	54	5	5	174	576	43	5	712	54
RTOR Reduction (vph)	0	0	94	0	3	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	157	31	0	61	0	174	618	0	5	764	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		12.9	12.9		12.9		13.0	70.5		1.1	58.6	
Effective Green, g (s)		12.9	12.9		12.9		13.0	70.5		1.1	58.6	
Actuated g/C Ratio		0.12	0.12		0.12		0.12	0.66		0.01	0.55	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		194	192		102		216	1223		18	1016	
v/s Ratio Prot							c0.10	0.34		0.00	c0.41	
v/s Ratio Perm		c0.10	0.02		0.07							
v/c Ratio		0.81	0.16		0.60		0.81	0.51		0.28	0.75	
Uniform Delay, d1		45.5	41.8		44.2		45.4	9.0		52.2	18.2	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		21.4	0.4		9.6		19.2	1.5		8.3	5.1	
Delay (s)		66.9	42.2		53.8		64.6	10.5		60.4	23.4	
Level of Service		E	D		D		E	B		E	C	
Approach Delay (s)		55.9			53.8			22.4			23.6	
Approach LOS		E			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			28.9				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			106.2				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			68.9%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1285	50	0	0	780	0	0	1045	0
Future Volume (vph)	0	0	0	1285	50	0	0	780	0	0	1045	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frnt												
Flt Protected				0.950	0.956							
Satd. Flow (prot)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.956							
Satd. Flow (perm)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1397	54	0	0	848	0	0	1136	0
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	0	0	726	725	0	0	848	0	0	1136	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2			2			2	
Detector Template				Left	Thru			Thru			Thru	
Leading Detector (ft)				20	100			100			100	
Trailing Detector (ft)				0	0			0			0	
Detector 1 Position(ft)				0	0			0			0	
Detector 1 Size(ft)				20	6			6			6	
Detector 1 Type				Cl+Ex	Cl+Ex			Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0			0.0			0.0	
Detector 1 Queue (s)				0.0	0.0			0.0			0.0	
Detector 1 Delay (s)				0.0	0.0			0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				46.2	46.2			32.8			32.8	
Actuated g/C Ratio				0.51	0.51			0.36			0.36	
v/c Ratio				0.84	0.84			0.66			0.61	
Control Delay				28.8	28.2			27.7			25.8	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				28.8	28.2			27.7			25.8	
LOS				C	C			C			C	
Approach Delay					28.5			27.7			25.8	
Approach LOS					C			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 27.4

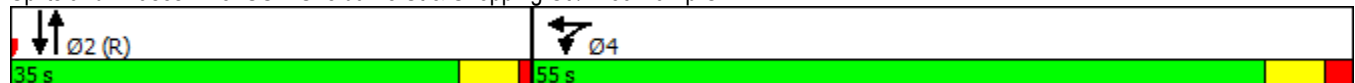
Intersection LOS: C

Intersection Capacity Utilization 71.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1285	50	0	0	780	0	0	1045	0
Future Volume (vph)	0	0	0	1285	50	0	0	780	0	0	1045	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1691			3539			5085	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1691			3539			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1397	54	0	0	848	0	0	1136	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	726	725	0	0	848	0	0	1136	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				46.2	46.2			32.8			32.8	
Effective Green, g (s)				46.2	46.2			32.8			32.8	
Actuated g/C Ratio				0.51	0.51			0.36			0.36	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				862	868			1289			1853	
v/s Ratio Prot				c0.43	0.43			c0.24			0.22	
v/s Ratio Perm												
v/c Ratio				0.84	0.84			0.66			0.61	
Uniform Delay, d1				18.8	18.7			23.9			23.4	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				7.5	7.0			2.6			1.5	
Delay (s)				26.3	25.7			26.5			24.9	
Level of Service				C	C			C			C	
Approach Delay (s)		0.0			26.0			26.5			24.9	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			25.8			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			71.1%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	25	375	30	20	35	355	1480	15	45	1325	20
Future Volume (vph)	40	25	375	30	20	35	355	1480	15	45	1325	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.905			0.999			0.998	
Flt Protected		0.970		0.950			0.950			0.950		
Satd. Flow (prot)	0	1807	1583	1770	1686	0	1770	3536	0	1770	3532	0
Flt Permitted		0.791		0.711			0.099			0.950		
Satd. Flow (perm)	0	1473	1583	1324	1686	0	184	3536	0	1770	3532	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			408		38			2			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	27	408	33	22	38	386	1609	16	49	1440	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	70	408	33	60	0	386	1625	0	49	1462	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effect Green (s)		11.6	11.6	11.6	11.6		61.5	61.5		7.9	47.4	
Actuated g/C Ratio		0.13	0.13	0.13	0.13		0.68	0.68		0.09	0.53	
v/c Ratio		0.37	0.73	0.19	0.24		0.91	0.67		0.31	0.79	
Control Delay		39.1	11.8	34.7	18.1		56.5	13.4		43.1	22.7	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		39.1	11.8	34.7	18.1		56.5	13.4		43.1	22.7	
LOS		D	B	C	B		E	B		D	C	
Approach Delay		15.8			24.0			21.6			23.4	
Approach LOS		B			C			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 21.6

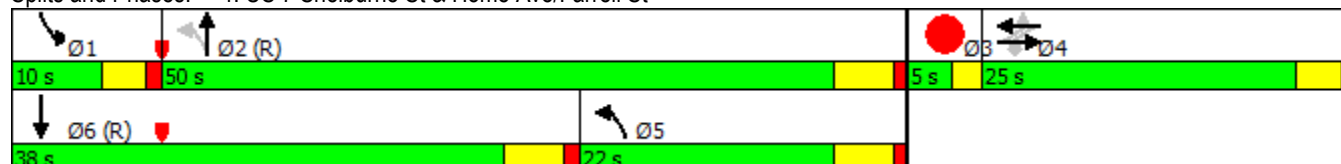
Intersection LOS: C

Intersection Capacity Utilization 78.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lanes, Volumes, Timings
4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱	↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	40	25	375	30	20	35	355	1480	15	45	1325	20
Future Volume (vph)	40	25	375	30	20	35	355	1480	15	45	1325	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.91		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1807	1583	1770	1686		1770	3534		1770	3531	
Flt Permitted		0.79	1.00	0.71	1.00		0.10	1.00		0.95	1.00	
Satd. Flow (perm)		1474	1583	1325	1686		185	3534		1770	3531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	27	408	33	22	38	386	1609	16	49	1440	22
RTOR Reduction (vph)	0	0	355	0	33	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	70	53	33	27	0	386	1624	0	49	1461	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		11.6	11.6	11.6	11.6		59.9	59.9		5.5	45.8	
Effective Green, g (s)		11.6	11.6	11.6	11.6		59.9	59.9		5.5	45.8	
Actuated g/C Ratio		0.13	0.13	0.13	0.13		0.67	0.67		0.06	0.51	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		189	204	170	217		450	2352		108	1796	
v/s Ratio Prot					0.02		c0.18	0.46		0.03	c0.41	
v/s Ratio Perm		c0.05	0.03	0.02			c0.39					
v/c Ratio		0.37	0.26	0.19	0.12		0.86	0.69		0.45	0.81	
Uniform Delay, d1		35.9	35.3	35.0	34.7		23.5	9.3		40.8	18.5	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.2	0.7	0.6	0.3		14.9	1.7		3.0	4.2	
Delay (s)		37.1	36.0	35.6	35.0		38.4	11.0		43.8	22.7	
Level of Service		D	D	D	C		D	B		D	C	
Approach Delay (s)		36.2			35.2			16.3			23.4	
Approach LOS		D			D			B			C	
Intersection Summary												
HCM 2000 Control Delay			21.6				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			78.8%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	297	9	0	2386	2029	0	
Future Volume (vph)	297	9	0	2386	2029	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.850						
Flt Protected	0.953						
Satd. Flow (prot)	1775	1504	0	3539	3539	0	
Flt Permitted	0.953						
Satd. Flow (perm)	1775	1504	0	3539	3539	0	
Right Turn on Red	Yes		Yes				
Satd. Flow (RTOR)	9						
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	323	10	0	2593	2205	0	
Shared Lane Traffic (%)	10%						
Lane Group Flow (vph)	324	9	0	2593	2205	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15	9			
Number of Detectors	1	1	2		2		
Detector Template	Left	Right	Thru		Thru		
Leading Detector (ft)	20	20	100		100		
Trailing Detector (ft)	0	0	0		0		
Detector 1 Position(ft)	0	0	0		0		
Detector 1 Size(ft)	20	20	6		6		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0	0.0		0.0		
Detector 1 Queue (s)	0.0	0.0	0.0		0.0		
Detector 1 Delay (s)	0.0	0.0	0.0		0.0		
Detector 2 Position(ft)			94		94		
Detector 2 Size(ft)			6		6		
Detector 2 Type			Cl+Ex		Cl+Ex		
Detector 2 Channel							
Detector 2 Extend (s)			0.0		0.0		
Turn Type	Prot	Prot	NA		NA		
Protected Phases	4	4	2		2	3	
Permitted Phases							
Detector Phase	4	4	2		2		
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0		5.0	1.0	

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0
Total Split (s)	24.0	24.0		82.0	82.0		24.0
Total Split (%)	18.5%	18.5%		63.1%	63.1%		18%
Maximum Green (s)	18.0	18.0		76.0	76.0		22.0
Yellow Time (s)	4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead					Lag
Lead-Lag Optimize?	Yes	Yes					Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		0.2
Recall Mode	None	None		C-Max	C-Max		None
Walk Time (s)	0.0	0.0		0.0	0.0		5.0
Flash Dont Walk (s)	0.0	0.0		17.0	17.0		17.0
Pedestrian Calls (#/hr)	0	0		0	0		0
Act Effect Green (s)	18.0	18.0		100.0	100.0		
Actuated g/C Ratio	0.14	0.14		0.77	0.77		
v/c Ratio	1.32	0.04		0.95	0.81		
Control Delay	213.7	24.8		23.0	12.3		
Queue Delay	0.0	0.0		0.0	46.1		
Total Delay	213.7	24.8		23.0	58.5		
LOS	F	C		C	E		
Approach Delay	208.6			23.0	58.5		
Approach LOS	F			C	E		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 50.3

Intersection LOS: D

Intersection Capacity Utilization 152.0%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

Ø2 (R)	Ø4	Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	297	9	0	2386	2029	0
Future Volume (vph)	297	9	0	2386	2029	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1773	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1773	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	323	10	0	2593	2205	0
RTOR Reduction (vph)	0	8	0	0	0	0
Lane Group Flow (vph)	324	1	0	2593	2205	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	245	208		2722	2722	
v/s Ratio Prot	c0.18	0.00		c0.73	0.62	
v/s Ratio Perm						
v/c Ratio	1.32	0.01		0.95	0.81	
Uniform Delay, d1	56.0	48.3		13.0	9.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	170.7	0.0		9.3	2.7	
Delay (s)	226.7	48.3		22.2	11.9	
Level of Service	F	D		C	B	
Approach Delay (s)	221.9			22.2	11.9	
Approach LOS	F			C	B	

Intersection Summary

HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	152.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	20	130	95	50	5	105	395	85	5	965	55
Future Volume (vph)	80	20	130	95	50	5	105	395	85	5	965	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	125		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.996			0.974			0.992	
Flt Protected		0.962			0.969		0.950			0.950		
Satd. Flow (prot)	0	1792	1583	0	1798	0	1770	1814	0	1770	1848	0
Flt Permitted		0.679			0.643		0.950			0.950		
Satd. Flow (perm)	0	1265	1583	0	1193	0	1770	1814	0	1770	1848	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			141		1			11			3	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		335			128			357			349	
Travel Time (s)		7.6			2.9			8.1			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	22	141	103	54	5	114	429	92	5	1049	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	109	141	0	162	0	114	521	0	5	1109	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9
Permitted Phases	

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	15.0		5.0	15.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		11.0	20.0		11.0	20.5	
Total Split (s)	24.0	24.0	24.0	24.0	24.0		14.0	87.0		14.0	87.0	
Total Split (%)	16.0%	16.0%	16.0%	16.0%	16.0%		9.3%	58.0%		9.3%	58.0%	
Maximum Green (s)	19.0	19.0	19.0	19.0	19.0		9.0	82.0		9.0	82.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Max		None	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		19.1	19.1		19.1		9.0	94.4		6.0	82.4	
Actuated g/C Ratio		0.15	0.15		0.15		0.07	0.73		0.05	0.63	
v/c Ratio		0.59	0.40		0.92		0.93	0.39		0.06	0.95	
Control Delay		67.1	12.0		104.6		123.9	10.0		64.8	39.2	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		67.1	12.0		104.6		123.9	10.0		64.8	39.2	
LOS		E	B		F		F	A		E	D	
Approach Delay		36.0			104.6			30.4			39.3	
Approach LOS		D			F			C			D	

Intersection Summary

Area Type: Other

Cycle Length: 150

Actuated Cycle Length: 130

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 41.2

Intersection LOS: D

Intersection Capacity Utilization 87.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 7: Champlain Pkwy & Home Ave

 Ø1	 Ø2	 Ø4	 Ø9
14 s	87 s	24 s	25 s
 Ø5	 Ø6	 Ø8	
14 s	87 s	24 s	

Lane Group	Ø9
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	17%
Maximum Green (s)	22.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

7: Champlain Pkwy & Home Ave

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↱		↰	↱	
Traffic Volume (vph)	80	20	130	95	50	5	105	395	85	5	965	55
Future Volume (vph)	80	20	130	95	50	5	105	395	85	5	965	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00		1.00	0.97		1.00	0.99	
Flt Protected		0.96	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1791	1583		1798		1770	1813		1770	1848	
Flt Permitted		0.68	1.00		0.64		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1265	1583		1193		1770	1813		1770	1848	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	22	141	103	54	5	114	429	92	5	1049	60
RTOR Reduction (vph)	0	0	121	0	1	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	109	20	0	161	0	114	518	0	5	1108	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		19.1	19.1		19.1		9.0	94.4		1.2	86.6	
Effective Green, g (s)		19.1	19.1		19.1		9.0	94.4		1.2	86.6	
Actuated g/C Ratio		0.14	0.14		0.14		0.07	0.69		0.01	0.63	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		177	221		166		116	1253		15	1172	
v/s Ratio Prot							c0.06	0.29		0.00	c0.60	
v/s Ratio Perm		0.09	0.01		c0.14							
v/c Ratio		0.62	0.09		0.97		0.98	0.41		0.33	0.95	
Uniform Delay, d1		55.2	51.1		58.4		63.7	9.1		67.3	22.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.2	0.2		60.9		77.7	1.0		12.7	16.1	
Delay (s)		61.5	51.3		119.3		141.4	10.1		79.9	38.9	
Level of Service		E	D		F		F	B		E	D	
Approach Delay (s)		55.7			119.3			33.7			39.0	
Approach LOS		E			F			C			D	
Intersection Summary												
HCM 2000 Control Delay			45.4									
HCM 2000 Level of Service											D	
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			136.5								18.0	
Intersection Capacity Utilization			87.3%								E	
ICU Level of Service												
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1485	140	1035	0	890	0	0	2040	5
Future Volume (vph)	0	0	0	1485	140	1035	0	890	0	0	2040	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Fr t					0.883							
Fl t Protected				0.950	0.994							
Satd. Flow (prot)	0	0	0	1681	1553	0	0	3539	0	0	5085	0
Fl t Permitted				0.950	0.994							
Satd. Flow (perm)	0	0	0	1681	1553	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					21							
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1614	152	1125	0	967	0	0	2217	5
Shared Lane Traffic (%)				10%								
Lane Group Flow (vph)	0	0	0	1453	1438	0	0	967	0	0	2222	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2			2			2	
Detector Template				Left	Thru			Thru			Thru	
Leading Detector (ft)				20	100			100			100	
Trailing Detector (ft)				0	0			0			0	
Detector 1 Position(ft)				0	0			0			0	
Detector 1 Size(ft)				20	6			6			6	
Detector 1 Type				Cl+Ex	Cl+Ex			Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0			0.0			0.0	
Detector 1 Queue (s)				0.0	0.0			0.0			0.0	
Detector 1 Delay (s)				0.0	0.0			0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				49.0	49.0			30.0			30.0	
Actuated g/C Ratio				0.54	0.54			0.33			0.33	
v/c Ratio				1.59	1.68			0.82			1.31	
Control Delay				291.9	333.5			34.5			172.6	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				291.9	333.5			34.5			172.6	
LOS				F	F			C			F	
Approach Delay					312.6			34.5			172.6	
Approach LOS					F			C			F	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.68

Intersection Signal Delay: 217.2

Intersection LOS: F

Intersection Capacity Utilization 125.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1485	140	1035	0	890	0	0	2040	5
Future Volume (vph)	0	0	0	1485	140	1035	0	890	0	0	2040	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	0.88			1.00			1.00	
Flt Protected				0.95	0.99			1.00			1.00	
Satd. Flow (prot)				1681	1553			3539			5084	
Flt Permitted				0.95	0.99			1.00			1.00	
Satd. Flow (perm)				1681	1553			3539			5084	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1614	152	1125	0	967	0	0	2217	5
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1453	1428	0	0	967	0	0	2222	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				49.0	49.0			30.0			30.0	
Effective Green, g (s)				49.0	49.0			30.0			30.0	
Actuated g/C Ratio				0.54	0.54			0.33			0.33	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				915	845			1179			1694	
v/s Ratio Prot				0.86	c0.92			0.27			c0.44	
v/s Ratio Perm												
v/c Ratio				1.59	1.69			0.82			1.31	
Uniform Delay, d1				20.5	20.5			27.5			30.0	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				269.8	315.8			6.4			144.6	
Delay (s)				290.3	336.3			34.0			174.6	
Level of Service				F	F			C			F	
Approach Delay (s)		0.0			313.2			34.0			174.6	
Approach LOS		A			F			C			F	
Intersection Summary												
HCM 2000 Control Delay			218.1			HCM 2000 Level of Service				F		
HCM 2000 Volume to Capacity ratio			1.55									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			125.2%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	195	30	110	70	10	40
Future Volume (Veh/h)	195	30	110	70	10	40
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	212	33	120	76	11	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			245		544	228
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			245		544	228
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		98	95
cM capacity (veh/h)			1321		454	811
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	245	196	54			
Volume Left	0	120	11			
Volume Right	33	0	43			
cSH	1700	1321	699			
Volume to Capacity	0.14	0.09	0.08			
Queue Length 95th (ft)	0	7	6			
Control Delay (s)	0.0	5.2	10.6			
Lane LOS		A	B			
Approach Delay (s)	0.0	5.2	10.6			
Approach LOS			B			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			35.2%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	65	145	25	40	140	245	10	160	20	150	250	45
Future Volume (vph)	65	145	25	40	140	245	10	160	20	150	250	45
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	158	27	43	152	266	11	174	22	163	272	49
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	256	461	207	484								
Volume Left (vph)	71	43	11	163								
Volume Right (vph)	27	266	22	49								
Hadj (s)	0.03	-0.29	-0.02	0.04								
Departure Headway (s)	8.3	7.3	8.5	7.5								
Degree Utilization, x	0.59	0.93	0.49	1.01								
Capacity (veh/h)	420	498	404	479								
Control Delay (s)	22.5	52.7	19.3	70.3								
Approach Delay (s)	22.5	52.7	19.3	70.3								
Approach LOS	C	F	C	F								
Intersection Summary												
Delay				48.3								
Level of Service				E								
Intersection Capacity Utilization				71.6%	ICU Level of Service	C						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↗↗	↗↗	↰
Traffic Volume (veh/h)	0	0	25	1594	1514	178
Future Volume (Veh/h)	0	0	25	1594	1514	178
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	27	1733	1646	193
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.78	0.69	0.69			
vC, conflicting volume	2566	823	1839			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1432	0	1314			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	92			
cM capacity (veh/h)	90	747	360			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	27	866	866	823	823	193
Volume Left	27	0	0	0	0	0
Volume Right	0	0	0	0	0	193
cSH	360	1700	1700	1700	1700	1700
Volume to Capacity	0.08	0.51	0.51	0.48	0.48	0.11
Queue Length 95th (ft)	6	0	0	0	0	0
Control Delay (s)	15.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.2			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			57.7%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	195	30	110	70	10	40
Future Volume (Veh/h)	195	30	110	70	10	40
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	212	33	120	76	11	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				335		
pX, platoon unblocked						
vC, conflicting volume			245	544	228	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			245	544	228	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)						
tF (s)			2.2	3.5	3.3	
p0 queue free %			91	98	95	
cM capacity (veh/h)			1321	454	811	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	245	196	54			
Volume Left	0	120	11			
Volume Right	33	0	43			
cSH	1700	1321	699			
Volume to Capacity	0.14	0.09	0.08			
Queue Length 95th (ft)	0	7	6			
Control Delay (s)	0.0	5.2	10.6			
Lane LOS		A	B			
Approach Delay (s)	0.0	5.2	10.6			
Approach LOS			B			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			35.2%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	20	110	0	10	15	90	5	55	10	100	20	20
Future Volume (vph)	20	110	0	10	15	90	5	55	10	100	20	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	120	0	11	16	98	5	60	11	109	22	22
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	142	125	76	153								
Volume Left (vph)	22	11	5	109								
Volume Right (vph)	0	98	11	22								
Hadj (s)	0.06	-0.42	-0.04	0.09								
Departure Headway (s)	4.7	4.2	4.7	4.7								
Degree Utilization, x	0.18	0.15	0.10	0.20								
Capacity (veh/h)	722	794	716	716								
Control Delay (s)	8.7	7.9	8.2	8.9								
Approach Delay (s)	8.7	7.9	8.2	8.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.5								
Level of Service				A								
Intersection Capacity Utilization				32.2%	ICU Level of Service	A						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	25	1594	1514	178
Future Volume (Veh/h)	0	0	25	1594	1514	178
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	27	1733	1646	193
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.79	0.69	0.69			
vC, conflicting volume	2566	823	1839			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1278	0	1314			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	92			
cM capacity (veh/h)	116	747	360			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	27	866	866	823	823	193
Volume Left	27	0	0	0	0	0
Volume Right	0	0	0	0	0	193
cSH	360	1700	1700	1700	1700	1700
Volume to Capacity	0.08	0.51	0.51	0.48	0.48	0.11
Queue Length 95th (ft)	6	0	0	0	0	0
Control Delay (s)	15.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.2			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			64.2%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	215	35	135	85	10	45
Future Volume (Veh/h)	215	35	135	85	10	45
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	38	147	92	11	49
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			272		639	253
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			272		639	253
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			89		97	94
cM capacity (veh/h)			1291		390	786
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	272	239	60			
Volume Left	0	147	11			
Volume Right	38	0	49			
cSH	1700	1291	663			
Volume to Capacity	0.16	0.11	0.09			
Queue Length 95th (ft)	0	10	7			
Control Delay (s)	0.0	5.4	11.0			
Lane LOS		A	B			
Approach Delay (s)	0.0	5.4	11.0			
Approach LOS			B			
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			38.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	75	160	35	55	160	250	15	175	20	155	295	60
Future Volume (vph)	75	160	35	55	160	250	15	175	20	155	295	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	174	38	60	174	272	16	190	22	168	321	65
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	294	506	228	554								
Volume Left (vph)	82	60	16	168								
Volume Right (vph)	38	272	22	65								
Hadj (s)	0.01	-0.26	-0.01	0.02								
Departure Headway (s)	8.4	7.5	8.7	7.8								
Degree Utilization, x	0.69	1.06	0.55	1.20								
Capacity (veh/h)	416	474	393	457								
Control Delay (s)	28.0	84.6	22.0	135.5								
Approach Delay (s)	28.0	84.6	22.0	135.5								
Approach LOS	D	F	C	F								
Intersection Summary												
Delay				82.9								
Level of Service				F								
Intersection Capacity Utilization				78.5%	ICU Level of Service	D						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	26	1670	1586	186
Future Volume (Veh/h)	0	0	26	1670	1586	186
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	28	1815	1724	202
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.78	0.68	0.68			
vC, conflicting volume	2688	862	1926			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1464	0	1415			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	91			
cM capacity (veh/h)	84	735	324			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	28	908	908	862	862	202
Volume Left	28	0	0	0	0	0
Volume Right	0	0	0	0	0	202
cSH	324	1700	1700	1700	1700	1700
Volume to Capacity	0.09	0.53	0.53	0.51	0.51	0.12
Queue Length 95th (ft)	7	0	0	0	0	0
Control Delay (s)	17.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			60.1%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Volume (veh/h)	215	35	135	85	10	45
Future Volume (Veh/h)	215	35	135	85	10	45
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	38	147	92	11	49
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)				335		
pX, platoon unblocked						
vC, conflicting volume			272		639	253
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			272		639	253
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			89		97	94
cM capacity (veh/h)			1291		390	786
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	272	239	60			
Volume Left	0	147	11			
Volume Right	38	0	49			
cSH	1700	1291	663			
Volume to Capacity	0.16	0.11	0.09			
Queue Length 95th (ft)	0	10	7			
Control Delay (s)	0.0	5.4	11.0			
Lane LOS		A	B			
Approach Delay (s)	0.0	5.4	11.0			
Approach LOS			B			
Intersection Summary						
Average Delay		3.4				
Intersection Capacity Utilization		38.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	20	120	0	10	20	90	5	50	15	120	20	15
Future Volume (vph)	20	120	0	10	20	90	5	50	15	120	20	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	130	0	11	22	98	5	54	16	130	22	16
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	152	131	75	168								
Volume Left (vph)	22	11	5	130								
Volume Right (vph)	0	98	16	16								
Hadj (s)	0.06	-0.40	-0.08	0.13								
Departure Headway (s)	4.7	4.3	4.7	4.8								
Degree Utilization, x	0.20	0.16	0.10	0.22								
Capacity (veh/h)	713	778	708	703								
Control Delay (s)	8.9	8.1	8.2	9.2								
Approach Delay (s)	8.9	8.1	8.2	9.2								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.7								
Level of Service				A								
Intersection Capacity Utilization				33.6%	ICU Level of Service	A						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↱↱	↱↱	↰
Traffic Volume (veh/h)	0	0	26	1670	1586	186
Future Volume (Veh/h)	0	0	26	1670	1586	186
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	28	1815	1724	202
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.79	0.68	0.68			
vC, conflicting volume	2688	862	1926			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1301	0	1415			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	91			
cM capacity (veh/h)	110	735	324			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	28	908	908	862	862	202
Volume Left	28	0	0	0	0	0
Volume Right	0	0	0	0	0	202
cSH	324	1700	1700	1700	1700	1700
Volume to Capacity	0.09	0.53	0.53	0.51	0.51	0.12
Queue Length 95th (ft)	7	0	0	0	0	0
Control Delay (s)	17.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			66.6%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	125	20	35	145	35	65
Future Volume (Veh/h)	125	20	35	145	35	65
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	22	38	158	38	71
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			158		381	147
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			158		381	147
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		94	92
cM capacity (veh/h)			1422		605	900
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	158	196	109			
Volume Left	0	38	38			
Volume Right	22	0	71			
cSH	1700	1422	769			
Volume to Capacity	0.09	0.03	0.14			
Queue Length 95th (ft)	0	2	12			
Control Delay (s)	0.0	1.7	10.5			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.7	10.5			
Approach LOS			B			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			33.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	85	130	50	30	165	145	10	170	30	245	375	50
Future Volume (vph)	85	130	50	30	165	145	10	170	30	245	375	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	92	141	54	33	179	158	11	185	33	266	408	54
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	287	370	229	728								
Volume Left (vph)	92	33	11	266								
Volume Right (vph)	54	158	33	54								
Hadj (s)	-0.01	-0.20	-0.04	0.06								
Departure Headway (s)	7.8	7.4	7.9	7.3								
Degree Utilization, x	0.62	0.76	0.51	1.47								
Capacity (veh/h)	436	468	416	487								
Control Delay (s)	22.8	29.7	18.8	241.8								
Approach Delay (s)	22.8	29.7	18.8	241.8								
Approach LOS	C	D	C	F								
Intersection Summary												
Delay				122.6								
Level of Service				F								
Intersection Capacity Utilization				93.2%	ICU Level of Service	F						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↗↗	↗↗	↰
Traffic Volume (veh/h)	0	0	5	2306	1747	40
Future Volume (Veh/h)	0	0	5	2306	1747	40
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	5	2507	1899	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.41	0.66	0.66			
vC, conflicting volume	3162	950	1942			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	1403			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	98			
cM capacity (veh/h)	413	718	320			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	5	1254	1254	950	950	43
Volume Left	5	0	0	0	0	0
Volume Right	0	0	0	0	0	43
cSH	320	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.74	0.74	0.56	0.56	0.03
Queue Length 95th (ft)	1	0	0	0	0	0
Control Delay (s)	16.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.0			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			81.2%	ICU Level of Service		D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	125	20	35	145	35	65
Future Volume (Veh/h)	125	20	35	145	35	65
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	22	38	158	38	71
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				335		
pX, platoon unblocked						
vC, conflicting volume			158		381	147
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			158		381	147
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		94	92
cM capacity (veh/h)			1422		605	900
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	158	196	109			
Volume Left	0	38	38			
Volume Right	22	0	71			
cSH	1700	1422	769			
Volume to Capacity	0.09	0.03	0.14			
Queue Length 95th (ft)	0	2	12			
Control Delay (s)	0.0	1.7	10.5			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.7	10.5			
Approach LOS			B			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			33.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	65	5	10	100	80	5	20	15	110	50	10
Future Volume (vph)	5	65	5	10	100	80	5	20	15	110	50	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	71	5	11	109	87	5	22	16	120	54	11
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	81	207	43	185								
Volume Left (vph)	5	11	5	120								
Volume Right (vph)	5	87	16	11								
Hadj (s)	0.01	-0.21	-0.17	0.13								
Departure Headway (s)	4.7	4.4	4.6	4.8								
Degree Utilization, x	0.11	0.25	0.06	0.24								
Capacity (veh/h)	708	778	713	711								
Control Delay (s)	8.3	8.8	7.9	9.3								
Approach Delay (s)	8.3	8.8	7.9	9.3								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.8									
Level of Service			A									
Intersection Capacity Utilization			35.8%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↱	↱	↰
Traffic Volume (veh/h)	0	0	5	2306	1747	40
Future Volume (Veh/h)	0	0	5	2306	1747	40
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	5	2507	1899	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.41	0.66	0.66			
vC, conflicting volume	3162	950	1942			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	1403			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	98			
cM capacity (veh/h)	413	718	320			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	5	1254	1254	950	950	43
Volume Left	5	0	0	0	0	0
Volume Right	0	0	0	0	0	43
cSH	320	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.74	0.74	0.56	0.56	0.03
Queue Length 95th (ft)	1	0	0	0	0	0
Control Delay (s)	16.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.0			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			81.6%	ICU Level of Service		D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	155	25	40	170	35	70
Future Volume (Veh/h)	155	25	40	170	35	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	168	27	43	185	38	76
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			195	452		182
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			195	452		182
tC, single (s)			4.1	6.4		6.2
tC, 2 stage (s)						
tF (s)			2.2	3.5		3.3
p0 queue free %			97	93		91
cM capacity (veh/h)			1378	547		861
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	195	228	114			
Volume Left	0	43	38			
Volume Right	27	0	76			
cSH	1700	1378	723			
Volume to Capacity	0.11	0.03	0.16			
Queue Length 95th (ft)	0	2	14			
Control Delay (s)	0.0	1.7	10.9			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.7	10.9			
Approach LOS			B			
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization			37.1%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	105	140	60	45	185	155	15	175	35	255	400	60
Future Volume (vph)	105	140	60	45	185	155	15	175	35	255	400	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	152	65	49	201	168	16	190	38	277	435	65
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	331	418	244	777								
Volume Left (vph)	114	49	16	277								
Volume Right (vph)	65	168	38	65								
Hadj (s)	-0.01	-0.18	-0.05	0.06								
Departure Headway (s)	8.3	7.8	8.7	8.1								
Degree Utilization, x	0.76	0.91	0.59	1.74								
Capacity (veh/h)	418	418	388	447								
Control Delay (s)	33.5	50.8	23.5	361.2								
Approach Delay (s)	33.5	50.8	23.5	361.2								
Approach LOS	D	F	C	F								
Intersection Summary												
Delay				180.0								
Level of Service				F								
Intersection Capacity Utilization				98.5%	ICU Level of Service		F					
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↱↱	↱↱	↰
Traffic Volume (veh/h)	0	0	5	2678	2029	47
Future Volume (Veh/h)	0	0	5	2678	2029	47
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	5	2911	2205	51
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.42	0.65	0.65			
vC, conflicting volume	3670	1102	2256			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	801	73	1852			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	98			
cM capacity (veh/h)	130	632	210			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	5	1456	1456	1102	1102	51
Volume Left	5	0	0	0	0	0
Volume Right	0	0	0	0	0	51
cSH	210	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.86	0.86	0.65	0.65	0.03
Queue Length 95th (ft)	2	0	0	0	0	0
Control Delay (s)	22.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.0			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			152.0%		ICU Level of Service	H
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	155	25	40	170	35	70
Future Volume (Veh/h)	155	25	40	170	35	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	168	27	43	185	38	76
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				335		
pX, platoon unblocked						
vC, conflicting volume			195	452	182	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			195	452	182	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)						
tF (s)			2.2	3.5	3.3	
p0 queue free %			97	93	91	
cM capacity (veh/h)			1378	547	861	
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	195	228	114			
Volume Left	0	43	38			
Volume Right	27	0	76			
cSH	1700	1378	723			
Volume to Capacity	0.11	0.03	0.16			
Queue Length 95th (ft)	0	2	14			
Control Delay (s)	0.0	1.7	10.9			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.7	10.9			
Approach LOS			B			
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization			37.1%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	70	10	10	105	90	5	20	15	125	45	10
Future Volume (vph)	5	70	10	10	105	90	5	20	15	125	45	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	76	11	11	114	98	5	22	16	136	49	11
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	92	223	43	196								
Volume Left (vph)	5	11	5	136								
Volume Right (vph)	11	98	16	11								
Hadj (s)	-0.03	-0.22	-0.17	0.14								
Departure Headway (s)	4.7	4.4	4.7	4.8								
Degree Utilization, x	0.12	0.27	0.06	0.26								
Capacity (veh/h)	703	771	693	698								
Control Delay (s)	8.4	9.0	8.0	9.6								
Approach Delay (s)	8.4	9.0	8.0	9.6								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			9.0									
Level of Service			A									
Intersection Capacity Utilization			37.5%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↗↗	↗↗	↰
Traffic Volume (veh/h)	0	0	5	2678	2029	47
Future Volume (Veh/h)	0	0	5	2678	2029	47
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	5	2911	2205	51
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.42	0.65	0.65			
vC, conflicting volume	3670	1102	2256			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	801	73	1852			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	98			
cM capacity (veh/h)	130	632	210			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	5	1456	1456	1102	1102	51
Volume Left	5	0	0	0	0	0
Volume Right	0	0	0	0	0	51
cSH	210	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.86	0.86	0.65	0.65	0.03
Queue Length 95th (ft)	2	0	0	0	0	0
Control Delay (s)	22.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.0			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			92.4%	ICU Level of Service		F
Analysis Period (min)			15			

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	25	360	30	22	35	376	1415	15	45	1275	44
Future Volume (vph)	43	25	360	30	22	35	376	1415	15	45	1275	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.908			0.998			0.995	
Flt Protected		0.969		0.950			0.950			0.950		
Satd. Flow (prot)	0	1805	1583	1770	1691	0	1770	3532	0	1770	3522	0
Flt Permitted		0.780		0.709			0.107			0.950		
Satd. Flow (perm)	0	1453	1583	1321	1691	0	199	3532	0	1770	3522	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			391		38			2			4	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	27	391	33	24	38	409	1538	16	49	1386	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	74	391	33	62	0	409	1554	0	49	1434	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)		11.7	11.7	11.7	11.7		61.4	61.4		7.9	47.3	
Actuated g/C Ratio		0.13	0.13	0.13	0.13		0.68	0.68		0.09	0.53	
v/c Ratio		0.39	0.72	0.19	0.25		0.95	0.65		0.31	0.77	
Control Delay		39.8	11.6	34.6	18.4		62.7	12.7		43.1	22.3	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		39.8	11.6	34.6	18.4		62.7	12.7		43.1	22.3	
LOS		D	B	C	B		E	B		D	C	
Approach Delay		16.1			24.0			23.1			23.0	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)		40	0	17	12		173	259		27	314	
Queue Length 95th (ft)		72	73	40	43		#392	494		60	#562	
Internal Link Dist (ft)		1348			332			637			353	
Turn Bay Length (ft)			200				150			300		
Base Capacity (vph)		339	669	308	423		432	2409		158	1852	
Starvation Cap Reductn		0	0	0	0		0	0		0	0	
Spillback Cap Reductn		0	0	0	0		0	0		0	0	
Storage Cap Reductn		0	0	0	0		0	0		0	0	
Reduced v/c Ratio		0.22	0.58	0.11	0.15		0.95	0.65		0.31	0.77	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 22.3

Intersection LOS: C

Intersection Capacity Utilization 79.5%

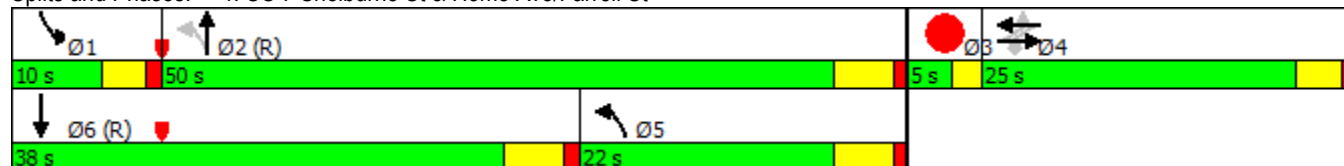
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lane Group	Ø3
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	25	360	30	22	35	376	1415	15	45	1275	44
Future Volume (vph)	43	25	360	30	22	35	376	1415	15	45	1275	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.91		1.00	1.00		1.00	0.99	
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1805	1583	1770	1691		1770	3534		1770	3521	
Flt Permitted		0.78	1.00	0.71	1.00		0.11	1.00		0.95	1.00	
Satd. Flow (perm)		1454	1583	1320	1691		199	3534		1770	3521	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	27	391	33	24	38	409	1538	16	49	1386	48
RTOR Reduction (vph)	0	0	340	0	33	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	74	51	33	29	0	409	1553	0	49	1432	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		11.7	11.7	11.7	11.7		59.8	59.8		5.5	45.7	
Effective Green, g (s)		11.7	11.7	11.7	11.7		59.8	59.8		5.5	45.7	
Actuated g/C Ratio		0.13	0.13	0.13	0.13		0.66	0.66		0.06	0.51	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		189	205	171	219		456	2348		108	1787	
v/s Ratio Prot					0.02		c0.19	0.44		0.03	c0.41	
v/s Ratio Perm		c0.05	0.03	0.02			c0.41					
v/c Ratio		0.39	0.25	0.19	0.13		0.90	0.66		0.45	0.80	
Uniform Delay, d1		35.9	35.2	34.9	34.7		23.5	9.0		40.8	18.4	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3	0.6	0.6	0.3		19.8	1.5		3.0	3.9	
Delay (s)		37.2	35.8	35.5	34.9		43.3	10.5		43.8	22.3	
Level of Service		D	D	D	C		D	B		D	C	
Approach Delay (s)		36.1			35.1			17.4			23.0	
Approach LOS		D			D			B			C	
Intersection Summary												
HCM 2000 Control Delay			22.0				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			79.5%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	276	11	0	2055	1747	0	
Future Volume (vph)	276	11	0	2055	1747	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Fr't	0.850						
Flt Protected	0.953						
Satd. Flow (prot)	1775	1504	0	3539	3539	0	
Flt Permitted	0.953						
Satd. Flow (perm)	1775	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)		11					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	300	12	0	2234	1899	0	
Shared Lane Traffic (%)		10%					
Lane Group Flow (vph)	301	11	0	2234	1899	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2	3	
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0	1.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	
Total Split (s)	24.0	24.0		82.0	82.0	24.0	
Total Split (%)	18.5%	18.5%		63.1%	63.1%	18%	
Maximum Green (s)	18.0	18.0		76.0	76.0	22.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	2.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	0.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	0.2	
Recall Mode	None	None		C-Max	C-Max	None	
Walk Time (s)	0.0	0.0		0.0	0.0	5.0	
Flash Dont Walk (s)	0.0	0.0		17.0	17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	
Act Effect Green (s)	18.0	18.0		100.0	100.0		

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Actuated g/C Ratio	0.14	0.14		0.77	0.77		
v/c Ratio	1.23	0.05		0.82	0.70		
Control Delay	179.4	23.4		12.7	9.2		
Queue Delay	0.0	0.0		0.0	23.6		
Total Delay	179.4	23.4		12.7	32.7		
LOS	F	C		B	C		
Approach Delay	173.9			12.7	32.7		
Approach LOS	F			B	C		
Queue Length 50th (ft)	~312	0		532	360		
Queue Length 95th (ft)	#496	20		638	427		
Internal Link Dist (ft)	258			305	166		
Turn Bay Length (ft)							
Base Capacity (vph)	245	217		2722	2722		
Starvation Cap Reductn	0	0		0	897		
Spillback Cap Reductn	0	0		0	0		
Storage Cap Reductn	0	0		0	0		
Reduced v/c Ratio	1.23	0.05		0.82	1.04		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.23

Intersection Signal Delay: 32.6

Intersection LOS: C

Intersection Capacity Utilization 82.3%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

 Ø2 (R)	 Ø4	 Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	276	11	0	2055	1747	0
Future Volume (vph)	276	11	0	2055	1747	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1773	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1773	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	300	12	0	2234	1899	0
RTOR Reduction (vph)	0	9	0	0	0	0
Lane Group Flow (vph)	301	2	0	2234	1899	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	245	208		2722	2722	
v/s Ratio Prot	c0.17	0.00		c0.63	0.54	
v/s Ratio Perm						
v/c Ratio	1.23	0.01		0.82	0.70	
Uniform Delay, d1	56.0	48.3		9.4	7.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	133.3	0.0		2.9	1.5	
Delay (s)	189.3	48.3		12.3	9.0	
Level of Service	F	D		B	A	
Approach Delay (s)	184.4			12.3	9.0	
Approach LOS	F			B	A	

Intersection Summary

HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1378	135	0	0	890	0	0	1965	5
Future Volume (vph)	0	0	0	1378	135	0	0	890	0	0	1965	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Fr t												
Flt Protected				0.950	0.961							
Satd. Flow (prot)	0	0	0	1681	1701	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.961							
Satd. Flow (perm)	0	0	0	1681	1701	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1498	147	0	0	967	0	0	2136	5
Shared Lane Traffic (%)				45%								
Lane Group Flow (vph)	0	0	0	824	821	0	0	967	0	0	2141	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				48.2	48.2			30.8			30.8	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio				0.54	0.54			0.34			0.34	
v/c Ratio				0.92	0.90			0.80			1.23	
Control Delay				35.8	33.8			33.1			137.5	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				35.8	33.8			33.1			137.5	
LOS				D	C			C			F	
Approach Delay					34.8			33.1			137.5	
Approach LOS					C			C			F	
Queue Length 50th (ft)				413	406			262			~566	
Queue Length 95th (ft)				#695	#684			341			#662	
Internal Link Dist (ft)		52			64			652			60	
Turn Bay Length (ft)												
Base Capacity (vph)				915	926			1211			1741	
Starvation Cap Reductn				0	0			0			0	
Spillback Cap Reductn				0	0			0			0	
Storage Cap Reductn				0	0			0			0	
Reduced v/c Ratio				0.90	0.89			0.80			1.23	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.23

Intersection Signal Delay: 80.7

Intersection LOS: F

Intersection Capacity Utilization 89.0%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↱			↕			↕	
Traffic Volume (vph)	0	0	0	1378	135	0	0	890	0	0	1965	5
Future Volume (vph)	0	0	0	1378	135	0	0	890	0	0	1965	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1700			3539			5084	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1700			3539			5084	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1498	147	0	0	967	0	0	2136	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	824	821	0	0	967	0	0	2141	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				48.2	48.2			30.8			30.8	
Effective Green, g (s)				48.2	48.2			30.8			30.8	
Actuated g/C Ratio				0.54	0.54			0.34			0.34	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				900	910			1211			1739	
v/s Ratio Prot				c0.49	0.48			0.27			c0.42	
v/s Ratio Perm												
v/c Ratio				0.92	0.90			0.80			1.23	
Uniform Delay, d1				19.0	18.8			26.8			29.6	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				13.7	12.0			5.6			109.3	
Delay (s)				32.7	30.8			32.3			138.9	
Level of Service				C	C			C			F	
Approach Delay (s)		0.0			31.8			32.3			138.9	
Approach LOS		A			C			C			F	
Intersection Summary												
HCM 2000 Control Delay			80.1			HCM 2000 Level of Service				F		
HCM 2000 Volume to Capacity ratio			1.04									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			89.0%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	10	276	15	5	10	367	1390	10	10	835	55
Future Volume (vph)	50	10	276	15	5	10	367	1390	10	10	835	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.897			0.999			0.991	
Flt Protected		0.960		0.950			0.950			0.950		
Satd. Flow (prot)	0	1788	1583	1770	1671	0	1770	3536	0	1770	3507	0
Flt Permitted		0.751		0.715			0.249			0.950		
Satd. Flow (perm)	0	1399	1583	1332	1671	0	464	3536	0	1770	3507	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			300		11			1			8	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	300	16	5	11	399	1511	11	11	908	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	300	16	16	0	399	1522	0	11	968	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)		10.3	10.3	10.3	10.3		68.4	68.4		6.2	48.7	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.76	0.76		0.07	0.54	
v/c Ratio		0.41	0.67	0.11	0.08		0.67	0.57		0.09	0.51	
Control Delay		42.9	12.3	34.5	20.8		21.0	7.1		40.5	14.9	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		42.9	12.3	34.5	20.8		21.0	7.1		40.5	14.9	
LOS		D	B	C	C		C	A		D	B	
Approach Delay		17.8			27.7			10.0			15.2	
Approach LOS		B			C			A			B	
Queue Length 50th (ft)		35	0	8	3		44	120		6	166	
Queue Length 95th (ft)		69	68	25	20		#227	387		22	263	
Internal Link Dist (ft)		1348			332			637			353	
Turn Bay Length (ft)			200				150			300		
Base Capacity (vph)		326	599	310	398		599	2687		125	1899	
Starvation Cap Reductn		0	0	0	0		0	0		0	0	
Spillback Cap Reductn		0	0	0	0		0	0		0	0	
Storage Cap Reductn		0	0	0	0		0	0		0	0	
Reduced v/c Ratio		0.20	0.50	0.05	0.04		0.67	0.57		0.09	0.51	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 12.6

Intersection LOS: B

Intersection Capacity Utilization 66.8%

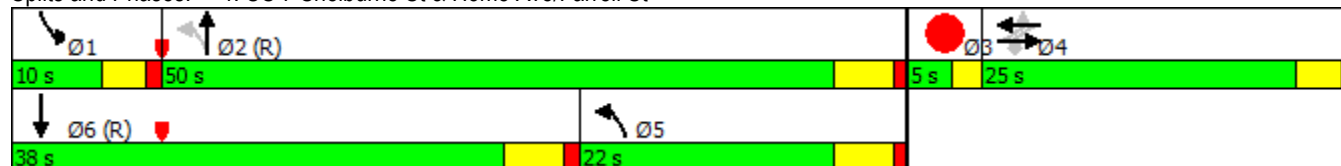
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lane Group	Ø3
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	10	276	15	5	10	367	1390	10	10	835	55
Future Volume (vph)	50	10	276	15	5	10	367	1390	10	10	835	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583	1770	1671		1770	3535		1770	3506	
Flt Permitted		0.75	1.00	0.71	1.00		0.25	1.00		0.95	1.00	
Satd. Flow (perm)		1399	1583	1331	1671		465	3535		1770	3506	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	300	16	5	11	399	1511	11	11	908	60
RTOR Reduction (vph)	0	0	266	0	10	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	65	34	16	6	0	399	1522	0	11	964	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		10.3	10.3	10.3	10.3		65.2	65.2		1.5	45.5	
Effective Green, g (s)		10.3	10.3	10.3	10.3		65.2	65.2		1.5	45.5	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.72	0.72		0.02	0.51	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		160	181	152	191		629	2560		29	1772	
v/s Ratio Prot					0.00		0.14	c0.43		0.01	c0.27	
v/s Ratio Perm		c0.05	0.02	0.01			c0.32					
v/c Ratio		0.41	0.19	0.11	0.03		0.63	0.59		0.38	0.54	
Uniform Delay, d1		37.0	36.1	35.7	35.4		13.1	6.0		43.8	15.2	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.7	0.5	0.3	0.1		2.1	1.0		8.1	1.2	
Delay (s)		38.7	36.6	36.0	35.5		15.2	7.0		51.9	16.4	
Level of Service		D	D	D	D		B	A		D	B	
Approach Delay (s)		37.0			35.8			8.7			16.8	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			14.5				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			66.8%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	97	16	0	1523	1514	0	
Future Volume (vph)	97	16	0	1523	1514	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.997	0.850					
Flt Protected	0.953						
Satd. Flow (prot)	1770	1504	0	3539	3539	0	
Flt Permitted	0.953						
Satd. Flow (perm)	1770	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	1	15					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	105	17	0	1655	1646	0	
Shared Lane Traffic (%)		10%					
Lane Group Flow (vph)	107	15	0	1655	1646	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2	3	
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0	1.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	
Total Split (s)	24.0	24.0		82.0	82.0	24.0	
Total Split (%)	18.5%	18.5%		63.1%	63.1%	18%	
Maximum Green (s)	18.0	18.0		76.0	76.0	22.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	2.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	0.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	0.2	
Recall Mode	None	None		C-Max	C-Max	None	
Walk Time (s)	0.0	0.0		0.0	0.0	5.0	
Flash Dont Walk (s)	0.0	0.0		17.0	17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	
Act Effect Green (s)	12.1	12.1		105.9	105.9		

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Actuated g/C Ratio	0.09	0.09		0.81	0.81		
v/c Ratio	0.64	0.10		0.57	0.57		
Control Delay	73.4	23.0		5.5	5.4		
Queue Delay	0.0	0.0		0.0	3.3		
Total Delay	73.4	23.0		5.5	8.7		
LOS	E	C		A	A		
Approach Delay	67.2			5.5	8.7		
Approach LOS	E			A	A		
Queue Length 50th (ft)	88	0		205	204		
Queue Length 95th (ft)	145	23		313	309		
Internal Link Dist (ft)	258			305	166		
Turn Bay Length (ft)							
Base Capacity (vph)	245	221		2882	2882		
Starvation Cap Reductn	0	0		0	1108		
Spillback Cap Reductn	0	0		0	0		
Storage Cap Reductn	0	0		0	0		
Reduced v/c Ratio	0.44	0.07		0.57	0.93		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 9.2

Intersection LOS: A

Intersection Capacity Utilization 57.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

  Ø2 (R)	 Ø4	  Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	97	16	0	1523	1514	0
Future Volume (vph)	97	16	0	1523	1514	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1771	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1771	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	105	17	0	1655	1646	0
RTOR Reduction (vph)	1	14	0	0	0	0
Lane Group Flow (vph)	106	1	0	1655	1646	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	12.1	12.1		105.9	105.9	
Effective Green, g (s)	12.1	12.1		105.9	105.9	
Actuated g/C Ratio	0.09	0.09		0.81	0.81	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	164	139		2882	2882	
v/s Ratio Prot	c0.06	0.00		c0.47	0.47	
v/s Ratio Perm						
v/c Ratio	0.65	0.01		0.57	0.57	
Uniform Delay, d1	56.9	53.5		4.2	4.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.4	0.0		0.8	0.8	
Delay (s)	63.3	53.5		5.0	5.0	
Level of Service	E	D		A	A	
Approach Delay (s)	62.1			5.0	5.0	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	7.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1367	50	0	0	890	0	0	1196	0
Future Volume (vph)	0	0	0	1367	50	0	0	890	0	0	1196	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frnt												
Flt Protected				0.950	0.956							
Satd. Flow (prot)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.956							
Satd. Flow (perm)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1486	54	0	0	967	0	0	1300	0
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	0	0	773	767	0	0	967	0	0	1300	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				47.3	47.3			31.7			31.7	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio				0.53	0.53			0.35			0.35	
v/c Ratio				0.88	0.86			0.78			0.73	
Control Delay				31.4	30.1			31.8			28.7	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				31.4	30.1			31.8			28.7	
LOS				C	C			C			C	
Approach Delay					30.8			31.8			28.7	
Approach LOS					C			C			C	
Queue Length 50th (ft)				366	358			262			240	
Queue Length 95th (ft)				#627	#615			341			294	
Internal Link Dist (ft)		52			64			652			60	
Turn Bay Length (ft)												
Base Capacity (vph)				915	921			1247			1792	
Starvation Cap Reductn				0	0			0			0	
Spillback Cap Reductn				0	0			0			0	
Storage Cap Reductn				0	0			0			0	
Reduced v/c Ratio				0.84	0.83			0.78			0.73	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 30.3

Intersection LOS: C

Intersection Capacity Utilization 73.3%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1367	50	0	0	890	0	0	1196	0
Future Volume (vph)	0	0	0	1367	50	0	0	890	0	0	1196	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1691			3539			5085	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1691			3539			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1486	54	0	0	967	0	0	1300	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	773	767	0	0	967	0	0	1300	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				47.3	47.3			31.7			31.7	
Effective Green, g (s)				47.3	47.3			31.7			31.7	
Actuated g/C Ratio				0.53	0.53			0.35			0.35	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				883	888			1246			1791	
v/s Ratio Prot				c0.46	0.45			c0.27			0.26	
v/s Ratio Perm												
v/c Ratio				0.88	0.86			0.78			0.73	
Uniform Delay, d1				18.8	18.6			26.0			25.4	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				9.7	8.7			4.8			2.6	
Delay (s)				28.4	27.3			30.8			28.0	
Level of Service				C	C			C			C	
Approach Delay (s)		0.0			27.9			30.8			28.0	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			28.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			73.3%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	25	385	30	22	35	416	1480	15	45	1325	44
Future Volume (vph)	43	25	385	30	22	35	416	1480	15	45	1325	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.908			0.999			0.995	
Flt Protected		0.969		0.950			0.950			0.950		
Satd. Flow (prot)	0	1805	1583	1770	1691	0	1770	3536	0	1770	3522	0
Flt Permitted		0.782		0.709			0.098			0.950		
Satd. Flow (perm)	0	1457	1583	1321	1691	0	183	3536	0	1770	3522	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			418		38			2			4	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	27	418	33	24	38	452	1609	16	49	1440	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	74	418	33	62	0	452	1625	0	49	1488	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

	↖	→	↘	↙	←	↖	↙	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)		11.9	11.9	11.9	11.9		61.2	61.2		8.0	47.1	
Actuated g/C Ratio		0.13	0.13	0.13	0.13		0.68	0.68		0.09	0.52	
v/c Ratio		0.39	0.73	0.19	0.24		1.07	0.68		0.31	0.81	
Control Delay		39.4	11.6	34.3	18.2		94.1	13.6		43.0	23.6	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		39.4	11.6	34.3	18.2		94.1	13.6		43.0	23.6	
LOS		D	B	C	B		F	B		D	C	
Approach Delay		15.8			23.8			31.1			24.3	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)		40	0	17	12		~238	281		27	335	
Queue Length 95th (ft)		71	75	39	42		#461	#601		60	#606	
Internal Link Dist (ft)		1348			332			637			353	
Turn Bay Length (ft)			200				150			300		
Base Capacity (vph)		340	690	309	424		424	2406		158	1846	
Starvation Cap Reductn		0	0	0	0		0	0		0	0	
Spillback Cap Reductn		0	0	0	0		0	0		0	0	
Storage Cap Reductn		0	0	0	0		0	0		0	0	
Reduced v/c Ratio		0.22	0.61	0.11	0.15		1.07	0.68		0.31	0.81	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 105

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 26.7

Intersection LOS: C

Intersection Capacity Utilization 83.1%

ICU Level of Service E

Analysis Period (min) 15

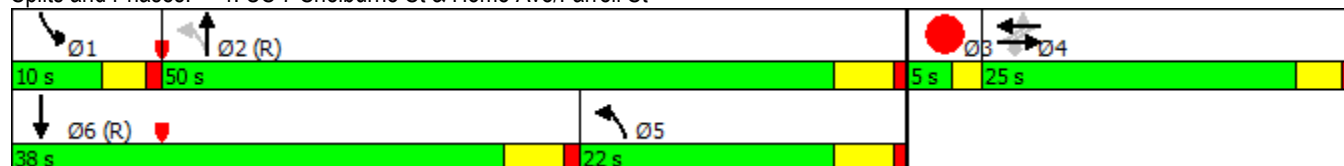
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lane Group	Ø3
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	25	385	30	22	35	416	1480	15	45	1325	44
Future Volume (vph)	43	25	385	30	22	35	416	1480	15	45	1325	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.91		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1805	1583	1770	1691		1770	3534		1770	3522	
Flt Permitted		0.78	1.00	0.71	1.00		0.10	1.00		0.95	1.00	
Satd. Flow (perm)		1456	1583	1320	1691		182	3534		1770	3522	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	27	418	33	24	38	452	1609	16	49	1440	48
RTOR Reduction (vph)	0	0	363	0	33	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	74	55	33	29	0	452	1624	0	49	1486	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		11.9	11.9	11.9	11.9		59.6	59.6		5.5	45.5	
Effective Green, g (s)		11.9	11.9	11.9	11.9		59.6	59.6		5.5	45.5	
Actuated g/C Ratio		0.13	0.13	0.13	0.13		0.66	0.66		0.06	0.51	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		192	209	174	223		448	2340		108	1780	
v/s Ratio Prot					0.02		c0.21	0.46		0.03	c0.42	
v/s Ratio Perm		c0.05	0.03	0.02			c0.46					
v/c Ratio		0.39	0.26	0.19	0.13		1.01	0.69		0.45	0.83	
Uniform Delay, d1		35.7	35.1	34.8	34.5		25.7	9.5		40.8	19.0	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3	0.7	0.5	0.3		44.8	1.7		3.0	4.8	
Delay (s)		37.0	35.8	35.3	34.7		70.4	11.2		43.8	23.8	
Level of Service		D	D	D	C		E	B		D	C	
Approach Delay (s)		36.0			34.9			24.1			24.5	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			25.9				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			83.1%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	317	13	0	2386	2029	0	
Future Volume (vph)	317	13	0	2386	2029	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt		0.850					
Flt Protected	0.953						
Satd. Flow (prot)	1775	1504	0	3539	3539	0	
Flt Permitted	0.953						
Satd. Flow (perm)	1775	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)		13					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	345	14	0	2593	2205	0	
Shared Lane Traffic (%)		10%					
Lane Group Flow (vph)	346	13	0	2593	2205	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2		3
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0		1.0
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0
Total Split (s)	24.0	24.0		82.0	82.0		24.0
Total Split (%)	18.5%	18.5%		63.1%	63.1%		18%
Maximum Green (s)	18.0	18.0		76.0	76.0		22.0
Yellow Time (s)	4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead					Lag
Lead-Lag Optimize?	Yes	Yes					Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		0.2
Recall Mode	None	None		C-Max	C-Max		None
Walk Time (s)	0.0	0.0		0.0	0.0		5.0
Flash Dont Walk (s)	0.0	0.0		17.0	17.0		17.0
Pedestrian Calls (#/hr)	0	0		0	0		0
Act Effect Green (s)	18.0	18.0		100.0	100.0		

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Actuated g/C Ratio	0.14	0.14		0.77	0.77		
v/c Ratio	1.41	0.06		0.95	0.81		
Control Delay	248.4	22.4		23.0	12.3		
Queue Delay	0.0	0.0		0.0	46.1		
Total Delay	248.4	22.4		23.0	58.5		
LOS	F	C		C	E		
Approach Delay	240.2			23.0	58.5		
Approach LOS	F			C	E		
Queue Length 50th (ft)	~391	0		852	513		
Queue Length 95th (ft)	#583	21		#1067	614		
Internal Link Dist (ft)	258			305	166		
Turn Bay Length (ft)							
Base Capacity (vph)	245	219		2722	2722		
Starvation Cap Reductn	0	0		0	714		
Spillback Cap Reductn	0	0		0	0		
Storage Cap Reductn	0	0		0	0		
Reduced v/c Ratio	1.41	0.06		0.95	1.10		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.41

Intersection Signal Delay: 53.3

Intersection LOS: D

Intersection Capacity Utilization 153.2%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

 Ø2 (R)	 Ø4	 Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	317	13	0	2386	2029	0
Future Volume (vph)	317	13	0	2386	2029	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1774	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1774	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	345	14	0	2593	2205	0
RTOR Reduction (vph)	0	11	0	0	0	0
Lane Group Flow (vph)	346	2	0	2593	2205	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	245	208		2722	2722	
v/s Ratio Prot	c0.20	0.00		c0.73	0.62	
v/s Ratio Perm						
v/c Ratio	1.41	0.01		0.95	0.81	
Uniform Delay, d1	56.0	48.3		13.0	9.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	208.0	0.0		9.3	2.7	
Delay (s)	264.0	48.3		22.2	11.9	
Level of Service	F	D		C	B	
Approach Delay (s)	256.2			22.2	11.9	
Approach LOS	F			C	B	

Intersection Summary

HCM 2000 Control Delay	34.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	153.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1508	140	0	0	890	0	0	2050	5
Future Volume (vph)	0	0	0	1508	140	0	0	890	0	0	2050	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Frnt												
Flt Protected				0.950	0.960							
Satd. Flow (prot)	0	0	0	1681	1699	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.960							
Satd. Flow (perm)	0	0	0	1681	1699	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1639	152	0	0	967	0	0	2228	5
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	0	0	885	906	0	0	967	0	0	2233	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				49.0	49.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio				0.54	0.54			0.33			0.33	
v/c Ratio				0.97	0.98			0.82			1.32	
Control Delay				44.3	46.8			34.5			175.4	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				44.3	46.8			34.5			175.4	
LOS				D	D			C			F	
Approach Delay					45.6			34.5			175.4	
Approach LOS					D			C			F	
Queue Length 50th (ft)				478	496			262			~606	
Queue Length 95th (ft)				#777	#797			341			#702	
Internal Link Dist (ft)		52			64			652			60	
Turn Bay Length (ft)												
Base Capacity (vph)				915	925			1179			1695	
Starvation Cap Reductn				0	0			0			0	
Spillback Cap Reductn				0	0			0			0	
Storage Cap Reductn				0	0			0			0	
Reduced v/c Ratio				0.97	0.98			0.82			1.32	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 101.5

Intersection LOS: F

Intersection Capacity Utilization 94.3%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1508	140	0	0	890	0	0	2050	5
Future Volume (vph)	0	0	0	1508	140	0	0	890	0	0	2050	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1699			3539			5084	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1699			3539			5084	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1639	152	0	0	967	0	0	2228	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	885	906	0	0	967	0	0	2233	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				49.0	49.0			30.0			30.0	
Effective Green, g (s)				49.0	49.0			30.0			30.0	
Actuated g/C Ratio				0.54	0.54			0.33			0.33	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				915	925			1179			1694	
v/s Ratio Prot				0.53	c0.53			0.27			c0.44	
v/s Ratio Perm												
v/c Ratio				0.97	0.98			0.82			1.32	
Uniform Delay, d1				19.7	20.0			27.5			30.0	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				21.9	24.3			6.4			147.5	
Delay (s)				41.6	44.3			34.0			177.5	
Level of Service				D	D			C			F	
Approach Delay (s)		0.0			43.0			34.0			177.5	
Approach LOS		A			D			C			F	
Intersection Summary												
HCM 2000 Control Delay			101.4			HCM 2000 Level of Service					F	
HCM 2000 Volume to Capacity ratio			1.11									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			94.3%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗		↖	↖↗		↖	↖↗	
Traffic Volume (vph)	50	10	311	15	5	10	382	1370	10	10	1015	70
Future Volume (vph)	50	10	311	15	5	10	382	1370	10	10	1015	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.897			0.999			0.990	
Flt Protected		0.960		0.950			0.950			0.950		
Satd. Flow (prot)	0	1788	1583	1770	1671	0	1770	3536	0	1770	3504	0
Flt Permitted		0.751		0.715			0.170			0.950		
Satd. Flow (perm)	0	1399	1583	1332	1671	0	317	3536	0	1770	3504	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			338		11			1			9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	338	16	5	11	415	1489	11	11	1103	76
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	338	16	16	0	415	1500	0	11	1179	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)		10.5	10.5	10.5	10.5		68.2	68.2		6.2	48.5	
Actuated g/C Ratio		0.12	0.12	0.12	0.12		0.76	0.76		0.07	0.54	
v/c Ratio		0.40	0.70	0.10	0.08		0.81	0.56		0.09	0.62	
Control Delay		42.3	12.4	34.1	20.5		34.9	7.2		40.5	17.0	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		42.3	12.4	34.1	20.5		34.9	7.2		40.5	17.0	
LOS		D	B	C	C		C	A		D	B	
Approach Delay		17.2			27.3			13.2			17.2	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)		35	0	8	3		95	117		6	221	
Queue Length 95th (ft)		68	71	25	19		#327	388		22	353	
Internal Link Dist (ft)		1348			332			637			353	
Turn Bay Length (ft)			200				150			300		
Base Capacity (vph)		326	628	310	398		514	2680		125	1891	
Starvation Cap Reductn		0	0	0	0		0	0		0	0	
Spillback Cap Reductn		0	0	0	0		0	0		0	0	
Storage Cap Reductn		0	0	0	0		0	0		0	0	
Reduced v/c Ratio		0.20	0.54	0.05	0.04		0.81	0.56		0.09	0.62	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 15.1

Intersection LOS: B

Intersection Capacity Utilization 73.1%

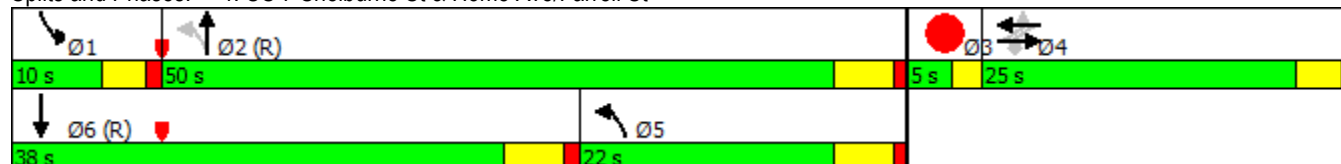
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St

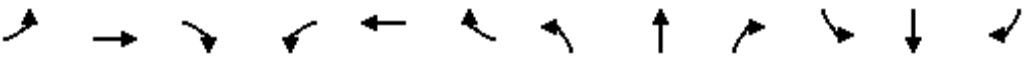


Lane Group	Ø3
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↩	↩	↩	↩		↩	↩		↩	↩	
Traffic Volume (vph)	50	10	311	15	5	10	382	1370	10	10	1015	70
Future Volume (vph)	50	10	311	15	5	10	382	1370	10	10	1015	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583	1770	1671		1770	3535		1770	3505	
Flt Permitted		0.75	1.00	0.71	1.00		0.17	1.00		0.95	1.00	
Satd. Flow (perm)		1399	1583	1331	1671		317	3535		1770	3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	338	16	5	11	415	1489	11	11	1103	76
RTOR Reduction (vph)	0	0	299	0	10	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	65	39	16	6	0	415	1500	0	11	1175	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		10.5	10.5	10.5	10.5		65.0	65.0		1.5	45.3	
Effective Green, g (s)		10.5	10.5	10.5	10.5		65.0	65.0		1.5	45.3	
Actuated g/C Ratio		0.12	0.12	0.12	0.12		0.72	0.72		0.02	0.50	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		163	184	155	194		555	2553		29	1764	
v/s Ratio Prot					0.00		c0.17	0.42		0.01	c0.34	
v/s Ratio Perm		c0.05	0.02	0.01			c0.37					
v/c Ratio		0.40	0.21	0.10	0.03		0.75	0.59		0.38	0.67	
Uniform Delay, d1		36.8	36.0	35.5	35.2		17.1	6.0		43.8	16.7	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.6	0.6	0.3	0.1		5.5	1.0		8.1	2.0	
Delay (s)		38.4	36.6	35.8	35.3		22.5	7.0		51.9	18.7	
Level of Service		D	D	D	D		C	A		D	B	
Approach Delay (s)		36.9			35.6			10.4			19.0	
Approach LOS		D			D			B			B	
Intersection Summary												
HCM 2000 Control Delay			16.5				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			73.1%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	102	17	0	1596	1586	0	
Future Volume (vph)	102	17	0	1596	1586	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.997	0.850					
Flt Protected	0.953						
Satd. Flow (prot)	1770	1504	0	3539	3539	0	
Flt Permitted	0.953						
Satd. Flow (perm)	1770	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	1	16					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	111	18	0	1735	1724	0	
Shared Lane Traffic (%)		10%					
Lane Group Flow (vph)	113	16	0	1735	1724	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2	3	
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0	1.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	
Total Split (s)	24.0	24.0		82.0	82.0	24.0	
Total Split (%)	18.5%	18.5%		63.1%	63.1%	18%	
Maximum Green (s)	18.0	18.0		76.0	76.0	22.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	2.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	0.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	0.2	
Recall Mode	None	None		C-Max	C-Max	None	
Walk Time (s)	0.0	0.0		0.0	0.0	5.0	
Flash Dont Walk (s)	0.0	0.0		17.0	17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	
Act Effect Green (s)	12.6	12.6		105.4	105.4		

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Actuated g/C Ratio	0.10	0.10		0.81	0.81		
v/c Ratio	0.66	0.10		0.60	0.60		
Control Delay	73.3	22.1		6.0	6.0		
Queue Delay	0.0	0.0		0.0	4.3		
Total Delay	73.3	22.1		6.0	10.3		
LOS	E	C		A	B		
Approach Delay	66.9			6.0	10.3		
Approach LOS	E			A	B		
Queue Length 50th (ft)	93	0		231	228		
Queue Length 95th (ft)	152	24		352	347		
Internal Link Dist (ft)	258			305	166		
Turn Bay Length (ft)							
Base Capacity (vph)	245	222		2869	2869		
Starvation Cap Reductn	0	0		0	1052		
Spillback Cap Reductn	0	0		0	0		
Storage Cap Reductn	0	0		0	0		
Reduced v/c Ratio	0.46	0.07		0.60	0.95		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 10.3

Intersection LOS: B

Intersection Capacity Utilization 60.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

  Ø2 (R)	 Ø4	  Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	102	17	0	1596	1586	0
Future Volume (vph)	102	17	0	1596	1586	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1771	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1771	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	111	18	0	1735	1724	0
RTOR Reduction (vph)	1	14	0	0	0	0
Lane Group Flow (vph)	112	2	0	1735	1724	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	12.6	12.6		105.4	105.4	
Effective Green, g (s)	12.6	12.6		105.4	105.4	
Actuated g/C Ratio	0.10	0.10		0.81	0.81	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	171	145		2869	2869	
v/s Ratio Prot	c0.06	0.00		c0.49	0.49	
v/s Ratio Perm						
v/c Ratio	0.66	0.01		0.60	0.60	
Uniform Delay, d1	56.6	53.1		4.6	4.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.7	0.0		1.0	0.9	
Delay (s)	63.3	53.1		5.5	5.5	
Level of Service	E	D		A	A	
Approach Delay (s)	62.1			5.5	5.5	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	7.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1292	50	0	0	965	0	0	1411	0
Future Volume (vph)	0	0	0	1292	50	0	0	965	0	0	1411	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frnt												
Flt Protected				0.950	0.956							
Satd. Flow (prot)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.956							
Satd. Flow (perm)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1404	54	0	0	1049	0	0	1534	0
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	0	0	730	728	0	0	1049	0	0	1534	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				46.3	46.3			32.7			32.7	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio				0.51	0.51			0.36			0.36	
v/c Ratio				0.84	0.84			0.82			0.83	
Control Delay				29.1	28.4			33.3			31.9	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				29.1	28.4			33.3			31.9	
LOS				C	C			C			C	
Approach Delay					28.7			33.3			31.9	
Approach LOS					C			C			C	
Queue Length 50th (ft)				330	327			294			301	
Queue Length 95th (ft)				508	501			#413			#393	
Internal Link Dist (ft)		52			64			652			60	
Turn Bay Length (ft)												
Base Capacity (vph)				915	921			1287			1850	
Starvation Cap Reductn				0	0			0			0	
Spillback Cap Reductn				0	0			0			0	
Storage Cap Reductn				0	0			0			0	
Reduced v/c Ratio				0.80	0.79			0.82			0.83	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 31.1

Intersection LOS: C

Intersection Capacity Utilization 73.5%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1292	50	0	0	965	0	0	1411	0
Future Volume (vph)	0	0	0	1292	50	0	0	965	0	0	1411	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1691			3539			5085	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1691			3539			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1404	54	0	0	1049	0	0	1534	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	730	728	0	0	1049	0	0	1534	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				46.3	46.3			32.7			32.7	
Effective Green, g (s)				46.3	46.3			32.7			32.7	
Actuated g/C Ratio				0.51	0.51			0.36			0.36	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				864	869			1285			1847	
v/s Ratio Prot				c0.43	0.43			0.30			c0.30	
v/s Ratio Perm												
v/c Ratio				0.84	0.84			0.82			0.83	
Uniform Delay, d1				18.8	18.6			25.9			26.1	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				7.6	7.1			5.8			4.5	
Delay (s)				26.4	25.7			31.7			30.6	
Level of Service				C	C			C			C	
Approach Delay (s)		0.0			26.1			31.7			30.6	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			29.3									
HCM 2000 Level of Service											C	
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			90.0								11.0	
Intersection Capacity Utilization			73.5%								D	
ICU Level of Service												
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱	↰	↱		↰	↰↱		↰	↰↱	
Traffic Volume (vph)	50	10	200	15	5	10	70	1060	10	10	645	50
Future Volume (vph)	50	10	200	15	5	10	70	1060	10	10	645	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.897			0.999			0.989	
Flt Protected		0.960		0.950			0.950			0.950		
Satd. Flow (prot)	0	1788	1583	1770	1671	0	1770	3536	0	1770	3500	0
Flt Permitted		0.751		0.715			0.360			0.950		
Satd. Flow (perm)	0	1399	1583	1332	1671	0	671	3536	0	1770	3500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			217		11			1			10	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	217	16	5	11	76	1152	11	11	701	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	217	16	16	0	76	1163	0	11	755	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effect Green (s)		9.6	9.6	9.6	9.6		69.1	69.1		6.2	53.8	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.77	0.77		0.07	0.60	
v/c Ratio		0.44	0.60	0.11	0.09		0.11	0.43		0.09	0.36	
Control Delay		45.8	12.6	36.2	22.0		4.9	5.2		40.5	11.6	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		45.8	12.6	36.2	22.0		4.9	5.2		40.5	11.6	
LOS		D	B	D	C		A	A		D	B	
Approach Delay		20.2			29.1			5.2			12.0	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)		35	0	8	3		7	77		6	118	
Queue Length 95th (ft)		72	61	26	20		32	231		22	180	
Internal Link Dist (ft)		1348			332			637			353	
Turn Bay Length (ft)			200				150			300		
Base Capacity (vph)		326	535	310	398		723	2716		125	2096	
Starvation Cap Reductn		0	0	0	0		0	0		0	0	
Spillback Cap Reductn		0	0	0	0		0	0		0	0	
Storage Cap Reductn		0	0	0	0		0	0		0	0	
Reduced v/c Ratio		0.20	0.41	0.05	0.04		0.11	0.43		0.09	0.36	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 9.6

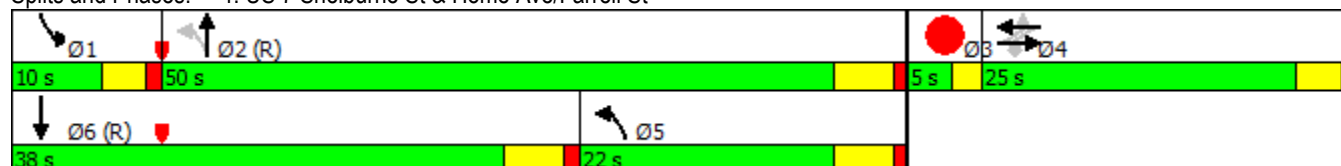
Intersection LOS: A

Intersection Capacity Utilization 53.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lane Group	Ø3
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱	↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	50	10	200	15	5	10	70	1060	10	10	645	50
Future Volume (vph)	50	10	200	15	5	10	70	1060	10	10	645	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583	1770	1671		1770	3534		1770	3501	
Flt Permitted		0.75	1.00	0.71	1.00		0.36	1.00		0.95	1.00	
Satd. Flow (perm)		1399	1583	1331	1671		671	3534		1770	3501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	217	16	5	11	76	1152	11	11	701	54
RTOR Reduction (vph)	0	0	194	0	10	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	65	23	16	6	0	76	1163	0	11	751	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		9.6	9.6	9.6	9.6		65.9	65.9		1.5	50.6	
Effective Green, g (s)		9.6	9.6	9.6	9.6		65.9	65.9		1.5	50.6	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.73	0.73		0.02	0.56	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		149	168	141	178		684	2587		29	1968	
v/s Ratio Prot					0.00		0.02	c0.33		0.01	c0.21	
v/s Ratio Perm		c0.05	0.01	0.01			0.06					
v/c Ratio		0.44	0.14	0.11	0.03		0.11	0.45		0.38	0.38	
Uniform Delay, d1		37.7	36.4	36.4	36.0		3.8	4.8		43.8	11.0	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.0	0.4	0.4	0.1		0.1	0.6		8.1	0.6	
Delay (s)		39.7	36.8	36.7	36.1		3.9	5.4		51.9	11.5	
Level of Service		D	D	D	D		A	A		D	B	
Approach Delay (s)		37.5			36.4			5.3			12.1	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			11.9				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			53.7%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	100	301	0	1523	1514	0	
Future Volume (vph)	100	301	0	1523	1514	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.923	0.850					
Flt Protected	0.976						
Satd. Flow (prot)	1678	1504	0	3539	3539	0	
Flt Permitted	0.976						
Satd. Flow (perm)	1678	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	34	213					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	109	327	0	1655	1646	0	
Shared Lane Traffic (%)		35%					
Lane Group Flow (vph)	223	213	0	1655	1646	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2	3	
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0	1.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	
Total Split (s)	24.0	24.0		82.0	82.0	24.0	
Total Split (%)	18.5%	18.5%		63.1%	63.1%	18%	
Maximum Green (s)	18.0	18.0		76.0	76.0	22.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	2.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	0.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	0.2	
Recall Mode	None	None		C-Max	C-Max	None	
Walk Time (s)	0.0	0.0		0.0	0.0	5.0	
Flash Dont Walk (s)	0.0	0.0		17.0	17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	
Act Efect Green (s)	17.0	17.0		101.0	101.0		

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Actuated g/C Ratio	0.13	0.13		0.78	0.78		
v/c Ratio	0.90	0.56		0.60	0.60		
Control Delay	83.2	12.5		7.3	7.3		
Queue Delay	0.0	0.0		0.0	6.2		
Total Delay	83.2	12.5		7.3	13.5		
LOS	F	B		A	B		
Approach Delay	48.7			7.3	13.5		
Approach LOS	D			A	B		
Queue Length 50th (ft)	159	0		272	270		
Queue Length 95th (ft)	#301	77		323	320		
Internal Link Dist (ft)	258			305	166		
Turn Bay Length (ft)							
Base Capacity (vph)	261	391		2750	2750		
Starvation Cap Reductn	0	0		0	1048		
Spillback Cap Reductn	0	0		0	0		
Storage Cap Reductn	0	0		0	0		
Reduced v/c Ratio	0.85	0.54		0.60	0.97		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 14.8

Intersection LOS: B

Intersection Capacity Utilization 64.3%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

 Ø2 (R)	 Ø4	 Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	100	301	0	1523	1514	0
Future Volume (vph)	100	301	0	1523	1514	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	0.92	0.85		1.00	1.00	
Flt Protected	0.98	1.00		1.00	1.00	
Satd. Flow (prot)	1679	1504		3539	3539	
Flt Permitted	0.98	1.00		1.00	1.00	
Satd. Flow (perm)	1679	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	327	0	1655	1646	0
RTOR Reduction (vph)	30	185	0	0	0	0
Lane Group Flow (vph)	193	28	0	1655	1646	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	17.0	17.0		101.0	101.0	
Effective Green, g (s)	17.0	17.0		101.0	101.0	
Actuated g/C Ratio	0.13	0.13		0.78	0.78	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	219	196		2749	2749	
v/s Ratio Prot	c0.12	0.02		c0.47	0.47	
v/s Ratio Perm						
v/c Ratio	0.88	0.14		0.60	0.60	
Uniform Delay, d1	55.5	50.0		6.1	6.0	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	30.8	0.1		1.0	1.0	
Delay (s)	86.3	50.2		7.1	7.0	
Level of Service	F	D		A	A	
Approach Delay (s)	68.6			7.1	7.0	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	64.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	80	106	40	5	5	137	515	40	5	625	40
Future Volume (vph)	50	80	106	40	5	5	137	515	40	5	625	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	125		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.987			0.989			0.991	
Flt Protected		0.981			0.961		0.950			0.950		
Satd. Flow (prot)	0	1827	1583	0	1767	0	1770	1842	0	1770	1846	0
Flt Permitted		0.874			0.515		0.950			0.950		
Satd. Flow (perm)	0	1628	1583	0	947	0	1770	1842	0	1770	1846	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			110		4			4			4	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		335			128			357			349	
Travel Time (s)		7.6			2.9			8.1			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	87	115	43	5	5	149	560	43	5	679	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	141	115	0	53	0	149	603	0	5	722	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	15.0		5.0	15.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		11.0	20.0		11.0	20.5	
Total Split (s)	18.0	18.0	18.0	18.0	18.0		17.0	60.0		17.0	60.0	
Total Split (%)	15.0%	15.0%	15.0%	15.0%	15.0%		14.2%	50.0%		14.2%	50.0%	
Maximum Green (s)	13.0	13.0	13.0	13.0	13.0		12.0	55.0		12.0	55.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Max		None	Max	
Walk Time (s)												

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	21%
Maximum Green (s)	22.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		12.4	12.4		12.4		11.7	70.3		5.9	55.6	
Actuated g/C Ratio		0.13	0.13		0.13		0.12	0.71		0.06	0.56	
v/c Ratio		0.69	0.39		0.43		0.71	0.46		0.05	0.70	
Control Delay		61.7	13.9		52.2		63.4	10.6		49.4	22.2	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		61.7	13.9		52.2		63.4	10.6		49.4	22.2	
LOS		E	B		D		E	B		D	C	
Approach Delay		40.3			52.2			21.1			22.4	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)		81	3		27		87	105		3	278	
Queue Length 95th (ft)		#217	60		#82		#233	462		17	#714	
Internal Link Dist (ft)		255			48			277			269	
Turn Bay Length (ft)			75				125			100		
Base Capacity (vph)		216	305		129		217	1311		217	1038	
Starvation Cap Reductn		0	0		0		0	0		0	0	
Spillback Cap Reductn		0	0		0		0	0		0	0	
Storage Cap Reductn		0	0		0		0	0		0	0	
Reduced v/c Ratio		0.65	0.38		0.41		0.69	0.46		0.02	0.70	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 98.9

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 25.3

Intersection LOS: C

Intersection Capacity Utilization 64.9%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: Champlain Pkwy & Home Ave

 Ø1	 Ø2	 Ø4	 Ø9
17 s	60 s	18 s	25 s
 Ø5	 Ø6	 Ø8	
17 s	60 s	18 s	

Lanes, Volumes, Timings
7: Champlain Pkwy & Home Ave

04/23/2020

Lane Group	Ø9
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

7: Champlain Pkwy & Home Ave

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰		↱	↰		↱	↰	
Traffic Volume (vph)	50	80	106	40	5	5	137	515	40	5	625	40
Future Volume (vph)	50	80	106	40	5	5	137	515	40	5	625	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.99		1.00	0.99		1.00	0.99	
Flt Protected		0.98	1.00		0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1828	1583		1767		1770	1843		1770	1846	
Flt Permitted		0.87	1.00		0.52		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1629	1583		948		1770	1843		1770	1846	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	87	115	43	5	5	149	560	43	5	679	43
RTOR Reduction (vph)	0	0	97	0	4	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	141	18	0	49	0	149	602	0	5	720	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		12.4	12.4		12.4		11.7	70.4		1.1	59.8	
Effective Green, g (s)		12.4	12.4		12.4		11.7	70.4		1.1	59.8	
Actuated g/C Ratio		0.12	0.12		0.12		0.11	0.67		0.01	0.57	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		191	186		111		196	1229		18	1046	
v/s Ratio Prot							c0.08	0.33		0.00	c0.39	
v/s Ratio Perm		c0.09	0.01		0.05							
v/c Ratio		0.74	0.10		0.45		0.76	0.49		0.28	0.69	
Uniform Delay, d1		45.0	41.5		43.3		45.5	8.7		51.8	16.2	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		13.8	0.2		2.8		15.8	1.4		8.3	3.7	
Delay (s)		58.8	41.8		46.2		61.4	10.1		60.1	19.9	
Level of Service		E	D		D		E	B		E	B	
Approach Delay (s)		51.2			46.2			20.2			20.2	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			25.4				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			105.5				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			64.9%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1312	50	0	0	715	0	0	930	0
Future Volume (vph)	0	0	0	1312	50	0	0	715	0	0	930	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Fr t												
Flt Protected				0.950	0.956							
Satd. Flow (prot)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.956							
Satd. Flow (perm)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1426	54	0	0	777	0	0	1011	0
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	0	0	742	738	0	0	777	0	0	1011	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				46.5	46.5			32.5			32.5	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio				0.52	0.52			0.36			0.36	
v/c Ratio				0.85	0.84			0.61			0.55	
Control Delay				29.8	28.9			26.7			24.9	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				29.8	28.9			26.7			24.9	
LOS				C	C			C			C	
Approach Delay					29.3			26.7			24.9	
Approach LOS					C			C			C	
Queue Length 50th (ft)				340	335			196			173	
Queue Length 95th (ft)				#534	514			260			217	
Internal Link Dist (ft)		52			64			652			60	
Turn Bay Length (ft)												
Base Capacity (vph)				915	921			1278			1837	
Starvation Cap Reductn				0	0			0			0	
Spillback Cap Reductn				0	0			0			0	
Storage Cap Reductn				0	0			0			0	
Reduced v/c Ratio				0.81	0.80			0.61			0.55	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 27.4

Intersection LOS: C

Intersection Capacity Utilization 71.8%

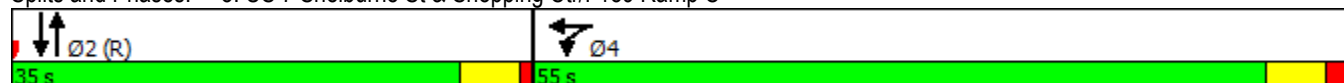
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

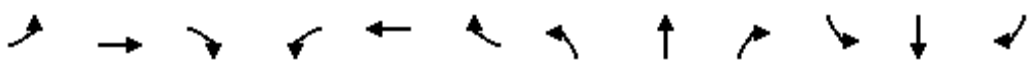
04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1312	50	0	0	715	0	0	930	0
Future Volume (vph)	0	0	0	1312	50	0	0	715	0	0	930	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1691			3539			5085	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1691			3539			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1426	54	0	0	777	0	0	1011	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	742	738	0	0	777	0	0	1011	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				46.5	46.5			32.5			32.5	
Effective Green, g (s)				46.5	46.5			32.5			32.5	
Actuated g/C Ratio				0.52	0.52			0.36			0.36	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				868	873			1277			1836	
v/s Ratio Prot				c0.44	0.44			c0.22			0.20	
v/s Ratio Perm												
v/c Ratio				0.85	0.85			0.61			0.55	
Uniform Delay, d1				18.8	18.7			23.5			22.9	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				8.2	7.6			2.2			1.2	
Delay (s)				27.1	26.2			25.7			24.1	
Level of Service				C	C			C			C	
Approach Delay (s)		0.0			26.7			25.7			24.1	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			25.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.75									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			71.8%			ICU Level of Service				C		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗		↖	↖↗		↖	↖↗	
Traffic Volume (vph)	35	25	142	30	20	35	168	1285	15	40	910	18
Future Volume (vph)	35	25	142	30	20	35	168	1285	15	40	910	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.905			0.998			0.997	
Flt Protected		0.972		0.950			0.950			0.950		
Satd. Flow (prot)	0	1811	1583	1770	1686	0	1770	3532	0	1770	3529	0
Flt Permitted		0.788		0.715			0.263			0.950		
Satd. Flow (perm)	0	1468	1583	1332	1686	0	490	3532	0	1770	3529	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			158		38			2			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	27	154	33	22	38	183	1397	16	43	989	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	154	33	60	0	183	1413	0	43	1009	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

	↖	→	↘	↙	←	↖	↙	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)		9.4	9.4	9.4	9.4		63.9	63.9		7.7	49.6	
Actuated g/C Ratio		0.10	0.10	0.10	0.10		0.71	0.71		0.09	0.55	
v/c Ratio		0.42	0.50	0.24	0.29		0.31	0.56		0.28	0.52	
Control Delay		45.4	11.9	39.8	21.3		11.7	9.1		42.7	14.3	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		45.4	11.9	39.8	21.3		11.7	9.1		42.7	14.3	
LOS		D	B	D	C		B	A		D	B	
Approach Delay		21.8			27.9			9.4			15.5	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)		35	0	18	12		34	203		23	175	
Queue Length 95th (ft)		72	50	44	46		75	339		54	258	
Internal Link Dist (ft)		1348			332			637			353	
Turn Bay Length (ft)			200				150			300		
Base Capacity (vph)		342	490	310	422		589	2509		153	1945	
Starvation Cap Reductn		0	0	0	0		0	0		0	0	
Spillback Cap Reductn		0	0	0	0		0	0		0	0	
Storage Cap Reductn		0	0	0	0		0	0		0	0	
Reduced v/c Ratio		0.19	0.31	0.11	0.14		0.31	0.56		0.28	0.52	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 13.0

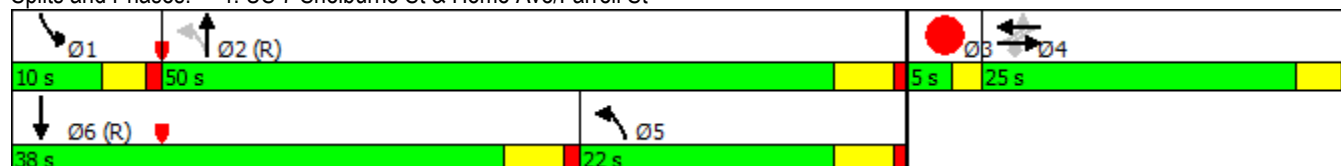
Intersection LOS: B

Intersection Capacity Utilization 60.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lane Group	Ø3
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱	↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	35	25	142	30	20	35	168	1285	15	40	910	18
Future Volume (vph)	35	25	142	30	20	35	168	1285	15	40	910	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.91		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1810	1583	1770	1686		1770	3533		1770	3529	
Flt Permitted		0.79	1.00	0.71	1.00		0.26	1.00		0.95	1.00	
Satd. Flow (perm)		1467	1583	1331	1686		489	3533		1770	3529	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	27	154	33	22	38	183	1397	16	43	989	20
RTOR Reduction (vph)	0	0	138	0	34	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	65	16	33	26	0	183	1412	0	43	1008	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		9.4	9.4	9.4	9.4		62.3	62.3		5.3	48.0	
Effective Green, g (s)		9.4	9.4	9.4	9.4		62.3	62.3		5.3	48.0	
Actuated g/C Ratio		0.10	0.10	0.10	0.10		0.69	0.69		0.06	0.53	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		153	165	139	176		603	2445		104	1882	
v/s Ratio Prot					0.02		0.06	c0.40		0.02	c0.29	
v/s Ratio Perm		c0.04	0.01	0.02			0.15					
v/c Ratio		0.42	0.10	0.24	0.15		0.30	0.58		0.41	0.54	
Uniform Delay, d1		37.8	36.5	37.0	36.7		8.1	7.1		40.9	13.7	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.9	0.3	0.9	0.4		0.3	1.0		2.7	1.1	
Delay (s)		39.7	36.7	37.9	37.0		8.4	8.1		43.5	14.8	
Level of Service		D	D	D	D		A	A		D	B	
Approach Delay (s)		37.6			37.3			8.1			16.0	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			14.0				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			60.1%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	135	388	0	2055	1747	0	
Future Volume (vph)	135	388	0	2055	1747	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.926	0.850					
Flt Protected	0.975						
Satd. Flow (prot)	1682	1504	0	3539	3539	0	
Flt Permitted	0.975						
Satd. Flow (perm)	1682	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	31	255					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	147	422	0	2234	1899	0	
Shared Lane Traffic (%)		34%					
Lane Group Flow (vph)	290	279	0	2234	1899	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2	3	
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0	1.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	
Total Split (s)	24.0	24.0		82.0	82.0	24.0	
Total Split (%)	18.5%	18.5%		63.1%	63.1%	18%	
Maximum Green (s)	18.0	18.0		76.0	76.0	22.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	2.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	0.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	0.2	
Recall Mode	None	None		C-Max	C-Max	None	
Walk Time (s)	0.0	0.0		0.0	0.0	5.0	
Flash Dont Walk (s)	0.0	0.0		17.0	17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	
Act Effect Green (s)	18.0	18.0		100.0	100.0		

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Actuated g/C Ratio	0.14	0.14		0.77	0.77		
v/c Ratio	1.12	0.65		0.82	0.70		
Control Delay	136.9	16.3		12.7	9.2		
Queue Delay	0.0	0.0		0.0	23.6		
Total Delay	136.9	16.3		12.7	32.7		
LOS	F	B		B	C		
Approach Delay	77.7			12.7	32.7		
Approach LOS	E			B	C		
Queue Length 50th (ft)	~257	18		532	360		
Queue Length 95th (ft)	#440	116		638	427		
Internal Link Dist (ft)	258			305	166		
Turn Bay Length (ft)							
Base Capacity (vph)	259	427		2722	2722		
Starvation Cap Reductn	0	0		0	897		
Spillback Cap Reductn	0	0		0	0		
Storage Cap Reductn	0	0		0	0		
Reduced v/c Ratio	1.12	0.65		0.82	1.04		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 28.7

Intersection LOS: C

Intersection Capacity Utilization 82.2%

ICU Level of Service E

Analysis Period (min) 15

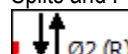
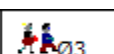
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

		
Ø2 (R)	Ø4	Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	135	388	0	2055	1747	0
Future Volume (vph)	135	388	0	2055	1747	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	0.93	0.85		1.00	1.00	
Flt Protected	0.98	1.00		1.00	1.00	
Satd. Flow (prot)	1682	1504		3539	3539	
Flt Permitted	0.98	1.00		1.00	1.00	
Satd. Flow (perm)	1682	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	147	422	0	2234	1899	0
RTOR Reduction (vph)	27	220	0	0	0	0
Lane Group Flow (vph)	263	59	0	2234	1899	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	232	208		2722	2722	
v/s Ratio Prot	c0.16	0.04		c0.63	0.54	
v/s Ratio Perm						
v/c Ratio	1.13	0.29		0.82	0.70	
Uniform Delay, d1	56.0	50.2		9.4	7.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	100.2	0.3		2.9	1.5	
Delay (s)	156.2	50.5		12.3	9.0	
Level of Service	F	D		B	A	
Approach Delay (s)	104.4			12.3	9.0	
Approach LOS	F			B	A	

Intersection Summary

HCM 2000 Control Delay	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	66	27	117	90	63	5	151	400	75	5	975	78
Future Volume (vph)	66	27	117	90	63	5	151	400	75	5	975	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	125		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.996			0.976			0.989	
Flt Protected		0.966			0.972		0.950			0.950		
Satd. Flow (prot)	0	1799	1583	0	1803	0	1770	1818	0	1770	1842	0
Flt Permitted		0.664			0.680		0.950			0.950		
Satd. Flow (perm)	0	1237	1583	0	1262	0	1770	1818	0	1770	1842	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			127		1			10			4	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		335			128			357			349	
Travel Time (s)		7.6			2.9			8.1			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	72	29	127	98	68	5	164	435	82	5	1060	85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	101	127	0	171	0	164	517	0	5	1145	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	1.0	1.0		5.0	15.0		5.0	15.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		11.0	20.0		11.0	20.5	
Total Split (s)	23.0	23.0	23.0	23.0	23.0		16.0	86.0		16.0	86.0	
Total Split (%)	15.3%	15.3%	15.3%	15.3%	15.3%		10.7%	57.3%		10.7%	57.3%	
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0		11.0	81.0		11.0	81.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Max		None	Max	
Walk Time (s)												

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	17%
Maximum Green (s)	22.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		18.1	18.1		18.1		11.1	95.4		6.0	81.4	
Actuated g/C Ratio		0.14	0.14		0.14		0.09	0.73		0.05	0.63	
v/c Ratio		0.59	0.39		0.97		1.09	0.39		0.06	0.99	
Control Delay		68.8	12.7		116.2		155.2	9.5		64.8	49.1	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		68.8	12.7		116.2		155.2	9.5		64.8	49.1	
LOS		E	B		F		F	A		E	D	
Approach Delay		37.5			116.2			44.6			49.2	
Approach LOS		D			F			D			D	
Queue Length 50th (ft)		77	0		138		~145	108		4	796	
Queue Length 95th (ft)		#182	63		#350		#355	388		20	#1583	
Internal Link Dist (ft)		255			48			277			269	
Turn Bay Length (ft)			75				125			100		
Base Capacity (vph)		172	329		176		150	1337		150	1155	
Starvation Cap Reductn		0	0		0		0	0		0	0	
Spillback Cap Reductn		0	0		0		0	0		0	0	
Storage Cap Reductn		0	0		0		0	0		0	0	
Reduced v/c Ratio		0.59	0.39		0.97		1.09	0.39		0.03	0.99	

Intersection Summary

Area Type: Other

Cycle Length: 150

Actuated Cycle Length: 130

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.09

Intersection Signal Delay: 51.7

Intersection LOS: D

Intersection Capacity Utilization 92.2%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: Champlain Pkwy & Home Ave

 Ø1	 Ø2	 Ø4	 Ø9
16 s	86 s	23 s	25 s
 Ø5	 Ø6	 Ø8	
16 s	86 s	23 s	

Lane Group	Ø9
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

7: Champlain Pkwy & Home Ave

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↱		↰	↱	
Traffic Volume (vph)	66	27	117	90	63	5	151	400	75	5	975	78
Future Volume (vph)	66	27	117	90	63	5	151	400	75	5	975	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00		1.00	0.98		1.00	0.99	
Flt Protected		0.97	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1799	1583		1804		1770	1818		1770	1842	
Flt Permitted		0.66	1.00		0.68		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1237	1583		1262		1770	1818		1770	1842	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	72	29	127	98	68	5	164	435	82	5	1060	85
RTOR Reduction (vph)	0	0	110	0	1	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	101	17	0	170	0	164	514	0	5	1144	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		18.1	18.1		18.1		11.1	95.4		1.2	85.5	
Effective Green, g (s)		18.1	18.1		18.1		11.1	95.4		1.2	85.5	
Actuated g/C Ratio		0.13	0.13		0.13		0.08	0.70		0.01	0.63	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		164	209		167		143	1270		15	1153	
v/s Ratio Prot							c0.09	0.28		0.00	c0.62	
v/s Ratio Perm		0.08	0.01		c0.13							
v/c Ratio		0.62	0.08		1.02		1.15	0.40		0.33	0.99	
Uniform Delay, d1		55.9	51.9		59.2		62.7	8.6		67.3	25.2	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.7	0.2		74.6		120.2	1.0		12.7	24.6	
Delay (s)		62.6	52.1		133.8		182.9	9.6		79.9	49.8	
Level of Service		E	D		F		F	A		E	D	
Approach Delay (s)		56.7			133.8			51.3			49.9	
Approach LOS		E			F			D			D	
Intersection Summary												
HCM 2000 Control Delay			57.5				HCM 2000 Level of Service			E		
HCM 2000 Volume to Capacity ratio			0.98									
Actuated Cycle Length (s)			136.5				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			92.2%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1343	135	0	0	810	0	0	1381	5
Future Volume (vph)	0	0	0	1343	135	0	0	810	0	0	1381	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Frnt												
Flt Protected				0.950	0.961							
Satd. Flow (prot)	0	0	0	1681	1701	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.961							
Satd. Flow (perm)	0	0	0	1681	1701	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												1
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1460	147	0	0	880	0	0	1501	5
Shared Lane Traffic (%)				45%								
Lane Group Flow (vph)	0	0	0	803	804	0	0	880	0	0	1506	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				47.8	47.8			31.2			31.2	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio				0.53	0.53			0.35			0.35	
v/c Ratio				0.90	0.89			0.72			0.85	
Control Delay				33.8	32.6			30.0			33.7	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				33.8	32.6			30.0			33.7	
LOS				C	C			C			C	
Approach Delay					33.2			30.0			33.7	
Approach LOS					C			C			C	
Queue Length 50th (ft)				393	390			231			293	
Queue Length 95th (ft)				#667	#662			303			#364	
Internal Link Dist (ft)		52			64			652			60	
Turn Bay Length (ft)												
Base Capacity (vph)				915	926			1226			1763	
Starvation Cap Reductn				0	0			0			0	
Spillback Cap Reductn				0	0			0			0	
Storage Cap Reductn				0	0			0			0	
Reduced v/c Ratio				0.88	0.87			0.72			0.85	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 32.7

Intersection LOS: C

Intersection Capacity Utilization 76.7%

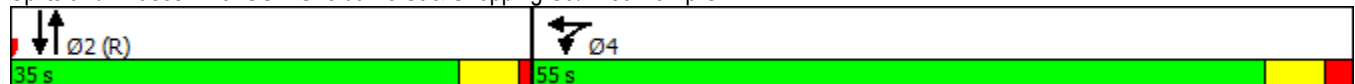
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1343	135	0	0	810	0	0	1381	5
Future Volume (vph)	0	0	0	1343	135	0	0	810	0	0	1381	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1700			3539			5083	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1700			3539			5083	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1460	147	0	0	880	0	0	1501	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	0	0	803	804	0	0	880	0	0	1505	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				47.8	47.8			31.2			31.2	
Effective Green, g (s)				47.8	47.8			31.2			31.2	
Actuated g/C Ratio				0.53	0.53			0.35			0.35	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				892	902			1226			1762	
v/s Ratio Prot				c0.48	0.47			0.25			c0.30	
v/s Ratio Perm												
v/c Ratio				0.90	0.89			0.72			0.85	
Uniform Delay, d1				19.0	18.8			25.6			27.3	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				12.1	11.0			3.6			5.5	
Delay (s)				31.0	29.8			29.2			32.8	
Level of Service				C	C			C			C	
Approach Delay (s)		0.0			30.4			29.2			32.8	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			31.0			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			76.7%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗		↖	↕		↖	↕	
Traffic Volume (vph)	50	10	220	15	5	10	75	1050	10	10	735	50
Future Volume (vph)	50	10	220	15	5	10	75	1050	10	10	735	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.897			0.999			0.991	
Flt Protected		0.960		0.950			0.950			0.950		
Satd. Flow (prot)	0	1788	1583	1770	1671	0	1770	3536	0	1770	3507	0
Flt Permitted		0.751		0.715			0.314			0.950		
Satd. Flow (perm)	0	1399	1583	1332	1671	0	585	3536	0	1770	3507	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			239		11			1			9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	239	16	5	11	82	1141	11	11	799	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	239	16	16	0	82	1152	0	11	853	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

	↖	→	↘	↙	←	↖	↙	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)		9.7	9.7	9.7	9.7		69.1	69.1		6.2	53.7	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.77	0.77		0.07	0.60	
v/c Ratio		0.43	0.62	0.11	0.08		0.13	0.42		0.09	0.41	
Control Delay		45.5	12.7	36.0	21.8		5.3	5.2		40.5	12.2	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		45.5	12.7	36.0	21.8		5.3	5.2		40.5	12.2	
LOS		D	B	D	C		A	A		D	B	
Approach Delay		19.7			28.9			5.2			12.5	
Approach LOS		B			C			A			B	
Queue Length 50th (ft)		35	0	8	3		7	77		6	140	
Queue Length 95th (ft)		72	63	26	20		35	231		22	211	
Internal Link Dist (ft)		1348			332			637			353	
Turn Bay Length (ft)			200				150			300		
Base Capacity (vph)		326	552	310	398		672	2713		125	2096	
Starvation Cap Reductn		0	0	0	0		0	0		0	0	
Spillback Cap Reductn		0	0	0	0		0	0		0	0	
Storage Cap Reductn		0	0	0	0		0	0		0	0	
Reduced v/c Ratio		0.20	0.43	0.05	0.04		0.12	0.42		0.09	0.41	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 9.9

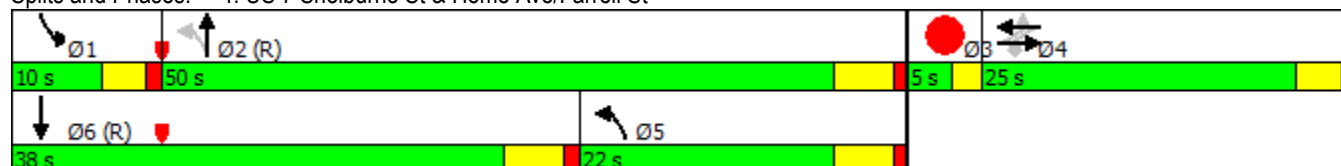
Intersection LOS: A

Intersection Capacity Utilization 53.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lane Group	Ø3
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↩	↩	↩	↩		↩	↩		↩	↩	
Traffic Volume (vph)	50	10	220	15	5	10	75	1050	10	10	735	50
Future Volume (vph)	50	10	220	15	5	10	75	1050	10	10	735	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.90		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1788	1583	1770	1671		1770	3534		1770	3506	
Flt Permitted		0.75	1.00	0.71	1.00		0.31	1.00		0.95	1.00	
Satd. Flow (perm)		1399	1583	1331	1671		585	3534		1770	3506	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	11	239	16	5	11	82	1141	11	11	799	54
RTOR Reduction (vph)	0	0	213	0	10	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	65	26	16	6	0	82	1152	0	11	849	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		9.7	9.7	9.7	9.7		65.8	65.8		1.5	50.4	
Effective Green, g (s)		9.7	9.7	9.7	9.7		65.8	65.8		1.5	50.4	
Actuated g/C Ratio		0.11	0.11	0.11	0.11		0.73	0.73		0.02	0.56	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		150	170	143	180		637	2583		29	1963	
v/s Ratio Prot					0.00		0.02	c0.33		0.01	c0.24	
v/s Ratio Perm		c0.05	0.02	0.01			0.07					
v/c Ratio		0.43	0.15	0.11	0.03		0.13	0.45		0.38	0.43	
Uniform Delay, d1		37.6	36.4	36.3	36.0		4.6	4.8		43.8	11.5	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.0	0.4	0.3	0.1		0.1	0.6		8.1	0.7	
Delay (s)		39.6	36.8	36.6	36.0		4.7	5.4		51.9	12.2	
Level of Service		D	D	D	D		A	A		D	B	
Approach Delay (s)		37.4			36.3			5.3			12.7	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			12.4				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			53.5%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	105	311	0	1596	1586	0	
Future Volume (vph)	105	311	0	1596	1586	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.924	0.850					
Flt Protected	0.976						
Satd. Flow (prot)	1680	1504	0	3539	3539	0	
Flt Permitted	0.976						
Satd. Flow (perm)	1680	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	33	220					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	114	338	0	1735	1724	0	
Shared Lane Traffic (%)		35%					
Lane Group Flow (vph)	232	220	0	1735	1724	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2	3	
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0	1.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	
Total Split (s)	24.0	24.0		82.0	82.0	24.0	
Total Split (%)	18.5%	18.5%		63.1%	63.1%	18%	
Maximum Green (s)	18.0	18.0		76.0	76.0	22.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	2.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	0.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	0.2	
Recall Mode	None	None		C-Max	C-Max	None	
Walk Time (s)	0.0	0.0		0.0	0.0	5.0	
Flash Dont Walk (s)	0.0	0.0		17.0	17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	
Act Effct Green (s)	17.2	17.2		100.8	100.8		

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Actuated g/C Ratio	0.13	0.13		0.78	0.78		
v/c Ratio	0.92	0.56		0.63	0.63		
Control Delay	87.7	12.4		7.8	7.8		
Queue Delay	0.0	0.0		0.0	9.3		
Total Delay	87.7	12.4		7.8	17.1		
LOS	F	B		A	B		
Approach Delay	51.0			7.8	17.1		
Approach LOS	D			A	B		
Queue Length 50th (ft)	168	0		298	295		
Queue Length 95th (ft)	#322	78		354	350		
Internal Link Dist (ft)	258			305	166		
Turn Bay Length (ft)							
Base Capacity (vph)	261	397		2743	2743		
Starvation Cap Reductn	0	0		0	1001		
Spillback Cap Reductn	0	0		0	0		
Storage Cap Reductn	0	0		0	0		
Reduced v/c Ratio	0.89	0.55		0.63	0.99		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 16.9

Intersection LOS: B

Intersection Capacity Utilization 66.7%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

Ø2 (R)	Ø4	Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	105	311	0	1596	1586	0
Future Volume (vph)	105	311	0	1596	1586	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	0.92	0.85		1.00	1.00	
Flt Protected	0.98	1.00		1.00	1.00	
Satd. Flow (prot)	1679	1504		3539	3539	
Flt Permitted	0.98	1.00		1.00	1.00	
Satd. Flow (perm)	1679	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	338	0	1735	1724	0
RTOR Reduction (vph)	29	191	0	0	0	0
Lane Group Flow (vph)	203	29	0	1735	1724	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	17.2	17.2		100.8	100.8	
Effective Green, g (s)	17.2	17.2		100.8	100.8	
Actuated g/C Ratio	0.13	0.13		0.78	0.78	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	222	198		2744	2744	
v/s Ratio Prot	c0.12	0.02		c0.49	0.49	
v/s Ratio Perm						
v/c Ratio	0.92	0.15		0.63	0.63	
Uniform Delay, d1	55.7	49.9		6.4	6.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	37.3	0.1		1.1	1.1	
Delay (s)	93.0	50.0		7.6	7.5	
Level of Service	F	D		A	A	
Approach Delay (s)	72.1			7.6	7.5	
Approach LOS	E			A	A	

Intersection Summary

HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	85	116	50	5	5	162	530	40	5	655	50
Future Volume (vph)	60	85	116	50	5	5	162	530	40	5	655	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	125		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.989			0.990			0.989	
Flt Protected		0.980			0.960		0.950			0.950		
Satd. Flow (prot)	0	1825	1583	0	1769	0	1770	1844	0	1770	1842	0
Flt Permitted		0.862			0.456		0.950			0.950		
Satd. Flow (perm)	0	1606	1583	0	840	0	1770	1844	0	1770	1842	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			108		3			4			4	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		335			128			357			349	
Travel Time (s)		7.6			2.9			8.1			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	92	126	54	5	5	176	576	43	5	712	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	157	126	0	64	0	176	619	0	5	766	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	15.0		5.0	15.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		11.0	20.0		11.0	20.0	
Total Split (s)	18.0	18.0	18.0	18.0	18.0		18.0	59.0		18.0	59.0	
Total Split (%)	15.0%	15.0%	15.0%	15.0%	15.0%		15.0%	49.2%		15.0%	49.2%	
Maximum Green (s)	13.0	13.0	13.0	13.0	13.0		13.0	54.0		13.0	54.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Max		None	Max	
Walk Time (s)												

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	21%
Maximum Green (s)	22.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		12.9	12.9		12.9		13.1	70.7		5.9	54.5	
Actuated g/C Ratio		0.13	0.13		0.13		0.13	0.71		0.06	0.55	
v/c Ratio		0.76	0.42		0.58		0.76	0.47		0.05	0.76	
Control Delay		66.7	16.6		63.3		64.9	10.9		49.4	25.5	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		66.7	16.6		63.3		64.9	10.9		49.4	25.5	
LOS		E	B		E		E	B		D	C	
Approach Delay		44.4			63.3			22.9			25.6	
Approach LOS		D			E			C			C	
Queue Length 50th (ft)		92	10		35		103	109		3	317	
Queue Length 95th (ft)		#251	72		#120		#274	480		17	#804	
Internal Link Dist (ft)		255			48			277			269	
Turn Bay Length (ft)			75				125			100		
Base Capacity (vph)		210	301		113		232	1306		232	1007	
Starvation Cap Reductn		0	0		0		0	0		0	0	
Spillback Cap Reductn		0	0		0		0	0		0	0	
Storage Cap Reductn		0	0		0		0	0		0	0	
Reduced v/c Ratio		0.75	0.42		0.57		0.76	0.47		0.02	0.76	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 99.8

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 28.5

Intersection LOS: C

Intersection Capacity Utilization 69.0%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: Champlain Pkwy & Home Ave

 Ø1	 Ø2	 Ø4	 Ø9
18 s	59 s	18 s	25 s
 Ø5	 Ø6	 Ø8	
18 s	59 s	18 s	

Lane Group	Ø9
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

7: Champlain Pkwy & Home Ave

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	85	116	50	5	5	162	530	40	5	655	50
Future Volume (vph)	60	85	116	50	5	5	162	530	40	5	655	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.99		1.00	0.99		1.00	0.99	
Flt Protected		0.98	1.00		0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1825	1583		1768		1770	1843		1770	1843	
Flt Permitted		0.86	1.00		0.46		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1605	1583		840		1770	1843		1770	1843	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	92	126	54	5	5	176	576	43	5	712	54
RTOR Reduction (vph)	0	0	95	0	3	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	157	31	0	61	0	176	618	0	5	764	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		12.9	12.9		12.9		13.1	70.6		1.1	58.6	
Effective Green, g (s)		12.9	12.9		12.9		13.1	70.6		1.1	58.6	
Actuated g/C Ratio		0.12	0.12		0.12		0.12	0.66		0.01	0.55	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		194	192		101		218	1224		18	1015	
v/s Ratio Prot							c0.10	0.34		0.00	c0.41	
v/s Ratio Perm		c0.10	0.02		0.07							
v/c Ratio		0.81	0.16		0.61		0.81	0.50		0.28	0.75	
Uniform Delay, d1		45.5	41.9		44.3		45.4	9.0		52.2	18.3	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		21.4	0.4		9.9		19.3	1.5		8.3	5.2	
Delay (s)		66.9	42.3		54.2		64.6	10.5		60.5	23.5	
Level of Service		E	D		D		E	B		E	C	
Approach Delay (s)		55.9			54.2			22.5			23.7	
Approach LOS		E			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			29.0				HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			106.3				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			69.0%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1287	50	0	0	780	0	0	1045	0
Future Volume (vph)	0	0	0	1287	50	0	0	780	0	0	1045	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frnt												
Flt Protected				0.950	0.956							
Satd. Flow (prot)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.956							
Satd. Flow (perm)	0	0	0	1681	1692	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1399	54	0	0	848	0	0	1136	0
Shared Lane Traffic (%)				48%								
Lane Group Flow (vph)	0	0	0	727	726	0	0	848	0	0	1136	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				46.2	46.2			32.8			32.8	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio				0.51	0.51			0.36			0.36	
v/c Ratio				0.84	0.84			0.66			0.61	
Control Delay				28.9	28.3			27.7			25.8	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				28.9	28.3			27.7			25.8	
LOS				C	C			C			C	
Approach Delay					28.6			27.7			25.8	
Approach LOS					C			C			C	
Queue Length 50th (ft)				328	325			220			201	
Queue Length 95th (ft)				504	497			288			249	
Internal Link Dist (ft)		52			64			652			60	
Turn Bay Length (ft)												
Base Capacity (vph)				915	921			1290			1854	
Starvation Cap Reductn				0	0			0			0	
Spillback Cap Reductn				0	0			0			0	
Storage Cap Reductn				0	0			0			0	
Reduced v/c Ratio				0.79	0.79			0.66			0.61	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 27.5

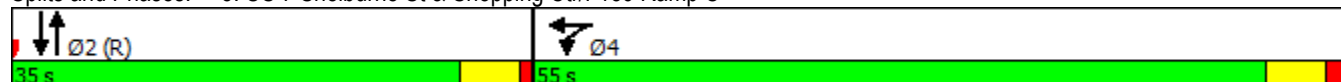
Intersection LOS: C

Intersection Capacity Utilization 71.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1287	50	0	0	780	0	0	1045	0
Future Volume (vph)	0	0	0	1287	50	0	0	780	0	0	1045	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1691			3539			5085	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1691			3539			5085	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1399	54	0	0	848	0	0	1136	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	727	726	0	0	848	0	0	1136	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				46.2	46.2			32.8			32.8	
Effective Green, g (s)				46.2	46.2			32.8			32.8	
Actuated g/C Ratio				0.51	0.51			0.36			0.36	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				862	868			1289			1853	
v/s Ratio Prot				c0.43	0.43			c0.24			0.22	
v/s Ratio Perm												
v/c Ratio				0.84	0.84			0.66			0.61	
Uniform Delay, d1				18.8	18.7			23.9			23.4	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				7.6	7.0			2.6			1.5	
Delay (s)				26.4	25.7			26.5			24.9	
Level of Service				C	C			C			C	
Approach Delay (s)		0.0			26.0			26.5			24.9	
Approach LOS		A			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			25.8			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			71.1%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	25	157	30	20	25	183	1295	15	40	935	18
Future Volume (vph)	35	25	157	30	20	25	183	1295	15	40	935	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.917			0.998			0.997	
Flt Protected		0.972		0.950			0.950			0.950		
Satd. Flow (prot)	0	1811	1583	1770	1708	0	1770	3532	0	1770	3529	0
Flt Permitted		0.794		0.715			0.252			0.950		
Satd. Flow (perm)	0	1479	1583	1332	1708	0	469	3532	0	1770	3529	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			171		27			2			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	27	171	33	22	27	199	1408	16	43	1016	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	171	33	49	0	199	1424	0	43	1036	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	3
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effct Green (s)		9.4	9.4	9.4	9.4		63.9	63.9		7.7	49.6	
Actuated g/C Ratio		0.10	0.10	0.10	0.10		0.71	0.71		0.09	0.55	
v/c Ratio		0.42	0.54	0.24	0.24		0.34	0.57		0.28	0.53	
Control Delay		45.2	12.6	39.9	23.1		12.8	9.1		42.7	14.5	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		45.2	12.6	39.9	23.1		12.8	9.1		42.7	14.5	
LOS		D	B	D	C		B	A		D	B	
Approach Delay		21.6			29.8			9.6			15.6	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)		35	0	18	12		37	206		23	182	
Queue Length 95th (ft)		72	55	44	43		81	342		54	267	
Internal Link Dist (ft)		1348			332			637			353	
Turn Bay Length (ft)			200				150			300		
Base Capacity (vph)		345	500	310	419		578	2509		153	1946	
Starvation Cap Reductn		0	0	0	0		0	0		0	0	
Spillback Cap Reductn		0	0	0	0		0	0		0	0	
Storage Cap Reductn		0	0	0	0		0	0		0	0	
Reduced v/c Ratio		0.19	0.34	0.11	0.12		0.34	0.57		0.28	0.53	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 13.2

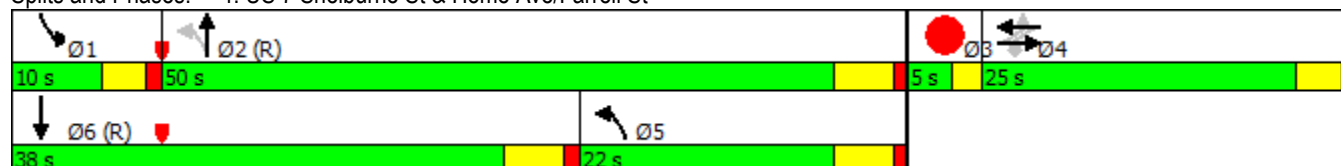
Intersection LOS: B

Intersection Capacity Utilization 60.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lane Group	Ø3
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	25	157	30	20	25	183	1295	15	40	935	18
Future Volume (vph)	35	25	157	30	20	25	183	1295	15	40	935	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.92		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1810	1583	1770	1709		1770	3533		1770	3529	
Flt Permitted		0.79	1.00	0.71	1.00		0.25	1.00		0.95	1.00	
Satd. Flow (perm)		1479	1583	1331	1709		468	3533		1770	3529	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	27	171	33	22	27	199	1408	16	43	1016	20
RTOR Reduction (vph)	0	0	153	0	24	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	65	18	33	25	0	199	1423	0	43	1035	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		9.4	9.4	9.4	9.4		62.3	62.3		5.3	48.0	
Effective Green, g (s)		9.4	9.4	9.4	9.4		62.3	62.3		5.3	48.0	
Actuated g/C Ratio		0.10	0.10	0.10	0.10		0.69	0.69		0.06	0.53	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		154	165	139	178		593	2445		104	1882	
v/s Ratio Prot					0.01		0.07	c0.40		0.02	c0.29	
v/s Ratio Perm		c0.04	0.01	0.02			0.16					
v/c Ratio		0.42	0.11	0.24	0.14		0.34	0.58		0.41	0.55	
Uniform Delay, d1		37.8	36.5	37.0	36.6		9.1	7.1		40.9	13.9	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.9	0.3	0.9	0.4		0.3	1.0		2.7	1.2	
Delay (s)		39.6	36.8	37.9	37.0		9.4	8.2		43.5	15.0	
Level of Service		D	D	D	D		A	A		D	B	
Approach Delay (s)		37.6			37.4			8.3			16.2	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			14.2				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			60.4%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	160	403	0	2386	2029	0	
Future Volume (vph)	160	403	0	2386	2029	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.933	0.850					
Flt Protected	0.973						
Satd. Flow (prot)	1691	1504	0	3539	3539	0	
Flt Permitted	0.973						
Satd. Flow (perm)	1691	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	26	249					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	174	438	0	2593	2205	0	
Shared Lane Traffic (%)		32%					
Lane Group Flow (vph)	314	298	0	2593	2205	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2	3	
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0	1.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	
Total Split (s)	24.0	24.0		82.0	82.0	24.0	
Total Split (%)	18.5%	18.5%		63.1%	63.1%	18%	
Maximum Green (s)	18.0	18.0		76.0	76.0	22.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	2.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	0.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead				Lag	
Lead-Lag Optimize?	Yes	Yes				Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	0.2	
Recall Mode	None	None		C-Max	C-Max	None	
Walk Time (s)	0.0	0.0		0.0	0.0	5.0	
Flash Dont Walk (s)	0.0	0.0		17.0	17.0	17.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	
Act Effect Green (s)	18.0	18.0		100.0	100.0		

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Actuated g/C Ratio	0.14	0.14		0.77	0.77		
v/c Ratio	1.23	0.71		0.95	0.81		
Control Delay	173.9	20.8		23.0	12.3		
Queue Delay	0.0	0.0		0.0	46.1		
Total Delay	173.9	20.8		23.0	58.5		
LOS	F	C		C	E		
Approach Delay	99.3			23.0	58.5		
Approach LOS	F			C	E		
Queue Length 50th (ft)	~307	38		852	513		
Queue Length 95th (ft)	#495	147		#1067	614		
Internal Link Dist (ft)	258			305	166		
Turn Bay Length (ft)							
Base Capacity (vph)	256	422		2722	2722		
Starvation Cap Reductn	0	0		0	714		
Spillback Cap Reductn	0	0		0	0		
Storage Cap Reductn	0	0		0	0		
Reduced v/c Ratio	1.23	0.71		0.95	1.10		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.23

Intersection Signal Delay: 46.1

Intersection LOS: D

Intersection Capacity Utilization 93.0%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

 Ø2 (R)	 Ø4	 Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

04/23/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	160	403	0	2386	2029	0
Future Volume (vph)	160	403	0	2386	2029	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	0.93	0.85		1.00	1.00	
Flt Protected	0.97	1.00		1.00	1.00	
Satd. Flow (prot)	1691	1504		3539	3539	
Flt Permitted	0.97	1.00		1.00	1.00	
Satd. Flow (perm)	1691	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	438	0	2593	2205	0
RTOR Reduction (vph)	22	215	0	0	0	0
Lane Group Flow (vph)	292	83	0	2593	2205	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	234	208		2722	2722	
v/s Ratio Prot	c0.17	0.06		c0.73	0.62	
v/s Ratio Perm						
v/c Ratio	1.25	0.40		0.95	0.81	
Uniform Delay, d1	56.0	51.1		13.0	9.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	141.3	0.5		9.3	2.7	
Delay (s)	197.3	51.5		22.2	11.9	
Level of Service	F	D		C	B	
Approach Delay (s)	126.3			22.2	11.9	
Approach LOS	F			C	B	

Intersection Summary

HCM 2000 Control Delay	29.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	86	22	142	95	63	5	171	395	85	5	965	88
Future Volume (vph)	86	22	142	95	63	5	171	395	85	5	965	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	125		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.996			0.974			0.987	
Flt Protected		0.962			0.972		0.950			0.950		
Satd. Flow (prot)	0	1792	1583	0	1803	0	1770	1814	0	1770	1839	0
Flt Permitted		0.647			0.629		0.950			0.950		
Satd. Flow (perm)	0	1205	1583	0	1167	0	1770	1814	0	1770	1839	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145		1			11			5	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		335			128			357			349	
Travel Time (s)		7.6			2.9			8.1			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	93	24	154	103	68	5	186	429	92	5	1049	96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	117	154	0	176	0	186	521	0	5	1145	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	15.0		5.0	15.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		11.0	20.0		11.0	20.5	
Total Split (s)	24.0	24.0	24.0	24.0	24.0		18.0	83.0		18.0	83.0	
Total Split (%)	16.0%	16.0%	16.0%	16.0%	16.0%		12.0%	55.3%		12.0%	55.3%	
Maximum Green (s)	19.0	19.0	19.0	19.0	19.0		13.0	78.0		13.0	78.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Max		None	Max	
Walk Time (s)												

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	17%
Maximum Green (s)	22.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		19.1	19.1		19.1		13.1	94.4		6.0	78.4	
Actuated g/C Ratio		0.15	0.15		0.15		0.10	0.73		0.05	0.60	
v/c Ratio		0.66	0.43		1.02		1.04	0.39		0.06	1.03	
Control Delay		72.2	14.0		128.8		135.9	10.0		64.8	61.5	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		72.2	14.0		128.8		135.9	10.0		64.8	61.5	
LOS		E	B		F		F	A		E	E	
Approach Delay		39.1			128.8			43.1			61.5	
Approach LOS		D			F			D			E	
Queue Length 50th (ft)		90	6		143		~155	114		4	861	
Queue Length 95th (ft)		#218	78		#369		#384	400		20	#1622	
Internal Link Dist (ft)		255			48			277			269	
Turn Bay Length (ft)			75				125			100		
Base Capacity (vph)		177	356		172		178	1320		178	1111	
Starvation Cap Reductn		0	0		0		0	0		0	0	
Spillback Cap Reductn		0	0		0		0	0		0	0	
Storage Cap Reductn		0	0		0		0	0		0	0	
Reduced v/c Ratio		0.66	0.43		1.02		1.04	0.39		0.03	1.03	

Intersection Summary

Area Type: Other

Cycle Length: 150

Actuated Cycle Length: 130

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 58.4

Intersection LOS: E

Intersection Capacity Utilization 93.6%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: Champlain Pkwy & Home Ave

 Ø1	 Ø2	 Ø4	 Ø9
18 s	83 s	24 s	25 s
 Ø5	 Ø6	 Ø8	
18 s	83 s	24 s	

Lane Group	Ø9
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

7: Champlain Pkwy & Home Ave

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↱		↰	↱	
Traffic Volume (vph)	86	22	142	95	63	5	171	395	85	5	965	88
Future Volume (vph)	86	22	142	95	63	5	171	395	85	5	965	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00		1.00	0.97		1.00	0.99	
Flt Protected		0.96	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1792	1583		1803		1770	1813		1770	1839	
Flt Permitted		0.65	1.00		0.63		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1204	1583		1168		1770	1813		1770	1839	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	93	24	154	103	68	5	186	429	92	5	1049	96
RTOR Reduction (vph)	0	0	125	0	1	0	0	3	0	0	2	0
Lane Group Flow (vph)	0	117	29	0	175	0	186	518	0	5	1143	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		19.1	19.1		19.1		13.1	94.4		1.2	82.5	
Effective Green, g (s)		19.1	19.1		19.1		13.1	94.4		1.2	82.5	
Actuated g/C Ratio		0.14	0.14		0.14		0.10	0.69		0.01	0.60	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		168	221		163		169	1253		15	1111	
v/s Ratio Prot							c0.11	0.29		0.00	c0.62	
v/s Ratio Perm		0.10	0.02		c0.15							
v/c Ratio		0.70	0.13		1.07		1.10	0.41		0.33	1.03	
Uniform Delay, d1		55.9	51.4		58.7		61.7	9.1		67.3	27.0	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		11.9	0.3		91.7		98.7	1.0		12.7	34.6	
Delay (s)		67.8	51.7		150.4		160.4	10.1		79.9	61.6	
Level of Service		E	D		F		F	B		E	E	
Approach Delay (s)		58.7			150.4			49.6			61.7	
Approach LOS		E			F			D			E	
Intersection Summary												
HCM 2000 Control Delay			64.4				HCM 2000 Level of Service			E		
HCM 2000 Volume to Capacity ratio			1.01									
Actuated Cycle Length (s)			136.5				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			93.6%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1478	135	0	0	795	0	0	1432	5
Future Volume (vph)	0	0	0	1478	135	0	0	795	0	0	1432	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Frnt												
Flt Protected				0.950	0.960							
Satd. Flow (prot)	0	0	0	1681	1699	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.960							
Satd. Flow (perm)	0	0	0	1681	1699	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)												1
Link Speed (mph)		30			30			30				30
Link Distance (ft)		132			144			732				140
Travel Time (s)		3.0			3.3			16.6				3.2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1607	147	0	0	864	0	0	1557	5
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	0	0	868	886	0	0	864	0	0	1562	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				49.0	49.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio				0.54	0.54			0.33			0.33	
v/c Ratio				0.95	0.96			0.73			0.92	
Control Delay				40.7	42.3			30.9			39.3	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				40.7	42.3			30.9			39.3	
LOS				D	D			C			D	
Approach Delay					41.5			30.9			39.3	
Approach LOS					D			C			D	
Queue Length 50th (ft)				460	473			225			309	
Queue Length 95th (ft)				#755	#771			296			#406	
Internal Link Dist (ft)		52			64			652			60	
Turn Bay Length (ft)												
Base Capacity (vph)				915	925			1179			1695	
Starvation Cap Reductn				0	0			0			0	
Spillback Cap Reductn				0	0			0			0	
Storage Cap Reductn				0	0			0			0	
Reduced v/c Ratio				0.95	0.96			0.73			0.92	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 38.5

Intersection LOS: D

Intersection Capacity Utilization 81.4%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1478	135	0	0	795	0	0	1432	5
Future Volume (vph)	0	0	0	1478	135	0	0	795	0	0	1432	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1699			3539			5083	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1699			3539			5083	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1607	147	0	0	864	0	0	1557	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	0	0	868	886	0	0	864	0	0	1561	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				49.0	49.0			30.0			30.0	
Effective Green, g (s)				49.0	49.0			30.0			30.0	
Actuated g/C Ratio				0.54	0.54			0.33			0.33	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				915	925			1179			1694	
v/s Ratio Prot				0.52	c0.52			0.24			c0.31	
v/s Ratio Perm												
v/c Ratio				0.95	0.96			0.73			0.92	
Uniform Delay, d1				19.3	19.5			26.5			28.9	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				18.3	19.9			4.1			9.8	
Delay (s)				37.6	39.4			30.5			38.7	
Level of Service				D	D			C			D	
Approach Delay (s)		0.0			38.5			30.5			38.7	
Approach LOS		A			D			C			D	
Intersection Summary												
HCM 2000 Control Delay			36.9			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			81.4%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	195	30	112	70	10	41
Future Volume (Veh/h)	195	30	112	70	10	41
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	212	33	122	76	11	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			245		548	228
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			245		548	228
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		98	94
cM capacity (veh/h)			1321		451	811
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	245	198	56			
Volume Left	0	122	11			
Volume Right	33	0	45			
cSH	1700	1321	701			
Volume to Capacity	0.14	0.09	0.08			
Queue Length 95th (ft)	0	8	6			
Control Delay (s)	0.0	5.2	10.6			
Lane LOS		A	B			
Approach Delay (s)	0.0	5.2	10.6			
Approach LOS			B			
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization			35.3%	ICU Level of Service		A
Analysis Period (min)			15			

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	65	146	25	40	142	245	10	160	20	150	250	45
Future Volume (vph)	65	146	25	40	142	245	10	160	20	150	250	45
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	159	27	43	154	266	11	174	22	163	272	49
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	257	463	207	484								
Volume Left (vph)	71	43	11	163								
Volume Right (vph)	27	266	22	49								
Hadj (s)	0.03	-0.29	-0.02	0.04								
Departure Headway (s)	8.1	7.2	8.3	7.5								
Degree Utilization, x	0.58	0.92	0.48	1.01								
Capacity (veh/h)	420	498	405	477								
Control Delay (s)	21.8	50.0	18.8	71.2								
Approach Delay (s)	21.8	50.0	18.8	71.2								
Approach LOS	C	E	C	F								
Intersection Summary												
Delay				47.6								
Level of Service				E								
Intersection Capacity Utilization				71.7%	ICU Level of Service		C					
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	25	1594	1514	179
Future Volume (Veh/h)	0	0	25	1594	1514	179
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	27	1733	1646	195
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.78	0.69	0.69			
vC, conflicting volume	2566	823	1841			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1432	0	1317			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	92			
cM capacity (veh/h)	90	747	359			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	27	866	866	823	823	195
Volume Left	27	0	0	0	0	0
Volume Right	0	0	0	0	0	195
cSH	359	1700	1700	1700	1700	1700
Volume to Capacity	0.08	0.51	0.51	0.48	0.48	0.11
Queue Length 95th (ft)	6	0	0	0	0	0
Control Delay (s)	15.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.2			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			57.8%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	195	30	112	70	10	41
Future Volume (Veh/h)	195	30	112	70	10	41
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	212	33	122	76	11	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				335		
pX, platoon unblocked						
vC, conflicting volume			245		548	228
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			245		548	228
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		98	94
cM capacity (veh/h)			1321		451	811
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	245	198	56			
Volume Left	0	122	11			
Volume Right	33	0	45			
cSH	1700	1321	701			
Volume to Capacity	0.14	0.09	0.08			
Queue Length 95th (ft)	0	8	6			
Control Delay (s)	0.0	5.2	10.6			
Lane LOS		A	B			
Approach Delay (s)	0.0	5.2	10.6			
Approach LOS			B			
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization			35.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	20	110	0	10	15	90	5	55	10	100	20	20
Future Volume (vph)	20	110	0	10	15	90	5	55	10	100	20	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	120	0	11	16	98	5	60	11	109	22	22
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	142	125	76	153								
Volume Left (vph)	22	11	5	109								
Volume Right (vph)	0	98	11	22								
Hadj (s)	0.06	-0.42	-0.04	0.09								
Departure Headway (s)	4.7	4.2	4.7	4.7								
Degree Utilization, x	0.18	0.15	0.10	0.20								
Capacity (veh/h)	722	794	716	716								
Control Delay (s)	8.7	7.9	8.2	8.9								
Approach Delay (s)	8.7	7.9	8.2	8.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.5									
Level of Service			A									
Intersection Capacity Utilization			32.2%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	25	1594	1514	180
Future Volume (Veh/h)	0	0	25	1594	1514	180
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	27	1733	1646	196
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.79	0.69	0.69			
vC, conflicting volume	2566	823	1842			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1278	0	1319			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	92			
cM capacity (veh/h)	116	747	358			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	27	866	866	823	823	196
Volume Left	27	0	0	0	0	0
Volume Right	0	0	0	0	0	196
cSH	358	1700	1700	1700	1700	1700
Volume to Capacity	0.08	0.51	0.51	0.48	0.48	0.12
Queue Length 95th (ft)	6	0	0	0	0	0
Control Delay (s)	15.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.2			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			64.3%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	215	35	137	85	10	46
Future Volume (Veh/h)	215	35	137	85	10	46
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	38	149	92	11	50
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			272	643		253
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			272	643		253
tC, single (s)			4.1	6.4		6.2
tC, 2 stage (s)						
tF (s)			2.2	3.5		3.3
p0 queue free %			88	97		94
cM capacity (veh/h)			1291	387		786
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	272	241	61			
Volume Left	0	149	11			
Volume Right	38	0	50			
cSH	1700	1291	663			
Volume to Capacity	0.16	0.12	0.09			
Queue Length 95th (ft)	0	10	8			
Control Delay (s)	0.0	5.4	11.0			
Lane LOS			A		B	
Approach Delay (s)	0.0	5.4	11.0			
Approach LOS			B			
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			38.9%		ICU Level of Service	
					A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	75	161	35	55	162	250	15	175	20	155	295	60
Future Volume (vph)	75	161	35	55	162	250	15	175	20	155	295	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	175	38	60	176	272	16	190	22	168	321	65
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	295	508	228	554								
Volume Left (vph)	82	60	16	168								
Volume Right (vph)	38	272	22	65								
Hadj (s)	0.01	-0.26	-0.01	0.02								
Departure Headway (s)	8.4	7.5	8.7	7.8								
Degree Utilization, x	0.69	1.06	0.55	1.20								
Capacity (veh/h)	416	474	393	457								
Control Delay (s)	28.1	86.2	22.1	135.9								
Approach Delay (s)	28.1	86.2	22.1	135.9								
Approach LOS	D	F	C	F								
Intersection Summary												
Delay				83.5								
Level of Service				F								
Intersection Capacity Utilization				78.7%	ICU Level of Service	D						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↗↗	↗↗	↰
Traffic Volume (veh/h)	0	0	26	1670	1586	188
Future Volume (Veh/h)	0	0	26	1670	1586	188
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	28	1815	1724	204
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.78	0.68	0.68			
vC, conflicting volume	2688	862	1928			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1460	0	1418			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	91			
cM capacity (veh/h)	85	735	323			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	28	908	908	862	862	204
Volume Left	28	0	0	0	0	0
Volume Right	0	0	0	0	0	204
cSH	323	1700	1700	1700	1700	1700
Volume to Capacity	0.09	0.53	0.53	0.51	0.51	0.12
Queue Length 95th (ft)	7	0	0	0	0	0
Control Delay (s)	17.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			60.1%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	215	35	137	85	10	46
Future Volume (Veh/h)	215	35	137	85	10	46
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	234	38	149	92	11	50
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				335		
pX, platoon unblocked						
vC, conflicting volume			272		643	253
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			272		643	253
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		97	94
cM capacity (veh/h)			1291		387	786
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	272	241	61			
Volume Left	0	149	11			
Volume Right	38	0	50			
cSH	1700	1291	663			
Volume to Capacity	0.16	0.12	0.09			
Queue Length 95th (ft)	0	10	8			
Control Delay (s)	0.0	5.4	11.0			
Lane LOS		A	B			
Approach Delay (s)	0.0	5.4	11.0			
Approach LOS			B			
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			38.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	20	120	0	10	20	90	5	50	15	120	20	15
Future Volume (vph)	20	120	0	10	20	90	5	50	15	120	20	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	130	0	11	22	98	5	54	16	130	22	16
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	152	131	75	168								
Volume Left (vph)	22	11	5	130								
Volume Right (vph)	0	98	16	16								
Hadj (s)	0.06	-0.40	-0.08	0.13								
Departure Headway (s)	4.7	4.3	4.7	4.8								
Degree Utilization, x	0.20	0.16	0.10	0.22								
Capacity (veh/h)	713	778	708	703								
Control Delay (s)	8.9	8.1	8.2	9.2								
Approach Delay (s)	8.9	8.1	8.2	9.2								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.7									
Level of Service			A									
Intersection Capacity Utilization			33.6%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↱↱	↱↱	↰
Traffic Volume (veh/h)	0	0	26	1670	1586	188
Future Volume (Veh/h)	0	0	26	1670	1586	188
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	28	1815	1724	204
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.79	0.68	0.68			
vC, conflicting volume	2688	862	1928			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1301	0	1418			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	91			
cM capacity (veh/h)	110	735	323			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	28	908	908	862	862	204
Volume Left	28	0	0	0	0	0
Volume Right	0	0	0	0	0	204
cSH	323	1700	1700	1700	1700	1700
Volume to Capacity	0.09	0.53	0.53	0.51	0.51	0.12
Queue Length 95th (ft)	7	0	0	0	0	0
Control Delay (s)	17.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			66.7%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	125	31	147	145	40	85
Future Volume (Veh/h)	125	31	147	145	40	85
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	34	160	158	43	92
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			170		631	153
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			170		631	153
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			89		89	90
cM capacity (veh/h)			1407		394	893
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	170	318	135			
Volume Left	0	160	43			
Volume Right	34	0	92			
cSH	1700	1407	637			
Volume to Capacity	0.10	0.11	0.21			
Queue Length 95th (ft)	0	10	20			
Control Delay (s)	0.0	4.5	12.2			
Lane LOS		A	B			
Approach Delay (s)	0.0	4.5	12.2			
Approach LOS			B			
Intersection Summary						
Average Delay			4.9			
Intersection Capacity Utilization			41.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	90	143	52	30	252	145	12	170	30	245	375	73
Future Volume (vph)	90	143	52	30	252	145	12	170	30	245	375	73
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	155	57	33	274	158	13	185	33	266	408	79
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	310	465	231	753								
Volume Left (vph)	98	33	13	266								
Volume Right (vph)	57	158	33	79								
Hadj (s)	-0.01	-0.16	-0.04	0.04								
Departure Headway (s)	8.4	7.7	8.8	8.1								
Degree Utilization, x	0.73	1.00	0.57	1.69								
Capacity (veh/h)	416	461	390	455								
Control Delay (s)	30.7	69.7	22.8	341.9								
Approach Delay (s)	30.7	69.7	22.8	341.9								
Approach LOS	D	F	C	F								
Intersection Summary												
Delay				173.2								
Level of Service				F								
Intersection Capacity Utilization				101.2%	ICU Level of Service	G						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↕	↕	↱
Traffic Volume (veh/h)	0	0	33	2306	1747	63
Future Volume (Veh/h)	0	0	33	2306	1747	63
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	36	2507	1899	68
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.41	0.66	0.66			
vC, conflicting volume	3224	950	1967			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	1441			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	88			
cM capacity (veh/h)	371	718	309			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	1254	1254	950	950	68
Volume Left	36	0	0	0	0	0
Volume Right	0	0	0	0	0	68
cSH	309	1700	1700	1700	1700	1700
Volume to Capacity	0.12	0.74	0.74	0.56	0.56	0.04
Queue Length 95th (ft)	10	0	0	0	0	0
Control Delay (s)	18.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			82.3%		ICU Level of Service	E
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	125	31	147	145	40	85
Future Volume (Veh/h)	125	31	147	145	40	85
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	34	160	158	43	92
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				335		
pX, platoon unblocked						
vC, conflicting volume			170		631	153
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			170		631	153
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			89		89	90
cM capacity (veh/h)			1407		394	893
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	170	318	135			
Volume Left	0	160	43			
Volume Right	34	0	92			
cSH	1700	1407	637			
Volume to Capacity	0.10	0.11	0.21			
Queue Length 95th (ft)	0	10	20			
Control Delay (s)	0.0	4.5	12.2			
Lane LOS		A	B			
Approach Delay (s)	0.0	4.5	12.2			
Approach LOS			B			
Intersection Summary						
Average Delay			4.9			
Intersection Capacity Utilization			41.7%	ICU Level of Service	A	
Analysis Period (min)			15			

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	67	5	10	111	80	5	20	15	110	50	12
Future Volume (vph)	5	67	5	10	111	80	5	20	15	110	50	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	73	5	11	121	87	5	22	16	120	54	13
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	83	219	43	187								
Volume Left (vph)	5	11	5	120								
Volume Right (vph)	5	87	16	13								
Hadj (s)	0.01	-0.19	-0.17	0.12								
Departure Headway (s)	4.7	4.4	4.7	4.8								
Degree Utilization, x	0.11	0.27	0.06	0.25								
Capacity (veh/h)	704	775	703	706								
Control Delay (s)	8.3	9.0	8.0	9.4								
Approach Delay (s)	8.3	9.0	8.0	9.4								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.9									
Level of Service			A									
Intersection Capacity Utilization			36.5%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↕↕	↕↕	↰
Traffic Volume (veh/h)	0	0	33	2306	1747	63
Future Volume (Veh/h)	0	0	33	2306	1747	63
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	36	2507	1899	68
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.41	0.66	0.66			
vC, conflicting volume	3224	950	1967			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	1441			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	88			
cM capacity (veh/h)	371	718	309			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	1254	1254	950	950	68
Volume Left	36	0	0	0	0	0
Volume Right	0	0	0	0	0	68
cSH	309	1700	1700	1700	1700	1700
Volume to Capacity	0.12	0.74	0.74	0.56	0.56	0.04
Queue Length 95th (ft)	10	0	0	0	0	0
Control Delay (s)	18.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			82.2%		ICU Level of Service	E
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Volume (veh/h)	155	36	152	170	40	90
Future Volume (Veh/h)	155	36	152	170	40	90
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	168	39	165	185	43	98
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			207		702	188
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			207		702	188
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		88	89
cM capacity (veh/h)			1364		355	855
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	207	350	141			
Volume Left	0	165	43			
Volume Right	39	0	98			
cSH	1700	1364	598			
Volume to Capacity	0.12	0.12	0.24			
Queue Length 95th (ft)	0	10	23			
Control Delay (s)	0.0	4.3	12.9			
Lane LOS		A	B			
Approach Delay (s)	0.0	4.3	12.9			
Approach LOS			B			
Intersection Summary						
Average Delay			4.8			
Intersection Capacity Utilization			45.5%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	110	153	62	45	272	155	17	175	35	255	400	83
Future Volume (vph)	110	153	62	45	272	155	17	175	35	255	400	83
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	120	166	67	49	296	168	18	190	38	277	435	90
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	353	513	246	802								
Volume Left (vph)	120	49	18	277								
Volume Right (vph)	67	168	38	90								
Hadj (s)	-0.01	-0.14	-0.04	0.04								
Departure Headway (s)	8.6	8.1	9.1	8.3								
Degree Utilization, x	0.84	1.16	0.62	1.85								
Capacity (veh/h)	414	446	380	447								
Control Delay (s)	43.0	120.3	26.0	410.2								
Approach Delay (s)	43.0	120.3	26.0	410.2								
Approach LOS	E	F	D	F								
Intersection Summary												
Delay				215.4								
Level of Service				F								
Intersection Capacity Utilization				106.2%	ICU Level of Service	G						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↱↱	↱↱	↰
Traffic Volume (veh/h)	0	0	33	2678	2029	69
Future Volume (Veh/h)	0	0	33	2678	2029	69
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	36	2911	2205	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.42	0.65	0.65			
vC, conflicting volume	3732	1102	2280			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	953	73	1889			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	82			
cM capacity (veh/h)	88	632	203			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	1456	1456	1102	1102	75
Volume Left	36	0	0	0	0	0
Volume Right	0	0	0	0	0	75
cSH	203	1700	1700	1700	1700	1700
Volume to Capacity	0.18	0.86	0.86	0.65	0.65	0.04
Queue Length 95th (ft)	16	0	0	0	0	0
Control Delay (s)	26.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	D					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			153.2%		ICU Level of Service	H
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

2: Queen City Park Rd & Austin Dr/Home Ave

02/28/2020

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Volume (veh/h)	155	36	152	170	40	90
Future Volume (Veh/h)	155	36	152	170	40	90
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	168	39	165	185	43	98
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				335		
pX, platoon unblocked						
vC, conflicting volume			207		702	188
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			207		702	188
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		88	89
cM capacity (veh/h)			1364		355	855
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	207	350	141			
Volume Left	0	165	43			
Volume Right	39	0	98			
cSH	1700	1364	598			
Volume to Capacity	0.12	0.12	0.24			
Queue Length 95th (ft)	0	10	23			
Control Delay (s)	0.0	4.3	12.9			
Lane LOS		A	B			
Approach Delay (s)	0.0	4.3	12.9			
Approach LOS			B			
Intersection Summary						
Average Delay			4.8			
Intersection Capacity Utilization			45.5%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Pine St & Home Ave

02/28/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	72	10	10	116	90	5	20	15	125	45	12
Future Volume (vph)	5	72	10	10	116	90	5	20	15	125	45	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	78	11	11	126	98	5	22	16	136	49	13
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	94	235	43	198								
Volume Left (vph)	5	11	5	136								
Volume Right (vph)	11	98	16	13								
Hadj (s)	-0.03	-0.21	-0.17	0.13								
Departure Headway (s)	4.8	4.4	4.8	4.9								
Degree Utilization, x	0.12	0.29	0.06	0.27								
Capacity (veh/h)	699	767	684	693								
Control Delay (s)	8.4	9.2	8.1	9.6								
Approach Delay (s)	8.4	9.2	8.1	9.6								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				9.1								
Level of Service				A								
Intersection Capacity Utilization				38.2%	ICU Level of Service	A						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

02/28/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↱↱	↱↱	↰
Traffic Volume (veh/h)	0	0	33	2678	2029	69
Future Volume (Veh/h)	0	0	33	2678	2029	69
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	36	2911	2205	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.42	0.65	0.65			
vC, conflicting volume	3732	1102	2280			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	953	73	1889			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	82			
cM capacity (veh/h)	88	632	203			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	1456	1456	1102	1102	75
Volume Left	36	0	0	0	0	0
Volume Right	0	0	0	0	0	75
cSH	203	1700	1700	1700	1700	1700
Volume to Capacity	0.18	0.86	0.86	0.65	0.65	0.04
Queue Length 95th (ft)	16	0	0	0	0	0
Control Delay (s)	26.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	D					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			93.0%	ICU Level of Service		F
Analysis Period (min)			15			

SIGNALIZED INTERSECTION CAPACITY ANALYSES SUMMARY BY LANE GROUP

Champlain Parkway No Build								Champlain Parkway Build						
		Burton No Build			Burton Build			Burton No Build			Burton Build			
Intersection	Movement	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	
2008														
US 7 / Home Ave														
AM	Home Ave	EB Left / Thru	0.41	38.7	D	0.41	38.7	D	0.44	39.7	D	0.44	39.7	D
		EB Right	0.19	36.6	D	0.19	36.6	D	0.14	36.8	D	0.14	36.8	D
	Farrell St	WB Left	0.11	36	D	0.11	36	D	0.11	36.7	D	0.11	36.7	D
		WB Thru / Right	0.03	35.5	D	0.03	35.5	D	0.03	36.1	D	0.03	36.1	D
	US 7	NB Left	0.63	15.1	B	0.63	15.2	B	0.11	3.9	A	0.11	3.9	A
		NB Thru / Right	0.59	7	A	0.59	7	A	0.45	5.4	A	0.45	5.4	A
	US 7	SB Left	0.38	51.9	D	0.38	51.9	D	0.38	51.9	D	0.38	51.9	D
		SB Thru / Right	0.54	16.4	B	0.54	16.4	B	0.38	11.5	B	0.38	11.5	B
PM	Home Ave	EB Left / Thru	0.38	37.2	D	0.39	37.2	D	0.42	39.7	D	0.42	39.7	D
		EB Right	0.24	36.1	D	0.25	35.8	D	0.10	36.7	D	0.10	36.7	D
	Farrell St	WB Left	0.20	35.9	D	0.19	35.5	D	0.24	37.9	D	0.24	37.9	D
		WB Thru / Right	0.13	35.2	D	0.13	34.9	C	0.15	37.0	D	0.15	37.0	D
	US 7	NB Left	0.74	27.1	C	0.90	43.3	D	0.29	8.1	A	0.30	8.4	A
		NB Thru / Right	0.66	10.3	B	0.66	10.5	B	0.58	8.1	A	0.58	8.1	A
	US 7	SB Left	0.45	43.8	D	0.45	43.8	D	0.41	43.5	D	0.41	43.5	D
		SB Thru / Right	0.78	21.2	C	0.80	22.3	C	0.53	14.8	B	0.54	14.8	B
US 7 / Queen City Park (south)														
AM	Queen City Park Rd	EB Left	0.64	63.1	E	0.65	63.3	E	0.88	86.3	F	0.88	86.3	F
		EB Right	0.01	53.5	D	0.01	53.5	D	0.14	50.2	D	0.14	50.2	D
	US 7	NB Thru	0.57	5.0	A	0.57	5.0	A	0.6	7.1	A	0.60	7.1	A
		SB Thru	0.57	5.0	A	0.57	5.0	A	0.6	7	A	0.60	7	A
PM	Queen City Park Rd	EB Left	1.14	156.1	F	1.23	189.3	F	1.08	139	F	1.13	156.2	F
		EB Right	0.01	48.3	D	0.01	48.3	D	0.22	49.9	D	0.29	50.5	D
	US 7	NB Thru	0.82	12.3	B	0.82	12.3	B	0.82	12.3	B	0.82	12.3	B
		SB Thru	0.70	9.0	A	0.70	9.0	A	0.7	9	A	0.70	9.0	A
Champlain Parkway / Home Ave														
AM	Home Ave	EB						0.74	58.8	E	0.74	58.8	E	
		EB Right						0.1	41.7	D	0.10	41.8	D	
	Home Ave	WB						0.45	46.1	D	0.45	46.2	D	
		NB Left						0.75	60.3	E	0.76	61.4	E	
	Champlain Parkway	NB						0.49	10.1	B	0.49	10.1	B	
		SB Left						0.28	60	E	0.28	60.1	E	
PM	Home Ave	EB						0.53	58.0	E	0.62	62.6	E	
		EB Right						0.07	51.6	D	0.08	52.1	D	
	Home Ave	WB						0.90	99.5	F	1.02	133.8	F	
		NB Left						0.88	116.4	F	1.15	182.9	F	
	Champlain Parkway	NB						0.40	9.2	A	0.40	9.6	A	
		SB Left						0.33	79.5	E	0.33	79.9	E	
I-189 Ramp C / US 7	I-189 Ramp C	WB Left	0.88	28.6	C	0.88	28.4	C	0.85	26.9	C	0.85	27.1	C
		WB	0.86	27.4	C	0.86	27.3	C	0.85	26.2	C	0.85	26.2	C
	US 7	NB	0.77	30.6	C	0.78	30.8	C	0.61	25.7	C	0.61	25.7	C
		SB	0.72	27.8	C	0.73	28.0	C	0.55	24.1	C	0.55	24.1	C
	US 7	WB Left	0.91	31.6	C	0.92	32.7	C	0.89	29.5	C	0.90	31.0	C
		WB	0.90	30.2	C	0.90	30.8	C	0.88	28.9	C	0.89	29.8	C
US 7	NB	0.79	31.8	C	0.80	32.3	C	0.71	28.9	C	0.72	29.2	C	
	SB	1.21	130.8	F	1.23	138.9	F	0.85	32.4	C	0.85	32.8	C	

SIGNALIZED INTERSECTION CAPACITY ANALYSES SUMMARY BY LANE GROUP

Champlain Parkway No Build														Champlain Parkway Build					
			Burton No Build			Burton Build			Burton No Build			Burton Build							
Intersection		Movement	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **					
2028																			
US 7 / Home Ave																			
AM	Home Ave	EB Left / Thru	0.40	38.4	D	0.40	38.4	D	0.43	39.6	D	0.43	39.6	D					
		EB Right	0.21	36.6	D	0.21	36.6	D	0.15	36.8	D	0.15	36.8	D					
	Farrell St	WB Left	0.10	35.8	D	0.10	35.8	D	0.11	36.6	D	0.11	36.6	D					
		WB Thru / Right	0.03	35.3	D	0.03	35.3	D	0.03	36	D	0.03	36	D					
	US 7	NB Left	0.74	22.4	C	0.75	22.5	C	0.13	4.7	A	0.13	4.7	A					
		NB Thru / Right	0.59	7.0	A	0.59	7.0	A	0.45	5.4	A	0.45	5.4	A					
	US 7	SB Left	0.38	51.9	D	0.38	51.9	D	0.38	51.9	D	0.38	51.9	D					
		SB Thru / Right	0.67	18.7	B	0.67	18.7	B	0.43	12.2	B	0.43	12.2	B					
PM	Home Ave	EB Left / Thru	0.37	37.1	D	0.39	37	D	0.42	39.6	D	0.42	39.6	D					
		EB Right	0.26	36	D	0.26	35.8	D	0.11	36.8	D	0.11	36.8	D					
	Farrell St	WB Left	0.19	35.6	D	0.19	35.3	D	0.24	37.9	D	0.24	37.9	D					
		WB Thru / Right	0.12	35	C	0.13	34.7	C	0.14	37.0	D	0.14	37.0	D					
	US 7	NB Left	0.86	38.4	D	1.01	70.4	E	0.32	9.1	A	0.34	9.4	A					
		NB Thru / Right	0.69	11	B	0.69	11.2	B	0.58	8.2	A	0.58	8.2	A					
	US 7	SB Left	0.45	43.8	D	0.45	43.8	D	0.41	43.5	D	0.41	43.5	D					
		SB Thru / Right	0.81	22.7	C	0.83	23.8	C	0.55	15.0	B	0.55	15.0	B					
US 7 / Queen City Park (south)																			
AM	Queen City Park Rd	EB Left	0.65	63.4	E	0.66	63.3	E	0.92	93	D	0.92	93	D					
		EB Right	0.01	53.2	D	0.01	53.1	D	0.15	50	F	0.15	50	F					
	US 7	NB Thru	0.60	5.5	A	0.60	5.5	A	0.63	7.6	A	0.63	7.6	A					
	US 7	SB Thru	0.60	5.4	A	0.60	5.5	A	0.63	7.5	A	0.63	7.5	A					
PM	Queen City Park Rd	EB Left	1.32	226.7	F	1.41	264	F	1.19	177.7	F	1.25	197.3	F					
		EB Right	0.01	48.3	D	0.01	48.3	D	0.33	50.9	D	0.40	51.5	D					
	US 7	NB Thru	0.95	22.2	C	0.95	22.2	C	0.95	22.2	C	0.95	22.2	C					
	US 7	SB Thru	0.81	11.9	B	0.81	11.9	B	0.81	11.9	B	0.81	11.9	B					
Champlain Parkway / Home Ave																			
AM	Home Ave	EB							0.81	66.9	E	0.81	66.9	E					
		EB Right							0.16	42.2	D	0.16	42.3	D					
	Home Ave	WB							0.60	53.8	D	0.61	54.2	D					
		NB Left							0.81	64.6	E	0.81	64.6	E					
	Champlain Parkway	NB							0.51	10.5	B	0.50	10.5	B					
		SB Left							0.28	60.4	E	0.28	60.5	E					
PM	Home Ave	EB							0.62	61.5	E	0.70	67.8	E					
		EB Right							0.09	51.3	D	0.13	51.7	D					
	Home Ave	WB							0.97	119.3	F	1.07	150.4	F					
		NB Left							0.98	141.4	F	1.10	160.4	F					
	Champlain Parkway	NB							0.41	10.1	B	0.41	10.1	B					
		SB Left							0.33	79.9	E	0.33	79.9	E					
AM	I-189 Ramp C	WB Left	0.85	26.5	C	0.84	26.4	C	0.84	26.3	C	0.84	26.4	C					
		WB	0.84	25.8	C	0.84	25.7	C	0.84	25.7	C	0.84	25.7	C					
	US 7	NB	0.81	31.6	C	0.82	31.7	C	0.66	26.5	C	0.66	26.5	C					
	US 7	SB	0.83	30.4	C	0.83	30.6	C	0.61	24.9	C	0.61	24.9	C					
	AM	I-189 Ramp C	WB Left	0.95	38.6	D	0.97	41.6	D	0.94	35.3	D	0.95	37.6	D				
			WB	0.97	41.3	D	0.98	44.3	D	0.95	37.5	D	0.96	39.4	D				
US 7		NB	0.82	34	C	0.82	34	C	0.73	30.4	C	0.73	30.5	C					
US 7		SB	1.31	174.6	F	1.32	177.5	F	0.92	38.1	D	0.92	38.7	D					



Safety Assessment Data

Five Year													Severity		Description	
Pgm/Class												Ratio		Index		
s 1 Town												Actual/Cr		es/1.)		
Highway	Rank	Route	System	Town	Mileage	AADT	Years	Crashes	Fatalities	Injuries	PDO	Critical Rate	Actual Rate	Ratio		
High Crash Segments																
#	114	US-7	Principal Arterial (u South Burlington		1.412 - 1.712	32257	5	224	0	25	209	6	12.684	2.114	20421	US 7 from Queen City Park Road to Laurel Hill drive
	334	US-7	Principal Arterial (u Burlington		0.174 - 0.474	26025	5	128	0	29	105	6.144	8.983	1.462	29320	US 7 from I-189 Ramp C to north of Scarff Ave
	247	I-189	Interstate- Urban (i Burlington- South Burlington		0.000 - 0.240	40400	5	43	0	14	33	1.194	1.944	1.628	37486	I-189 from the merge of Ramp E through the merge of Ramp A
High Crash Intersections																
#	76	US-7- <0189>- SWIFT ST.- SOUTH BURLINGTON	Principal Arterial (u South Burlington/Burlington		1.720 - 0.010	38650	5	60	0	1	59	0.731	0.851	1.163	12587	US 7 I-189 Ramp A and Swift Street

AOT Route	Crash Type	Collision Direction	Weather	Impairment	Involving	Road Condition	Surface Condition
HOME AV	Injury	Single Vehicle Crash	Cloudy	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Ice
INDUSTRIAL PKWY	Property Damage Only	Head On	Clear	None	None	None	Dry
INDUSTRIAL PKWY	Property Damage Only	Rear End	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	Rear End	Clear	None	Heavy Truck	Road Surface Condition(wet, icy, snow, slush, etc)	Ice
HOME AV	Property Damage Only	Rear End	Cloudy	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
BATCHELDER ST	Property Damage Only	Other - Explain in Narrative	Clear	None	None	Unknown	Unknown
HOME AVE	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
HOME AVE	Injury	Rear End	Cloudy	None	Bicycle	None	Dry
BATCHELDER ST	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
PINE ST	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Snow
HOME AVE	Property Damage Only	Rear End	Clear	None	None	None	Dry
PINE ST	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	Same Direction Sideswipe	Cloudy	None	None	None	Wet
HOME AVE	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Cloudy	None	None	None	Wet
PINE ST	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
PINE ST	Property Damage Only	Right Turn and Thru, Same Direction Sideswipe/Angle Crash ^^--	Cloudy	None	None	None	Wet
PINE ST	Property Damage Only	Rear End	Clear	None	None	None	Dry
PINE ST	Property Damage Only	Rear End	Clear	None	None	None	Dry
PINE ST	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Cloudy	None	None	None	Dry
PINE ST	Property Damage Only	Rear End	Clear	None	None	None	Dry
PINE ST	Property Damage Only	Head On	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
PINE ST	Property Damage Only	Rear End	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
PINE ST	Property Damage Only	Same Direction Sideswipe		None	None	None	Dry
PINE ST	Property Damage Only	Rear End	Cloudy	None	Heavy Truck	None	Dry
PINE ST	Injury	Rear End	Clear	None	None	None	Dry
PINE ST	Injury	Rear End	Clear	None	None	None	Dry
PINE ST	Property Damage Only			None	None		
HOME AVE	Property Damage Only	Left Turn and Thru, Broadside v<--	Clear	Alcohol	None	None	Dry
HOME AVE	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	Rear End	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
HOME AVE	Property Damage Only	Right Turn and Thru, Same Direction Sideswipe/Angle Crash ^^--	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
QUEEN CITY PARK RD	Property Damage Only			None	None	None	Dry
QUEEN CITY PARK RD	Property Damage Only	Single Vehicle Crash	Clear	Alcohol	None	None	Dry
INDUSTRIAL PKWY	Property Damage Only	Other - Explain in Narrative	Wind	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Ice
INDUSTRIAL PKWY	Injury	Other - Explain in Narrative	Cloudy	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Ice
QUEEN CITY PARK RD	Injury	Head On	Clear	None	None	None	Dry
PINE ST	Property Damage Only	Rear End	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
PINE ST	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
PINE ST	Property Damage Only	Rear End	Clear	None	None	None	Dry
PINE ST	Property Damage Only	Head On	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Ice
PINE ST	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
QUEEN CITY PARK RD	Property Damage Only	Single Vehicle Crash	Clear	None	None	None	Dry
PINE ST	Property Damage Only			None	None		
PINE ST	Property Damage Only	Head On	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Snow
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Property Damage Only	Right Turn and Thru, Angle Broadside -->^--	Rain	None	None	None	Wet

AOT Route	Crash Type	Collision Direction	Weather	Impairment	Involving	Road Condition	Surface Condition
US-7	Property Damage Only	Left Turn and Thru, Same Direction Sideswipe/Angle Crash vv--	Cloudy	None	None	None	Wet
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	Heavy Truck	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Cloudy	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Rain	None	None	None	Wet
US-7	Injury	Left Turn and Thru, Broadside v<--	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe		None	Heavy Truck	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Same Direction Sideswipe/Angle Crash vv--	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only		Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Wet
US-7	Property Damage Only	Left Turns, Same Direction, Rear End v--v--	Cloudy	None	Heavy Truck	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Property Damage Only			None	None		
US-7	Property Damage Only			None	None		
I-189	Property Damage Only			None	None		
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Snow
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Right Turn and Thru, Same Direction Sideswipe/Angle Crash ^^--		None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	Heavy Truck	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Injury	Rear End	Clear	None	None	Unknown	Dry
I-189	Injury	Rear End	Cloudy	None	None	None	Dry
I-189							
I-189	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	None	None	None	Dry
I-189							
I-189	Property Damage Only			None	None		
I-189	Property Damage Only	Rear End	Clear	Alcohol	None	None	Dry
I-189	Injury	Rear End	Clear	None	None	None	Wet
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	Heavy Truck	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Injury	Rear End	Rain	None	None	None	Wet
I-189	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Wet
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	Heavy Truck	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Single Vehicle Crash	Cloudy	None	None	None	Wet
SHELBURNE ST	Property Damage Only	Same Direction Sideswipe	Cloudy	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Rear-to-rear	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Left Turn and Thru, Head On ^v--	Clear	None	None	None	Dry

AOT Route	Crash Type	Collision Direction	Weather	Impairment	Involving	Road Condition	Surface Condition
SHELBURNE ST	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Opp Direction Sideswipe	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
I-189	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Injury	No Turns, Thru moves only, Broadside ^<	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Cloudy	None	None	None	Wet
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Ice
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Rain	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Wet
I-189	Injury	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
I-189	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Injury	Rear End		None	None	None	Dry
I-189	Injury	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
I-189	Injury	Single Vehicle Crash	Rain	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Injury	Rear End	Rain	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Wet
I-189	Injury	Rear End	Cloudy	None	None	None	Dry
I-189	Injury	Single Vehicle Crash	Clear	None	None	None	Dry
I-189	Property Damage Only	Single Vehicle Crash		None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Ice
I-189	Property Damage Only	Single Vehicle Crash	Cloudy	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Wet
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Single Vehicle Crash	Clear	None	None	None	Dry
I-189	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Ice
I-189	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
I-189	Injury	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
I-189	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
I-189	Injury	Rear End	Clear	None	None	None	Dry
I-189	Property Damage Only	Single Vehicle Crash	Cloudy	None	Heavy Truck	None	Wet
I-189	Property Damage Only	Rear End	Cloudy	None	None	Unknown	Dry
I-189	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
I-189	Injury	Same Direction Sideswipe	Clear	None	None	None	Dry
I-189	Property Damage Only	Rear End	Clear	None	Heavy Truck	None	Wet
I-189 EXIT 1 RAMP							
I-189	Property Damage Only	Single Vehicle Crash	Cloudy	Alcohol	None	None	Dry
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	

[illegible]

AOT Route	Crash Type	Collision Direction	Weather	Impairment	Involving	Road Condition	Surface Condition
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End		None	None	None	Dry
US-7	Property Damage Only	Rear End	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Injury	Same Direction Sideswipe	Clear	None	Motorcycle	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Broadside v<--	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Property Damage Only	Rear End	Freezing Precipitation	None	None	None	Wet
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe		None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Rain	None	None	None	Wet
US-7	Property Damage Only		Unknown	None	None		
US-7	Property Damage Only		Rain	None	None	None	Wet
US-7	Property Damage Only	Left Turn and Thru, Broadside v<--		None	None	Other - Explain in Narrative	Dry
US-7	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	None	None	None	Dry
US-7	Injury	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only		Cloudy	None	None	None	Dry
US-7	Property Damage Only			None	None		
US-7	Property Damage Only	Other - Explain in Narrative	Clear	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Property Damage Only	Left Turns, Opposite Directions, Head On/Angle Crash --^v--	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	Other - Explain in Narrative	Wet
US-7	Property Damage Only	Same Direction Sideswipe	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	Heavy Truck	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Property Damage Only	Single Vehicle Crash	Rain	None	None	None	Wet
US-7	Property Damage Only	Rear End	Clear	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Dry
US-7	Injury	Rear End	Rain	None	None	None	Wet
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	Motorcycle	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Same Direction Sideswipe/Angle Crash vv--	Rain	None	None	None	Wet
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Rear End	Rain	None	None	None	Wet
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End		None	None		
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Rain	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Wet
US-7	Property Damage Only	Rear End	Rain	None	None		
US-7	Property Damage Only	Same Direction Sideswipe	Cloudy	None	None		
US-7	Property Damage Only		Unknown	None	None		
US-7	Property Damage Only	Rear-to-rear	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Cloudy	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow

AOT Route	Crash Type	Collision Direction	Weather	Impairment	Involving	Road Condition	Surface Condition
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None		
US-7	Property Damage Only		Unknown	None	None		
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Broadside v<--	Clear	None	None	None	Dry
US-7	Injury	Left Turn and Thru, Broadside v<--	Clear	None	None	None	Dry
US-7	Injury	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	Motorcycle	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	Heavy Truck	None	Dry
US-7	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
US-7	Property Damage Only			None	None		
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	
US-7	Property Damage Only			None	None		
US-7	Property Damage Only	Same Direction Sideswipe	Rain	None	None	None	Wet
US-7	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
US-7	Property Damage Only	Single Vehicle Crash	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Unknown	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Cloudy	None	None	None	Wet
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	Heavy Truck	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only			None	None		
I-189	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Freezing Precipitation	None	None	None	Wet
US-7	Property Damage Only	Same Direction Sideswipe	Rain	None	None	None	Wet
US-7	Property Damage Only	Rear End	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Wet
US-7	Property Damage Only	Same Direction Sideswipe	Rain	None	None	Unknown	Wet
US-7	Property Damage Only	Rear End	Cloudy	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Ice
US-7	Injury	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Injury	No Turns, Thru moves only, Broadside ^<	Freezing Precipitation	None	None	None	Wet
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Cloudy	None	None	None	Wet
US-7	Property Damage Only	Rear End	Rain	None	None	None	Wet
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Single Vehicle Crash		None	None	None	Not Reported
US-7	Property Damage Only		Clear	None	None	Unknown	Dry
US-7	Property Damage Only			None	Heavy Truck		
US-7	Property Damage Only	Same Direction Sideswipe		None	Heavy Truck	None	Dry
US-7	Property Damage Only			None	None		
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry

AOT Route	Crash Type	Collision Direction	Weather	Impairment	Involving	Road Condition	Surface Condition
US-7	Injury	No Turns, Thru moves only, Broadside ^<	Rain	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Wet
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Same Direction Sideswipe/Angle Crash vv--	Cloudy	None	None	None	Unknown
SHELBURNE ST	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Other - Explain in Narrative	Rain	None	None	None	Wet
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Wet
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Other - Explain in Narrative	Cloudy	None	None	Unknown	Dry
SHELBURNE ST	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only			None	None		
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Ice
US-7	Property Damage Only	Left Turn and Thru, Same Direction Sideswipe/Angle Crash vv--	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Left Turns, Same Direciton, Rear End v--v--	Cloudy	None	Heavy Truck	None	Dry
US-7	Property Damage Only			None	None		
US-7	Property Damage Only	Rear End	Clear	None	Heavy Truck	Road Surface Condition(wet, icy, snow, slush, etc)	Dry
US-7	Injury	Left Turn and Thru, Broadside v<--	Cloudy	None	None	None	Dry
US-7	Property Damage Only			None	None		
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Cloudy	None	None	None	Dry
US-7	Injury	Left Turn and Thru, Angle Broadside -->v--	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Freezing Precipitation	None	None	Road Surface Condition(wet, icy, snow, slush, etc)	Snow
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Rear End	Rain	None	None	None	Wet
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear-to-rear	Freezing Precipitation	None	None	None	Snow
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	None	None	None	Snow
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Cloudy	None	None	None	Wet
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Freezing Precipitation	None	None	None	Slush
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Wet
US-7	Property Damage Only	Rear End	Clear	None	None	Other - Explain in Narrative	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Cloudy	None	None	None	Slush
US-7	Injury	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Injury	Rear End	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Injury	No Turns, Thru moves only, Broadside ^<	Clear	None	Bicycle	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry

AOT Route	Crash Type	Collision Direction	Weather	Impairment	Involving	Road Condition	Surface Condition
US-7	Injury	Other - Explain in Narrative	Rain	None	Pedestrian	None	Wet
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Cloudy	None	None	None	Wet
US-7	Property Damage Only	Right Turn and Thru, Same Direction Sideswipe/Angle Crash ^^--	Clear	None	None	None	Dry
US-7	Injury	Other - Explain in Narrative	Cloudy	None	Pedestrian	None	Dry
US-7	Property Damage Only	Rear End	Rain	None	None	None	Wet
US-7	Property Damage Only	Same Direction Sideswipe	Rain	None	None	None	Wet
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Head On	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Rain	None	Heavy Truck	None	Wet
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Same Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	Opp Direction Sideswipe	Clear	None	None	None	Dry
US-7	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	Heavy Truck	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Rain	None	None	Unknown	Wet
US-7	Property Damage Only	Rear End	Cloudy	None	None	None	Dry
US-7	Injury	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	Dry
US-7	Property Damage Only			None	None		
US-7	Property Damage Only			None	None		
US-7	Property Damage Only			None	None		
US-7	Property Damage Only			None	None		
US-7	Fatal	No Turns, Thru moves only, Broadside ^<	Clear	Alcohol	None	None	Dry
US-7	Property Damage Only			None	None		
US-7	Property Damage Only			None	None		
US-7	Property Damage Only			None	None		
US-7	Property Damage Only			None	None		
US-7	Property Damage Only			None	None		
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	None	None	None	Dry
US-7	Injury	Rear End	Clear	None	None	None	Dry
US-7	Property Damage Only			None	None		
SHELBURNE ST	Property Damage Only	Opp Direction Sideswipe	Clear	Alcohol	None	None	Dry
HOME AVE	Injury	Right Turn and Thru, Broadside ^<--	Clear	None	Pedestrian	None	Dry
SHELBURNE ST	Property Damage Only	Head On	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Other - Explain in Narrative	Unknown	None	None	Unknown	Unknown
SHELBURNE ST	Property Damage Only	Left Turn and Thru, Same Direction Sideswipe/Angle Crash vv--	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	Left and Right Turns, Simultaneous Turn Crash --vv--	Cloudy	Alcohol	None	None	Wet
SHELBURNE ST	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
SHELBURNE ST	Property Damage Only	Rear-to-rear	Clear	None	None	None	Dry
HOME AVE	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	None	None	None	
SHELBURNE ST	Property Damage Only	Other - Explain in Narrative	Clear	None	None	None	Dry
HOME AVE	Property Damage Only			None	None		
HOME AVE	Injury	Same Direction Sideswipe	Cloudy	None	Pedestrian	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry
US-7	Injury	Left Turn and Thru, Angle Broadside -->v--	Cloudy	None	None	None	Dry
US-7	Property Damage Only	Rear End	Clear	None	None	None	Dry



Single Lane Bridge

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	63	63	63	63	63	63
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	209	208	196	204	181	199
Vehs Exited	209	208	194	201	177	197
Starting Vehs	1	1	0	0	0	0
Ending Vehs	1	1	2	3	4	1
Travel Distance (mi)	57	56	53	55	49	54
Travel Time (hr)	2.6	2.5	2.4	2.5	2.2	2.5
Total Delay (hr)	0.5	0.4	0.4	0.5	0.4	0.4
Total Stops	180	173	169	175	143	168
Fuel Used (gal)	2.3	2.2	2.1	2.2	1.9	2.2

Interval #0 Information Seeding

Start Time	6:57
End Time	7:00
Total Time (min)	3
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00					
End Time	8:00					
Total Time (min)	60					
Run Number	1	2	3	4	5	Avg
Vehs Entered	209	208	196	204	181	199
Vehs Exited	209	208	194	201	177	197
Starting Vehs	1	1	0	0	0	0
Ending Vehs	1	1	2	3	4	1
Travel Distance (mi)	57	56	53	55	49	54
Travel Time (hr)	2.6	2.5	2.4	2.5	2.2	2.5
Total Delay (hr)	0.5	0.4	0.4	0.5	0.4	0.4
Total Stops	180	173	169	175	143	168
Fuel Used (gal)	2.3	2.2	2.1	2.2	1.9	2.2

1: EB Queen City Park Rd Performance by approach

Approach	EB	WB	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.0	0.1
Total Delay (hr)	0.2	0.0	0.2
Total Del/Veh (s)	5.6	1.6	4.4

2: WB Queen City Park Road Performance by approach

Approach	EB	WB	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.1	0.0
Total Delay (hr)	0.1	0.1	0.2
Total Del/Veh (s)	1.6	6.6	3.1

Total Network Performance

Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.2
Total Delay (hr)	0.4
Total Del/Veh (s)	7.8

Intersection: 1: EB Queen City Park Rd

Movement	EB
Directions Served	T
Maximum Queue (ft)	77
Average Queue (ft)	37
95th Queue (ft)	61
Link Distance (ft)	623
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: WB Queen City Park Road

Movement	WB
Directions Served	T
Maximum Queue (ft)	62
Average Queue (ft)	26
95th Queue (ft)	54
Link Distance (ft)	652
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: EB Queen City Park Rd

Phase	1	2
Movement(s) Served	EBT	WBT
Maximum Green (s)	3.0	3.0
Minimum Green (s)	1.0	1.0
Recall	None	None
Avg. Green (s)	2.1	2.2
g/C Ratio	-0.01	-0.01
Cycles Skipped (%)	39	73
Cycles @ Minimum (%)	24	10
Cycles Maxed Out (%)	14	7
Cycles with Peds (%)	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	63	63	63	63	63	63
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	283	313	287	261	265	282
Vehs Exited	281	310	286	260	266	281
Starting Vehs	1	1	2	2	4	2
Ending Vehs	3	4	3	3	3	3
Travel Distance (mi)	76	85	78	71	72	76
Travel Time (hr)	3.6	4.0	3.6	3.3	3.3	3.6
Total Delay (hr)	0.7	0.8	0.7	0.7	0.6	0.7
Total Stops	245	271	252	232	224	244
Fuel Used (gal)	3.1	3.4	3.1	2.9	2.9	3.1

Interval #0 Information Seeding

Start Time	6:57
End Time	7:00
Total Time (min)	3
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00					
End Time	8:00					
Total Time (min)	60					
Run Number	1	2	3	4	5	Avg
Vehs Entered	283	313	287	261	265	282
Vehs Exited	281	310	286	260	266	281
Starting Vehs	1	1	2	2	4	2
Ending Vehs	3	4	3	3	3	3
Travel Distance (mi)	76	85	78	71	72	76
Travel Time (hr)	3.6	4.0	3.6	3.3	3.3	3.6
Total Delay (hr)	0.7	0.8	0.7	0.7	0.6	0.7
Total Stops	245	271	252	232	224	244
Fuel Used (gal)	3.1	3.4	3.1	2.9	2.9	3.1

1: EB Queen City Park Rd Performance by approach

Approach	EB	WB	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.0	0.1
Total Delay (hr)	0.3	0.1	0.4
Total Del/Veh (s)	6.6	1.7	4.5

2: WB Queen City Park Road Performance by approach

Approach	EB	WB	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.2	0.1
Total Delay (hr)	0.1	0.2	0.3
Total Del/Veh (s)	1.7	7.6	4.1

Total Network Performance

Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.2
Total Delay (hr)	0.7
Total Del/Veh (s)	8.8

Intersection: 1: EB Queen City Park Rd

Movement	EB
Directions Served	T
Maximum Queue (ft)	90
Average Queue (ft)	44
95th Queue (ft)	72
Link Distance (ft)	623
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: WB Queen City Park Road

Movement	WB
Directions Served	T
Maximum Queue (ft)	91
Average Queue (ft)	38
95th Queue (ft)	67
Link Distance (ft)	652
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: EB Queen City Park Rd

Phase	1	2
Movement(s) Served	EBT	WBT
Maximum Green (s)	3.0	3.0
Minimum Green (s)	1.0	1.0
Recall	None	None
Avg. Green (s)	2.3	2.3
g/C Ratio	-0.01	-0.01
Cycles Skipped (%)	47	62
Cycles @ Minimum (%)	17	12
Cycles Maxed Out (%)	14	10
Cycles with Peds (%)	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:57	6:57	6:57	6:57	6:57	6:57
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	63	63	63	63	63	63
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	308	325	325	269	281	301
Vehs Exited	310	324	327	271	279	303
Starting Vehs	4	3	6	3	1	4
Ending Vehs	2	4	4	1	3	3
Travel Distance (mi)	84	88	88	73	76	82
Travel Time (hr)	3.9	4.2	4.0	3.4	3.5	3.8
Total Delay (hr)	0.7	0.8	0.8	0.6	0.6	0.7
Total Stops	263	283	265	228	240	255
Fuel Used (gal)	3.4	3.6	3.5	3.0	3.1	3.3

Interval #0 Information Seeding

Start Time	6:57
End Time	7:00
Total Time (min)	3

No data recorded this interval.

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60

Run Number	1	2	3	4	5	Avg
Vehs Entered	308	325	325	269	281	301
Vehs Exited	310	324	327	271	279	303
Starting Vehs	4	3	6	3	1	4
Ending Vehs	2	4	4	1	3	3
Travel Distance (mi)	84	88	88	73	76	82
Travel Time (hr)	3.9	4.2	4.0	3.4	3.5	3.8
Total Delay (hr)	0.7	0.8	0.8	0.6	0.6	0.7
Total Stops	263	283	265	228	240	255
Fuel Used (gal)	3.4	3.6	3.5	3.0	3.1	3.3

1: EB Queen City Park Rd Performance by approach

Approach	EB	WB	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.3	0.0	0.3
Total Delay (hr)	0.5	0.0	0.5
Total Del/Veh (s)	6.2	1.7	5.9

2: WB Queen City Park Road Performance by approach

Approach	EB	WB	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.1	0.0
Total Delay (hr)	0.1	0.0	0.2
Total Del/Veh (s)	1.6	7.1	2.0

Total Network Performance

Denied Delay (hr)			0.0
Denied Del/Veh (s)			0.3
Total Delay (hr)			0.7
Total Del/Veh (s)			8.1

Intersection: 1: EB Queen City Park Rd

Movement	EB
Directions Served	T
Maximum Queue (ft)	138
Average Queue (ft)	57
95th Queue (ft)	94
Link Distance (ft)	623
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: WB Queen City Park Road

Movement	WB
Directions Served	T
Maximum Queue (ft)	36
Average Queue (ft)	13
95th Queue (ft)	37
Link Distance (ft)	652
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: EB Queen City Park Rd

Phase	1	2
Movement(s) Served	EBT	WBT
Maximum Green (s)	3.0	3.0
Minimum Green (s)	1.0	1.0
Recall	None	None
Avg. Green (s)	2.3	2.4
g/C Ratio	-0.01	-0.01
Cycles Skipped (%)	24	94
Cycles @ Minimum (%)	24	2
Cycles Maxed Out (%)	21	1
Cycles with Peds (%)	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0



Memorandum

To: John Caulo, Project Manager

Date: April 23, 2020

Project #: 58237.00

From: Jenn Conley, PE, PTOE
Karen Sentoff, EIT

Re: Burton Hub
Additional Information for South Burlington, Vermont

VHB has conducted a Traffic Impact Study (TIS) for the proposed redevelopment of the Burton Hub properties located at 180 and 266 Queen City Park Road (formerly 80 and 152 Industrial Parkway) in Burlington, Vermont. The findings of the TIS have been summarized in a memorandum dated WHAT.

As outlined in the TIS, site encapsulates the Burton main office and retail property at 180 Queen City Park Road as well as the partially vacant adjacent facility at 266 Queen City Park Road, which currently serves as prototyping, storage, and office space for Burton. The proposed redevelopment program of the site includes the following elements:

- 180 Queen City Park Road will be adapted to serve as 66,300 square feet of office space with 2,750 square feet of storage;
- 266 Queen City Park Road will be renovated to serve multiple purposes, including:
 - o 10,275 square feet of office space;
 - o 8,745 square feet of research and development;
 - o 18,425 square feet of manufacturing;
 - o 12,545 square feet of storage and warehousing;
 - o 7,825 square feet of retail;
 - o 6,835 square feet of restaurant;
 - o 12,265 square feet of performing arts space; and,
 - o 7,465 square feet of indoor recreation space;
- Parking will be reconfigured from the current 276 spaces at 180 Queen City Park Road and 181 spaces at 266 Queen City Park Road to be a combined 496 spaces.

A number of concerns have been raised by the City and residents of South Burlington. This memorandum provides clarification on those topics and additional information as appropriate.

Existing Conditions

Additional information on the roadway and pedestrian network in South Burlington is provided below. The South Burlington intersections of Queen City Park Road at Central Avenue, Queen City Park Road at Pine Street and Queen City Park Road at the KMart/Hannaford Connector City were not included in the TIS. Information on those intersections is provided below. In addition, additional information was requested on the trip generation of the Burton site.

Existing Roadway Conditions at South Burlington Intersections

Queen City Park Road is a Class 2 Town Highway situated at the southernmost edge of Burlington, Vermont, crossing over to South Burlington before reaching its eastern terminus at US-7 / Shelburne Road. On July 1st, 2019, the name of Industrial Parkway, from its southern terminus at Queen City Park Road to its northern terminus at Home Avenue, was changed to Queen City Park Road. With the name change came the renumbering of the locations along the new section of Queen City Park Road, including 180 and 266 Queen City Park Road, where Burton's proposed headquarter expansion is located.

Queen City Park Road at the southern origin is posted as 25 miles per hour and is otherwise assumed to be 25 mph. In the immediate vicinity of the Burton site, Queen City Park Road has 28-feet of pavement width to facilitate two-way traffic. South of the project site, Queen City Park Road narrows to 25' of pavement width and again to 22' as it crosses a single lane bridge with no traffic control. "No Parking This Side of Street" signage is posted along the north and east side of Queen City Park Road from the one-way bridge to Home Avenue. Just off of Queen City Park Road along Central Avenue there are posted "Park Smart" signs.

There are no formalized bicycle or pedestrian facilities along Queen City Park Road in the immediate vicinity of the project site, with the exception of approximately 130 feet of sidewalk and a bus transit shelter in front of GMT's facility and approximately 400 feet of side path from Central Avenue to a pedestrian bridge adjacent to the single lane bridge south of the project site. These two short facilities are not connected to other active transportation facilities or the broader network like the sidewalks that begin approximately 240 feet further east along Queen City Park Road, the sidewalks to the north on Home Avenue or Austin Drive, or the bike path that runs along the proposed Champlain Parkway corridor.

Queen City Park Road intersects with Central Avenue to form a three way unsignalized intersection with the Central Avenue approach operating under stop control. Each leg of this intersection consists of a single lane in each direction. As outlined above, there is a sidepath on the northeast corner of the intersection from the single lane bridge to Central Avenue.

To the east of the single lane bridge, Pine Street intersects with Queen City Park Road at a three way unsignalized intersection with Pine Street under Stop sign control. Each leg of the intersection consists of a single lane in each direction. Pedestrians are accommodated on a sidewalk along the south edge of Queen City Park Road and there is a shared use path that meets the intersection immediately west of Pine Street and extends along the future alignment of the Champlain Parkway from that point to Home Avenue.

Another 1,100 feet to the east, just prior to meeting US Route 7, Queen City Park Road intersects with what has been called the K-Mart Connector and more recently provides access to the Hannaford Plaza. The Connector forms the south leg of the unsignalized intersection and Queen City Park Road forms the west and north legs. A stub to one building and a pedestrian connection to US Route 7 form the east leg of the intersection. Each leg of the intersection is controlled by a stop sign. A sidewalk is provided along the south side of Queen City Park Road and the stub to the east.

Existing Site Trip Generation

A comparison of the trip generation as counted at the site driveways versus the trips anticipated to be generated by the Institute of Transportation Engineers (ITE). The trips entering and exiting the site driveway were observed on Wednesday, July 31, 2019. As outlined above, there were construction projects occurring in the greater area (Pine Street, Kmart connector) but none that prevented access to the Burton site. Although the existing counts were collected in July, typically a vacation period for employers, Burton has indicated that their staff tends to take more vacation time during the winter months than during the summer months. In any case, the counted trip generation was higher than ITE. To provide the most conservatively high calculation of future net new trips, for future conditions analyses, credit was only taken for the trips estimated by ITE.

Future Conditions

The future conditions section of the TIS focused on anticipated Champlain Parkway traffic patterns, proposed Burton Hub development, other considerations for development on Queen City Park Road, and the future condition traffic networks for evaluating the Burton Hub project development. To address South Burlington's concerns, the status of the Champlain Parkway was reviewed, future trip generation and distribution was clarified and the operation of the South Burlington intersections was determined under future conditions with and without the Champlain Parkway.

Future traffic volume conditions

As outlined, the Champlain Parkway is a proposed transportation link that will connect from I-189 and US Route 7 along the I-189 alignment with its first intersection at Home Avenue, a four-way signalized intersection providing more direct access from I-189 and I-89 beyond into this area that includes the Burton property.

The Champlain Parkway underwent significant review, traffic analysis, roadway design and is anticipated to be constructed in upcoming years. The Champlain Parkway traffic analysis evaluated 2008 traffic volume operations both without and with the Champlain Parkway in place. The Champlain Parkway traffic analysis also evaluated 2028 conditions without and with the Champlain Parkway in place. The City of Burlington has requested that the project evaluate the impact of the Burton project on the base condition traffic volumes as well as on future year 2028 traffic volume conditions as evaluated in the Champlain Parkway traffic analysis – both without and with the Champlain Parkway infrastructure in place.

Intersection Traffic Volumes

The existing traffic volumes available at the South Burlington intersections were obtained from historic VTrans data and balanced along Queen City Park Road between US 7, the Connector and Pine Street to represent the existing conditions. The growth and volume adjustments associated with the twenty-year time horizon and Champlain Parkway traffic reassignments were included in the 2028 volumes at those intersections.

Proposed Trip Generation

As outlined above and in the TIS, 180 Queen City Park Road will be adapted to serve as 66,300 square feet of office space with 2,750 square feet of storage. 266 Queen City Park Road will be renovated to serve multiple purposes, including: 10,275 square feet of office space; 8,745 square feet of research and development; 18,425 square feet of

manufacturing; 12,545 square feet of storage and warehousing; 7,825 square feet of retail; 6,835 square feet of restaurant; 12,265 square feet of performing arts space; and, 7,465 square feet of indoor recreation space.

Trip estimates calculated for the proposed redevelopment in the TIS were calculated based on rates published by the Institute of Transportation Engineers (ITE) in the 10th edition of the Trip Generation Manual for the weekday AM and PM peak hours. In addition, because there is not an applicable ITE LUC for the Performing Arts Center, VHB obtained information from the Higher Ground who will be occupying the site.

Based on information from Higher Ground's website, the facility hosts an average of four to five events per week with typical showtimes of 7:30 or 8:30 PM with door opening an hour earlier. The existing Higher Ground parking lot accommodates 350 vehicles which accommodates even sold out nights (1050 attendees), or a rate of three attendees per vehicle.

The proposed venue will accommodate 1500 people at a peak event. Although peak level events are expected to be rare, to be conservative, the analysis was based on a peak event night. Based on the operational plan, events are expected to continue to start between 7:30 and 8:30 PM.

Applying the one vehicle trip per three attendees' parking generation rate to the proposed site occupancy of 1500 people results in a peak parking demand of 500 trips per show. Although shows are anticipated to start significantly after the peak hour, a conservatively high estimate of approximately 30 percent of those trips were considered to arrive during the commuter peak hour.

Because the restaurant space is expected to serve employees of Burton as well as concert goers and the public, the trip generation was calculated using two different approaches. The first was on a non-event night when the restaurant was operating primarily serving the general public and the PM peak hour trip generation was estimated to be 97 trips based on ITE. The second approach was on a night of a peak event at the performance venue. On a peak event night, it was conservatively estimated that 50 percent of the trips to the restaurant space will be internally captured by Burton employees and concertgoers. With peak occupancy at the performance venue and 50% of the restaurant venue serving the public instead of performance attendees, the trip generation was approximately double that if the restaurant was serving non-event attendees on a different night. The higher trip generation was used.

The total trip generation of the site is anticipated to be 121 AM peak hour trips (101 in and 20 out) and 363 PM peak hour trips (211 in and 153 out). As indicated above, the current site is generating 115 AM peak hour trips (97 in and 18 out) and 141 PM peak hour trips (37 in and 104 out). Therefore, the net trip generation anticipated at the site will be 6 trips during the weekday AM peak hour (4 in and 2 out) and 222 trips during the PM peak hour (174 in and 48 out).

Trip Distribution

The trips generated by the proposed redevelopment were assigned to area roadways based on likely trip patterns associated with those trips. For employees and visitors to Burton, the trips were assigned following existing traffic patterns to and from the site. Approximately 60 percent of Burton trips approach from/depart to the east on Queen City Park Road and 40 percent approach from/depart to the north on Queen City Park Road. The trips were then distributed per existing traffic patterns.

The trip distribution for Higher Ground patrons was developed by obtaining zip code data from credit cards used for tickets at the existing venue for the past year. Based on that data, approximately 30 percent of Higher Ground patrons will approach locally from the north, approximately 20 percent will approach locally from the south, and 50 percent will approach more regionally via I-189. Therefore, the Higher Ground trips were assigned separately than Burton traffic to reflect different travel patterns.

For the condition with the Champlain Parkway in place, the trip distribution considered how the presence of that roadway would influence travelers when making route choices. Some trips may use the Champlain Parkway to avoid congestion on US Route 7 when accessing the site, however, a significant amount of trips will continue to access the site via the existing routing as most Burlington related trips will not see reduced travel times associated with the addition of Champlain Parkway to the infrastructure. A review of the Champlain Parkway traffic volume networks indicates that peak hour trips to and from Burton and surrounding businesses were not expected to divert from current travel routes. However, the Champlain Parkway did not anticipate the redevelopment to include a more regional generator such as Higher Ground. The Higher Ground trips that are expected to originate more regionally were diverted to Champlain Parkway for the condition with that infrastructure in place. Local trips exiting to Route 7 and points south continued to be distributed via Queen City Park Road.

Human Powered Trips

South Burlington raised a concern regarding trips made by human powered modes such as bicycling and walking. Although based on the time frame of the typical show, walking and cycling trips will be low, some local residents may choose these modes. For trips made by bicycle, Higher Ground will encourage patrons to exit the site and proceed north on Queen City Park Road, turn right onto Home Avenue and travel to local destinations rather than leaving the site to the south where a cyclist would have to cross the single lane bridge. Without proper lighting on the bicycle, travel to the south may cause a safety concern where a driver in the opposing direction did not see the cyclist on the bridge before proceeding. The Higher Ground operational plan will include informing Higher Ground staff to direct all cyclists to the safer route. Pedestrians will be able to proceed in either direction. To the north pedestrians will travel on sidewalks within the Burton site and then either along the eastern roadway edge or cross to the sidewalk on the western side of Queen City Park Road to connect to the sidewalk network on Home Avenue. Pedestrian trips to the south will require the crossing of Queen City Park Road to access the sidepath to the south of the roadway and safely cross the single lane bridge. As outlined above, these pedestrians will proceed along the roadway edge until reaching the sidewalk on the south side of Queen City Park Road just east of Arthur Court.

Off Peak Hours

The critical traffic time analyzed was the combination of the weekday commuter peak hour and the overlap of early patron arrival for a peak attendance event. The more typical occurrence would be a lower attended event and less of an overlap between commuter traffic and event traffic. As outlined in application materials, there will be opportunities for the community and private events to use the space as available. These events may take place at different times of day, but are not likely to reach the level of a full occupancy performance. The peer review consultant for the City of Burlington did express a concern regarding the operation of the single lane bridge after a peak attendance event. The operation of the single lane bridge is discussed in detail in the TIS and below.

Traffic Analyses

Intersection capacity analyses were performed for the study area intersections and presented in the TIS. The intersections in South Burlington were similarly analyzed using the criteria published in the *2000 Highway Capacity Manual*.¹ Level of Service is the term that defines the conditions that may occur on a given roadway or at an intersection when accommodating various traffic volume loads. Levels of service range from A to F with LOS A representing generally free flowing operating conditions and LOS F representing generally congested conditions. Copies of the LOS calculations are provided in the Appendix.

TIS Intersections

The TIS summarized the operational analysis at the *signalized* study area intersections during the Existing and 2028 AM and PM peak hours under No Build and Build conditions. The signalized intersections along US Route 7 currently operate at LOS C or better in the peak hour. Without construction of the Champlain Parkway, the addition of traffic associated with the Burton redevelopment will result in changes in delay of less than 4 seconds per vehicle during the weekday PM peak hour.

The Champlain Parkway is anticipated to alleviate some of the existing delays along US Route 7 (Shelburne Street) as traffic diverts from the US Route 7 corridor to the Champlain Parkway. The newly signalized intersection of Home Avenue at the Champlain Parkway is anticipated to operate at LOS C in the AM peak hour and LOS E in the PM peak hour. It is possible that design changes to lane usage may occur prior to completion of construction. With the Champlain Parkway constructed, the addition of the traffic associated with the Burton redevelopment will result in changes in delay of less than 15 seconds per vehicle during the weekday PM peak hour. The City of South Burlington requested that operational results be provided by movement. That information is provided in the Appendix of this memorandum.

The TIS included the operational analysis at the *unsignalized* study area intersections during the Existing and 2028 AM and PM peak hours under No Build and Build conditions. As shown in the TIS, all intersection approaches are expected to operate at LOS C or better. For all intersection approaches included in the TIS, changes related to the trips generated from the proposed Burton redevelopment result in delay increases of less than 4 seconds once the Champlain Parkway is constructed.

The operational analysis at the *unsignalized* intersections along Queen City Park Road in South Burlington indicates that all intersection approaches are expected to operate at LOS C or better with Burton trip related delay increases of less than 3 seconds. Once the Champlain Parkway is in place, Pine Street will dead end at the Champlain Parkway and no longer connect to Queen City Park Road. The resulting traffic volumes at these two unsignalized locations would change, resulting in significantly less delay for the heavier movements. For all intersection approaches, changes related to the trips generated from the proposed Burton redevelopment result in delay increases of less than 3 seconds.

¹ Highway Capacity Manual, Federal Highway Administration, Transportation Research Board, 2000.

Other Analysis – One Lane Bridge

The one lane bridge on Queen City Park Road currently operates as a yield control unsignalized intersection with vehicles yielding in the event there is a vehicle operating in the opposing direction on the bridge. The City of South Burlington has expressed a concern regarding the operation of the bridge in the future. Based on the traffic volumes presented in the Champlain Parkway traffic analysis, traffic volumes along Queen City Park Road are anticipated to change very little with the addition of the new roadway infrastructure to the network, so it is likely that the bridge will continue to operate in a similar fashion in the future.

The Burton redevelopment will increase traffic volumes during the PM peak hour, however, based on the origins of the traffic and the routes provided by mapping software and smartphone apps to reach the site, the PM peak hour traffic entering the Higher Ground portion of the site is more likely to use Home Avenue to reach the site. During the late evening hours, when Higher Ground traffic will be exiting and mapping software and smartphone apps are more likely to route traffic toward the one lane bridge, the typical traffic volumes on the bridge will be significantly lower than during the peak hour with little to no opposing traffic, and therefore able to accommodate the exiting eastbound traffic.

VHB has simulated the one lane bridge operation using SimTraffic. The bridge was simulated as series of closely spaced, signalized, split phase intersections representative of the alternating, two-way operation in the real-world. Consistent with operations in the field, where most vehicles hesitate before proceeding, the simulation shows most vehicles have little delay before proceeding and travel across the bridge one at a time in alternating directions. At times in the simulation, as in the field, traffic on the same approach will travel one after the other when no other vehicles are waiting.

The Build PM peak hour and late evening Higher Ground show release scenarios were simulated and found to be consistent with the existing operations. The delay for the existing operation of the one lane bridge was estimated to be less than 8 seconds. Additional simulations of Burton build and late evening Higher Ground show release scenarios revealed no more than one additional second of delay for the build conditions. The outputs from the simulations are included in the Appendix.

Operational Plan

The operators of Higher Ground have been working with area residents to develop an operational plan to address their concerns regarding traffic, parking and safety. The operational plan indicates the levels of staff anticipated to be on site based on the size of the events and how that staff will manage the safety and operations of the entering and exiting patrons and is provided as a part of the permit application. Relevant to the concerns raised by South Burlington, the plan includes reference to signage being deployed at the end of Central Avenue indicating that event parking is not permitted, and that the road is not a through route to discourage patrons looking for a cut through to the south. In addition, the routing of bicyclists exiting to the north provides those cyclists with a safer route than traveling over the one lane bridge to the east. Higher Ground staff will direct cyclists to the north when exiting the site.

There is a commitment to encourage non-automobile trips. As such, Higher Ground will encourage patrons to arrive by Green Mountain Transit (GMT). Because GMT route schedules end before the anticipated end time of events, the potential for dedicated GMT bus(es) is being discussed. In addition, University of Vermont and Champlain College

have been approached regarding the potential for students to access the site using existing shuttles. Further discussion will continue. Finally, the venue is considering preferred, dedicated high-occupancy vehicle parking on site to incentivize carpooling and ride sharing.

Conclusions

The redevelopment of the Burton site will accommodate a new mix of land uses including a performing arts space. As outlined above, conservatively high trip generation estimates are anticipated to increase site trips by 6 trips during the AM peak hour and 222 trips during the PM peak hour. As shown, the delay increases associated with the project at the South Burlington intersections are anticipated to be minor.

Higher Ground has committed to an operational plan to address the concerns raised by the neighbors and officials with concerns regarding traffic, parking and safety. As indicated above, measures will be taken to eliminate parking and unnecessary trips Central Avenue. In addition, the site is working to encourage non-automobile trips by working with GMT and area colleges to provide busses and shuttles for patrons to the site. Finally, the plan contains direction to staff to ensure that cyclist travel on the safer of the two routes leaving the site when visibility is poor.



Technical Appendix Traffic

- South Burlington Intersection Capacity Analyses
 - Unsignalized Intersections LOS Summary
 - Unsignalized Intersection Reports Burton Hub No Build
 - Unsignalized Intersection Reports Burton Hub Build

UNSIGNALIZED INTERSECTION CAPACITY ANALYSES SUMMARY
SOUTH BURLINGTON INTERSECTIONS

Intersection		Champlain Parkway No Build						Champlain Parkway Build					
		Burton No Build			Burton Build			Burton No Build			Burton Build		
Movement		v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **
		2008											
AM	Queen City Park Rd / Pine St												
	EB from Queen City Park Rd	0.02	1.8	A	0.02	1.8	A	Pine Street to Dead End at Champlain Parkway			Pine Street to Dead End at Champlain Parkway		
	WB from Queen City Park Rd	0.19	0.0		0.19	0.0							
	SB from Pine St	0.32	13.2	B	0.32	13.2	B						
	Queen City Park Rd / Hannaford Access												
	EB from Queen City Park Rd	0.36	10.1	B	0.37	10.1	B	0.09	7.3	A	0.09	7.3	A
	WB from Apt Access	0.03	7.7	A	0.03	7.7	A	0.01	6.6	A	0.01	6.6	A
	NB from Hannaford Access	0.17	9.2	A	0.17	9.2	A	0.04	7.5	A	0.04	7.6	A
	SB from Queen City Park Rd Ext	0.26	8.8	A	0.26	8.8	A	0.06	6.8	A	0.06	6.8	A
PM	Queen City Park Rd / Pine St												
	EB from Queen City Park Rd	0.02	1.2	A	0.02	1.1	A	Pine Street to Dead End at Champlain Parkway			Pine Street to Dead End at Champlain Parkway		
	WB from Queen City Park Rd	0.15	0.0		0.18	0.0							
	SB from Pine St	0.40	14.4	B	0.45	16.2	C						
	Queen City Park Rd / Hannaford Access												
	EB from Queen City Park Rd	0.50	12.1	B	0.55	13.5	B	0.17	7.9	A	0.21	8.3	A
	WB from Apt Access	0.00	7.9	A	0.00	8.2	A	0.00	7.3	A	0.00	7.5	A
	NB from Hannaford Access	0.30	10.3	B	0.31	10.7	B	0.10	7.9	A	0.10	8.1	A
	SB from Queen City Park Rd Ext	0.12	8.4	A	0.19	9.0	A	0.04	7.1	A	0.10	7.3	A
		Champlain Parkway No Build						Champlain Parkway Build					
		Burton No Build			Burton Build			Burton No Build			Burton Build		
Movement		v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **
		2008											
AM	Queen City Park Rd / Pine St												
	EB from Queen City Park Rd	0.02	1.8	A	0.02	1.8	A	Pine Street to Dead End at Champlain Parkway			Pine Street to Dead End at Champlain Parkway		
	WB from Queen City Park Rd	0.20	0.0		0.20	0.0							
	SB from Pine St	0.34	13.7	B	0.34	13.7	B						
	Queen City Park Rd / Hannaford Access												
	EB from Queen City Park Rd	0.38	10.4	B	0.39	10.4	B	0.09	7.3	A	0.09	7.3	A
	WB from Apt Access	0.03	7.8	A	0.03	7.8	A	0.01	6.6	A	0.01	6.6	A
	NB from Hannaford Access	0.18	9.3	A	0.18	9.3	A	0.04	7.6	A	0.04	7.6	A
	SB from Queen City Park Rd Ext	0.28	9.0	A	0.28	9.0	A	0.06	6.8	A	0.07	6.9	A
PM	Queen City Park Rd / Pine St												
	EB from Queen City Park Rd	0.02	1.2	A	0.02	1.1	A	Pine Street to Dead End at Champlain Parkway			Pine Street to Dead End at Champlain Parkway		
	WB from Queen City Park Rd	0.17	0.0		0.20	0.0							
	SB from Pine St	0.50	17.1	C	0.56	20.0	C						
	Queen City Park Rd / Hannaford Access												
	EB from Queen City Park Rd	0.60	14.6	B	0.66	16.8	C	0.20	8.2	A	0.24	8.6	A
	WB from Apt Access	0.00	8.2	A	0.00	8.5	A	0.00	7.4	A	0.00	7.6	A
	NB from Hannaford Access	0.36	11.4	B	0.38	11.9	B	0.12	8.1	A	0.12	8.3	A
	SB from Queen City Park Rd Ext	0.14	8.9	A	0.22	9.6	A	0.04	7.2	A	0.11	7.5	A

⁺ Volume to capacity ratio

* Delay expressed in seconds per vehicle

** Level of Service

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	0	42	0	0	5	30	1	0	1	3	53
Future Volume (vph)	33	0	42	0	0	5	30	1	0	1	3	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.924			0.865						0.874	
Flt Protected		0.979						0.954			0.999	
Satd. Flow (prot)	0	1685	0	0	1611	0	0	1777	0	0	1626	0
Flt Permitted		0.979						0.954			0.999	
Satd. Flow (perm)	0	1685	0	0	1611	0	0	1777	0	0	1626	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			129			158			113	
Travel Time (s)		24.9			2.9			3.6			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	36	0	46	0	0	5	33	1	0	1	3	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	82	0	0	5	0	0	34	0	0	62	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	26.1%											
Analysis Period (min)	15											
	ICU Level of Service A											

HCM Unsignalized Intersection Capacity Analysis

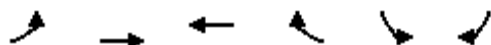
10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	33	0	42	0	0	5	30	1	0	1	3	53
Future Volume (vph)	33	0	42	0	0	5	30	1	0	1	3	53
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	36	0	46	0	0	5	33	1	0	1	3	58
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	82	5	34	62								
Volume Left (vph)	36	0	33	1								
Volume Right (vph)	46	5	0	58								
Hadj (s)	-0.21	-0.57	0.23	-0.52								
Departure Headway (s)	3.9	3.6	4.4	3.6								
Degree Utilization, x	0.09	0.01	0.04	0.06								
Capacity (veh/h)	900	963	797	974								
Control Delay (s)	7.3	6.6	7.5	6.8								
Approach Delay (s)	7.3	6.6	7.5	6.8								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.1									
Level of Service			A									
Intersection Capacity Utilization			26.1%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings
9: Queen City Park Rd & Pine St

04/23/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	20	75	124	173	174	13
Future Volume (vph)	20	75	124	173	174	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.921		0.991	
Flt Protected		0.990			0.956	
Satd. Flow (prot)	0	1844	1716	0	1765	0
Flt Permitted		0.990			0.956	
Satd. Flow (perm)	0	1844	1716	0	1765	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		1207	1095		1741	
Travel Time (s)		27.4	24.9		39.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	82	135	188	189	14
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	104	323	0	203	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

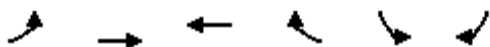
Intersection Capacity Utilization 38.4% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

9: Queen City Park Rd & Pine St

04/23/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	75	124	173	174	13
Future Volume (Veh/h)	20	75	124	173	174	13
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	82	135	188	189	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	323				355	229
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	323				355	229
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				70	98
cM capacity (veh/h)	1237				632	810
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	104	323	203			
Volume Left	22	0	189			
Volume Right	0	188	14			
cSH	1237	1700	641			
Volume to Capacity	0.02	0.19	0.32			
Queue Length 95th (ft)	1	0	34			
Control Delay (s)	1.8	0.0	13.2			
Lane LOS	A		B			
Approach Delay (s)	1.8	0.0	13.2			
Approach LOS			B			
Intersection Summary						
Average Delay			4.5			
Intersection Capacity Utilization		38.4%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	118	0	149	1	1	17	107	3	0	3	11	188
Future Volume (vph)	118	0	149	1	1	17	107	3	0	3	11	188
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.925			0.878						0.874	
Flt Protected		0.978			0.998			0.954			0.999	
Satd. Flow (prot)	0	1685	0	0	1632	0	0	1777	0	0	1626	0
Flt Permitted		0.978			0.998			0.954			0.999	
Satd. Flow (perm)	0	1685	0	0	1632	0	0	1777	0	0	1626	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			91			153			113	
Travel Time (s)		24.9			2.1			3.5			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	128	0	162	1	1	18	116	3	0	3	12	204
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	290	0	0	20	0	0	119	0	0	219	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	50.8%					ICU Level of Service A						
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	118	0	149	1	1	17	107	3	0	3	11	188
Future Volume (vph)	118	0	149	1	1	17	107	3	0	3	11	188
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	128	0	162	1	1	18	116	3	0	3	12	204
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	290	20	119	219								
Volume Left (vph)	128	1	116	3								
Volume Right (vph)	162	18	0	204								
Hadj (s)	-0.21	-0.50	0.23	-0.52								
Departure Headway (s)	4.5	4.6	5.1	4.3								
Degree Utilization, x	0.36	0.03	0.17	0.26								
Capacity (veh/h)	751	697	652	781								
Control Delay (s)	10.1	7.7	9.2	8.8								
Approach Delay (s)	10.1	7.7	9.2	8.8								
Approach LOS	B	A	A	A								
Intersection Summary												
Delay			9.4									
Level of Service			A									
Intersection Capacity Utilization			50.8%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	0	44	0	0	5	32	1	0	1	3	56
Future Volume (vph)	35	0	44	0	0	5	32	1	0	1	3	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.925			0.865						0.873	
Flt Protected		0.978						0.954			0.999	
Satd. Flow (prot)	0	1685	0	0	1611	0	0	1777	0	0	1625	0
Flt Permitted		0.978						0.954			0.999	
Satd. Flow (perm)	0	1685	0	0	1611	0	0	1777	0	0	1625	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			122			157			113	
Travel Time (s)		24.9			2.8			3.6			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	0	48	0	0	5	35	1	0	1	3	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	86	0	0	5	0	0	36	0	0	65	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 26.5%	ICU Level of Service A											
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis

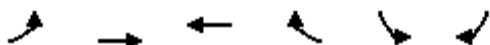
10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	35	0	44	0	0	5	32	1	0	1	3	56
Future Volume (vph)	35	0	44	0	0	5	32	1	0	1	3	56
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	38	0	48	0	0	5	35	1	0	1	3	61
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	86	5	36	65								
Volume Left (vph)	38	0	35	1								
Volume Right (vph)	48	5	0	61								
Hadj (s)	-0.21	-0.57	0.23	-0.53								
Departure Headway (s)	3.9	3.6	4.4	3.6								
Degree Utilization, x	0.09	0.01	0.04	0.06								
Capacity (veh/h)	897	957	795	970								
Control Delay (s)	7.3	6.6	7.6	6.8								
Approach Delay (s)	7.3	6.6	7.6	6.8								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				7.2								
Level of Service				A								
Intersection Capacity Utilization				26.5%	ICU Level of Service	A						
Analysis Period (min)				15								

Lanes, Volumes, Timings
9: Queen City Park Rd & Pine St

04/23/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	79	130	181	182	14
Future Volume (vph)	21	79	130	181	182	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.921		0.990	
Flt Protected		0.990			0.956	
Satd. Flow (prot)	0	1844	1716	0	1763	0
Flt Permitted		0.990			0.956	
Satd. Flow (perm)	0	1844	1716	0	1763	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		1207	1095		1741	
Travel Time (s)		27.4	24.9		39.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	23	86	141	197	198	15
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	109	338	0	213	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

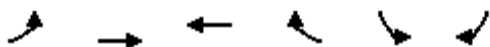
Intersection Capacity Utilization 39.9% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

9: Queen City Park Rd & Pine St

04/23/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (veh/h)	21	79	130	181	182	14
Future Volume (Veh/h)	21	79	130	181	182	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	86	141	197	198	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	338				372	240
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	338				372	240
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				68	98
cM capacity (veh/h)	1221				617	799
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	109	338	213			
Volume Left	23	0	198			
Volume Right	0	197	15			
cSH	1221	1700	627			
Volume to Capacity	0.02	0.20	0.34			
Queue Length 95th (ft)	1	0	37			
Control Delay (s)	1.8	0.0	13.7			
Lane LOS	A		B			
Approach Delay (s)	1.8	0.0	13.7			
Approach LOS			B			
Intersection Summary						
Average Delay			4.7			
Intersection Capacity Utilization			39.9%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	123	0	156	1	1	17	112	3	0	3	12	197
Future Volume (vph)	123	0	156	1	1	17	112	3	0	3	12	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.925			0.878						0.874	
Flt Protected		0.978			0.998			0.953			0.999	
Satd. Flow (prot)	0	1685	0	0	1632	0	0	1775	0	0	1626	0
Flt Permitted		0.978			0.998			0.953			0.999	
Satd. Flow (perm)	0	1685	0	0	1632	0	0	1775	0	0	1626	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			119			144			113	
Travel Time (s)		24.9			2.7			3.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	134	0	170	1	1	18	122	3	0	3	13	214
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	304	0	0	20	0	0	125	0	0	230	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	52.4%											
Analysis Period (min)	15											
ICU Level of Service A												

HCM Unsignalized Intersection Capacity Analysis

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	123	0	156	1	1	17	112	3	0	3	12	197
Future Volume (vph)	123	0	156	1	1	17	112	3	0	3	12	197
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	134	0	170	1	1	18	122	3	0	3	13	214
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	304	20	125	230								
Volume Left (vph)	134	1	122	3								
Volume Right (vph)	170	18	0	214								
Hadj (s)	-0.21	-0.50	0.23	-0.52								
Departure Headway (s)	4.6	4.7	5.2	4.3								
Degree Utilization, x	0.38	0.03	0.18	0.28								
Capacity (veh/h)	743	681	643	771								
Control Delay (s)	10.4	7.8	9.3	9.0								
Approach Delay (s)	10.4	7.8	9.3	9.0								
Approach LOS	B	A	A	A								
Intersection Summary												
Delay			9.6									
Level of Service			A									
Intersection Capacity Utilization			52.4%	ICU Level of Service				A				
Analysis Period (min)			15									

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	6	55	0	0	0	51	24	0	1	9	20
Future Volume (vph)	78	6	55	0	0	0	51	24	0	1	9	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.947									0.910	
Flt Protected		0.973						0.967			0.998	
Satd. Flow (prot)	0	1716	0	0	1863	0	0	1801	0	0	1692	0
Flt Permitted		0.973						0.967			0.998	
Satd. Flow (perm)	0	1716	0	0	1863	0	0	1801	0	0	1692	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			192			145			113	
Travel Time (s)		24.9			4.4			3.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	85	7	60	0	0	0	55	26	0	1	10	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	152	0	0	0	0	0	81	0	0	33	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type: Unsignalized												
Intersection Capacity Utilization 25.4%												
ICU Level of Service A												
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis

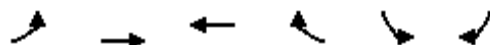
10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	78	6	55	0	0	0	51	24	0	1	9	20
Future Volume (vph)	78	6	55	0	0	0	51	24	0	1	9	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	85	7	60	0	0	0	55	26	0	1	10	22
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	152	0	81	33								
Volume Left (vph)	85	0	55	1								
Volume Right (vph)	60	0	0	22								
Hadj (s)	-0.09	0.00	0.17	-0.36								
Departure Headway (s)	4.1	4.3	4.4	4.0								
Degree Utilization, x	0.17	0.00	0.10	0.04								
Capacity (veh/h)	860	812	777	867								
Control Delay (s)	7.9	7.3	7.9	7.1								
Approach Delay (s)	7.9	0.0	7.9	7.1								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				7.8								
Level of Service				A								
Intersection Capacity Utilization				25.4%	ICU Level of Service	A						
Analysis Period (min)				15								

Lanes, Volumes, Timings
9: Queen City Park Rd & Pine St

04/23/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	139	76	152	221	15
Future Volume (vph)	21	139	76	152	221	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.910		0.992	
Flt Protected		0.993			0.955	
Satd. Flow (prot)	0	1850	1695	0	1765	0
Flt Permitted		0.993			0.955	
Satd. Flow (perm)	0	1850	1695	0	1765	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		1207	1095		1741	
Travel Time (s)		27.4	24.9		39.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	23	151	83	165	240	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	174	248	0	256	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

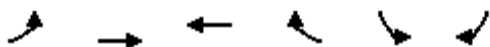
Intersection Capacity Utilization 44.9% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

9: Queen City Park Rd & Pine St

04/23/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	21	139	76	152	221	15
Future Volume (Veh/h)	21	139	76	152	221	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	151	83	165	240	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	248				362	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	248				362	166
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				62	98
cM capacity (veh/h)	1318				626	879
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	174	248	256			
Volume Left	23	0	240			
Volume Right	0	165	16			
cSH	1318	1700	637			
Volume to Capacity	0.02	0.15	0.40			
Queue Length 95th (ft)	1	0	48			
Control Delay (s)	1.2	0.0	14.4			
Lane LOS	A		B			
Approach Delay (s)	1.2	0.0	14.4			
Approach LOS			B			
Intersection Summary						
Average Delay		5.7				
Intersection Capacity Utilization		44.9%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	203	16	142	0	1	1	131	61	1	4	23	53
Future Volume (vph)	203	16	142	0	1	1	131	61	1	4	23	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.947			0.932			0.999			0.910	
Flt Protected		0.973						0.967			0.998	
Satd. Flow (prot)	0	1716	0	0	1736	0	0	1799	0	0	1692	0
Flt Permitted		0.973						0.967			0.998	
Satd. Flow (perm)	0	1716	0	0	1736	0	0	1799	0	0	1692	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			175			147			113	
Travel Time (s)		24.9			4.0			3.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	221	17	154	0	1	1	142	66	1	4	25	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	392	0	0	2	0	0	209	0	0	87	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	51.3%				ICU Level of Service A							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	203	16	142	0	1	1	131	61	1	4	23	53
Future Volume (vph)	203	16	142	0	1	1	131	61	1	4	23	53
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	221	17	154	0	1	1	142	66	1	4	25	58
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	392	2	209	87								
Volume Left (vph)	221	0	142	4								
Volume Right (vph)	154	1	1	58								
Hadj (s)	-0.09	-0.27	0.17	-0.36								
Departure Headway (s)	4.6	4.9	5.2	4.8								
Degree Utilization, x	0.50	0.00	0.30	0.12								
Capacity (veh/h)	750	652	656	676								
Control Delay (s)	12.1	7.9	10.3	8.4								
Approach Delay (s)	12.1	7.9	10.3	8.4								
Approach LOS	B	A	B	A								
Intersection Summary												
Delay			11.1									
Level of Service			B									
Intersection Capacity Utilization			51.3%	ICU Level of Service		A						
Analysis Period (min)			15									

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	7	64	0	0	0	59	27	0	2	10	24
Future Volume (vph)	91	7	64	0	0	0	59	27	0	2	10	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.947									0.910	
Flt Protected		0.973						0.967			0.997	
Satd. Flow (prot)	0	1716	0	0	1863	0	0	1801	0	0	1690	0
Flt Permitted		0.973						0.967			0.997	
Satd. Flow (perm)	0	1716	0	0	1863	0	0	1801	0	0	1690	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			151			143			113	
Travel Time (s)		24.9			3.4			3.3			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	99	8	70	0	0	0	64	29	0	2	11	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	177	0	0	0	0	0	93	0	0	39	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 27.3%	ICU Level of Service A											
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis

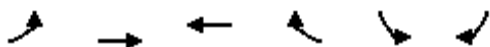
10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	91	7	64	0	0	0	59	27	0	2	10	24
Future Volume (vph)	91	7	64	0	0	0	59	27	0	2	10	24
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	99	8	70	0	0	0	64	29	0	2	11	26
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	177	0	93	39								
Volume Left (vph)	99	0	64	2								
Volume Right (vph)	70	0	0	26								
Hadj (s)	-0.09	0.00	0.17	-0.36								
Departure Headway (s)	4.1	4.4	4.5	4.0								
Degree Utilization, x	0.20	0.00	0.12	0.04								
Capacity (veh/h)	849	795	762	845								
Control Delay (s)	8.2	7.4	8.1	7.2								
Approach Delay (s)	8.2	0.0	8.1	7.2								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.0								
Level of Service				A								
Intersection Capacity Utilization				27.3%	ICU Level of Service	A						
Analysis Period (min)				15								

Lanes, Volumes, Timings
9: Queen City Park Rd & Pine St

04/23/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	24	162	88	176	256	17
Future Volume (vph)	24	162	88	176	256	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.910		0.992	
Flt Protected		0.994			0.955	
Satd. Flow (prot)	0	1852	1695	0	1765	0
Flt Permitted		0.994			0.955	
Satd. Flow (perm)	0	1852	1695	0	1765	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		1207	1095		1741	
Travel Time (s)		27.4	24.9		39.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	176	96	191	278	18
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	202	287	0	296	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

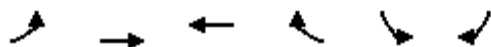
Intersection Capacity Utilization 50.5% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

9: Queen City Park Rd & Pine St

04/23/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	24	162	88	176	256	17
Future Volume (Veh/h)	24	162	88	176	256	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	176	96	191	278	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	287				420	192
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	287				420	192
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				52	98
cM capacity (veh/h)	1275				578	850
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	202	287	296			
Volume Left	26	0	278			
Volume Right	0	191	18			
cSH	1275	1700	590			
Volume to Capacity	0.02	0.17	0.50			
Queue Length 95th (ft)	2	0	70			
Control Delay (s)	1.2	0.0	17.1			
Lane LOS	A		C			
Approach Delay (s)	1.2	0.0	17.1			
Approach LOS			C			
Intersection Summary						
Average Delay		6.7				
Intersection Capacity Utilization		50.5%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	18	165	0	1	1	152	71	1	4	27	61
Future Volume (vph)	235	18	165	0	1	1	152	71	1	4	27	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.947			0.932			0.999			0.910	
Flt Protected		0.973						0.967			0.998	
Satd. Flow (prot)	0	1716	0	0	1736	0	0	1799	0	0	1692	0
Flt Permitted		0.973						0.967			0.998	
Satd. Flow (perm)	0	1716	0	0	1736	0	0	1799	0	0	1692	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			169			142			113	
Travel Time (s)		24.9			3.8			3.2			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	20	179	0	1	1	165	77	1	4	29	66
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	454	0	0	2	0	0	243	0	0	99	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type: Unsignalized												
Intersection Capacity Utilization 56.3%												
ICU Level of Service B												
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	235	18	165	0	1	1	152	71	1	4	27	61
Future Volume (vph)	235	18	165	0	1	1	152	71	1	4	27	61
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	255	20	179	0	1	1	165	77	1	4	29	66
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	454	2	243	99								
Volume Left (vph)	255	0	165	4								
Volume Right (vph)	179	1	1	66								
Hadj (s)	-0.09	-0.27	0.17	-0.36								
Departure Headway (s)	4.8	5.2	5.4	5.1								
Degree Utilization, x	0.60	0.00	0.36	0.14								
Capacity (veh/h)	729	603	617	636								
Control Delay (s)	14.6	8.2	11.4	8.9								
Approach Delay (s)	14.6	8.2	11.4	8.9								
Approach LOS	B	A	B	A								
Intersection Summary												
Delay				12.9								
Level of Service				B								
Intersection Capacity Utilization				56.3%	ICU Level of Service	B						
Analysis Period (min)				15								

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	6	55	0	0	0	51	24	0	1	9	71
Future Volume (vph)	101	6	55	0	0	0	51	24	0	1	9	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.954									0.882	
Flt Protected		0.970						0.967			0.999	
Satd. Flow (prot)	0	1724	0	0	1863	0	0	1801	0	0	1641	0
Flt Permitted		0.970						0.967			0.999	
Satd. Flow (perm)	0	1724	0	0	1863	0	0	1801	0	0	1641	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			197			284			113	
Travel Time (s)		24.9			4.5			6.5			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	110	7	60	0	0	0	55	26	0	1	10	77
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	177	0	0	0	0	0	81	0	0	88	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 26.7%	ICU Level of Service A											
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis

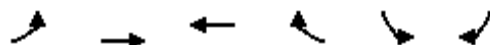
10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	101	6	55	0	0	0	51	24	0	1	9	71
Future Volume (vph)	101	6	55	0	0	0	51	24	0	1	9	71
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	110	7	60	0	0	0	55	26	0	1	10	77
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	177	0	81	88								
Volume Left (vph)	110	0	55	1								
Volume Right (vph)	60	0	0	77								
Hadj (s)	-0.05	0.00	0.17	-0.49								
Departure Headway (s)	4.2	4.5	4.6	3.9								
Degree Utilization, x	0.21	0.00	0.10	0.10								
Capacity (veh/h)	822	775	750	876								
Control Delay (s)	8.3	7.5	8.1	7.3								
Approach Delay (s)	8.3	0.0	8.1	7.3								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.0								
Level of Service				A								
Intersection Capacity Utilization				26.7%	ICU Level of Service	A						
Analysis Period (min)				15								

Lanes, Volumes, Timings
9: Queen City Park Rd & Pine St

04/23/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	162	127	152	221	15
Future Volume (vph)	21	162	127	152	221	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.926		0.992	
Flt Protected		0.994			0.955	
Satd. Flow (prot)	0	1852	1725	0	1765	0
Flt Permitted		0.994			0.955	
Satd. Flow (perm)	0	1852	1725	0	1765	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		1207	1095		1741	
Travel Time (s)		27.4	24.9		39.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	23	176	138	165	240	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	199	303	0	256	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

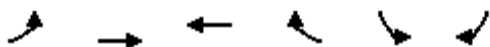
Intersection Capacity Utilization 46.0% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

9: Queen City Park Rd & Pine St

04/23/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	21	162	127	152	221	15
Future Volume (Veh/h)	21	162	127	152	221	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	176	138	165	240	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	303				442	220
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	303				442	220
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				57	98
cM capacity (veh/h)	1258				562	819
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	199	303	256			
Volume Left	23	0	240			
Volume Right	0	165	16			
cSH	1258	1700	573			
Volume to Capacity	0.02	0.18	0.45			
Queue Length 95th (ft)	1	0	57			
Control Delay (s)	1.1	0.0	16.2			
Lane LOS	A		C			
Approach Delay (s)	1.1	0.0	16.2			
Approach LOS			C			
Intersection Summary						
Average Delay			5.8			
Intersection Capacity Utilization			46.0%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	226	16	142	0	1	1	131	61	1	4	23	104
Future Volume (vph)	226	16	142	0	1	1	131	61	1	4	23	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.950			0.932			0.999			0.893	
Flt Protected		0.971						0.967			0.999	
Satd. Flow (prot)	0	1718	0	0	1736	0	0	1799	0	0	1662	0
Flt Permitted		0.971						0.967			0.999	
Satd. Flow (perm)	0	1718	0	0	1736	0	0	1799	0	0	1662	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			157			310			113	
Travel Time (s)		24.9			3.6			7.0			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	246	17	154	0	1	1	142	66	1	4	25	113
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	417	0	0	2	0	0	209	0	0	142	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type: Unsignalized												
Intersection Capacity Utilization 57.1%												
ICU Level of Service B												
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	226	16	142	0	1	1	131	61	1	4	23	104
Future Volume (vph)	226	16	142	0	1	1	131	61	1	4	23	104
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	246	17	154	0	1	1	142	66	1	4	25	113
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	417	2	209	142								
Volume Left (vph)	246	0	142	4								
Volume Right (vph)	154	1	1	113								
Hadj (s)	-0.07	-0.27	0.17	-0.44								
Departure Headway (s)	4.8	5.2	5.3	4.9								
Degree Utilization, x	0.55	0.00	0.31	0.19								
Capacity (veh/h)	724	608	629	674								
Control Delay (s)	13.5	8.2	10.7	9.0								
Approach Delay (s)	13.5	8.2	10.7	9.0								
Approach LOS	B	A	B	A								
Intersection Summary												
Delay				11.9								
Level of Service				B								
Intersection Capacity Utilization				57.1%	ICU Level of Service	B						
Analysis Period (min)				15								

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	114	7	64	0	0	0	59	27	0	2	10	75
Future Volume (vph)	114	7	64	0	0	0	59	27	0	2	10	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.953									0.883	
Flt Protected		0.970						0.967			0.999	
Satd. Flow (prot)	0	1722	0	0	1863	0	0	1801	0	0	1643	0
Flt Permitted		0.970						0.967			0.999	
Satd. Flow (perm)	0	1722	0	0	1863	0	0	1801	0	0	1643	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			224			306			113	
Travel Time (s)		24.9			5.1			7.0			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	124	8	70	0	0	0	64	29	0	2	11	82
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	202	0	0	0	0	0	93	0	0	95	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	28.6%											
Analysis Period (min)	15											
ICU Level of Service A												

HCM Unsignalized Intersection Capacity Analysis

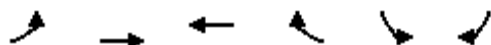
10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	114	7	64	0	0	0	59	27	0	2	10	75
Future Volume (vph)	114	7	64	0	0	0	59	27	0	2	10	75
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	124	8	70	0	0	0	64	29	0	2	11	82
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	202	0	93	95								
Volume Left (vph)	124	0	64	2								
Volume Right (vph)	70	0	0	82								
Hadj (s)	-0.05	0.00	0.17	-0.48								
Departure Headway (s)	4.3	4.6	4.6	4.0								
Degree Utilization, x	0.24	0.00	0.12	0.11								
Capacity (veh/h)	811	757	736	842								
Control Delay (s)	8.6	7.6	8.3	7.5								
Approach Delay (s)	8.6	0.0	8.3	7.5								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				8.3								
Level of Service				A								
Intersection Capacity Utilization				28.6%	ICU Level of Service	A						
Analysis Period (min)				15								

Lanes, Volumes, Timings
9: Queen City Park Rd & Pine St

04/23/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	24	185	139	176	256	17
Future Volume (vph)	24	185	139	176	256	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.925		0.992	
Flt Protected		0.994			0.955	
Satd. Flow (prot)	0	1852	1723	0	1765	0
Flt Permitted		0.994			0.955	
Satd. Flow (perm)	0	1852	1723	0	1765	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		1207	1095		1741	
Travel Time (s)		27.4	24.9		39.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	201	151	191	278	18
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	227	342	0	296	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

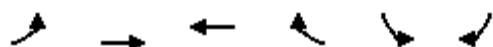
Intersection Capacity Utilization 51.8% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

9: Queen City Park Rd & Pine St

04/23/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	24	185	139	176	256	17
Future Volume (Veh/h)	24	185	139	176	256	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	201	151	191	278	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	342				500	246
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	342				500	246
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				46	98
cM capacity (veh/h)	1217				519	792
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	227	342	296			
Volume Left	26	0	278			
Volume Right	0	191	18			
cSH	1217	1700	530			
Volume to Capacity	0.02	0.20	0.56			
Queue Length 95th (ft)	2	0	85			
Control Delay (s)	1.1	0.0	20.0			
Lane LOS	A		C			
Approach Delay (s)	1.1	0.0	20.0			
Approach LOS			C			
Intersection Summary						
Average Delay		7.1				
Intersection Capacity Utilization		51.8%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	258	18	165	0	1	1	152	71	1	4	27	112
Future Volume (vph)	258	18	165	0	1	1	152	71	1	4	27	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.950			0.932			0.999			0.894	
Flt Protected		0.972						0.967			0.999	
Satd. Flow (prot)	0	1720	0	0	1736	0	0	1799	0	0	1664	0
Flt Permitted		0.972						0.967			0.999	
Satd. Flow (perm)	0	1720	0	0	1736	0	0	1799	0	0	1664	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			209			361			113	
Travel Time (s)		24.9			4.8			8.2			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	280	20	179	0	1	1	165	77	1	4	29	122
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	479	0	0	2	0	0	243	0	0	155	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 62.8%	ICU Level of Service B											
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	258	18	165	0	1	1	152	71	1	4	27	112
Future Volume (vph)	258	18	165	0	1	1	152	71	1	4	27	112
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	280	20	179	0	1	1	165	77	1	4	29	122
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	479	2	243	155								
Volume Left (vph)	280	0	165	4								
Volume Right (vph)	179	1	1	122								
Hadj (s)	-0.07	-0.27	0.17	-0.43								
Departure Headway (s)	4.9	5.5	5.6	5.2								
Degree Utilization, x	0.66	0.00	0.38	0.22								
Capacity (veh/h)	705	558	594	633								
Control Delay (s)	16.8	8.5	11.9	9.6								
Approach Delay (s)	16.8	8.5	11.9	9.6								
Approach LOS	C	A	B	A								
Intersection Summary												
Delay			14.2									
Level of Service			B									
Intersection Capacity Utilization			62.8%	ICU Level of Service					B			
Analysis Period (min)			15									

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	0	42	0	0	5	30	1	0	1	3	55
Future Volume (vph)	34	0	42	0	0	5	30	1	0	1	3	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.925			0.865						0.873	
Flt Protected		0.978						0.954			0.999	
Satd. Flow (prot)	0	1685	0	0	1611	0	0	1777	0	0	1625	0
Flt Permitted		0.978						0.954			0.999	
Satd. Flow (perm)	0	1685	0	0	1611	0	0	1777	0	0	1625	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			206			272			113	
Travel Time (s)		24.9			4.7			6.2			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	0	46	0	0	5	33	1	0	1	3	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	83	0	0	5	0	0	34	0	0	64	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 26.2%	ICU Level of Service A											
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis

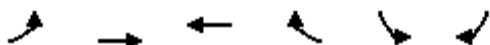
10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	34	0	42	0	0	5	30	1	0	1	3	55
Future Volume (vph)	34	0	42	0	0	5	30	1	0	1	3	55
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	0	46	0	0	5	33	1	0	1	3	60
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	83	5	34	64								
Volume Left (vph)	37	0	33	1								
Volume Right (vph)	46	5	0	60								
Hadj (s)	-0.21	-0.57	0.23	-0.53								
Departure Headway (s)	3.9	3.6	4.4	3.6								
Degree Utilization, x	0.09	0.01	0.04	0.06								
Capacity (veh/h)	898	961	796	973								
Control Delay (s)	7.3	6.6	7.6	6.8								
Approach Delay (s)	7.3	6.6	7.6	6.8								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				7.2								
Level of Service				A								
Intersection Capacity Utilization				26.2%	ICU Level of Service	A						
Analysis Period (min)				15								

Lanes, Volumes, Timings
9: Queen City Park Rd & Pine St

04/23/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	20	76	126	173	174	13
Future Volume (vph)	20	76	126	173	174	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.922		0.991	
Flt Protected		0.990			0.956	
Satd. Flow (prot)	0	1844	1717	0	1765	0
Flt Permitted		0.990			0.956	
Satd. Flow (perm)	0	1844	1717	0	1765	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		1207	1095		1741	
Travel Time (s)		27.4	24.9		39.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	83	137	188	189	14
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	105	325	0	203	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

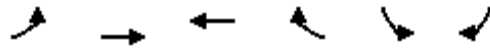
Intersection Capacity Utilization 38.4% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

9: Queen City Park Rd & Pine St

04/23/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	76	126	173	174	13
Future Volume (Veh/h)	20	76	126	173	174	13
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	83	137	188	189	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	325				358	231
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	325				358	231
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				70	98
cM capacity (veh/h)	1235				629	808
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	105	325	203			
Volume Left	22	0	189			
Volume Right	0	188	14			
cSH	1235	1700	639			
Volume to Capacity	0.02	0.19	0.32			
Queue Length 95th (ft)	1	0	34			
Control Delay (s)	1.8	0.0	13.2			
Lane LOS	A		B			
Approach Delay (s)	1.8	0.0	13.2			
Approach LOS			B			
Intersection Summary						
Average Delay			4.5			
Intersection Capacity Utilization		38.4%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	0	149	1	1	17	107	3	0	3	11	190
Future Volume (vph)	119	0	149	1	1	17	107	3	0	3	11	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.925			0.878						0.874	
Flt Protected		0.978			0.998			0.954			0.999	
Satd. Flow (prot)	0	1685	0	0	1632	0	0	1777	0	0	1626	0
Flt Permitted		0.978			0.998			0.954			0.999	
Satd. Flow (perm)	0	1685	0	0	1632	0	0	1777	0	0	1626	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			223			219			113	
Travel Time (s)		24.9			5.1			5.0			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	129	0	162	1	1	18	116	3	0	3	12	207
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	291	0	0	20	0	0	119	0	0	222	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	51.0%											
Analysis Period (min)	15											
	ICU Level of Service A											

HCM Unsignalized Intersection Capacity Analysis

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	119	0	149	1	1	17	107	3	0	3	11	190
Future Volume (vph)	119	0	149	1	1	17	107	3	0	3	11	190
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	129	0	162	1	1	18	116	3	0	3	12	207
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	291	20	119	222								
Volume Left (vph)	129	1	116	3								
Volume Right (vph)	162	18	0	207								
Hadj (s)	-0.21	-0.50	0.23	-0.52								
Departure Headway (s)	4.5	4.6	5.1	4.3								
Degree Utilization, x	0.37	0.03	0.17	0.26								
Capacity (veh/h)	749	695	651	781								
Control Delay (s)	10.1	7.7	9.2	8.8								
Approach Delay (s)	10.1	7.7	9.2	8.8								
Approach LOS	B	A	A	A								
Intersection Summary												
Delay	9.4											
Level of Service	A											
Intersection Capacity Utilization	51.0%			ICU Level of Service			A					
Analysis Period (min)	15											

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	0	44	0	0	5	32	1	0	1	3	58
Future Volume (vph)	36	0	44	0	0	5	32	1	0	1	3	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.926			0.865						0.873	
Flt Protected		0.978						0.954			0.999	
Satd. Flow (prot)	0	1687	0	0	1611	0	0	1777	0	0	1625	0
Flt Permitted		0.978						0.954			0.999	
Satd. Flow (perm)	0	1687	0	0	1611	0	0	1777	0	0	1625	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			231			270			113	
Travel Time (s)		24.9			5.3			6.1			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	0	48	0	0	5	35	1	0	1	3	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	87	0	0	5	0	0	36	0	0	67	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 26.5%	ICU Level of Service A											
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis

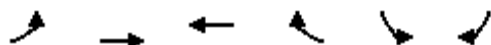
10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	36	0	44	0	0	5	32	1	0	1	3	58
Future Volume (vph)	36	0	44	0	0	5	32	1	0	1	3	58
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	0	48	0	0	5	35	1	0	1	3	63
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	87	5	36	67								
Volume Left (vph)	39	0	35	1								
Volume Right (vph)	48	5	0	63								
Hadj (s)	-0.21	-0.57	0.23	-0.53								
Departure Headway (s)	3.9	3.6	4.4	3.6								
Degree Utilization, x	0.09	0.01	0.04	0.07								
Capacity (veh/h)	894	956	794	970								
Control Delay (s)	7.3	6.6	7.6	6.9								
Approach Delay (s)	7.3	6.6	7.6	6.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay				7.2								
Level of Service				A								
Intersection Capacity Utilization				26.5%	ICU Level of Service	A						
Analysis Period (min)				15								

Lanes, Volumes, Timings
9: Queen City Park Rd & Pine St

04/23/2020



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	80	132	181	182	14
Future Volume (vph)	21	80	132	181	182	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.922		0.990	
Flt Protected		0.990			0.956	
Satd. Flow (prot)	0	1844	1717	0	1763	0
Flt Permitted		0.990			0.956	
Satd. Flow (perm)	0	1844	1717	0	1763	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		1207	1095		1741	
Travel Time (s)		27.4	24.9		39.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	23	87	143	197	198	15
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	110	340	0	213	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

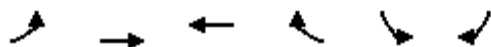
Intersection Capacity Utilization 40.0% ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

9: Queen City Park Rd & Pine St

04/23/2020



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	21	80	132	181	182	14
Future Volume (Veh/h)	21	80	132	181	182	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	87	143	197	198	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	340				374	242
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	340				374	242
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				68	98
cM capacity (veh/h)	1219				615	797
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	110	340	213			
Volume Left	23	0	198			
Volume Right	0	197	15			
cSH	1219	1700	625			
Volume to Capacity	0.02	0.20	0.34			
Queue Length 95th (ft)	1	0	38			
Control Delay (s)	1.8	0.0	13.7			
Lane LOS	A		B			
Approach Delay (s)	1.8	0.0	13.7			
Approach LOS			B			
Intersection Summary						
Average Delay		4.7				
Intersection Capacity Utilization		40.0%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	0	156	1	1	17	112	3	0	3	12	199
Future Volume (vph)	125	0	156	1	1	17	112	3	0	3	12	199
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.925			0.878						0.874	
Flt Protected		0.978			0.998			0.953			0.999	
Satd. Flow (prot)	0	1685	0	0	1632	0	0	1775	0	0	1626	0
Flt Permitted		0.978			0.998			0.953			0.999	
Satd. Flow (perm)	0	1685	0	0	1632	0	0	1775	0	0	1626	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1095			223			334			113	
Travel Time (s)		24.9			5.1			7.6			2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	136	0	170	1	1	18	122	3	0	3	13	216
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	306	0	0	20	0	0	125	0	0	232	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	52.6%											
Analysis Period (min)	15											
ICU Level of Service A												

HCM Unsignalized Intersection Capacity Analysis

10: Hannaford Access/Queen City Park Rd Ext & Queen City Park Rd/Apt Access

04/23/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	125	0	156	1	1	17	112	3	0	3	12	199
Future Volume (vph)	125	0	156	1	1	17	112	3	0	3	12	199
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	0	170	1	1	18	122	3	0	3	13	216
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	306	20	125	232								
Volume Left (vph)	136	1	122	3								
Volume Right (vph)	170	18	0	216								
Hadj (s)	-0.21	-0.50	0.23	-0.52								
Departure Headway (s)	4.6	4.7	5.2	4.3								
Degree Utilization, x	0.39	0.03	0.18	0.28								
Capacity (veh/h)	742	680	642	770								
Control Delay (s)	10.4	7.8	9.3	9.0								
Approach Delay (s)	10.4	7.8	9.3	9.0								
Approach LOS	B	A	A	A								
Intersection Summary												
Delay			9.7									
Level of Service			A									
Intersection Capacity Utilization			52.6%	ICU Level of Service				A				
Analysis Period (min)			15									



October 29, 2019

John Caulo
LANDPLAN
61 Central Avenue
Burlington, VT 05401

Re: Ability to Serve – 266 Queen City Park Road, Burlington, VT

Dear Mr. Caulo:

BED will be able to provide electric service to this project if required. However, provision of electric service to this project will be contingent on compliance with the design provided to you by BED and all applicable rules and regulations of BED and the State of Vermont Public Service Board.

BED energy services staff will work with you to ensure that the design complies with the current version of the Vermont Commercial Building Energy Standards (CBES). In addition, BED is interested in assisting with the identification, analysis and implementation of cost-effective energy efficient design, emerging technologies and alternative energy system options. Please call Chris Burns, Director of Energy Services at 802-865-7337 (cburns@burlingtonelectric.com) to begin this process. Early involvement by BED and periodic review will expedite the approval process and assure access to available energy efficiency rebates.

If you have further questions or concerns, please feel free to contact me at 865-7436.

Sincerely,

A handwritten signature in blue ink that reads "Andrew J. Elliston".

Andrew Elliston, P.E.
Director of Engineering and Technical Services
802-865-7436
aelliston@burlingtonelectric.com



Burlington Fire Department

Office of the City Fire Marshal

132 North Avenue, Burlington, Vermont 05401

Phone (802) 864-5577, Fax (802) 658-7665

www.burlingtonvt.gov/fire

bfdfiremarshal@burlingtonvt.gov



26 November

ISSUED VIA EMAIL ONLY

Burton Snowboards, Inc.
Attn: Michael Fialko-Casey, Facilities Manager
180 Queen City Park Rd.
Burlington, VT 05401

**Re: Fire Department "Ability to Serve" Letter of Approval
Burton Facility Renovation and Change of Use for "Burton HUB" and "Higher Ground" (Performing arts center)
Burton Snowboards
266 Queen City Park Rd
Burlington, Vermont**

Dear Mr. Fialko-Casey,

This letter is to inform you that I have reviewed the conceptual plans you provided for the proposed site improvements to be located at 266 Queen City Park Rd. in Burlington, VT. This project is a proposed change of use of the existing facility to "Burton Hub" "Higher Ground" (performing arts center). We feel this project will not negatively impact our fire department or our ability to serve this site. Furthermore, this project will not have an adverse effect on the surrounding properties with respect to fire suppression.

This review was completed respective to the requirements of Burlington Code of Ordinances Chapter 13, Vermont Fire and Building Safety Code 2015, and NFPA 1 (Uniform Fire Code, 2015 Edition) requirements for fire department access and water supply (Chapter 18).

We appreciate your notification of this project to us, and for giving us the opportunity to comment. If you should have any questions in the future, please do not hesitate to contact me.

Yours in Public Safety,

BC Barry J. Simays, CFPS, IAAI-CFI
Fire Marshal

Cc: Chief Engineer Steven A. Locke
File, FH #10463



**POLICE DEPARTMENT
CITY OF BURLINGTON**

TO: Burlington Development Review Board
FROM: Chief of Police Jennifer Morrison
DATE: April 17, 2020
RE: Burton's Burlington Hub / Higher Ground Performing Arts Center and application for a Conditional Use permit

The Burlington Police Department has reviewed proposals by Burton to develop a mixed-use facility in Burlington's south end. Insofar as the provision of police services is concerned, Deputy Chief Jon Murad of the Burlington Police Department (BPD) has discussed Burton's proposals with representatives of the company and the project, specifically Justin Worthley and John Caulo. On his recommendation, the BPD offers its approval of Burton's Conditional Use application to the Development Review Board, with certain conditions listed below.

Burton seeks to convert unused warehouse space at its Queen City Park Road campus into a mixed-use facility. This facility is intended to be a part of and consistent with the South End Arts District. According to Burton's "Mixed Use Hub" concept, the spaces would include a food hall, indoor skate park, retail store, and performing arts venue. Higher Ground, a local event producer currently based in South Burlington, will operate the performing arts center. These uses would be combined with Burton's core functions that are already on-site, including its R&D/prototype center, walk-up warranty service, and product innovation and testing labs.

On a typical daily basis, providing police services with regard to these uses is within BPD's capacity. But some of the larger events envisioned for the facility—up to 1,500 people—will require close coordination with facility owners and managers. The challenge will be that some large events at the new Higher Ground / Mixed Use Hub have the potential to divert BPD resources during times when those resources are normally focused on downtown Burlington's "bar closing."

Specific concerns include: managing traffic flow in either direction on Queen City Park Road, particularly at the narrow bridge over the railroad tracks between Arthur Ct and Central Ave but also north to the intersection with Home Ave; large gatherings in the parking lots before and after large events; the potential for disorder inside the venue during large events and/or performances by specific artists whose followings include disproportionate numbers of disruptive elements; and, for the South Burlington Police Department (SBPD), after-hours activity potentially leaking into Red Rocks Park and down Central Ave.



POLICE DEPARTMENT
CITY OF BURLINGTON

Accordingly, BPD's approval of the Conditional Use application is contingent on assurances by Burton and Higher Ground that event-specific, properly resourced security plans are put in place to address traffic concerns, crowd control, and the potential for disorder. Such plans might include additional private security personnel, personnel to direct traffic, and potentially armed security personnel (of the type provided by off-duty law enforcement).

During Deputy Chief Murad's discussion with Mr. Worthley and Mr. Caulo, attended as well by South Burlington Police Chief Shawn Burke, it was made clear that close coordination has been a hallmark of the relationship between Higher Ground and the SBPD. Building on the coordination Higher Ground and SBPD have enjoyed and furthering it in the new relationship between Higher Ground and BPD will be integral to ensuring public safety for large events.

Regarding Burton's well-earned reputation as a good neighbor, we note Burton's invaluable role in fighting the current global COVID-19 pandemic. Governor Phil Scott recently called Burton's efforts "a prime example of how Vermonters are rising to the occasion and uniting around a common purpose during these unprecedented times." The Burlington Police Department has every reason to believe this responsible corporate citizenship will continue as the Mixed Use Hub is developed.

Assuming that assurances of proper security for large events are provided, BPD supports Burton's Conditional Use application.

Jennifer Morrison, Chief of Police

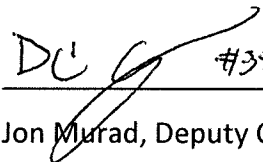


POLICE DEPARTMENT
CITY OF BURLINGTON

TO: Burlington Development Review Board
FROM: Deputy Chief of Police Jon Murad
DATE: April 30, 2020
RE: Follow Up to Burlington Police Department Letter of Support for Burton's Burlington Hub / Higher Ground Performing Arts Center and application for a Conditional Use permit

On Thursday, April 30, 2020, the undersigned attended a meeting with Luke McGowan (Director, Burlington Community Economic Development Office) and representatives of Burton and Higher Ground (Justin Worthley, Alex Crothers, Alan Newman, Mark Balderston, and John Caulo). During this meeting we discussed the "Burton Hub – Performing Arts Center (PAC) Operational Management Plan" of April 23, 2020, and the ways in which it addressed observations previously made by the Burlington Police Department (BPD) in a letter dated April 17, 2020. Having reviewed and discussed the Operational Management Plan, the BPD reiterates its approval of Burton's Conditional Use application to the Development Review Board, without reservation.

The Operational Management Plan addresses pre-event management, event management, and post-event management, and delineates responsive protocols based on event size. It covers traffic, gatherings outside the venue, coordination with local law enforcement, and screening and security policies. Owing to the clarity of and assurances in the Operational Management Plan, as well as the project leads' demonstrated history of responsible management and strong relationships with the South Burlington Police Department, the BPD offers its unconditional support of Burton's Conditional Use application.

 #337 04/30/2020
Jon Murad, Deputy Chief of Operations



City of Burlington
Department of Public Works

Water Resources Division
234 Penny Lane
Burlington, VT 05401
802.863.4501 P
www.burlingtonvt.gov/DPW

Chapin Spencer
PUBLIC WORKS DEPARTMENT DIRECTOR

Megan Moir
WATER RESOURCES DIVISION DIRECTOR

November 26, 2019

John Caulo
LANDPLAN
61 Central Ave
Burlington, VT 05401

Re: Water and Wastewater Allocation Request for Change of Use at 266 Queen City Park Road (Burton Campus)

Dear John,

This letter is to inform you, your client, the State of Vermont Environmental District and other interested parties that the City of Burlington's water and wastewater facilities have sufficient capacity to handle flows associated with a Performing Arts Venue at the above address. We have reserved 7,500 gpd (gals/day) for both water and sewer. This is based on a maximum of 1500 persons at 5 gpd per person.

Wastewater flow from this area is treated at our Main Wastewater Plant on Lavalley Lane. It is important to note that this letter only addresses dry weather treatment plant and not organic loading or wet weather collection system capacities. Our collection system serving this area is a combined sewer system (CSS) and our efforts over many years has been to remove stormwater input to the CSS. We are in draft stages of a combined sewer policy that eventually will require customers connected to our combined sewer to either remove stormwater input or offset increased wastewater baseflow. We reserve the right to contact you/your client regarding a potential offset project after a formal policy has been approved.

This letter is good for three (3) years from the date of writing. If this letter is not filed with the proper offices, or if the proper permits are not obtained within that year, you will need to reapply. Any changes in flow estimates or property usage also requires reapplication. Please feel free to call me at 343-0125 if you have any questions.

Sincerely,

Steve Roy, P.E.
Project Engineer
Burlington Public Works

queencity266_cap

**BURTON SNOWBOARDS & HIGHER
GROUND**

HUB PROJECT

Noise Assessment | April 20, 2020



PREPARED FOR:
BURTON SNOWBOARDS & HIGHER GROUND

SUBMITTED BY:
RSG

IN COOPERATION WITH:
JOHN CAULO, PROJECT MANAGER

55 Railroad Row
White River Junction, VT 05001
802.295.4999
www.rsginc.com



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1.0 INTRODUCTION

Burton Snowboards is planning to renovate a manufacturing and warehouse building at 266 Queen City Park Road, adjacent to their headquarters at 180 Queen City Park Road. The renovation is called the Burton Global Hub Project (“Hub Project” or “Project”) and includes an indoor concert venue, restaurants, retail space, indoor recreation area, office space, manufacturing, and prototyping workshop. Higher Ground, currently located in South Burlington, plans to operate the indoor concert venue.

In preparation for permitting the Project, RSG was retained to evaluate exterior noise due to rooftop mechanical equipment and the concert venue. This assessment includes:

- A description of the site and the surrounding area.
- A review of the applicable noise limits and guidelines.
- Discussion of background sound levels in the area.
- Sound propagation modeling method and results.
- Conclusions.

A primer on acoustics is provided in Appendix A.

There are no quantitative noise standards for the City of Burlington, but there is a qualitative noise ordinance discussed in Section 3.1. As a result, we evaluate the Project against other commonly applied community noise guidelines that are quantitative, yet parallel to the Burlington noise ordinance and Act 250’s Quechee Test, as discussed in Section 3.3. The information provided in this report leads us to conclude that the proposed concert venue can be constructed and operated in such a way as to:

- Comply with Sec. 21-13(b)(1) of the Burlington Noise Control Ordinance.
- Not cause an “undue adverse impact on aesthetics” with regard to noise as evaluated under Act 250.
- Comply with WHO Community Noise Guidelines.

2.0 PROJECT DESCRIPTION

Burton Snowboards' headquarters is located at 180 Queen City Park Road¹ (180), and they also own the adjacent manufacturing and warehouse building at 266 Queen City Park Road (266). The parking lot at 266 is currently used by Burton staff at both 180 and 266 during the day, and a portion of the interior space at 266 is currently used as a prototyping workshop.

The area around 180 and 266 Queen City Park Road is zoned as "Enterprise – Light Manufacturing." There are other manufacturing facilities along Queen City Park Road and a CCTA² bus facility to the north. Queen City Park Road wraps around the west and south sides of 266, and along the southside of Queen City Park Road is the Burlington/South Burlington city line. Over the city line in South Burlington is a VELCO substation to the south, Red Rocks Park to the southwest, and a Green Mountain Power substation and the Champlain Water District treatment facility. Just east of 180 and 266 is a Vermont Rail System train track.

Across the rail line to the east are the closest residences to the Project on Arthur Court (approximately 390 to 590 feet away³). Other nearby residences are along South Crest Drive and Pine Street to the northeast (720 to 1,370 feet), along Maple Avenue to the south in South Burlington (765 to 885 feet), and at the Redstone Condominiums to the west off of Austin Drive (985 to 1,400 feet).

Part of the Hub Project involves redeveloping the south side of the building at 266 into a concert venue which would be operated by Higher Ground. Another part of the Hub Project involves redeveloping the northwest corner of the building at 266 into a restaurant space that could serve Burton staff during the day and concertgoers in the evenings. The primary sources of sound from these proposed uses include rooftop mechanical equipment (HVAC and ventilation fans) and sound transmitted through the walls and roof of the building during a concert.

The concert venue is expected to have a similar schedule to the Higher Ground facility currently located in South Burlington. This includes occasional daytime events, but most events would occur in the evening starting generally between 7:30 and 9 PM and ending generally between 11 PM and 2 AM. Sound checks would occur before the event during the day, and attendees would start arriving generally up to an hour before the start of the event.

A map showing the surrounding area and the components of 266 assessed in this study is provided in Figure 1.

¹ Formerly Industrial Parkway

² Chittenden County Transportation Authority

³ Distances are from residences to the concert venue portion of the building at 266.





FIGURE 1: SITE MAP

3.0 NOISE STANDARDS AND GUIDELINES

3.1 LOCAL STANDARDS

Burlington Standards

The Hub Project is located in the City of Burlington and subject to Burlington regulations. There are no Burlington statutes or regulations that establish quantitative noise standards applicable to this Project. There is, however, a noise ordinance for the City of Burlington that prohibits unreasonable noise. The noise ordinance states:

It shall be unlawful for any person to make or cause to be made any loud or unreasonable noise. Noise shall be deemed to be unreasonable when it disturbs, injures or endangers the peace or health of another or when it endangers the health, safety or welfare of the community. Any such noise shall be considered to be a noise disturbance and a public nuisance.

The ordinance also provides more specific prohibitions for music:

The operation or permitting the use or operation of any musical instrument, radio, television, phonograph, or other device for the production or reproduction of sound in such a manner as to be plainly audible through walls between units within the same building, from another property or from the street between the hours of 10:00 p.m. and 7:00 a.m. or in such a manner as to unreasonably disturb the peace, quiet or comfort of the public.

South Burlington Standards

While the Project is located in Burlington and subject to Burlington regulations, the City of South Burlington is just south of the Project parcel. South Burlington has qualitative standards in its noise ordinances, and also quantitative noise standards in the South Burlington Land Development Regulations. These South Burlington regulations do not directly apply to land uses located in another municipality; however, they are being discussed and are relevant because they influence the character of the area in South Burlington and thus may be considered under Act 250. The specific sound level limits are defined in Section A.3(b)(ii) which states:

It shall be a violation of these Regulations for any property owner to create or allow the creation of noise in excess of the following stated limits in the City during the hours of 12:00 AM and 8:00 AM:

- a. 45 dBA based on a one-hour average measured at any point where the property on which the noise emanates adjoins any property used for residential purposes.



- b. 60 dBA based on a one-hour average measured at any point where the property on which the noise emanates adjoins any property used for commercial purposes.*

3.2 STATE STANDARDS

There are no Vermont statutes or regulations that establish quantitative noise standards applicable to this Project.

Noise from the Hub Project will be assessed in the Act 250 proceeding under Criterion 8, aesthetics. Noise is evaluated under Criterion 8 via the Quechee Test which first asks if the project will cause an adverse impact on aesthetics with regard to noise, by comparing the existing character of the area with the future character of the area given the proposed project. If a project is considered to cause an adverse impact, the Quechee Test then asks if the project will cause an undue adverse impact on aesthetics with regard to noise. To determine if the adverse impacts are undue three questions must be considered:

1. Is the project so out of character with the area that it would offend the sensibilities of the average person? Does it rise to the level of being considered shocking and offensive?
2. Has the applicant failed to take generally available mitigating steps which a reasonable person would take to improve the harmony of the Project with its surroundings?
3. Does the project violate a clear, written community standard regarding noise or acoustical aesthetics?

If there is an affirmative answer to any of these questions, then the project is considered to cause an undue adverse impact, and it fails the Quechee Test. Under the Quechee Test, the proposed Project must:

- Not be considered shocking and offensive to the average person.
- Implement reasonable mitigation measures to reduce potential impacts.
- Meet local noise standards.

3.3 COMMUNITY NOISE GUIDELINES

Both the World Health Organization (WHO) and the American National Standards Institute (ANSI) have community noise guidelines that are quantitative. These guidelines also speak to many of the same qualitative features of the Burlington noise ordinance and Act 250's Quechee Test. The WHO guidelines, discussed below, specifically address potential health impacts. This parallels the Burlington noise ordinance which prohibits the endangering of "health, safety or welfare of the community."

The WHO guidelines also address noise annoyance, which parallels the Quechee Test's "shocking and offensive" requirements. The ANSI standard discussed below speaks to land use compatibility as it relates to sound from different land uses which also parallels the Quechee Test's "shocking and offensive" requirements. That is, if the soundscape of one land use is found to be compatible with that of a neighboring land use, then the soundscape should not be considered shocking and offensive to the average person.

World Health Organization

The WHO has studied and adopted various noise guidelines to address health and aesthetic issues. In the WHO's Community Noise Guidelines⁴, they write, "The scope of WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professional trying to protect people from the harmful effects of noise in non-industrial environments."

The WHO guideline to protect against serious annoyance is 55 dBA averaged over a 16-hour daytime period from 7 AM to 11 PM outside of a residence and to protect against moderate annoyance the WHO recommends a limit of 50 dBA averaged over a 16-hour daytime period. The WHO guideline for night (11 PM to 7 AM) is 45 dBA averaged over an 8-hour period to protect against sleep disturbance. These WHO guidelines are to be measured outdoors.

The WHO guidelines also establish a recommended limit for entertainment venues to protect against hearing impairment of attendees which 100 dBA averaged over a 4-hour period.

American National Standard, ANSI S12.9 Part 5

For additional context regarding land use compatibility, we can look to the American National Standard, ANSI S12.9 Part 5, "Quantities and Procedures for Description and Measurement of Environmental Sound – Part 5: Sound Level Descriptors for Determination of Compatible Land Use." ANSI S12.9 Part 5 provides ratings of compatibility for varying sound levels for different land uses in Annex A of the standard. The standard uses an annual average of the day-night average sound level (DNL)⁵. For urban/suburban residential areas, the standard lists a DNL of up to 55 dBA as being compatible, and a DNL of up to 60 dBA as being marginally compatible.

3.4 HUB PROJECT EVALUATION

For this study, we assess if the Project meets WHO and ANSI guidelines to provide quantification to the Burlington and Act 250 standards. Note that the guidelines are not absolute

⁴ "Guidelines for Community Noise," Edited by Birgitta Berglund, Thomas Lindvall, Dietrich H. Schwela, World Health Organization, Geneva, 2000.

⁵ A day-night level is the average frequency-weighted sound level with a 10-dB penalty applied to nighttime sound levels between 10 PM and 7 AM.



limits. The most stringent guideline is the WHO's nighttime level of 45 dBA (L_8). If the Hub Project meets the WHO's nighttime limit, it will also meet the WHO's annoyance limits and the ANSI limits for being compatible with urban/suburban residential areas.

4.0 BACKGROUND SOUND LEVELS

Background sound levels were not measured for this Project, because they have been quantified on several occasions throughout the Project area on other projects⁶. Background sound levels (L_{eq}) during the day (7 AM to 10 PM) are in the upper 40s to low 50s dBA; generally, between 47 and 52 dBA. During the quietest times during the day the sound levels can be down in the upper 30s dBA. The primary sources of noise during the day is local and distant traffic, aircraft flyovers, and equipment at the surrounding industrial, utility, and transportation facilities.

Background sound levels (L_{eq}) at night (10 PM to 7 AM) are generally in the low 40s between 40 and 45 dBA. During the quietest times at night, sound levels can be in the low 30's dBA. The primary sources of noise during the night are similar to the daytime sources (distant traffic and mechanical/electrical equipment at surrounding properties) but are at lower levels than during the day due to less traffic on roads and less equipment that is in use at night.

There are also biogenic (i.e. birds and insects) and geophonic (i.e. wind through trees) sound sources that occur throughout the day and night.

These sound levels are existing, but both daytime and nighttime sound levels are expected to increase in the area along Queen City Park Road, Arthur Court, South Crest Drive, Pine Street, Central Avenue, and Maple Avenue once the Southern Connector Project is constructed.

⁶ Southern Connector, VELCO Queen City Substation, Chittenden County Noise Map



5.0 SOUND PROPAGATION MODELING

Sound propagation modeling was conducted to estimate the sound levels throughout the area due to rooftop mechanical equipment and concert events at 266.

5.1 MODELING METHODOLOGY

Modeling for the study was completed using the International Standards Organization ISO 9613-2 standard, “Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation,” as implemented in the Cadna A acoustical modeling software. The ISO standard states,

This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level ... under meteorological conditions favorable to propagation from sources of known sound emissions. These conditions are for downwind propagation ... or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.

The model takes into account source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain.

Cadna A is an internationally accepted acoustical model, used by many other noise control professionals in the United States and abroad. It has also been accepted for many years as a reliable noise modeling methodology by Act 250 commissions, the former Environmental Board, the Vermont Superior Court Environmental Division, and the Vermont Supreme Court.

Standard modeling methodology takes into account moderate nighttime inversions or equivalently, moderate downwind conditions. For this study, we modeled sound propagation in accordance with ISO 9613-2 with spectral ground attenuation, using hard ground on roadways and parking lots ($G=0$), partly hard and partly porous ground ($G=0.6$) within the neighboring substations, and porous ground ($G=1$) elsewhere. Model input data is provided in Appendix B.

A 10-meter by 10-meter (33-foot by 33-foot) grid of 1.5 meter (5 foot) high receivers was set up in the model, covering approximately 190 acres around the site. A receiver is a point above the ground at which the computer model calculates a sound level. In addition, 192 discrete

receivers were modeled at nearby residences⁷ at a height of 4 meters (13 feet). Their locations are provided in Appendix C.

5.2 NOISE SOURCES

Exterior Sources

The exterior sources associated with the concert venue and food services area include rooftop air handling units, hood exhaust fans, hood intake fans, vehicle movements in the parking lots, and people socializing in the outdoor lounge on the southwest corner of the building. In addition, there are already some existing rooftop air handling units that will remain in place.

A total of 11 existing air handling units were included in the model. An additional eight new air handling units were modeled for the study, five of which are associated with the concert venue and three that are associated with food services. Five hood exhaust fans and five hood intake fans were also modeled. The sound power levels of each piece of rooftop equipment is provided in Table 1. The sound emissions for rooftop equipment are from manufacturer data of representative equipment.

Also provided in Table 1, are the sound emissions used for people socializing in the outdoor lounge. No outdoor music is proposed for the outdoor lounge area. The sound emissions were derived from 15 “loud” male voices⁸ all speaking simultaneously.

Lastly, onsite vehicle noise was modeled in two ways. In one model run, it was assumed that 100 vehicles would access (enter or exit) parking spacing while a concert was underway. In a second model run, it was assumed that 500 vehicles access (exit) parking spaces at the end of a concert for a sold-out event. The modeled sound power level for each parking lot scenario is provided in Table 1.

⁷ The locations and types of discrete receivers included in the model were identified through Vermont E911 data.

⁸ Harris, Cyril M., “Handbook of Acoustical Measurements and Noise Control”



TABLE 1: SOUND POWER LEVELS OF MODELED OUTDOOR SOURCES (dBZ, UNLESS SPECIFIED OTHERWISE)

Modeled Outdoor Sources	Octave Band Center Frequency (Hz)									Overall Sound Power Level (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
New HVAC 20 Ton		96	88	84	84	82	78	73	66	87
New HVAC 25 Ton		97	88	84	83	81	77	73	67	86
Existing Carrier 48HC 24	96	96	88	84	84	82	78	73	66	87
Existing Carrier 48HC A06		88	83	76	74	71	67	64	60	78
Existing Carrier 48HC D08		91	84	80	79	77	72	67	64	82
New Hood Exhaust		75	83	82	73	68	66	59	53	77
New Hood Intake		84	81	80	76	75	74	69	66	81
Outdoor Lounge	65	65	70	80	87	84	78	76	67	88
Parking Lot (100 Cars)										93
Parking Lot (500 Cars)										100

Interior Sources

The interior source is for the concert venue is amplified music. The type and level of music will vary from concert to concert. To represent a conservatively high sound level scenario, RSG conducted sound level monitoring at Higher Ground's existing facility in South Burlington during a hard rock concert on August 17, 2019. The event was selected in consultation with Higher Ground to ensure that it would be a representative of an event that produces conservatively high sound levels compared to other events that are held by the venue.

The interior sound level (L_{eq}) during the concert while music was being played was 99 dBA.⁹ This value is typical for a loud concert and consistent with World Health Organization Guidelines for entertainment events, discussed in Section 3.3 above, to protect against hearing impairment of attendees. For the sound propagation model, the same levels were used inside the proposed concert space at 266. In addition, an interior sound level of 86 dBA was modeled in the adjacent building spaces (backstage, lobby, and food area). The interior sound levels were then transmitted through the exterior walls and roof taking into account the sound transmission loss of those building elements.

The spectra of the modeled interior sound levels are provided in Table 2, and modeled sound transmission loss of the exterior walls and roof are provided in Appendix B. The spectra shown

⁹ While there were brief periods when the interior sound level exceeded 99 dBA, the 99 dBA is representative of the diffuse field (where the sound pressure is nearly the same around the room, except near the sound source) that would impinge on the building envelope while music is being played, and is therefore an appropriate value to use in modeling breakout noise through the structure.

in Table 2 and used in the model, are representative of the full music frequency range including bass, midrange, and treble.

TABLE 2: MODELED INTERIOR SOUND PRESSURE LEVELS (dBZ, UNLESS SPECIFIED OTHERWISE)

Modeled Interior Sources	Octave Band Center Frequency (Hz)									Overall Interior Sound Pressure Level (dBA)
	31.5	63	125	250	500	1000	2000	4000	8000	
Hard Rock Concert	84	100	100	94	90	89	80	79	75	99
Sound in Adjacent Spaces During Hard Rock Concert	76	92	89	83	76	76	67	66	62	86

A map showing all the modeled sources of sound is provided in Figure 2. Point sources are shown by symbols on the roof and area sources are identified by orange callout boxes.

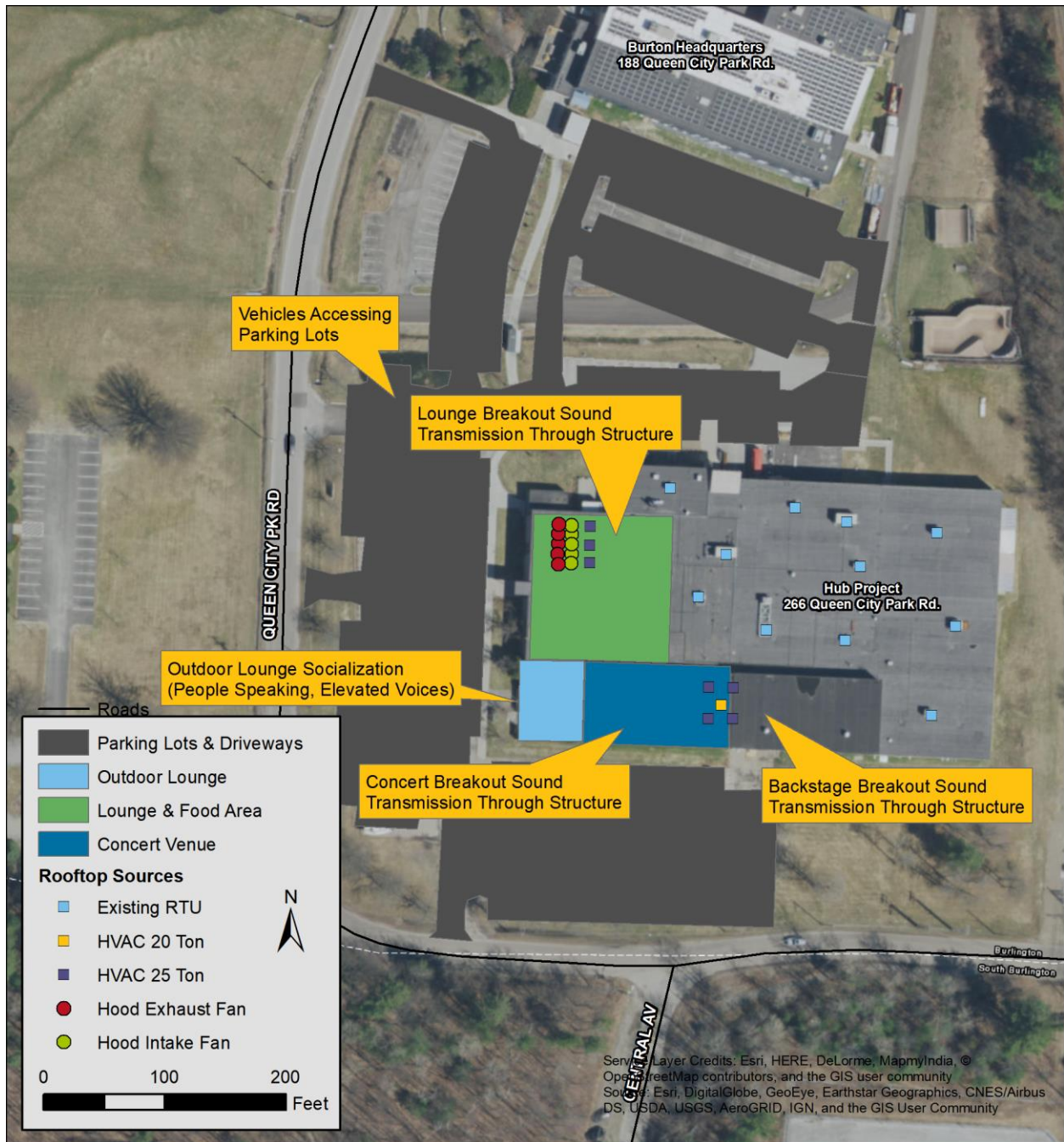


FIGURE 2: MAP OF MODELED SOUND SOURCES

5.3 PLANNED MITIGATION

There are a few mitigation measures that have been incorporated into the plans for the Hub Project that are included in the sound propagation model results. Higher Ground is working with another acoustical consultant to fit-up the interior of the concert venue and this mitigation will be incorporated into those plans:

1. The transmission loss of the concert venue roof will be increased, particularly at low frequencies. This could be completed in several ways that are under consideration. The transmission loss of the ceiling/roof assembly over the concert venue in the model assumed a layer of sheetrock was added to the underside of the existing steel trusses. Specifically, the transmission loss of the modeled ceiling/roof assembly is modeled at:

	OCTAVE BAND CENTER FREQUENCY (HZ)								
	31.5	63	125	250	500	1000	2000	4000	8000
Ceiling/Roof Transmission Loss (dB):	17	20	36	52	62	67	64	75	79

2. Most of the exterior walls of the facility are made of concrete block, but a portion of the southern exterior wall of the concert venue is currently just metal siding. The transmission loss of the area that is just metal siding will be increased. This could be completed in several ways that are under consideration, but in the model insulation and 5/8-inch Type X drywall was added to the interior side of the wall resulting in a modeled transmission loss of:

	OCTAVE BAND CENTER FREQUENCY (HZ)								
	31.5	63	125	250	500	1000	2000	4000	8000
Southern Exterior Wall with Insulation & Drywall (currently just metal siding) Transmission Loss (dB):	13	14	21	36	46	52	55	44	48

3. The main entrance and the exit to the outdoor lounge area will have double sets of doors that act as a sound lock that prevent music propagating out an open door to the exterior.

These steps would represent reasonable mitigation measures for this Project.

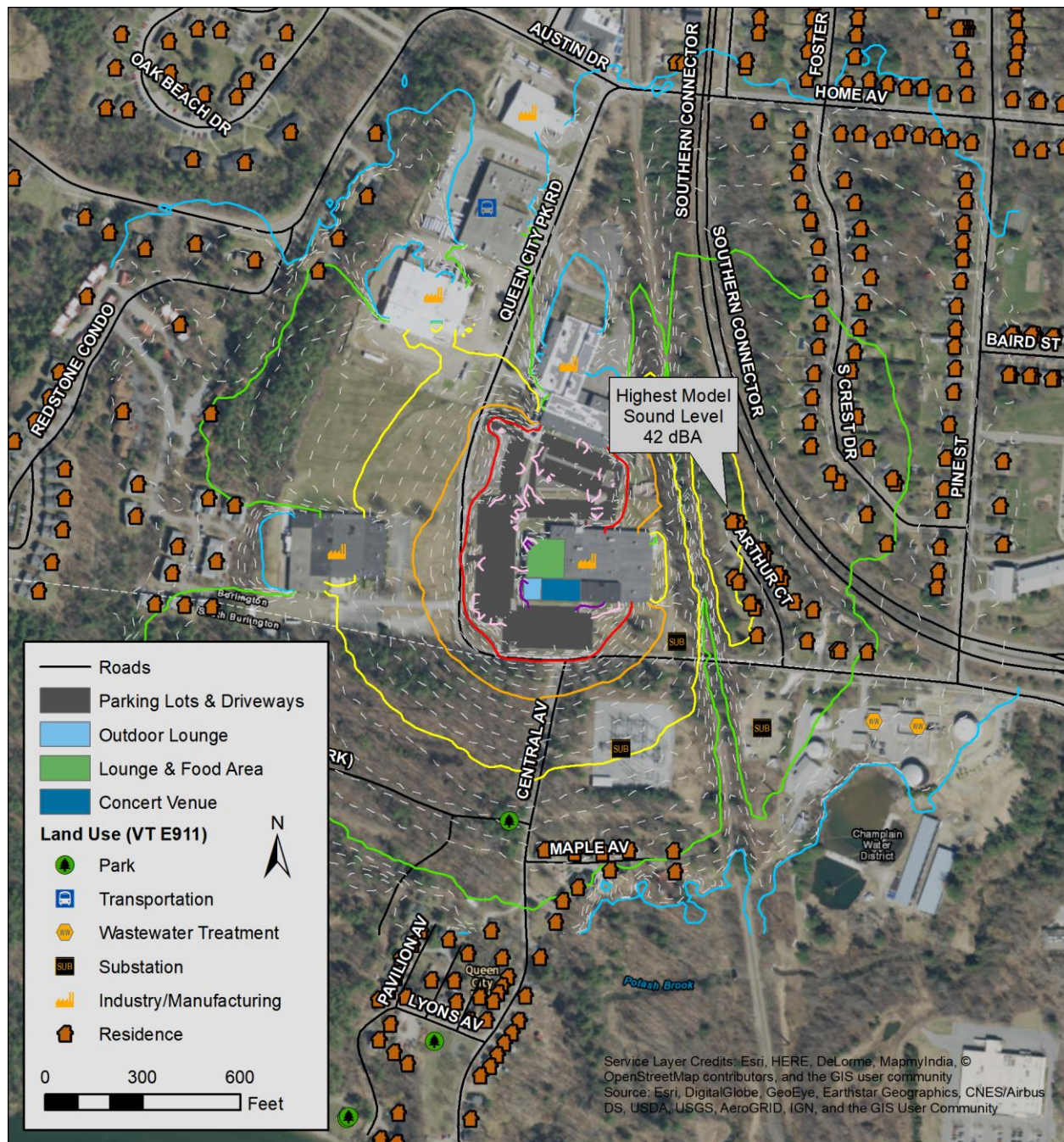


5.4 MODEL RESULTS

Two scenarios were modeled. The first scenario included all of the sources shown in Figure 2, which is representative of the facility in full use during a hard rock concert while music is playing (Concert Model). The second scenario only included rooftop mechanical equipment and 500 vehicles leaving the parking lot which would be representative of people leaving at the end of a sold-out show (End-of-Concert Model). Both scenarios include all rooftop equipment (existing and proposed) operating at the full capacity simultaneously. This is unlikely to be a frequent occurrence but is a conservative assumption for assessing projected sound levels.

The results for the Concert Model are presented in Figure 3. The highest modeled sound level at a residence for this scenario is 42 dBA which occurs at 20 Arthur Court just east of the venue. The results for the End-of-Concert Model are presented in Figure 4. The highest modeled sound level at a residence for this scenario is 44 dBA which also occurs at 20 Arthur Court. Model results for all 192 modeled residences are provided in tabular format in Appendix C.

The sound levels from these modeled scenarios represent conservative conditions under which the highest sound levels are expected to occur, specifically highest hourly average nighttime sound levels ($L_{eq,1-hr}$). The proposed concert venue may be used for a variety of music and performance genres. Most other genres are expected to produce lower sound levels than those of a hard rock concert. In addition, the End-of-Concert Model, assumes the vehicle load in the parking lot is for a sold-out show. Many shows would have less than the modeled number of vehicles resulting in lower sound levels.



Sound Pressure Levels

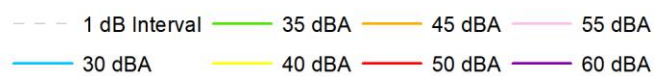
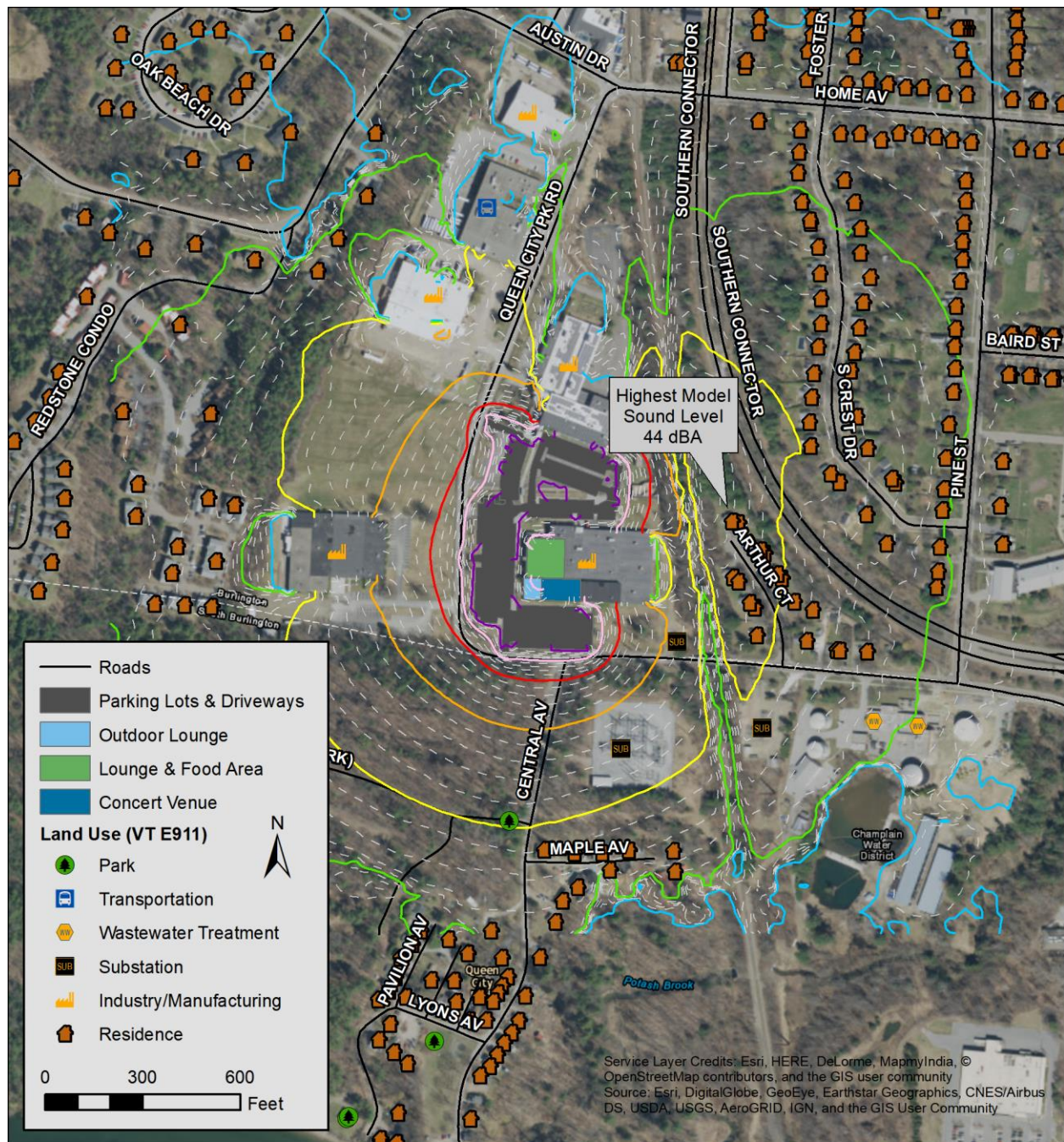


FIGURE 3: MODEL RESULTS - CONCERT MODEL (L_{EQ} WHILE MUSIC IS PLAYING)





Sound Pressure Levels

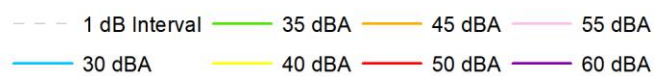


FIGURE 4: MODEL RESULTS - END-OF-CONCERT MODEL

6.0 CONCLUSIONS

Burton Snowboards is applying for permits to redevelop the property at 266 Queen City Park Road, adjacent to their headquarters, into the Burton Global Hub Project which includes an indoor concert venue and restaurants among other uses. Higher Ground, currently located in South Burlington, plans to operate the concert venue. RSG was retained to evaluate the exterior noise from rooftop equipment and the concert venue.

The character of the area surrounding the Project parcel is a mixture of industrial, transportation, utility, and residential land uses along a planned transportation corridor (Southern Connector). Background sound levels in the area are generally in the upper 40s to low 50s dBA during the day and in the low 40s dBA at night. Typical sound sources in the area include traffic noise, aircraft flyovers, mechanical equipment from the industrial and utility land uses in the area, bird calls, and wind through the trees. The City of South Burlington is just south of the Hub Project and while the noise regulations for South Burlington, discussed in Section 3.1, do not directly apply to the Hub Project, they inform the character of the area to the south.

Sound propagation modeling was conducted to predict the highest hourly average sound pressure levels ($L_{eq, 1-hr}$) that could occur at night from the proposed concert venue. Two scenarios were modeled: sound levels during a hard rock concert and sound levels at the end of a sold-out concert when people are leaving the site. Model results indicate that all modeled receptors will experience sound levels of 45 dBA or less. These projected sound levels are:

- Comparable to existing nighttime sound levels in the area (Section 4.0);
- Below the WHO's nighttime noise guideline of 45 dBA $L_{eq,8-hr}$ (Section 3.3);
- Considered compatible with urban/suburban residential areas, per ANSI S12.9 Part 5 (Section 3.3); and
- Below the sound level limits set in the South Burlington noise ordinance (Section 3.1).

Given that projected sound levels are comparable to existing nighttime sound levels in the area, below WHO's nighttime noise guideline, and considered compatible with urban/suburban residential areas, the Hub Project should not create noise that would be considered "unreasonable" or that "endangers the health, safety or welfare of the community" as discussed in the Burlington noise ordinance. As such, the Hub Project can be constructed and operated in such a way as to comply with Sec. 21-13(b)(1) of the Burlington Noise Control Ordinance.

Given that the projected sound levels are comparable to the existing nighttime sound levels in the area and considered compatible with urban/suburban residential areas, noise from the Project should not be considered shocking and offensive to the average person. As discussed in



Section 5.3, the applicant is planning mitigation measures through working with Higher Grounds acoustical consultant to fit-up the interior of the concert venue to increase the transmission loss of the building shell. And the projected sound levels from Hub Project are less than the South Burlington noise ordinance, to the extent it would be deemed a clear, written community standard regarding noise. As such, the Hub Project can be constructed and operated in such a way as to not cause an undue adverse impact on aesthetics with regard to noise as evaluated under Act 250.

APPENDIX A. ACOUSTICS PRIMER

Sound consists of tiny, repeating fluctuations in ambient air pressure. The strength, or amplitude, of these fluctuations determines the sound pressure level. “Noise” can be defined as “a sound of any kind, especially when loud, confused, indistinct, or disagreeable.”

Expressing Sound in Decibel Levels

The varying air pressure that constitutes sound can be characterized in many different ways. The human ear is the basis for the metrics that are used in acoustics. Normal human hearing is sensitive to sound fluctuations over an enormous range of pressures, from about 20 micropascals (the “threshold of audibility”) to about 20 Pascals (the “threshold of pain”).¹⁰ This factor of one million in sound pressure difference is challenging to convey in engineering units. Instead, sound pressure is converted to sound “levels” in units of “decibels” (dB, named after Alexander Graham Bell). Once a measured sound is converted to dB, it is denoted as a level with the letter “L.”

The conversion from sound pressure in pascals to sound level in dB is a four-step process. First, the sound wave’s measured amplitude is squared and the mean is taken. Second, a ratio is taken between the mean square sound pressure and the square of the threshold of audibility (20 micropascals). Third, using the logarithm function, the ratio is converted to factors of 10. The final result is multiplied by 10 to give the decibel level. By this decibel scale, sound levels range from 0 dB at the threshold of audibility to 120 dB at the threshold of pain.

Typical sources of noise, and their sound pressure levels, are listed on the scale in Figure 5.

Human Response to Sound Levels: Apparent Loudness

For every 20 dB increase in sound level, the sound pressure increases by a *factor* of 10; the sound *level* range from 0 dB to 120 dB covers 6 factors of 10, or one million, in sound *pressure*. However, for an increase of 10 dB in sound *level* as measured by a meter, humans perceive an approximate doubling of apparent loudness: to the human ear, a sound level of 70 dB sounds about “twice as loud” as a sound level of 60 dB. Smaller changes in sound level, less than 3 dB up or down, are generally not perceptible.

¹⁰ The pascal is a measure of pressure in the metric system. In Imperial units, they are themselves very small: one pascal is only 145 millionths of a pound per square inch (psi). The sound pressure at the threshold of audibility is only 3 one-billionths of one psi: at the threshold of pain, it is about 3 one-thousandths of one psi.



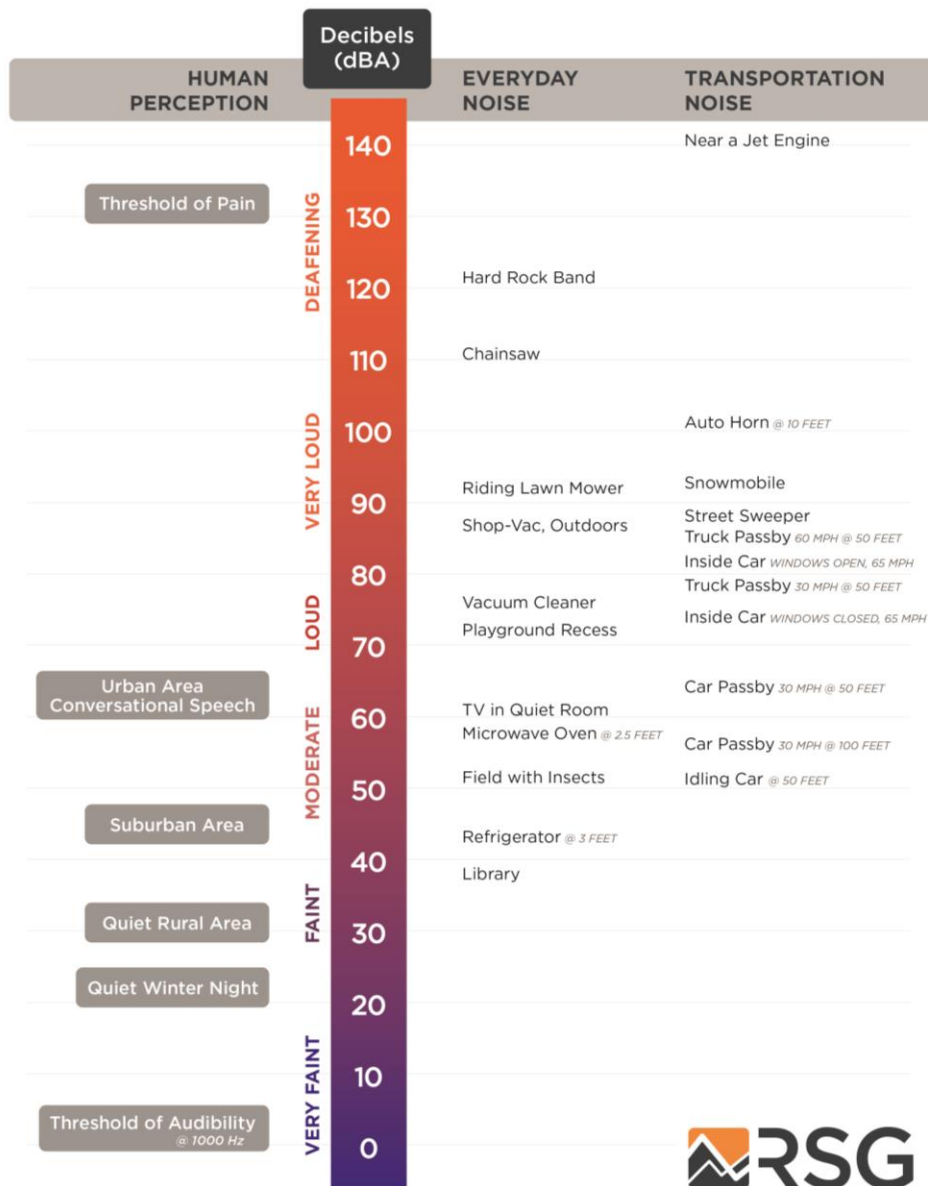


FIGURE 5: A SCALE OF SOUND PRESSURE LEVELS FOR TYPICAL NOISE SOURCES¹¹

¹¹ While a “Hard Rock Concert” is noted as 120 dBA in this figure, it should be noted that this is a generalized value that represent how loud some concerts can get and is representative of short-term sound levels that can cause hearing loss. The sound levels that are produced by any given concert are dependent on architecture of the venue and how the concert venue runs their facility. As with other noise studies, the best sound data is what we can measure of the actual operation under real world conditions that is representative of how that particular facility or equipment operates. This is the approach RSG took in this study and is discussed in Section 5.2 of this report.

Frequency Spectrum of Sound

The “frequency” of a sound is the rate at which it fluctuates in time, expressed in Hertz (Hz), or cycles per second. Few sounds occur at only one frequency: most sound contains energy at many different frequencies, and it can be broken down into different frequency divisions, or bands. These bands are similar to musical pitches, from low tones to high tones. The most common division is the standard octave band. An octave is the range of frequencies whose upper frequency limit is twice its lower frequency limit, exactly like an octave in music. An octave band is identified by its center frequency: each successive band’s center frequency is twice as high (one octave) as the previous band. For example, the 500 Hz octave band includes all sound whose frequencies range between 354 Hz (Hertz, or cycles per second) and 707 Hz. The next band is centered at 1,000 Hz with a range between 707 Hz and 1,414 Hz. The range of human hearing is divided into 10 standard octave bands: 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1,000 Hz, 2,000 Hz, 4,000 Hz, 8,000 Hz, and 16,000 Hz. For analyses that require finer frequency detail, each octave-band can be subdivided. A commonly-used subdivision creates three smaller bands within each octave band, or so-called 1/3-octave bands.

Human Response to Frequency: Weighting of Sound Levels

The human ear is not equally sensitive to sounds of all frequencies. Sounds at some frequencies seem louder than others, despite having the same decibel level as measured by a sound level meter. In particular, human hearing is much more sensitive to medium pitches (from about 500 Hz to about 4,000 Hz) than to very low or very high pitches. For example, a tone measuring 80 dB at 500 Hz (a medium pitch) sounds quite a bit louder than a tone measuring 80 dB at 60 Hz (a very low pitch). The frequency response of normal human hearing ranges from 20 Hz to 20,000 Hz. Below 20 Hz, sound pressure fluctuations are not “heard,” but sometimes can be “felt.” This is known as “infrasound.” Likewise, above 20,000 Hz, sound can no longer be heard by humans; this is known as “ultrasound.” As humans age, they tend to lose the ability to hear higher frequencies first; many adults do not hear very well above about 16,000 Hz. Most natural and man-made sound occurs in the range from about 40 Hz to about 4,000 Hz. Some insects and birdsongs reach to about 8,000 Hz.

To adjust measured sound pressure levels so that they mimic human hearing response, sound level meters apply filters, known as “frequency weightings,” to the signals. There are several defined weighting scales, including “A,” “B,” “C,” “D,” “G,” and “Z.” The most common weighting scale used in environmental noise analysis and regulation is A-weighting. This weighting represents the sensitivity of the human ear to sounds of low to moderate level. It attenuates sounds with frequencies below 1000 Hz and above 4000 Hz; it amplifies slightly sounds between 1000 Hz and 4000 Hz, where the human ear is particularly sensitive. The C-weighting scale is sometimes used to describe louder sounds. The B- and D- scales are seldom used. All of these frequency weighting scales are normalized to the average human hearing response at



1000 Hz: at this frequency, the filters neither attenuate nor amplify. When a reported sound level has been filtered using a frequency weighting, the letter is appended to “dB.” For example, sound with A-weighting is usually denoted “dBA.” When no filtering is applied, the level is denoted “dB” or “dBZ.” The letter is also appended as a subscript to the level indicator “L,” for example “L_A” for A-weighted levels.

Time Response of Sound Level Meters

Because sound levels can vary greatly from one moment to the next, the time over which sound is measured can influence the value of the levels reported. Often, sound is measured in real time, as it fluctuates. In this case, acousticians apply a so-called “time response” to the sound level meter, and this time response is often part of regulations for measuring noise. If the sound level is varying slowly, over a few seconds, “Slow” time response is applied, with a time constant of one second. If the sound level is varying quickly (for example, if brief events are mixed into the overall sound), “Fast” time response can be applied, with a time constant of one-eighth of a second.¹² The time response setting for a sound level measurement is indicated with the subscript “S” for Slow and “F” for Fast: L_S or L_F. A sound level meter set to Fast time response will indicate higher sound levels than one set to Slow time response when brief events are mixed into the overall sound, because it can respond more quickly.

In some cases, the maximum sound level that can be generated by a source is of concern. Likewise, the minimum sound level occurring during a monitoring period may be required. To measure these, the sound level meter can be set to capture and hold the highest and lowest levels measured during a given monitoring period. This is represented by the subscript “max,” denoted as “L_{max}.” One can define a “max” level with Fast response L_{Fmax} (1/8-second time constant), Slow time response L_{Smax} (1-second time constant), or Continuous Equivalent level over a specified time period L_{eq,max}. Note that, in the Act 250 precedents set by the former Environmental Board and the Vermont Superior Court Environmental Division utilizes L_{Smax}.

Accounting for Changes in Sound over Time

A sound level meter’s time response settings are useful for continuous monitoring. However, they are less useful in summarizing sound levels over longer periods. To do so, acousticians apply simple statistics to the measured sound levels, resulting in a set of defined types of sound level related to averages over time. An example is shown in Figure 6. The sound level at each instant of time is the grey trace going from left to right. Over the total time it was measured, the sound energy spends certain fractions of time near various levels, ranging from the minimum (about 28 dB in the figure) to the maximum (about 65 dB in the figure). The simplest descriptor is the average sound level, known as the Equivalent Continuous Sound Level. Statistical levels

¹² There is a third time response defined by standards, the “Impulse” response. This response was defined to enable use of older, analog meters when measuring very brief noises; it is no longer in common use.

are used to determine for what percentage of time the sound is louder than any given level. These levels are described in the following sections.

Equivalent Continuous Sound Level - L_{eq}

One straightforward, common way of describing sound levels is in terms of the Continuous Equivalent Sound Level, or L_{eq} . The L_{eq} is the average sound pressure level over a defined period of time, such as one hour or one day. L_{eq} is the most commonly used descriptor in noise standards and regulations. L_{eq} is representative of the overall sound to which a person is exposed. Because of the logarithmic calculation of decibels, L_{eq} tends to favor higher sound levels: loud and infrequent sources have a larger impact on the resulting average sound level than quieter but more frequent noises. For example, in Figure 6, even though the sound levels spends most of the time near about 34 dBA, the L_{eq} is 41 dBA, having been “inflated” by the maximum level of 65 dBA.

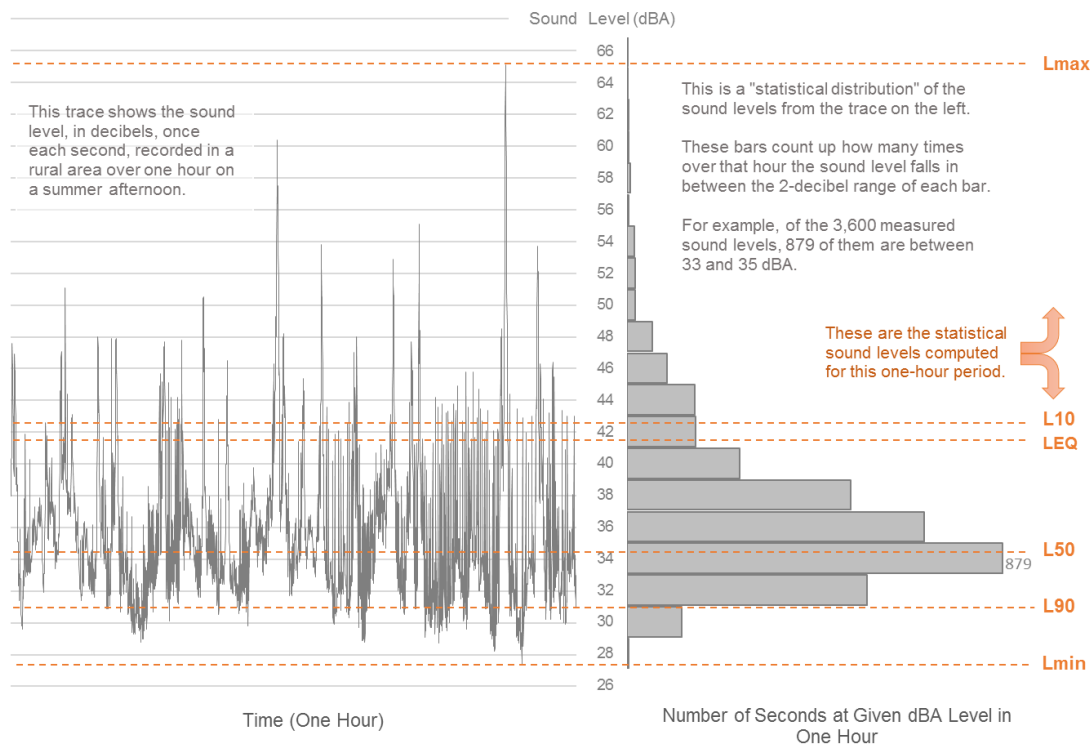


FIGURE 6: EXAMPLE OF DESCRIPTIVE TERMS OF SOUND MEASUREMENT OVER TIME

Percentile Sound Levels – L_n

Percentile sound levels describe the statistical distribution of sound levels over time. " L_N " is the level above which the sound spends " N " percent of the time. For example, L_{90} (sometimes called the "residual base level") is the sound level exceeded 90% of the time: the sound is louder than L_{90} most of the time. L_{10} is the sound level that is exceeded only 10% of the time. L_{50} (the "median level") is exceeded 50% of the time: half of the time the sound is louder than L_{50} , and half the time it is quieter than L_{50} . Note that L_{50} (median) and L_{eq} (mean) are not always the same, for reasons described in the previous Section.

L_{90} is often a good representation of the "ambient sound" in an area. This is the sound that persists for longer periods, and below which the overall sound level seldom falls. It tends to filter out other short-term environmental sounds that aren't part of the source being investigated. L_{10} represents the higher, but less frequent, sound levels. These could include such events as barking dogs, vehicles driving by and aircraft flying overhead, gusts of wind, and work operations. L_{90} represents the background sound that is present when these event noises are excluded.

Note that if one sound source is very constant and dominates the noise in an area, all of the descriptive sound levels mentioned here tend toward the same value. It is when the sound is varying widely from one moment to the next that the statistical descriptors are useful.

Sound Levels from Multiple Sources: Adding Decibels

Because of the way that sound levels in decibels are calculated, the sounds from more than one source do not add arithmetically. Instead, two sound sources that are the same decibel level increase the total sound level by 3 dB. For example, suppose the sound from an industrial blower registers 80 dB at a distance of 2 meters (6.6 feet). If a second industrial blower is operated next to the first one, the sound level from both machines will be 83 dB, not 160 dB. Adding two more blowers (a total of four) raises the sound level another 3 dB to 86 dB. Finally, adding four more blowers (a total of eight) raises the sound level to 89 dB. It would take eight total blowers, running together, for a person to judge the sound as having “doubled in loudness.”

Recall from the explanation of sound levels that a difference of 10 decibels is a factor of 20 in sound pressure and a factor of 10 in sound power. (The difference between sound pressure and sound power is described in the next Section.) If two sources of sound differ individually by 10 decibels, the louder of the two is generating *ten times* more sound. This means that the loudest source(s) in any situation always dominates the total sound level. Looking again at the industrial blower running at 80 decibels, if a small ventilator fan whose level alone is 70 decibels were operated next to the industrial blower, the total sound level increases by only 0.4 decibels, to 80.4 decibels. The small fan is only 10% as loud as the industrial blower, so the larger blower completely dominates the total sound level.

The Difference Between Sound Pressure and Sound Power

The human ear and microphones respond to variations in sound *pressure*. However, in characterizing the sound emitted by a specific source, it is proper to refer to sound *power*. While sound pressure induced by a source can vary with distance and conditions, the power is the same for the source under all conditions, regardless of the surroundings or the distance to the nearest listener. In this way, sound power levels are used to characterize noise sources because they act like a “fingerprint” of the source. An analogy can be made to light bulbs. The bulb emits a constant amount of light under all conditions, but its perceived brightness diminishes as one moves away from it.

Both sound power and sound pressure levels are described in terms of decibels, but they are not the same thing. Decibels of sound pressure are related to 20 micropascals, as explained at the beginning of this primer. Sound power is a measure of the acoustic power emitted or radiated by a source; its decibels are relative to one picowatt.



Sound Propagation Outdoors

As a listener moves away from a source of sound, the sound level decreases due to “geometrical divergence”: the sound waves spread outward like ripples in a pond and lose energy. For a sound source that is compact in size, the received sound level diminishes or attenuates by 6 dB for every doubling of distance: a sound whose level is measured as 70 dBA at 100 feet from a source will have a measured level of 64 dBA at 200 feet from the source and 58 dBA at 400 feet. Other factors, such as walls, berms, buildings, terrain, atmospheric absorption, and intervening vegetation will also further reduce the sound level reaching the listener.

The type of ground over which sound is propagating can have a strong influence on sound levels. Harder ground, pavement, and open water are very reflective, while soft ground, snow cover, or grass is more absorptive. In general, sounds of higher frequency will attenuate more over a given distance than sounds of lower frequency: the “boom” of thunder can be heard much further away than the initial “crack.”

Atmospheric and meteorological conditions can enhance or attenuate sound from a source in the direction of the listener. Wind blowing from the source toward the listener tends to enhance sound levels; wind blowing away from the listener toward the source tends to attenuate sound levels. Normal temperature profiles (typical of a sunny day, where the air is warmer near the ground and gets colder with increasing altitude) tend to attenuate sound levels; inverted profiles (typical of nighttime and some overcast conditions) tend to enhance sound levels.

APPENDIX B. MODEL INPUT DATA

TABLE 3: MODELED POINT SOURCES

SOURCE	SOUND POWER LEVEL (dBA)	HEIGHT ABOVE ROOF (m)	COORDINATES (VT STATE PLANE)		ELEVATION + SOURCE HEIGHT (m)
			X (m)	Y (m)	
HVAC 25 Ton	86	1.5	442715	216607	61
HVAC 25 Ton	86	1.5	442714	216597	61
HVAC 25 Ton	86	1.5	442714	216602	61
HVAC 25 Ton	86	1.5	442750	216558	66
HVAC 25 Ton	86	1.5	442744	216558	66
HVAC 25 Ton	86	1.5	442751	216566	66
HVAC 25 Ton	86	1.5	442744	216566	66
HVAC 20 Ton	87	1.5	442748	216562	66
Hood Intake	81	0.6	442710	216600	60
Hood Exhaust	77	0.6	442706	216602	60
Hood Exhaust	77	0.6	442706	216605	60
Hood Intake	81	0.6	442710	216604	60
Hood Intake	81	0.6	442710	216607	60
Hood Intake	81	0.6	442710	216597	60
Hood Intake	81	0.6	442710	216602	60
Hood Exhaust	77	0.6	442706	216600	60
Hood Exhaust	77	0.6	442706	216597	60
Hood Exhaust	77	0.6	442707	216607	60
Existing RTU	87	1.5	442779	216608	61
Existing RTU	87	1.5	442748	216599	61
Existing RTU	77	1.0	442800	216559	61
Existing RTU	77	1.0	442807	216581	61
Existing RTU	77	1.0	442802	216605	61
Existing RTU	82	1.0	442779	216578	61
Existing RTU	82	1.0	442782	216596	61
Existing RTU	82	1.0	442766	216611	61
Existing RTU	82	2.0	442759	216580	62
Existing RTU	82	1.0	442735	216616	61
Existing RTU	82	1.0	442742	216589	61



TABLE 4: MODELED AREA SOURCES

AREA SOURCES	ORIENTATION	SOUND POWER LEVEL (dBA)	TRANSMISSION LOSS ID	AREA (m ²)
Concert Roof Breakout	Horizontal	84	Concert Roof	752
Lounge Roof Breakout	Horizontal	86	Commercial Roof	1286
Outdoor Lounge	Horizontal	88	NA	NA
Backstage Roof Breakout	Horizontal	84	Commercial Roof	745
South Lounge Wall	Vertical	65	Existing Concrete Block	84
West Lounge Wall	Vertical	69	Existing Concrete Block	222
North Lounge Wall	Vertical	67	Existing Concrete Block	127
West Concert Wall	Vertical	80	Existing Concrete Block	226
Southwest Concert Wall 1	Vertical	82	Existing Concrete Block	371
Southeast Concert Wall 2	Vertical	82	Improved Metal Siding	432
North Concert Wall	Vertical	82	Existing Concrete Block	365
East Concert Wall	Vertical	77	Existing Concrete Block	105
Loading Door South	Vertical	74	Existing Metal Siding	21

TABLE 5: MODELED TRANSMISSION LOSS OF ROOFS AND EXTERIOR WALLS (dB)

TRANSMISSION LOSS ID	OCTAVE BAND CENTER FREQUENCY (HZ)								
	31.5	63	125	250	500	1000	2000	4000	8000
Existing Concrete Block	13	26	31	36	40	42	45	45	45
Existing Metal Siding	7	13	12	23	27	29	31	36	35
Commercial Roof	6	10	27	47	57	61	63	54	66
Concert Roof	17	20	36	52	62	67	64	75	79
Improved Metal Siding	13	14	21	36	46	52	55	44	48

TABLE 6: MODEL PARAMETER SETTINGS

MODEL PARAMETER	SETTING
Atmospheric Absorption	Based on 10°C and 70% RH
Foliage	None
Ground Absorption	ISO 9613-2 spectral, G=0 on roads and parking lots, G=0.6 in substations, and G=1 elsewhere
Receiver Height	1.5 meters for sound level isolines and 4.0 meters for discrete residential receivers
Search Radius	2000 meters from each source
Reflection	2 orders of reflection
Buildings	Only buildings along Queen City Park Rd at heights between 3 and 11 meters.

APPENDIX C. DETAILED MODEL RESULTS

Residence Address	Modeled Sound Level (dBA)		Coordinates (VT State Plane)		Elevation + Receiver Height (m)
	Concert Model	End-of-Concert Model	X (m)	Y (m)	
80 AUSTIN DR	28	31	442305	217013	48
209 AUSTIN DR	29	33	442309	216896	54
80 AUSTIN DR	27	30	442314	217051	48
80 AUSTIN DR	27	30	442320	217082	48
161 AUSTIN DR	33	36	442321	216729	68
80 AUSTIN DR	28	31	442326	217011	48
161 AUSTIN DR	33	36	442333	216631	66
161 AUSTIN DR	33	36	442335	216661	66
197 AUSTIN DR	31	34	442342	216881	57
161 AUSTIN DR	35	37	442351	216549	67
80 AUSTIN DR	27	30	442364	217075	48
80 AUSTIN DR	28	31	442365	217046	48
161 AUSTIN DR	35	37	442367	216578	67
161 AUSTIN DR	35	37	442372	216603	67
161 AUSTIN DR	34	36	442374	216810	61
80 AUSTIN DR	28	31	442377	217028	49
161 AUSTIN DR	36	38	442379	216548	66
80 AUSTIN DR	29	32	442387	216965	49
181 AUSTIN DR	32	35	442389	216886	55
80 AUSTIN DR	27	30	442391	217087	47
80 AUSTIN DR	28	31	442397	217026	49
161 AUSTIN DR	35	38	442402	216648	65
161 AUSTIN DR	36	38	442404	216727	62
161 AUSTIN DR	37	39	442405	216546	64
161 AUSTIN DR	35	38	442408	216588	64
80 AUSTIN DR	28	30	442412	217086	47
161 AUSTIN DR	35	39	442426	216641	63
80 AUSTIN DR	29	31	442428	217023	49
80 AUSTIN DR	30	32	442435	216962	50
80 AUSTIN DR	28	31	442437	217038	49
165 AUSTIN DR	34	36	442445	216870	56
80 AUSTIN DR	27	30	442456	217133	47
80 AUSTIN DR	28	31	442457	217056	48

Residence Address	Modeled Sound Level (dBA)		Coordinates (VT State Plane)		Elevation + Receiver Height (m)
	Concert Model	End-of-Concert Model	X (m)	Y (m)	
80 AUSTIN DR	28	31	442474	217084	47
80 AUSTIN DR	29	32	442478	216991	50
155 AUSTIN DR	36	38	442504	216860	60
145 AUSTIN DR	33	36	442523	216891	60
121 AUSTIN DR	34	36	442550	216931	60
91 AUSTIN DR	30	33	442558	216989	53
80 AUSTIN DR	28	31	442588	217124	48
9 PAVILION AVE	33	35	442593	216230	53
11 PAVILION AVE	33	36	442601	216243	54
9 PLEASANT AVE	33	36	442627	216235	54
35 CENTRAL AVE	35	37	442666	216243	59
26 CENTRAL AVE	37	39	442716	216318	60
34 CENTRAL AVE	35	37	442726	216251	59
32 CENTRAL AVE	35	37	442733	216271	59
4 MAPLE AVE	37	39	442744	216315	60
28 CENTRAL AVE	36	38	442747	216283	59
6 MAPLE AVE	37	39	442770	216316	60
7 MAPLE AVE	36	38	442777	216300	58
8 MAPLE AVE	36	39	442795	216318	60
12 MAPLE AVE	36	38	442837	216318	60
11 MAPLE AVE	35	37	442838	216298	58
6 HOME AVE	30	32	442839	217055	51
8 HOME AVE	30	32	442846	217055	51
20 ARTHUR CT	42	44	442892	216626	61
13 ARTHUR CT	41	43	442893	216573	61
18 ARTHUR CT	42	43	442897	216624	61
11 ARTHUR CT	41	42	442898	216569	61
42 BATCHELDER ST	31	32	442904	217051	51
40 BATCHELDER ST	31	32	442905	217057	50
9 ARTHUR CT	41	42	442908	216549	61
7 ARTHUR CT	41	42	442913	216545	61
38 BATCHELDER ST	29	31	442915	217115	49
364 QUEEN CITY PARK RD	41	41	442915	216519	61
32 BATCHELDER ST	29	31	442915	217129	49
52 BATCHELDER ST	30	31	442916	217083	50
29 HOME AVE	32	34	442916	217000	53

Residence Address	Modeled Sound Level (dBA)		Coordinates (VT State Plane)		Elevation + Receiver Height (m)
	Concert Model	End-of-Concert Model	X (m)	Y (m)	
48 BATCHELDER ST	30	31	442918	217098	50
14 ARTHUR CT	40	42	442918	216599	61
12 ARTHUR CT	40	42	442922	216596	61
10 ARTHUR CT	39	41	442934	216576	61
8 ARTHUR CT	39	41	442939	216572	61
2 ARTHUR CT	39	40	442950	216550	62
19 S CREST DR	33	35	442954	216952	57
17 S CREST DR	33	34	442954	216972	56
5 S CREST DR	32	34	442955	216992	55
29 S CREST DR	34	36	442957	216925	58
147 FOSTER ST	31	33	442962	217040	53
378 QUEEN CITY PARK RD	38	40	442962	216514	62
145 FOSTER ST	30	32	442963	217066	52
99 S CREST DR	38	40	442964	216719	63
35 S CREST DR	34	36	442965	216908	58
115 FOSTER ST	29	30	442965	217142	49
103 S CREST DR	38	40	442965	216696	63
37 S CREST DR	34	36	442966	216905	58
91 S CREST DR	38	40	442966	216742	62
139 FOSTER ST	30	31	442967	217081	51
133 FOSTER ST	29	31	442967	217097	51
382 QUEEN CITY PARK RD	38	40	442968	216543	62
85 S CREST DR	37	39	442968	216764	62
127 FOSTER ST	29	31	442969	217112	50
123 FOSTER ST	29	31	442971	217124	50
79 S CREST DR	36	38	442972	216789	62
45 S CREST DR	34	36	442972	216883	60
53 S CREST DR	35	37	442974	216858	60
69 S CREST DR	36	38	442975	216811	61
59 S CREST DR	35	37	442975	216835	62
109 S CREST DR	38	40	442984	216670	64
388 QUEEN CITY PARK RD	37	39	442990	216505	62
115 S CREST DR	38	40	442992	216662	64
390 QUEEN CITY PARK RD	37	38	442993	216505	62
53 HOME AVE	32	34	442993	216989	57
20 S CREST DR	33	35	442997	216945	59

Residence Address	Modeled Sound Level (dBA)		Coordinates (VT State Plane)		Elevation + Receiver Height (m)
	Concert Model	End-of-Concert Model	X (m)	Y (m)	
146 FOSTER ST	31	33	443000	217035	56
84 S CREST DR	36	38	443003	216767	63
144 FOSTER ST	30	32	443006	217061	55
30 S CREST DR	36	38	443006	216924	60
78 S CREST DR	33	35	443006	216784	63
138 FOSTER ST	30	32	443008	217082	54
98 S CREST DR	37	39	443008	216724	64
130 FOSTER ST	29	31	443010	217097	53
70 S CREST DR	35	37	443011	216807	63
126 FOSTER ST	29	30	443011	217111	51
59 HOME AVE	32	34	443011	216989	59
46 S CREST DR	34	36	443012	216877	61
38 S CREST DR	33	35	443012	216900	61
116 FOSTER ST	28	30	443013	217145	50
60 S CREST DR	35	37	443014	216831	63
129 S CREST DR	37	38	443018	216633	64
396 QUEEN CITY PARK RD	36	38	443018	216504	62
112 S CREST DR	37	38	443019	216694	65
56 HOME AVE	31	33	443020	217039	59
54 S CREST DR	34	36	443021	216854	63
57 MORSE PL	28	30	443030	217143	51
65 HOME AVE	32	34	443031	216983	61
135 S CREST DR	36	38	443036	216605	64
68 HOME AVE	31	33	443037	217035	61
124 S CREST DR	36	38	443041	216666	65
128 S CREST DR	36	38	443045	216662	65
75 HOME AVE	31	33	443048	216989	62
76 HOME AVE	31	33	443054	217032	62
65 MORSE PL	28	30	443055	217143	52
83 HOME AVE	31	33	443066	216987	64
82 HOME AVE	31	32	443071	217032	63
69 MORSE PL	27	29	443074	217143	53
967 PINE ST	28	30	443080	217104	57
85 HOME AVE	31	33	443083	216986	64
1149 PINE ST	34	36	443083	216564	61
1143 PINE ST	34	36	443085	216579	62



Residence Address	Modeled Sound Level (dBA)		Coordinates (VT State Plane)		Elevation + Receiver Height (m)
	Concert Model	End-of-Concert Model	X (m)	Y (m)	
1135 PINE ST	34	36	443086	216602	63
1125 PINE ST	34	36	443089	216636	64
1123 PINE ST	34	36	443090	216656	65
88 HOME AVE	30	32	443090	217026	63
1119 PINE ST	35	36	443092	216685	65
1099 PINE ST	34	36	443095	216717	66
89 HOME AVE	31	33	443098	216983	65
1085 PINE ST	34	36	443099	216747	66
1073 PINE ST	34	35	443100	216790	67
1079 PINE ST	34	35	443100	216769	66
1069 PINE ST	34	35	443101	216806	67
1061 PINE ST	33	35	443101	216827	67
977 PINE ST	28	30	443104	217088	59
1053 PINE ST	33	35	443105	216851	68
981 PINE ST	29	31	443106	217067	61
975 PINE ST	28	30	443106	217088	59
1045 PINE ST	33	34	443107	216871	68
1037 PINE ST	33	34	443108	216888	68
1033 PINE ST	32	34	443109	216905	67
961 PINE ST	27	29	443109	217127	55
963 PINE ST	27	29	443109	217126	55
973 PINE ST	28	30	443109	217087	59
957 MORSE PL	26	29	443110	217142	54
1021 PINE ST	32	33	443111	216945	66
1027 PINE ST	32	34	443111	216926	67
991 PINE ST	29	31	443111	217050	62
92 HOME AVE	30	32	443112	217026	64
971 PINE ST	27	30	443112	217087	59
95 HOME AVE	31	33	443116	216981	65
1124 PINE ST	33	34	443143	216641	64
1120 PINE ST	33	35	443145	216682	65
1132 PINE ST	32	34	443145	216604	63
1 BAIRD ST	33	34	443151	216763	67
3 BAIRD ST	33	34	443153	216763	67
2 BAIRD ST	32	34	443153	216801	67
106 HOME AVE	29	31	443154	217021	64

Residence Address	Modeled Sound Level (dBA)		Coordinates (VT State Plane)		Elevation + Receiver Height (m)
	Concert Model	End-of-Concert Model	X (m)	Y (m)	
4 BAIRD ST	32	34	443155	216801	67
990 PINE ST	28	30	443156	217050	62
968 PINE ST	27	29	443158	217095	59
984 PINE ST	27	30	443158	217065	61
956 PINE ST	26	28	443158	217141	55
960 PINE ST	26	29	443158	217125	56
964 PINE ST	26	29	443158	217111	58
974 PINE ST	27	29	443160	217078	61
105 HOME AVE	30	32	443162	216975	66
5 BAIRD ST	32	34	443170	216762	66
6 BAIRD ST	32	34	443172	216801	67
7 BAIRD ST	32	34	443173	216762	66
1110 PINE ST	32	34	443174	216722	65
8 BAIRD ST	32	33	443175	216801	67
112 HOME AVE	28	30	443177	217020	64





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City of Burlington
Department of Public Works

Technical Services Engineering Division
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TO: Scott Gustin, Principal Planner & Assistant Administrative Officer, Dept. of Permitting & Inspections

FROM: Susan Molzon, P.E., Senior Public Works Engineer

CC: Chapin Spencer, Director
Norm Baldwin, P.E., Assistant Director/City Engineer
Laura Wheelock, P.E., Senior Public Works Engineer

DATE: June 26, 2020

SUBJECT: Burton Hub, 180 and 266 Queen City Park Road – Department of Public Works
Comments on Traffic Impact Study

The Department of Public Works (DPW), in consultation with Clough Harbour & Associates (CHA), has reviewed the submitted Traffic Impact Study (TIS) conducted by VHB, revised April 23, 2020 and a Memo of Additional Information for South Burlington dated April 23, 2020, for the proposed redevelopment of the Burton Hub properties located at 180 and 266 Queen City Park Road. City staff concurs with the independent analysis and comments provided in the attached CHA Memorandum dated June 26, 2020 and offers the following conclusions and recommendations:

- The traffic generated by the Burton Hub project will exacerbate the amount of delay at the Pine Street and Home Avenue intersection and increase traffic volumes on Home Avenue during the evening peak prior to construction of the Champlain Parkway. We recommend the Applicant complete a post-construction traffic analysis of neighborhood traffic impacts along Home Avenue after the Burton Hub redevelopment project is completed. Traffic calming measures will be warranted if the results of this analysis demonstrate the predicted values for traffic volume and intersection operation have been exceeded, and the street qualifies for traffic calming under DPW's guidelines. Costs for implementation of warranted traffic calming measures will be shared equally between the City and the Applicant.
- The traffic study shows that the Burton Hub project will have a negative impact at the intersection of Home Avenue and the Champlain Parkway during the evening peak. We recommend the Applicant perform a traffic study analysis of the Champlain Parkway/Home Avenue intersection after the Champlain Parkway is opened to vehicle traffic to determine if mitigation of increased traffic related to the Burton Hub site is necessary for the intersection to function as designed.
- We recommend all events in the performing arts space be restricted to not contribute to the peak hour traffic on surrounding roads before 6:00PM Monday through Friday.
- The traffic study shows that the Burton Hub project will not have a significant impact on traffic operations at other intersections within the study area, with or without construction of the Champlain Parkway.
- The traffic study shows that the operations of the one-lane Queen City Park Road bridge during morning and afternoon peak hours will be comparable in both the Build and No Build conditions of the Burton Hub project.

- During the review process, VHB provided updated Highway Capacity Manual Reports and Level of Service Tables to correct minor inconsistencies. We recommend the Applicant revise the TIS to formally incorporate these documents and resubmit an updated TIS for record purposes.

Please contact us if you have any questions or require additional information related to this review.

ATTACHMENTS:

CHA Burton Hub Review Memo, Dated June 26, 2020

Highway Capacity Manual Reports

Revised LOS Tables – Updated June 2020



MEMORANDUM
Burton Hub Mixed-Use Redevelopment – Queen City Park Road
Burlington, VT

To: Susan Molzon, PE
From: David Kahlbaugh, AICP
Date: June 26, 2020

The comments below are provided based upon a review of the following documents for the Burton Hub Mixed-Use Redevelopment at 180 and 266 Queen City Park Road:

- Traffic Impact Study & Appendix, VHB (Revised April 23, 2020)
- Memo-Additional Information for South Burlington (April 23, 2020)

Review Comments:

1. *Traffic Volumes:* The traffic study used the ETC and ETC+20 design volumes for the Champlain Parkway as the basis for evaluating the impacts of the Burton Hub project. VHB's assessment of these volumes in the context of available historical traffic data is consistent with research done for the Parkway project, and we agree that the volumes as presented in the study are an appropriate basis for the impact analysis.
2. *Site Traffic Generation and Distribution:* We agree with the methodology used to estimate the trip generation of the project, and the estimation of the site trips and route distribution (both with and without the Champlain Parkway). We note that there are minor arithmetic inaccuracies in Table 2 and related text (+/- 1 vehicle), but these are due to data rounding in VHB's calculation spreadsheets (found in the appendix) and they are within the precision of the estimates and do not affect the impact assessment.

The Traffic Study shows a small number of trips to the site originating from the surrounding neighborhoods during the PM peak hour in the condition without the Parkway but does not show these same trips in the condition with the Parkway. Since these trips are local, it is not expected that they would divert to the Parkway for access to the site. However, the amount of this traffic is minimal (2 vehicle trips in the peak hour), and this does not affect the impact assessment.

3. *Traffic Operations Analysis:*

- Errata:
 - the capacity analysis reports provided in the Appendix for the 2028 PM Peak Hour condition with the Parkway and without the Burton Hub project are a misprint and do not correlate to the LOS results shown in Table 3 of the Report. The correct capacity analysis reports were forwarded by VHB and are attached.
 - The LOS information for the intersection of US7 and Queen City Park Road for the 2008 Parkway Build-Burton No-Build scenario (PM Peak) are incorrectly transcribed from the analysis in the Appendix. A comparison is provided below:

	v/c	Delay	LOS
As shown in Table 3	0.89	30.8 secs	C
Per HCM Report in Appendix	0.87	30.3 secs	C

- The capacity analyses of the signalized and unsignalized intersections of US7 and Queen City Park Road are incorrect as shown in the study for the following scenarios, because they are based on incorrect volume inputs for the US7 northbound through movement:
 - 2008 Parkway Build-Burton Build scenario (PM Peak)
 - 2028 Parkway Build-Burton Build scenario (PM Peak)

The updated analyses and LOS Tables from VHB are attached. The Burton Hub project is not anticipated to generate a significant amount of new traffic at this intersection either with or without the Champlain Parkway (< 30 new trips on any approach), and the analysis shows that the project will not have a significant impact at these two intersections.

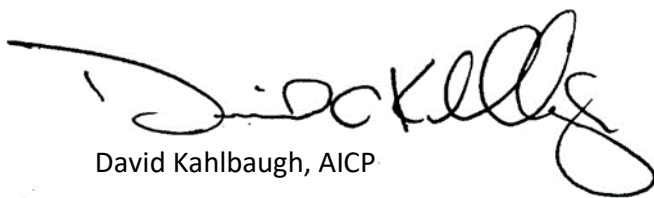
- As noted in the study, the intersection of Pine Street and Home Avenue will operate at LOS E (AM) and LOS F (PM) without the Champlain Parkway. The traffic generated by the Burton Hub project will exacerbate the amount of delay at this location until the Parkway is constructed. The Burton Hub project will also add site traffic on Home Avenue between US 7 and Queen City Park Road/Austin Drive during the period prior to the Parkway's construction.
- The traffic study shows that the project will have an impact at the intersection of Home Avenue and the Champlain Parkway. As shown in Table 3, the overall intersection LOS will change from LOS D to LOS E in the peak hour with the traffic added by the Burton Hub project. The study should identify mitigation strategies to address this impact.

- The traffic study shows that the project will not have a significant impact on traffic operations at other study intersections within the study area, with or without the Champlain Parkway.
 - We agree with the methodology used to represent the alternating one-way traffic operations on the Queen City Park Road bridge. These analyses show that the operations in the Build condition will be comparable to the No-Build conditions during the morning and afternoon peak hours, and that these operations will have low vehicle delays and short queues. The analyses also show that the one-lane bridge can accommodate the projected traffic on Queen City Park Road during the evening condition after the end of events at the Higher Ground component of the project.
4. *Parking Analysis:* The peak parking demand for sold-out events is 500 spaces, which is basically all the parking supply available on the site. Supplemental off-site parking may be required for specific events depending on the Time-of-Day considerations for parking for other uses on the site. This might be accommodated with temporary parking using grassed areas of the site and/or adjacent parking lots of other properties. An event parking management plan should be provided to outline this plan.

The on-site parking supply is not all internally accessible from within the site and requires separate points of access to/from Queen City Park Road. There should be onsite attendants should be provided during the Higher Ground events to guide traffic to available parking to minimize unnecessary circulation to find a parking spot, and to facilitate exit after the event. This should be part of an event management plan developed for the site.

Respectfully submitted,

Clough, Harbour & Associates, LLP



David Kahlbaugh, AICP

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

06/24/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	5	2180	1747	40
Future Volume (Veh/h)	0	0	5	2180	1747	40
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	5	2370	1899	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.41	0.66	0.66			
vC, conflicting volume	3094	950	1942			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	1403			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	98			
cM capacity (veh/h)	413	718	320			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	5	1185	1185	950	950	43
Volume Left	5	0	0	0	0	0
Volume Right	0	0	0	0	0	43
cSH	320	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.70	0.70	0.56	0.56	0.03
Queue Length 95th (ft)	1	0	0	0	0	0
Control Delay (s)	16.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.0			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			81.6%	ICU Level of Service		D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

06/24/2020

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	33	2185	1747	63
Future Volume (Veh/h)	0	0	33	2185	1747	63
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	36	2375	1899	68
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.41	0.66	0.66			
vC, conflicting volume	3158	950	1967			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	1441			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	88			
cM capacity (veh/h)	371	718	309			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	1188	1188	950	950	68
Volume Left	36	0	0	0	0	0
Volume Right	0	0	0	0	0	68
cSH	309	1700	1700	1700	1700	1700
Volume to Capacity	0.12	0.70	0.70	0.56	0.56	0.04
Queue Length 95th (ft)	10	0	0	0	0	0
Control Delay (s)	18.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			83.0%	ICU Level of Service		E
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

06/24/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↱↱	↱↱	↰
Traffic Volume (veh/h)	0	0	5	2536	2029	47
Future Volume (Veh/h)	0	0	5	2536	2029	47
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	5	2757	2205	51
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.42	0.65	0.65			
vC, conflicting volume	3594	1102	2256			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	616	73	1852			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	98			
cM capacity (veh/h)	171	632	210			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	5	1378	1378	1102	1102	51
Volume Left	5	0	0	0	0	0
Volume Right	0	0	0	0	0	51
cSH	210	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.81	0.81	0.65	0.65	0.03
Queue Length 95th (ft)	2	0	0	0	0	0
Control Delay (s)	22.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.0			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			92.4%	ICU Level of Service		F
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

06/24/2020

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	33	2541	2029	69
Future Volume (Veh/h)	0	0	33	2541	2029	69
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	36	2762	2205	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.42	0.65	0.65			
vC, conflicting volume	3658	1102	2280			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	772	73	1889			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	82			
cM capacity (veh/h)	115	632	203			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	1381	1381	1102	1102	75
Volume Left	36	0	0	0	0	0
Volume Right	0	0	0	0	0	75
cSH	203	1700	1700	1700	1700	1700
Volume to Capacity	0.18	0.81	0.81	0.65	0.65	0.04
Queue Length 95th (ft)	16	0	0	0	0	0
Control Delay (s)	26.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	D					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			93.8%	ICU Level of Service		F
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

06/22/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	33	2326	1747	63
Future Volume (Veh/h)	0	0	33	2326	1747	63
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	36	2528	1899	68
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.41	0.66	0.66			
vC, conflicting volume	3235	950	1967			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	1441			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	88			
cM capacity (veh/h)	371	718	309			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	1264	1264	950	950	68
Volume Left	36	0	0	0	0	0
Volume Right	0	0	0	0	0	68
cSH	309	1700	1700	1700	1700	1700
Volume to Capacity	0.12	0.74	0.74	0.56	0.56	0.04
Queue Length 95th (ft)	10	0	0	0	0	0
Control Delay (s)	18.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			83.1%	ICU Level of Service		E
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: US 7 Shelburne Rd & Queen City Park Rd

06/22/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↰	↱↱	↱↱	↰
Traffic Volume (veh/h)	0	0	33	2698	2029	69
Future Volume (Veh/h)	0	0	33	2698	2029	69
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	36	2933	2205	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				246	134	
pX, platoon unblocked	0.42	0.65	0.65			
vC, conflicting volume	3744	1102	2280			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	978	73	1889			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	82			
cM capacity (veh/h)	85	632	203			
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	1466	1466	1102	1102	75
Volume Left	36	0	0	0	0	0
Volume Right	0	0	0	0	0	75
cSH	203	1700	1700	1700	1700	1700
Volume to Capacity	0.18	0.86	0.86	0.65	0.65	0.04
Queue Length 95th (ft)	16	0	0	0	0	0
Control Delay (s)	26.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	D					
Approach Delay (s)	0.3			0.0		
Approach LOS						
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			154.0%		ICU Level of Service	H
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

06/22/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	276	11	0	2083	1747	0
Future Volume (vph)	276	11	0	2083	1747	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1773	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1773	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	300	12	0	2264	1899	0
RTOR Reduction (vph)	0	9	0	0	0	0
Lane Group Flow (vph)	301	2	0	2264	1899	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	245	208		2722	2722	
v/s Ratio Prot	c0.17	0.00		c0.64	0.54	
v/s Ratio Perm						
v/c Ratio	1.23	0.01		0.83	0.70	
Uniform Delay, d1	56.0	48.3		9.6	7.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	133.3	0.0		3.1	1.5	
Delay (s)	189.3	48.3		12.7	9.0	
Level of Service	F	D		B	A	
Approach Delay (s)	184.4			12.7	9.0	
Approach LOS	F			B	A	

Intersection Summary

HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

06/22/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	135	388	0	2083	1747	0
Future Volume (vph)	135	388	0	2083	1747	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	0.93	0.85		1.00	1.00	
Flt Protected	0.98	1.00		1.00	1.00	
Satd. Flow (prot)	1682	1504		3539	3539	
Flt Permitted	0.98	1.00		1.00	1.00	
Satd. Flow (perm)	1682	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	147	422	0	2264	1899	0
RTOR Reduction (vph)	27	220	0	0	0	0
Lane Group Flow (vph)	263	59	0	2264	1899	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	232	208		2722	2722	
v/s Ratio Prot	c0.16	0.04		c0.64	0.54	
v/s Ratio Perm						
v/c Ratio	1.13	0.29		0.83	0.70	
Uniform Delay, d1	56.0	50.2		9.6	7.5	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	100.2	0.3		3.1	1.5	
Delay (s)	156.2	50.5		12.7	9.0	
Level of Service	F	D		B	A	
Approach Delay (s)	104.4			12.7	9.0	
Approach LOS	F			B	A	

Intersection Summary

HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

06/22/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	317	13	0	2414	2029	0
Future Volume (vph)	317	13	0	2414	2029	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1774	1504		3539	3539	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1774	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	345	14	0	2624	2205	0
RTOR Reduction (vph)	0	11	0	0	0	0
Lane Group Flow (vph)	346	2	0	2624	2205	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	245	208		2722	2722	
v/s Ratio Prot	c0.20	0.00		c0.74	0.62	
v/s Ratio Perm						
v/c Ratio	1.41	0.01		0.96	0.81	
Uniform Delay, d1	56.0	48.3		13.4	9.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	208.0	0.0		10.7	2.7	
Delay (s)	264.0	48.3		24.1	11.9	
Level of Service	F	D		C	B	
Approach Delay (s)	256.2			24.1	11.9	
Approach LOS	F			C	B	

Intersection Summary

HCM 2000 Control Delay	35.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	154.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

06/22/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	160	403	0	2414	2029	0
Future Volume (vph)	160	403	0	2414	2029	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	0.93	0.85		1.00	1.00	
Flt Protected	0.97	1.00		1.00	1.00	
Satd. Flow (prot)	1691	1504		3539	3539	
Flt Permitted	0.97	1.00		1.00	1.00	
Satd. Flow (perm)	1691	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	438	0	2624	2205	0
RTOR Reduction (vph)	22	215	0	0	0	0
Lane Group Flow (vph)	292	83	0	2624	2205	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	234	208		2722	2722	
v/s Ratio Prot	c0.17	0.06		c0.74	0.62	
v/s Ratio Perm						
v/c Ratio	1.25	0.40		0.96	0.81	
Uniform Delay, d1	56.0	51.1		13.4	9.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	141.3	0.5		10.7	2.7	
Delay (s)	197.3	51.5		24.1	11.9	
Level of Service	F	D		C	B	
Approach Delay (s)	126.3			24.1	11.9	
Approach LOS	F			C	B	

Intersection Summary

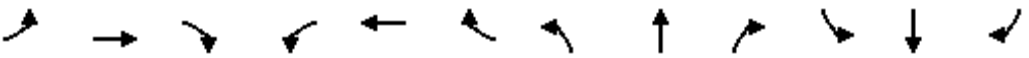
HCM 2000 Control Delay	30.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

06/03/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗		↖	↖↗		↖	↖↗	
Traffic Volume (vph)	35	25	155	30	20	25	175	1295	15	40	935	15
Future Volume (vph)	35	25	155	30	20	25	175	1295	15	40	935	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	0		0	150		0	300		0
Storage Lanes	0		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.917			0.998			0.998	
Flt Protected		0.972		0.950			0.950			0.950		
Satd. Flow (prot)	0	1811	1583	1770	1708	0	1770	3532	0	1770	3532	0
Flt Permitted		0.794		0.715			0.253			0.950		
Satd. Flow (perm)	0	1479	1583	1332	1708	0	471	3532	0	1770	3532	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			168		27			2			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1428			412			717			433	
Travel Time (s)		32.5			9.4			16.3			9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	27	168	33	22	27	190	1408	16	43	1016	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	168	33	49	0	190	1424	0	43	1032	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

06/03/2020

Lane Group	Ø3
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	3
Permitted Phases	

Lanes, Volumes, Timings

4: US 7 Shelburne St & Home Ave/Farrell St

06/03/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	4	4		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		4.0	20.0		4.0	20.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0		22.0	30.0		8.0	30.0	
Total Split (s)	25.0	25.0	25.0	25.0	25.0		22.0	50.0		10.0	38.0	
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%		24.4%	55.6%		11.1%	42.2%	
Maximum Green (s)	21.0	21.0	21.0	21.0	21.0		17.0	45.0		6.0	33.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lag	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			10.0			10.0	
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	12.0			15.0			15.0	
Pedestrian Calls (#/hr)	0	0	0	0	0			0			0	
Act Effect Green (s)		9.4	9.4	9.4	9.4		63.9	63.9		7.7	49.6	
Actuated g/C Ratio		0.10	0.10	0.10	0.10		0.71	0.71		0.09	0.55	
v/c Ratio		0.42	0.53	0.24	0.24		0.33	0.57		0.28	0.53	
Control Delay		45.2	12.6	39.9	23.1		12.4	9.1		42.7	14.5	
Queue Delay		0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay		45.2	12.6	39.9	23.1		12.4	9.1		42.7	14.5	
LOS		D	B	D	C		B	A		D	B	
Approach Delay		21.7			29.8			9.5			15.6	
Approach LOS		C			C			A			B	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 85

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 13.2

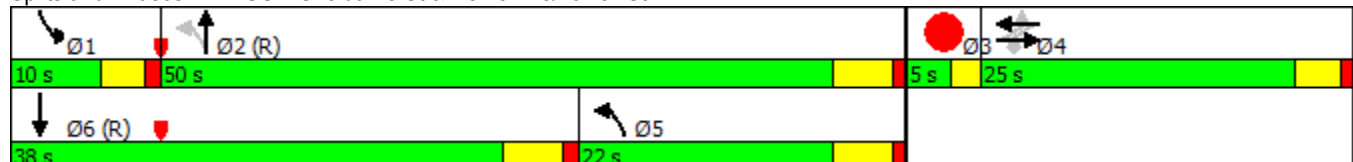
Intersection LOS: B

Intersection Capacity Utilization 60.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: US 7 Shelburne St & Home Ave/Farrell St



Lanes, Volumes, Timings
4: US 7 Shelburne St & Home Ave/Farrell St

06/03/2020

Lane Group	Ø3
Detector Phase	
Switch Phase	
Minimum Initial (s)	2.0
Minimum Split (s)	5.0
Total Split (s)	5.0
Total Split (%)	6%
Maximum Green (s)	3.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

4: US 7 Shelburne St & Home Ave/Farrell St

06/03/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	25	155	30	20	25	175	1295	15	40	935	15
Future Volume (vph)	35	25	155	30	20	25	175	1295	15	40	935	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.92		1.00	1.00		1.00	1.00	
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1810	1583	1770	1709		1770	3533		1770	3531	
Flt Permitted		0.79	1.00	0.71	1.00		0.25	1.00		0.95	1.00	
Satd. Flow (perm)		1479	1583	1331	1709		472	3533		1770	3531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	27	168	33	22	27	190	1408	16	43	1016	16
RTOR Reduction (vph)	0	0	150	0	24	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	65	18	33	25	0	190	1423	0	43	1031	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4			2					
Actuated Green, G (s)		9.4	9.4	9.4	9.4		62.3	62.3		5.3	48.0	
Effective Green, g (s)		9.4	9.4	9.4	9.4		62.3	62.3		5.3	48.0	
Actuated g/C Ratio		0.10	0.10	0.10	0.10		0.69	0.69		0.06	0.53	
Clearance Time (s)		4.0	4.0	4.0	4.0		5.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		154	165	139	178		594	2445		104	1883	
v/s Ratio Prot					0.01		0.07	c0.40		0.02	c0.29	
v/s Ratio Perm		c0.04	0.01	0.02			0.16					
v/c Ratio		0.42	0.11	0.24	0.14		0.32	0.58		0.41	0.55	
Uniform Delay, d1		37.8	36.5	37.0	36.6		8.7	7.1		40.9	13.8	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.9	0.3	0.9	0.4		0.3	1.0		2.7	1.2	
Delay (s)		39.6	36.8	37.9	37.0		9.1	8.2		43.5	15.0	
Level of Service		D	D	D	D		A	A		D	B	
Approach Delay (s)		37.6			37.4			8.3			16.1	
Approach LOS		D			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			14.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			60.4%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

06/03/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Lane Configurations							
Traffic Volume (vph)	155	385	0	2386	2029	0	
Future Volume (vph)	155	385	0	2386	2029	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	1.00	
Frt	0.933	0.850					
Flt Protected	0.973						
Satd. Flow (prot)	1691	1504	0	3539	3539	0	
Flt Permitted	0.973						
Satd. Flow (perm)	1691	1504	0	3539	3539	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	26	249					
Link Speed (mph)	30			30	30		
Link Distance (ft)	338			385	246		
Travel Time (s)	7.7			8.8	5.6		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	168	418	0	2593	2205	0	
Shared Lane Traffic (%)		32%					
Lane Group Flow (vph)	302	284	0	2593	2205	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	12			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15	9	15			9	
Number of Detectors	1	1		2	2		
Detector Template	Left	Right		Thru	Thru		
Leading Detector (ft)	20	20		100	100		
Trailing Detector (ft)	0	0		0	0		
Detector 1 Position(ft)	0	0		0	0		
Detector 1 Size(ft)	20	20		6	6		
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		
Detector 1 Channel							
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		
Detector 2 Position(ft)				94	94		
Detector 2 Size(ft)				6	6		
Detector 2 Type				Cl+Ex	Cl+Ex		
Detector 2 Channel							
Detector 2 Extend (s)				0.0	0.0		
Turn Type	Prot	Prot		NA	NA		
Protected Phases	4	4		2	2		3
Permitted Phases							
Detector Phase	4	4		2	2		
Switch Phase							
Minimum Initial (s)	5.0	5.0		5.0	5.0		1.0

Lanes, Volumes, Timings

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

06/03/2020



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø3
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0
Total Split (s)	24.0	24.0		82.0	82.0		24.0
Total Split (%)	18.5%	18.5%		63.1%	63.1%		18%
Maximum Green (s)	18.0	18.0		76.0	76.0		22.0
Yellow Time (s)	4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		
Total Lost Time (s)	6.0	6.0		6.0	6.0		
Lead/Lag	Lead	Lead					Lag
Lead-Lag Optimize?	Yes	Yes					Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		0.2
Recall Mode	None	None		C-Max	C-Max		None
Walk Time (s)	0.0	0.0		0.0	0.0		5.0
Flash Dont Walk (s)	0.0	0.0		17.0	17.0		17.0
Pedestrian Calls (#/hr)	0	0		0	0		0
Act Effect Green (s)	18.0	18.0		100.0	100.0		
Actuated g/C Ratio	0.14	0.14		0.77	0.77		
v/c Ratio	1.18	0.67		0.95	0.81		
Control Delay	157.5	18.3		23.0	12.3		
Queue Delay	0.0	0.0		0.0	46.1		
Total Delay	157.5	18.3		23.0	58.5		
LOS	F	B		C	E		
Approach Delay	90.0			23.0	58.5		
Approach LOS	F			C	E		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.18

Intersection Signal Delay: 44.8

Intersection LOS: D

Intersection Capacity Utilization 92.4%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

Ø2 (R)	Ø4	Ø3
82 s	24 s	24 s

HCM Signalized Intersection Capacity Analysis

6: US 7 Shelburne St/US 7 Shelburne Rd & Queen City Park Rd

06/03/2020



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	155	385	0	2386	2029	0
Future Volume (vph)	155	385	0	2386	2029	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		0.95	0.95	
Frt	0.93	0.85		1.00	1.00	
Flt Protected	0.97	1.00		1.00	1.00	
Satd. Flow (prot)	1692	1504		3539	3539	
Flt Permitted	0.97	1.00		1.00	1.00	
Satd. Flow (perm)	1692	1504		3539	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	168	418	0	2593	2205	0
RTOR Reduction (vph)	22	215	0	0	0	0
Lane Group Flow (vph)	280	69	0	2593	2205	0
Turn Type	Prot	Prot		NA	NA	
Protected Phases	4	4		2	2	
Permitted Phases						
Actuated Green, G (s)	18.0	18.0		100.0	100.0	
Effective Green, g (s)	18.0	18.0		100.0	100.0	
Actuated g/C Ratio	0.14	0.14		0.77	0.77	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	234	208		2722	2722	
v/s Ratio Prot	c0.17	0.05		c0.73	0.62	
v/s Ratio Perm						
v/c Ratio	1.19	0.33		0.95	0.81	
Uniform Delay, d1	56.0	50.6		13.0	9.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	121.7	0.3		9.3	2.7	
Delay (s)	177.7	50.9		22.2	11.9	
Level of Service	F	D		C	B	
Approach Delay (s)	116.3			22.2	11.9	
Approach LOS	F			C	B	

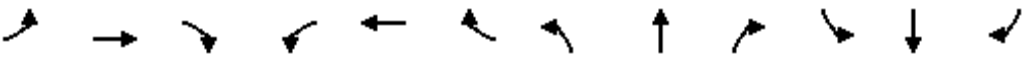
Intersection Summary

HCM 2000 Control Delay	28.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
7: Champlain Pkwy & Home Ave

06/03/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	20	130	95	50	5	105	395	85	5	965	55
Future Volume (vph)	80	20	130	95	50	5	105	395	85	5	965	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		75	0		0	125		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.996			0.974			0.992	
Flt Protected		0.962			0.969		0.950			0.950		
Satd. Flow (prot)	0	1792	1583	0	1798	0	1770	1814	0	1770	1848	0
Flt Permitted		0.679			0.643		0.950			0.950		
Satd. Flow (perm)	0	1265	1583	0	1193	0	1770	1814	0	1770	1848	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			141		1			11			3	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		335			128			357			349	
Travel Time (s)		7.6			2.9			8.1			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	22	141	103	54	5	114	429	92	5	1049	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	109	141	0	162	0	114	521	0	5	1109	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

06/03/2020

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9
Permitted Phases	

Lanes, Volumes, Timings

7: Champlain Pkwy & Home Ave

06/03/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4	8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	15.0		5.0	15.0	
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0		11.0	20.0		11.0	20.5	
Total Split (s)	24.0	24.0	24.0	24.0	24.0		14.0	87.0		14.0	87.0	
Total Split (%)	16.0%	16.0%	16.0%	16.0%	16.0%		9.3%	58.0%		9.3%	58.0%	
Maximum Green (s)	19.0	19.0	19.0	19.0	19.0		9.0	82.0		9.0	82.0	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	Max		None	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		19.1	19.1		19.1		9.0	94.4		6.0	82.4	
Actuated g/C Ratio		0.15	0.15		0.15		0.07	0.73		0.05	0.63	
v/c Ratio		0.59	0.40		0.92		0.93	0.39		0.06	0.95	
Control Delay		67.1	12.0		104.6		123.9	10.0		64.8	39.2	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		67.1	12.0		104.6		123.9	10.0		64.8	39.2	
LOS		E	B		F		F	A		E	D	
Approach Delay		36.0			104.6			30.4			39.3	
Approach LOS		D			F			C			D	

Intersection Summary

Area Type: Other

Cycle Length: 150

Actuated Cycle Length: 130

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 41.2

Intersection LOS: D

Intersection Capacity Utilization 87.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 7: Champlain Pkwy & Home Ave

 Ø1	 Ø2	 Ø4	 Ø9
14 s	87 s	24 s	25 s
 Ø5	 Ø6	 Ø8	
14 s	87 s	24 s	

Lane Group	Ø9
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	17%
Maximum Green (s)	22.0
Yellow Time (s)	3.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	5
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

7: Champlain Pkwy & Home Ave

06/03/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↱		↰	↱	
Traffic Volume (vph)	80	20	130	95	50	5	105	395	85	5	965	55
Future Volume (vph)	80	20	130	95	50	5	105	395	85	5	965	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00		1.00	0.97		1.00	0.99	
Flt Protected		0.96	1.00		0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1791	1583		1798		1770	1813		1770	1848	
Flt Permitted		0.68	1.00		0.64		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1265	1583		1193		1770	1813		1770	1848	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	22	141	103	54	5	114	429	92	5	1049	60
RTOR Reduction (vph)	0	0	121	0	1	0	0	3	0	0	1	0
Lane Group Flow (vph)	0	109	20	0	161	0	114	518	0	5	1108	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		19.1	19.1		19.1		9.0	94.4		1.2	86.6	
Effective Green, g (s)		19.1	19.1		19.1		9.0	94.4		1.2	86.6	
Actuated g/C Ratio		0.14	0.14		0.14		0.07	0.69		0.01	0.63	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		177	221		166		116	1253		15	1172	
v/s Ratio Prot							c0.06	0.29		0.00	c0.60	
v/s Ratio Perm		0.09	0.01		c0.14							
v/c Ratio		0.62	0.09		0.97		0.98	0.41		0.33	0.95	
Uniform Delay, d1		55.2	51.1		58.4		63.7	9.1		67.3	22.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.2	0.2		60.9		77.7	1.0		12.7	16.1	
Delay (s)		61.5	51.3		119.3		141.4	10.1		79.9	38.9	
Level of Service		E	D		F		F	B		E	D	
Approach Delay (s)		55.7			119.3			33.7			39.0	
Approach LOS		E			F			C			D	
Intersection Summary												
HCM 2000 Control Delay			45.4									
HCM 2000 Level of Service											D	
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			136.5								18.0	
Intersection Capacity Utilization			87.3%								E	
ICU Level of Service												
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

06/03/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1455	135	0	0	795	0	0	1430	5
Future Volume (vph)	0	0	0	1455	135	0	0	795	0	0	1430	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	0.91
Frnt												
Flt Protected				0.950	0.960							
Satd. Flow (prot)	0	0	0	1681	1699	0	0	3539	0	0	5085	0
Flt Permitted				0.950	0.960							
Satd. Flow (perm)	0	0	0	1681	1699	0	0	3539	0	0	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											1	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		132			144			732			140	
Travel Time (s)		3.0			3.3			16.6			3.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1582	147	0	0	864	0	0	1554	5
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	0	0	854	875	0	0	864	0	0	1559	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2			2			2	
Detector Template				Left	Thru			Thru			Thru	
Leading Detector (ft)				20	100			100			100	
Trailing Detector (ft)				0	0			0			0	
Detector 1 Position(ft)				0	0			0			0	
Detector 1 Size(ft)				20	6			6			6	
Detector 1 Type				Cl+Ex	Cl+Ex			Cl+Ex			Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0			0.0			0.0	
Detector 1 Queue (s)				0.0	0.0			0.0			0.0	
Detector 1 Delay (s)				0.0	0.0			0.0			0.0	
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Detector Phase				4	4			2			2	
Switch Phase												
Minimum Initial (s)				15.0	15.0			30.0			30.0	

Lanes, Volumes, Timings

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

06/03/2020

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)				24.0	24.0			35.0			35.0	
Total Split (s)				55.0	55.0			35.0			35.0	
Total Split (%)				61.1%	61.1%			38.9%			38.9%	
Maximum Green (s)				49.0	49.0			30.0			30.0	
Yellow Time (s)				4.0	4.0			4.0			4.0	
All-Red Time (s)				2.0	2.0			1.0			1.0	
Lost Time Adjust (s)				0.0	0.0			0.0			0.0	
Total Lost Time (s)				6.0	6.0			5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Recall Mode				None	None			C-Max			C-Max	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								11.0			11.0	
Pedestrian Calls (#/hr)								0			0	
Act Effect Green (s)				48.9	48.9			30.1			30.1	
Actuated g/C Ratio				0.54	0.54			0.33			0.33	
v/c Ratio				0.94	0.95			0.73			0.92	
Control Delay				38.6	40.6			30.7			38.6	
Queue Delay				0.0	0.0			0.0			0.0	
Total Delay				38.6	40.6			30.7			38.6	
LOS				D	D			C			D	
Approach Delay					39.6			30.7			38.6	
Approach LOS					D			C			D	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 37.4

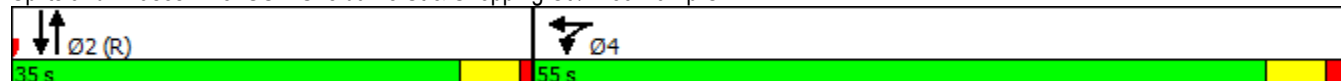
Intersection LOS: D

Intersection Capacity Utilization 80.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C



HCM Signalized Intersection Capacity Analysis

8: US 7 Shelburne St & Shopping Ctr/I-189 Ramp C

06/03/2020

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	1455	135	0	0	795	0	0	1430	5
Future Volume (vph)	0	0	0	1455	135	0	0	795	0	0	1430	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				6.0	6.0			5.0			5.0	
Lane Util. Factor				0.95	0.95			0.95			0.91	
Frt				1.00	1.00			1.00			1.00	
Flt Protected				0.95	0.96			1.00			1.00	
Satd. Flow (prot)				1681	1699			3539			5083	
Flt Permitted				0.95	0.96			1.00			1.00	
Satd. Flow (perm)				1681	1699			3539			5083	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1582	147	0	0	864	0	0	1554	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	0	0	854	875	0	0	864	0	0	1558	0
Turn Type				Split	NA			NA			NA	
Protected Phases				4	4			2			2	
Permitted Phases												
Actuated Green, G (s)				48.9	48.9			30.1			30.1	
Effective Green, g (s)				48.9	48.9			30.1			30.1	
Actuated g/C Ratio				0.54	0.54			0.33			0.33	
Clearance Time (s)				6.0	6.0			5.0			5.0	
Vehicle Extension (s)				3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)				913	923			1183			1699	
v/s Ratio Prot				0.51	c0.52			0.24			c0.31	
v/s Ratio Perm												
v/c Ratio				0.94	0.95			0.73			0.92	
Uniform Delay, d1				19.1	19.4			26.4			28.8	
Progression Factor				1.00	1.00			1.00			1.00	
Incremental Delay, d2				16.3	18.1			4.0			9.4	
Delay (s)				35.3	37.5			30.4			38.1	
Level of Service				D	D			C			D	
Approach Delay (s)		0.0			36.4			30.4			38.1	
Approach LOS		A			D			C			D	
Intersection Summary												
HCM 2000 Control Delay			35.8			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)			11.0			
Intersection Capacity Utilization			80.8%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

SIGNALIZED INTERSECTION CAPACITY ANALYSES SUMMARY

Intersection Movement	Champlain Parkway No Build						Champlain Parkway Build					
	Burton No Build			Burton Build			Burton No Build			Burton Build		
	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **
2008												
US 7 / Home Ave												
AM Peak Hour	0.62	14.5	B	0.62	14.5	B	0.47	11.9	B	0.47	11.9	B
PM Peak Hour	0.73	19.7	B	0.83	22.0	C	0.59	14.0	B	0.59	14.0	B
US 7 / Queen City Park (north)												
AM Peak Hour	0.59	7.0	A	0.59	7.1	A	0.65	14.2	B	0.65	14.2	B
PM Peak Hour	0.88	20.0	C	0.91	23.1	C	0.87	20.6	C	0.89	22.3	C
Champlain Parkway / Home Ave												
AM Peak Hour							0.68	25.3	C	0.68	25.4	C
PM Peak Hour							0.89	38.8	D	0.98	57.5	E
I-189 Ramp C / US 7												
AM Peak Hour	0.83	28.6	C	0.84	28.6	C	0.75	25.6	C	0.75	25.6	C
PM Peak Hour	1.03	76.2	E	1.04	80.1	F	0.89	30.8	C	0.88	31.0	C
2028												
US 7 / Home Ave												
AM Peak Hour	0.72	16.5	B	0.72	16.5	B	0.47	12.4	B	0.47	12.4	B
PM Peak Hour	0.80	21.6	C	0.92	25.9	C	0.59	14.1	B	0.59	14.2	B
US 7 / Queen City Park (north)												
AM Peak Hour	0.62	7.5	A	0.62	7.5	A	0.69	15.0	B	0.69	15.0	B
PM Peak Hour	1.03	30.8	C	1.05	35.0	C	1.01	28.2	C	1.02	30.6	C
Champlain Parkway / Home Ave												
AM Peak Hour							0.74	28.9	C	0.74	29.0	C
PM Peak Hour							0.92	45.4	D	1.01	64.4	E
I-189 Ramp C / US 7												
AM Peak Hour	0.84	29.2	C	0.84	29.3	C	0.77	25.8	C	0.77	25.8	C
PM Peak Hour	1.10	99.2	F	1.11	101.4	F	0.94	35.8	D	0.94	36.9	D

* Volume to capacity ratio

* Delay expressed in seconds per vehicle

** Level of Service

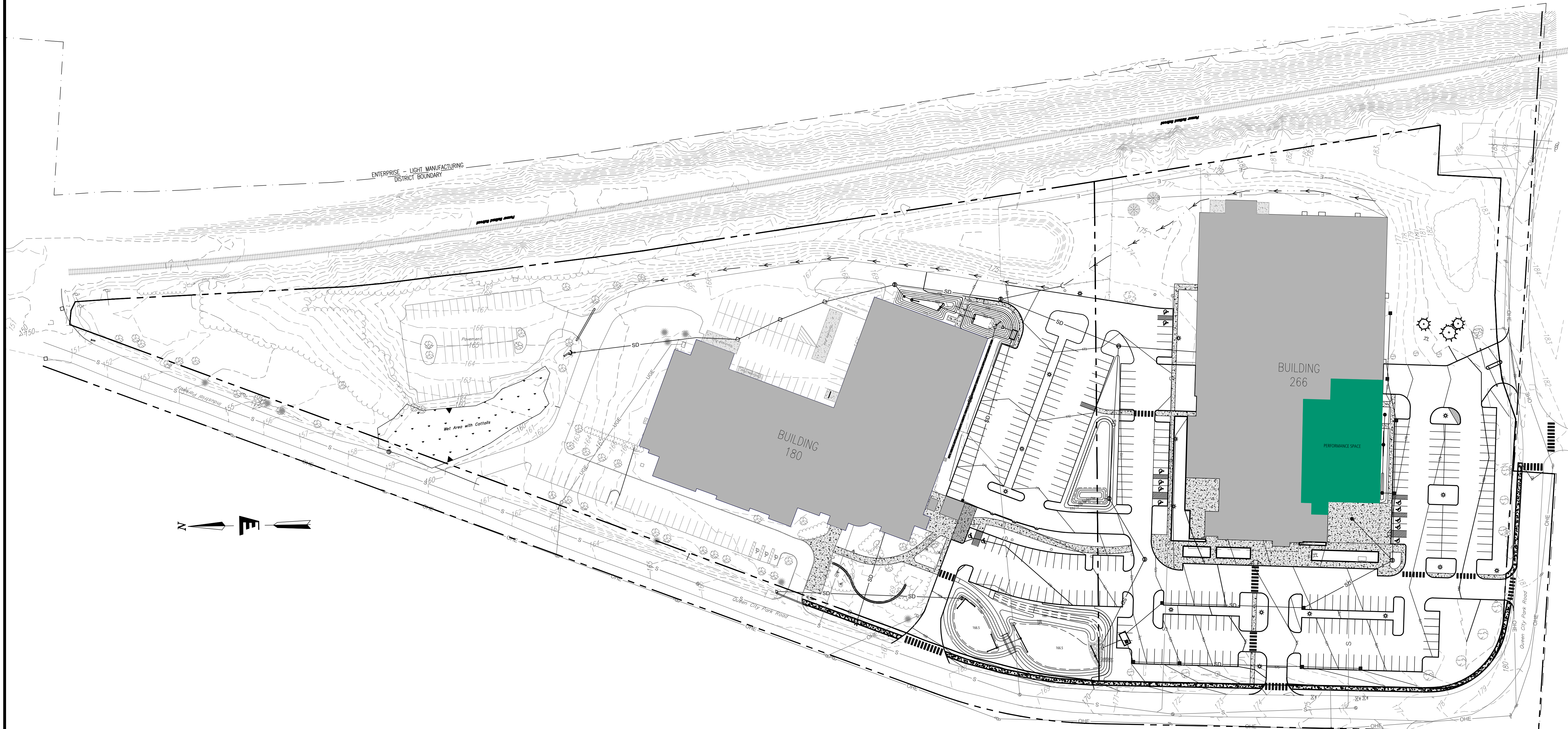
UNSIGNALIZED INTERSECTION CAPACITY ANALYSES SUMMARY

Intersection Movement		Champlain Parkway No Build						Champlain Parkway Build					
		Burton No Build			Burton Build			Burton No Build			Burton Build		
		v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **
		2008											
AM	Queen City Park / Home Ave / Austin Dr												
	WB from Home Ave	0.09	5.2	A	0.09	5.2	A	0.09	5.2	A	0.09	5.2	A
	NB from Queen City Park Rd	0.08	10.6	B	0.08	10.6	B	0.08	10.6	B	0.08	10.6	B
	Pine St / Home Ave												
	EB from Home Ave	0.59	22.5	C	0.58	21.8	C	0.18	8.7	A	0.18	8.7	A
	WB from Home Ave	0.93	52.7	F	0.92	50.0	E	0.15	7.9	A	0.15	7.9	A
	NB from Pine St	0.49	19.3	C	0.48	18.8	C	0.10	8.2	A	0.10	8.2	A
	SB from Pine St	1.01	70.3	F	1.01	71.2	F	0.20	8.9	A	0.20	8.9	A
PM	US 7 / Queen City Park (north)												
	NB left onto Queen City Park Rd	0.08	15.8	C	0.08	15.9	C	0.08	15.8	C	0.08	15.9	C
	Queen City Park / Home Ave / Austin Dr												
	WB from Home Ave	0.03	1.7	A	0.11	4.4	A	0.03	1.7	A	0.11	4.5	A
	NB from Queen City Park Rd	0.14	10.5	B	0.21	12.2	B	0.14	10.5	B	0.21	12.2	B
	Pine St / Home Ave												
	EB from Home Ave	0.62	22.8	C	0.73	30.7	D	0.11	8.3	A	0.11	8.3	A
	WB from Home Ave	0.76	29.7	D	1.00	69.7	F	0.25	8.8	A	0.27	9.0	A
	NB from Pine St	0.51	18.8	C	0.57	22.8	C	0.06	7.9	A	0.06	8.0	A
	SB from Pine St	1.47	241.8	F	1.69	341.9	F	0.24	9.3	A	0.25	9.4	A
	US 7 / Queen City Park (north)												
	NB left onto Queen City Park Rd	0.02	16.4	C	0.12	18.2	C	0.02	16.4	C	0.12	18.2	C
Intersection Movement		Champlain Parkway No Build						Champlain Parkway Build					
		Burton No Build			Burton Build			Burton No Build			Burton Build		
		v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **	v/c ⁺	Delay*	LOS **
		2028											
AM	Queen City Park / Home Ave / Austin Dr												
	WB left from Home Ave	0.11	5.4	A	0.12	5.4	A	0.11	5.4	A	0.12	5.4	A
	NB from Queen City Park Rd	0.09	11.0	B	0.09	11.0	B	0.09	11.0	B	0.09	11.0	B
	Pine St / Home Ave												
	EB from Home Ave	0.69	28.0	D	0.69	28.1	D	0.20	8.9	A	0.20	8.9	A
	WB from Home Ave	1.06	84.6	F	1.06	86.2	F	0.16	8.1	A	0.16	8.1	A
	NB from Pine St	0.55	22.0	C	0.55	22.1	C	0.10	8.2	A	0.10	8.2	A
	SB from Pine St	1.20	135.5	F	1.20	135.9	F	0.22	9.2	A	0.22	9.2	A
PM	US 7 / Queen City Park (north)												
	NB left onto Queen City Park Rd	0.09	17.2	C	0.09	17.2	C	0.09	17.2	C	0.09	17.2	C
	Queen City Park / Home Ave / Austin Dr												
	WB left from Home Ave	0.03	1.7	A	0.12	4.3	A	0.03	1.7	A	0.12	4.3	A
	NB from Queen City Park Rd	0.16	10.9	B	0.24	12.9	B	0.16	10.9	B	0.24	12.9	B
	Pine St / Home Ave												
	EB from Home Ave	0.76	33.5	D	0.84	43.0	E	0.12	8.4	A	0.12	8.4	A
	WB from Home Ave	0.91	50.8	F	1.16	120.3	F	0.27	9.0	A	0.29	9.2	A
	NB from Pine St	0.59	23.5	C	0.62	26.0	D	0.06	8.0	A	0.06	8.1	A
	SB from Pine St	1.74	361.2	F	1.85	410.2	F	0.26	9.6	A	0.27	9.6	A
	US 7 / Queen City Park (north)												
	NB left onto Queen City Park Rd	0.02	22.6	C	0.18	26.6	D	0.02	22.6	C	0.18	26.6	D

* Volume to capacity ratio

* Delay expressed in seconds per vehicle

** Level of Service



Existing Coverage	
180 Queen City Park (North)	
Lot Area	375,252 ft ²
Buildings	68,356 ft ²
Sidewalks	6,889 ft ²
Roads and Parking	122,472 ft ²
Total Lot Coverage	52.7%
Parking Count	236

Proposed Coverage	
180 Queen City Park (North)	
Lot Area	375,252 ft ²
Buildings	68,356 ft ²
Sidewalks	7,052 ft ²
Roads and Parking	110,359 ft ²
Total Lot Coverage	49.5%
Parking Count	244

Zoning District	
Enterprise - Light Manufacturing	
Setbacks	
Front	5 ft
Side	0 ft
Rear	10 %
Max Coverage	
80 %	

Existing Parking Total	416
Proposed Parking Total	416

Total Existing Impervious Area	378,909 ft ²
Total Proposed Impervious Area	377,213 ft ²
Net Change	-1,696 ft ²

PROPOSED CONDITIONS PLAN

Client: **Burton Snowboards**
180 Queen City Park Road
Burlington, Vermont

Project Title: **PARKING LOT AND STORMWATER IMPROVEMENTS**
Burlington, Vermont

Designed By: PB
Checked By: PB
Drawn By: TLB
Scale: As Noted
Date: Nov 4, 2019

C0.3

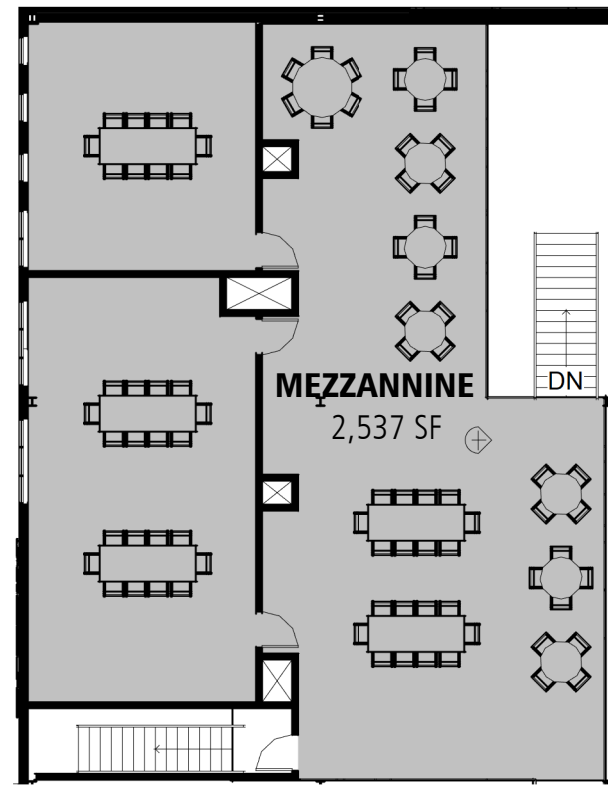
EV#18174

ENGINEERING VENTURES PC
208 Flynn Avenue, Suite 2A Burlington, VT 05401
tel. 802.683.6225 • fax 802.683.6306
85 Mechanic Street, Suite 350A, Lebanon, NH 03766
tel. 603.442.9333 • fax 603.442.9331
www.engineeringventures.com

Rev. No.	Description	Chkd.
1	REVISIONS TO PROPOSED PARKING LAYOUT	PB
2	SIGHT LINES, REVISED WEST AND SOUTH ENTRANCES	PB
3	REVISED SOUTHEAST ENTRANCE AND COVERAGE TABLE 1-3-2020	PB
4	REVISED COVERAGE TABLE 1-31-2020	PB
5	HIGHLIGHTED EVENT SPACE 2-11-2020	PB

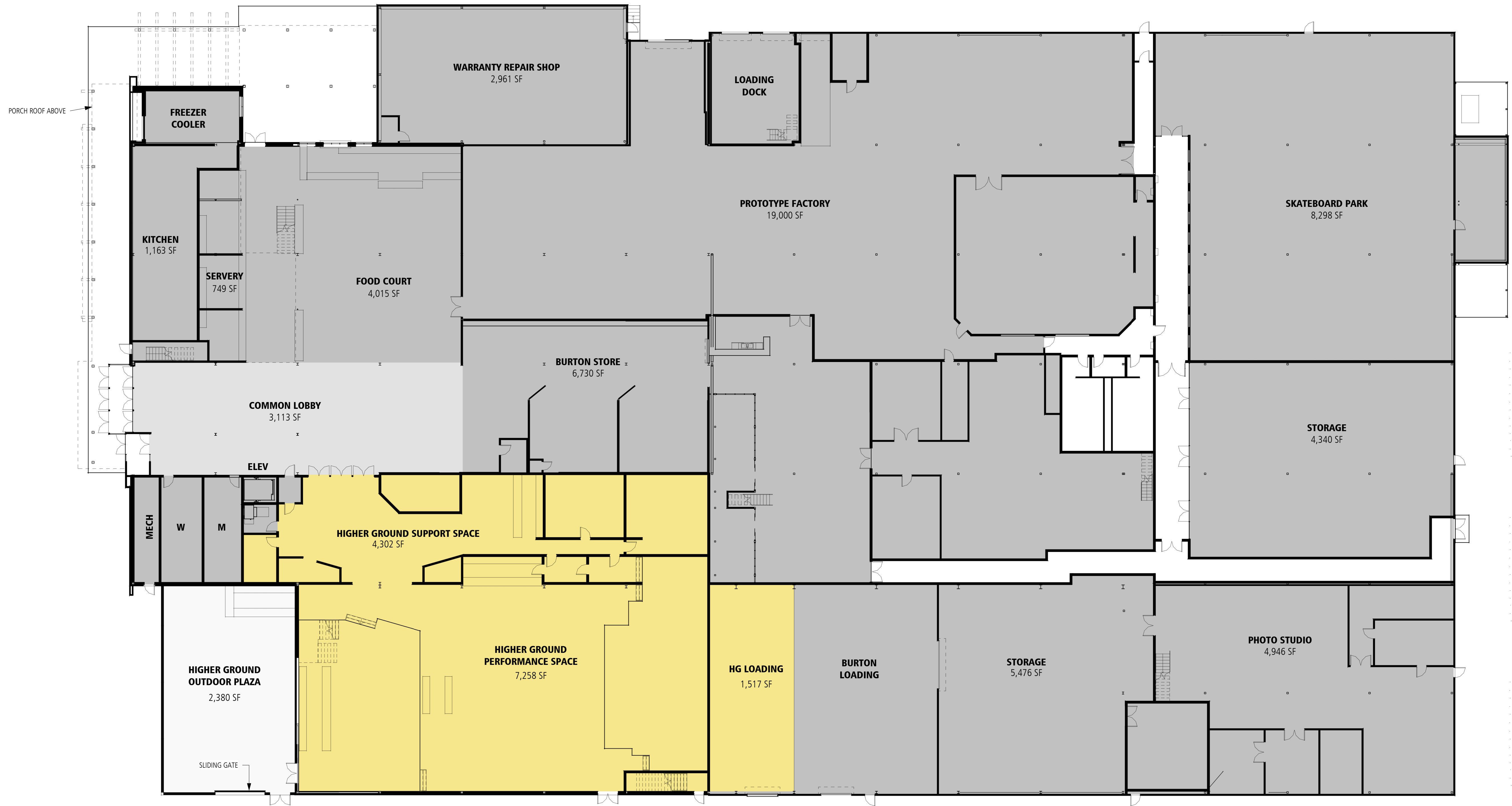
Stamp





2 MEZZANINE
1/16" = 1'-0"

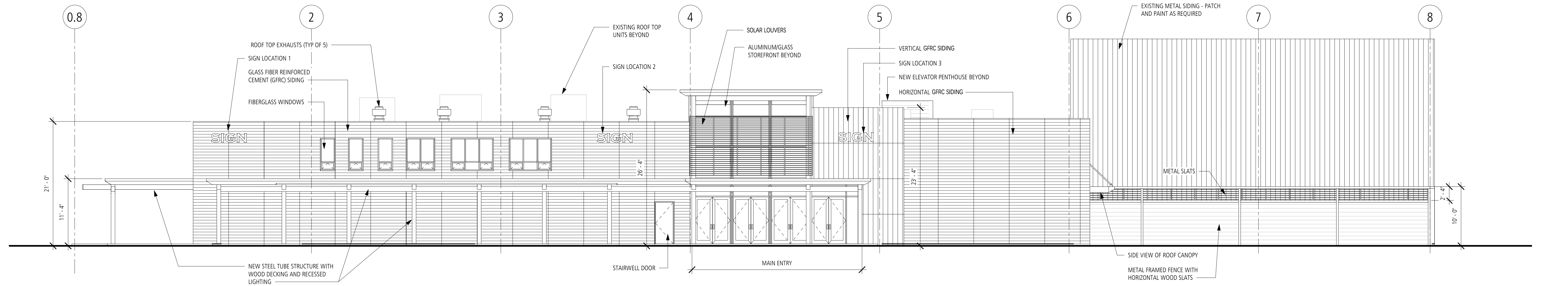
A-102 1



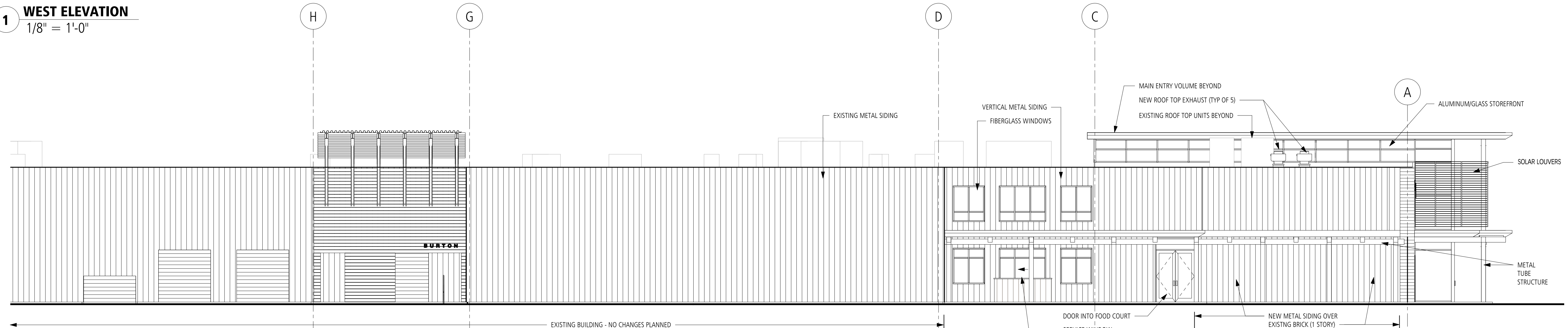
1 FIRST FLOOR PLAN
1/16" = 1'-0"

HIGHER GROUND AREA - 11,560 SF (13.6%)
TOTAL BUILDING AREA - 85,036 SF (100.0%)

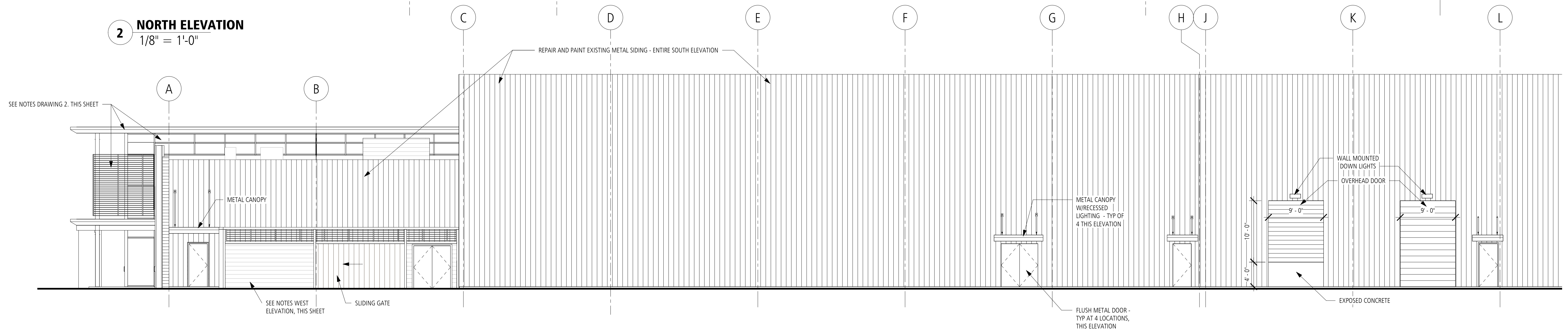
3
A-102



1 WEST ELEVATION
1/8" = 1'-0"



2 NORTH ELEVATION
1/8" = 1'-0"



3 SOUTH ELEVATION
1/8" = 1'-0"



RENDERINGS COURTESY OF WAGNER HODGSON ASSOCIATES



FACADE SLATS MADE OF GLASSFIBRE REINFORCED CONCRETE

öko skin

With öko skin, Rieder offers concrete facades in a slatted design. The various surfaces create a lively interplay of colour. The slats can be mounted with little effort and are, unlike wood, maintenance free.

▼ SIZES ▼ COLOURS AND SURFACES ▼ ÖKO SKIN STRIPES

▼ ÖKO SKIN HIDDEN FIX

GLASS FIBER REINFORCED CONCRETE (GFRC) PLANK SIDING

Louver Materials & Finishes

SHADOTIMBER

Shadotimber are fixed or operable exterior solar shading louver systems that incorporate a unique, alternate solar shading solution. It consists of timber wood louvers, usually western red cedar which, if left untreated, ages to a silvery-grey tone. The louvers can be installed either horizontally or vertically on the building's façade.

Alternatively, a simulated wood appearance can be provided on shadometal louvers through a dye-sublimation process which will remain colorfast at the original appearance.

This type of system is generally intended for shorter spans without the need for additional supporting framework.

Features and benefits

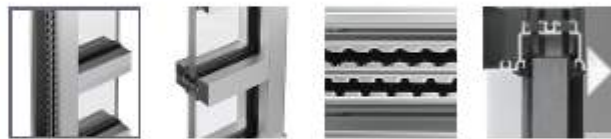
- Although normally western red cedar, other types of timber wood can be provided.
- Ideal for shorter spans and thinner louvers.
- All principal support components are manufactured from corrosion-resistant extruded aluminum alloy with stainless steel fixings.
- Fully operable or fixed.



SOLAR LOUVERS

Products ▶ Trifab™ 451UT Framing System

ADDITIONAL PRODUCT INFO
OVERVIEW
PROJECT REPORTS
CAD & SPEC DOWNLOAD
ORDER LITERATURE
BLAST RESISTANT INFORMATION
KAWNEER FINISHES
DOCUMENTS
LITERATURE
MY PRODUCTS [Empty](#) / [View All](#) ▶



Product Features

Trifab 451UT (Ultra Thermal) Framing System provides improved thermal performance to increase energy efficiency by employing a "dual" Isoloc(MC) thermal break.

Key Features Include:

- Trifab 451UT is 4-1/2" deep with a 2" sightline
- Center Plane glass application
- Flush glazed from either the inside or outside
- Screw Spline fabrication
- Dual Isoloc™ lanced and debridged thermal break
- Infill options up to 1-1/8" thickness
- Permanodic™ anodized finishes in 7 choices
- Painted finishes in standard and custom choices

Optional Features:

- High performance flashing
- Acoustical rating per AAMA 1901 and ASTM E 1425
- Project specific U-factors (See thermal charts in Architectural Detail Manual)

Product Applications:

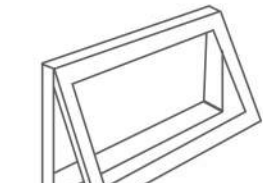
- Storefront, Ribbon Window or Punched Openings
- Single-span
- Integrated entrance framing allowing Kawneer standard entrances or other specialty entrances to be incorporated
- Kawneer windows or GLASSvent™ are easily incorporated

ALUMINUM STOREFRONT

Awning, Casement

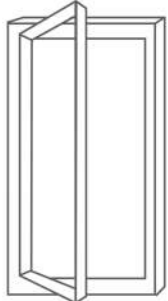
ADC 325 Series Standard Features

- Sealant: Low VOC (environmentally friendly).
- Standard 3 1/4" closed-back insulated frame. Standard insulated close-back sash.
- Available in standard white, custom, split-finish, and/or veneer wrap (oak, fir, others).
- Standard rotogear operators with standard collapsible handles.
- Standard multi-point locks where applicable (19" nominal height).
- Standard concealed hinges – tamper resistant for added security.
- Sash unlooks for interior service if necessary.
- Paint & Finish: Advanced polyurethane baked on or electrostatically applied finish.
- Frame & Sash: Pultruded 0.090" nominal wall fiberglass (52-62% glass fibers + 35-45% resin + 7-13% filler).
- Insect Screen: Standard full screen. Removable stamped aluminum frame with black fiberglass mesh.
- Insulation: Expanded Poly Styrene (EPS) Type 1.
- Weatherseal: Santoprene Rubber Seals (main, secondary, spline), glazing tape, dust.
- Frame and corners are mechanically secured and joined at 45 angle.
- Exterior glazed window with aluminum stops.
- Please contact an Accurate Dorwin Window representative for sizing options.



Awning

Projected window hinged at the top is the only window style that keeps the rain out while allowing fresh air in.

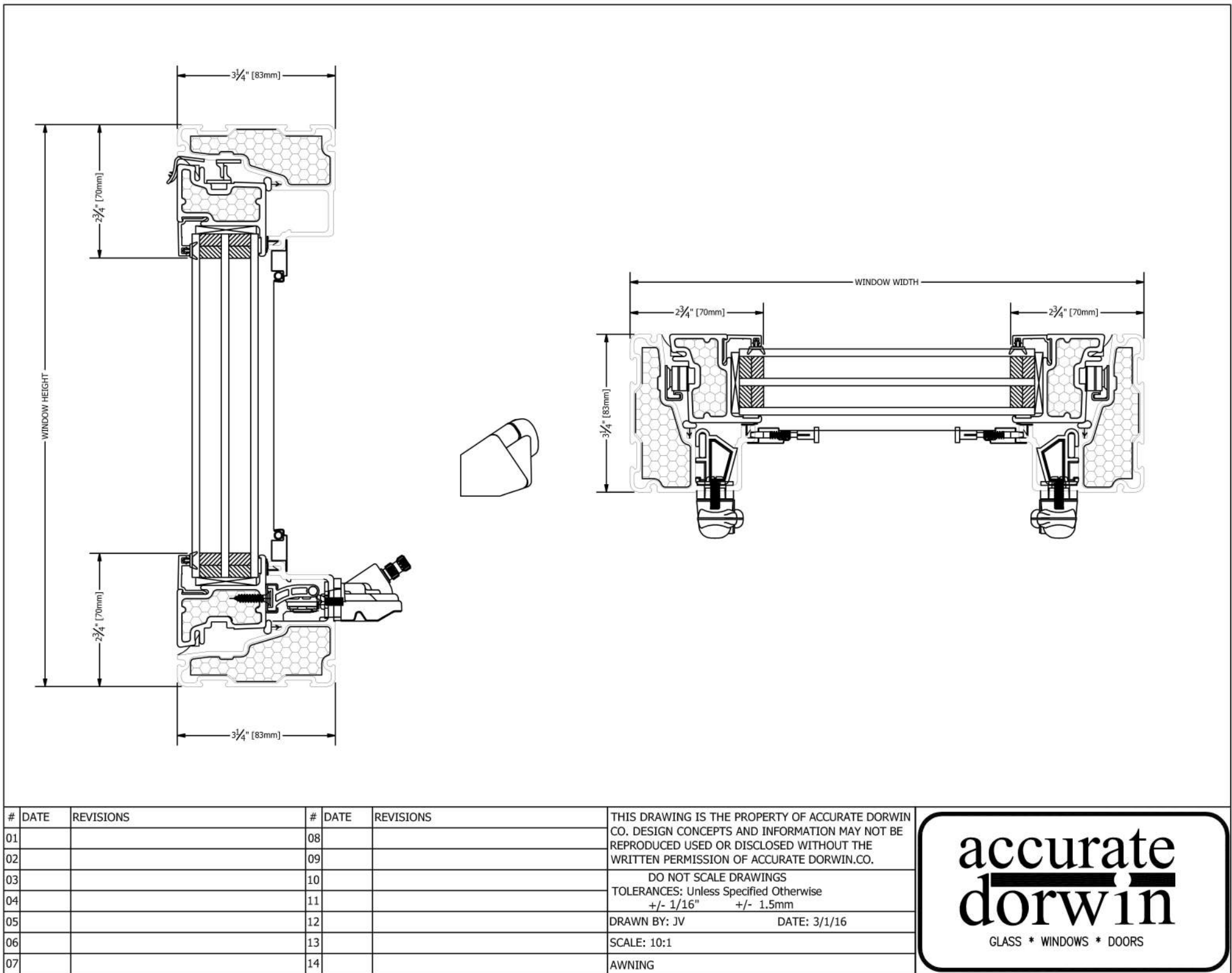


Casement

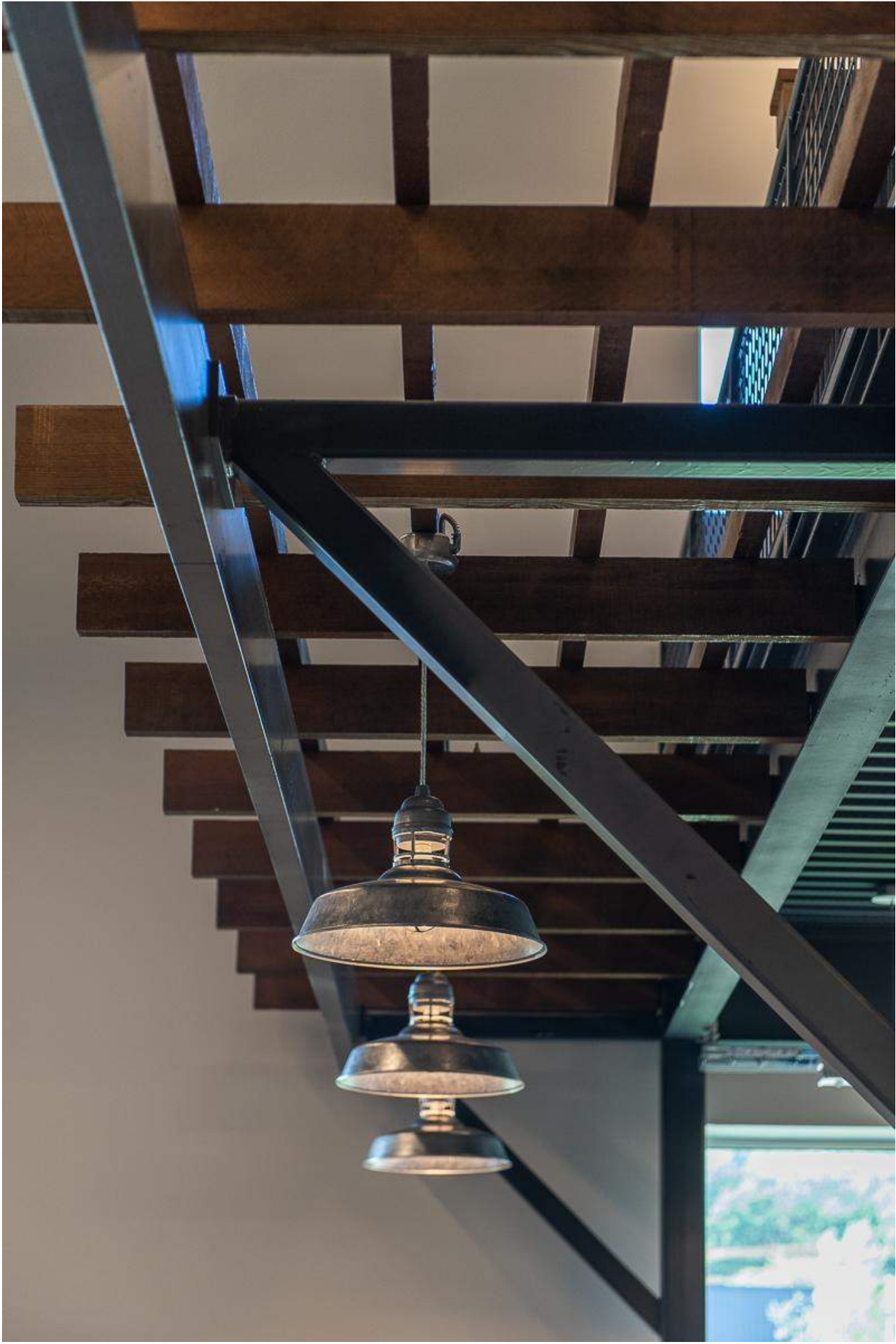
Projected window hinged at the jamb (opening up to 90 degrees) which provides the most optimal air ventilation.

10

www.accuratedorwin.com | 1.888.862.4442



FIBERGLASS WINDOWS



METAL STRUCTURE WITH WOOD SLATS

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Restricted Delivery Fee (Endorsement Required)		
Total Postage & Fees	\$	

Sent To Luke Duruis
 Street & Apt. No.,
 or PO Box No. 1104 NORTH WILLARD ST
 City, State, ZIP+4 BTV 05401

See Reverse for Instructions
 PS Form 3800, July 2014

ZONING DENIAL
 City of Burlington, Vermont
 Department of Permitting and Inspections
 5 Pine Street Burlington, Vermont 05401

Appeal Period Expiration Date: May 21

District

Tax ID: 045-1-09

Project Type: Residential - Site Imp/Landscaping/Parking/Fence

Project Description: Install fence and related gates.

Construction Cost: \$1,500

Lot Size (Sq Ft): 8,052

Net New Habitable Sq Ft:

Net New Number of Residential
Units:

Existing % Lot Coverage:

Existing Number of Parking Spaces:

Proposed % Lot Coverage:

Proposed Number of Parking
Spaces:

Net New % Lot Coverage:

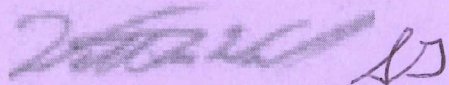
Required Number of Parking Spaces:

Zoning #: 21-275

Decision By: Administrative

Level of Review: FC

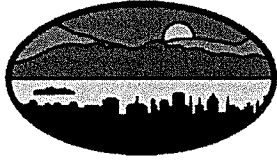
Decision: DENIED


 Zoning Administrative Officer

Decision Date: May 6, 2021

An Administrative decision may be appealed by an interested person within 15 days from the Decision.
 Please contact the Zoning Division for more information.

Balance Due: \$0



City of
Burlington, Vermont
645 Pine Street

Zoning Application Denial – Reasons for Denial

ZP #: 21-275

Tax ID: 045-1-091-000

Issue Date: May 6, 2021

Decision: Denied

Property Address: 164 North Willard Street

Description: Install fence and related gates.

Reasons for Denial:

1. Per Sec. 2.7.8, *Withhold Permit*, of the Comprehensive Development Ordinance, existence of a continuing zoning violation on the property precludes approval of this zoning application. Specifically, the gravel parking area to the south of the paved driveway was found to be an enforceable zoning violation by the Development Review Board and in related court decisions relative to 15-0797AP and 19-0474DT. Lacking remedy of this continuing zoning violation, the application cannot be approved.



Department of Planning and Zoning

149 Church Street, City Hall

Burlington, VT 05401-8415

Phone: (802) 865-7188

Fax: (802) 865-7195

www.burlingtonvt.gov/pz

Zoning Permit Application

Use this form for ALL zoning permit applications. See the relevant checklist for specific requirements.

PROJECT LOCATION ADDRESS: 164 North Willard

PROPERTY OWNER*: Luke Purvis

*If condominium unit, written approval from the Association is also required

POSTAL ADDRESS: 164 North Willard, #1

CITY, ST, ZIP: Burlington VT 05401

DAY PHONE: 609-235-5792

EMAIL: l.purvis78@yahoo.com

SIGNATURE: Luke Purvis

I am the owner. In addition, I duly authorize the applicant (if noted) to act on my behalf for all matters pertaining to this zoning permit application.

APPLICANT: _____

POSTAL ADDRESS: RECEIVED

CITY, ST, ZIP: MAR 09 2021

DAY PHONE: BURLINGTON PERMITTING & INSPECTIONS

EMAIL: _____

SIGNATURE: _____

Description of Proposed Project: Install fence along northern & eastern boundaries & driveway gate

Existing Use of Property: ☐ Single Family ☒ Multi Family: # 3 Units ☐ Other: _____

Proposed Use of Property: ☐ Single Family ☒ Multi Family: # 3 Units ☐ Other: _____

• **Does your project involve new construction, addition, alteration, renovation, or repair to a structure that is heated or cooled?** Yes ☐ No ☒

(If yes, the Vermont Residential Building Energy Standards (VRBES) apply. Visit the P&Z Office, Public Service Board or PSB website for details.)

• **Will 400 sq ft or more of land be disturbed, exposed and/or developed?** Yes ☐ No ☒

(If yes, you will need to submit the 'Erosion Prevention and Sediment Control Plan' questionnaire, with a site plan)

• **For Single Family & Duplex, will total impervious area be 2500 sq ft or more?** Yes ☐ No ☒

(If yes, you will need to submit the 'Stormwater Management Plan' questionnaire, with a site plan)

• **Are you proposing any work within or above the public right of way?** Yes ☐ No ☒

(If yes, you will need to receive prior approval from the Department of Public Works)

Estimated Construction Cost (value)*: \$ 1500

(*Estimated cost a typical contractor would charge for all materials and labor, regardless of who physically completes the work)

Within 30 days of submission, the permit application will be reviewed for completeness, and, if complete, will be processed administratively or referred to a board for review. All permit approvals or denials are subject to an appeal period (15 days for administrative permit; 30 days for board permit). A building (and/or electrical, mechanical, plumbing, curb cut) permit will also be required. Contact the Department of Public Works at 802-863-9094 to inquire. Please ask for assistance if you have any questions about filling out this form. Call the Planning and Zoning at 802-865-7188, or visit the office in the lower level of City Hall, 149 Church Street.

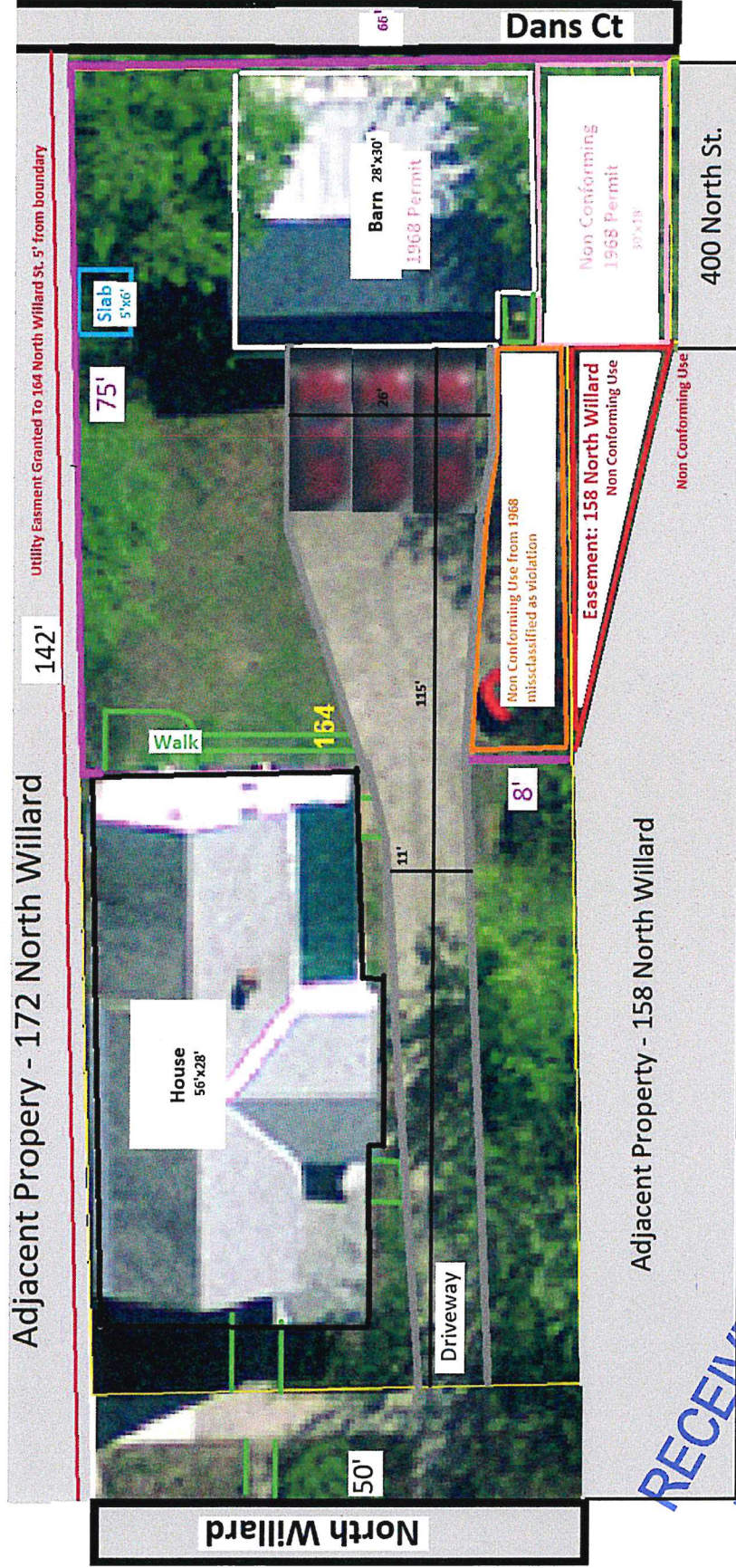
Office Use Only: Zone: RL Eligible for Design Review? Y Age of House 1885 (32) Lot Size 8052

Type: SN ☐ AW ☐ FC ☒ BA ☐ COA 1 ☐ COA 2 ☐ COA 3 ☐ CU ☐ MA ☐ VR ☐ HO ☐ SP ☐ DT ☐ MP ☐

Check No. 792 Amount Paid \$122 Zoning Permit # 21-0749FC

164 North Willard St. - Proposed Fence Project

Site Plan



164 North Willard St.
Burlington VT 05401

Prepared By: Luke Purvis
On: 2/28/2021

Scale: 1cm = 3.4 ft

Proposed
Fence Line

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164 North Willard St. - Proposed Fence Project

Installation Plan and Materials

Install an 8' foot tall horizontal cedar fence on the eastern boundary along Dans Court. Good side will face Dans Ct. The bottom of the fence panel will begin at the curb height of Dans Ct. There will be a gate on the south side of the barn to allow continued access to Dans Court.

- 6"x6" and 4"x6" pressure treated posts
- 1x3, 1x6 Eastern White Cedar for horizontals
- Concrete footings
- Gate – to the south of the barn

Install horizontal cedar fence along the current fence line between 164 and 172 North Willard St. This fence will be good both sides. The Fence will have 8' height where it meets Dans Ct. and taper down to 4' height for most of the run and then increase up to 8' at the house for privacy entering and exiting back doors.

- 4"x4" pressure treated posts, cedar clad
- 1x3 and 1x6 Eastern White Cedar for horizontals
- Compact gravel footings

Install perpendicular fence spur from the 158 North Willard border with horizontal cedar planks, 6' tall, with driveway gate at the easterly line of the main 164 North Willard house to complete a fenced enclosure for 164 North Willard back yard.

- 4"x4" pressure treated posts
- 1x3 and 1x6 Eastern White Cedar for horizontals
- Concrete footings
- Gate to cross driveway

3/7/2021 – 164 North Willard - Fence Plan – No changes to existing uses, structures, boundaries proposed.

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164 North Willard St. - Proposed Fence Project

Materials and Style Representation

The fence shall be constructed of pressure treated posts and eastern white cedar boards with a gap for airflow and focus on privacy. This picture was chosen to show how the fence would taper from full height for privacy on Dan's Ct, to a shorter height for most of the run along the boundary to 172 North Willard.



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164 North Willard St. - Proposed Fence Project

Current View / Proposed View of Dans Ct. - North Side



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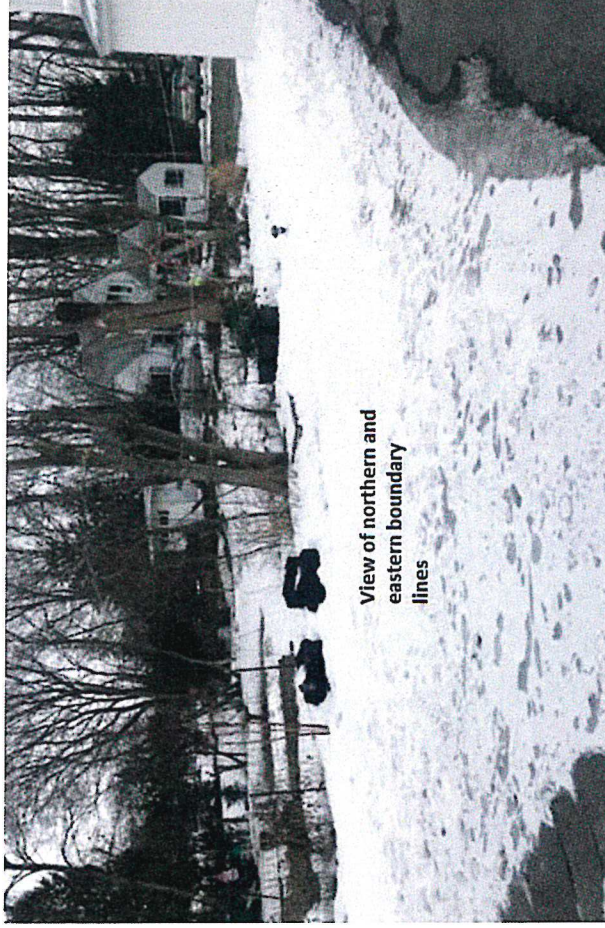


This is a likeness of the fence to show the privacy from the adjacent parking area gained.

164 North Willard St. - Proposed Fence Project

Current Views of Proposed Fence Lines

The Eastern boundary
along Dans Ct - view to
the south



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Along the 172 North Willard (Northern) boundary, the fence will follow the line of the current metal fence and be good both sides.

Along the Dan's court boundary, the fence will be placed close to the wall boundary to replace a fence that had been built into the top of the curb of the Dan's Court Retaining wall that had gotten into disrepair and was recently removed. This configuration will continue to allow access behind the barn to 164 North Willard Owners for maintenance.

164 North Willard St. - Proposed Fence Project

Current Views of Proposed Fence Lines



The barn along the easterly boundary and the Dans Ct. boundary wall to the south of the barn.



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MAR 09 2021

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This is where the fence spur for the driveway gate will go

Scott Gustin

From: Scott Gustin
Sent: Monday, March 29, 2021 9:46 AM
To: Luke Purvis
Subject: 164 North Willard Street fence application
Attachments: 164 North Willard Parking 2021.jpg

Good morning Luke,

I've reviewed your zoning application for a fence at 164 North Willard Street. The proposed fence looks as though it could be permitted. There are a couple of items that need to be addressed.

- The unpermitted "south" parking space remains in place and in use. Sec. 2.7.8, Withhold Permit, of the Comprehensive Development Ordinance precludes issuance of a zoning for properties that have ongoing violations – unless the permit is to remedy the violation. Such is not the case here.
- The site plan notes a few "nonconformities" that are not legitimately nonconforming. The site plan cannot be approved.

A fence application may be approvable if the parking violation is remedied and is reflected on the application site plan. The application as presently submitted cannot be approved. You may choose to keep your application as is or revise it to be acceptable. A denial can, of course, be appealed to the Development Review Board. A revised, acceptable application could be approved within a matter of days. Please let me know by April 1, 2021 how you'd like to proceed.

Scott

Scott Gustin, AICP, CFM
Principal Planner & Asst. Administrative Officer
Dept. of Permitting & Inspections
645 Pine Street
Burlington, VT 05401
(802) 865-7189

Scott Gustin

From: Luke Purvis <lpurvis78@yahoo.com>
Sent: Thursday, April 01, 2021 3:23 PM
To: Scott Gustin
Subject: Fwd: Fence Permit Revision 164 North Willard St.

[WARNING]: This email was sent from someone outside of the City of Burlington.

Hi Scott, here the revisions. Thanks for talking it through.
Luke

Sent from my iPhone

Begin forwarded message:

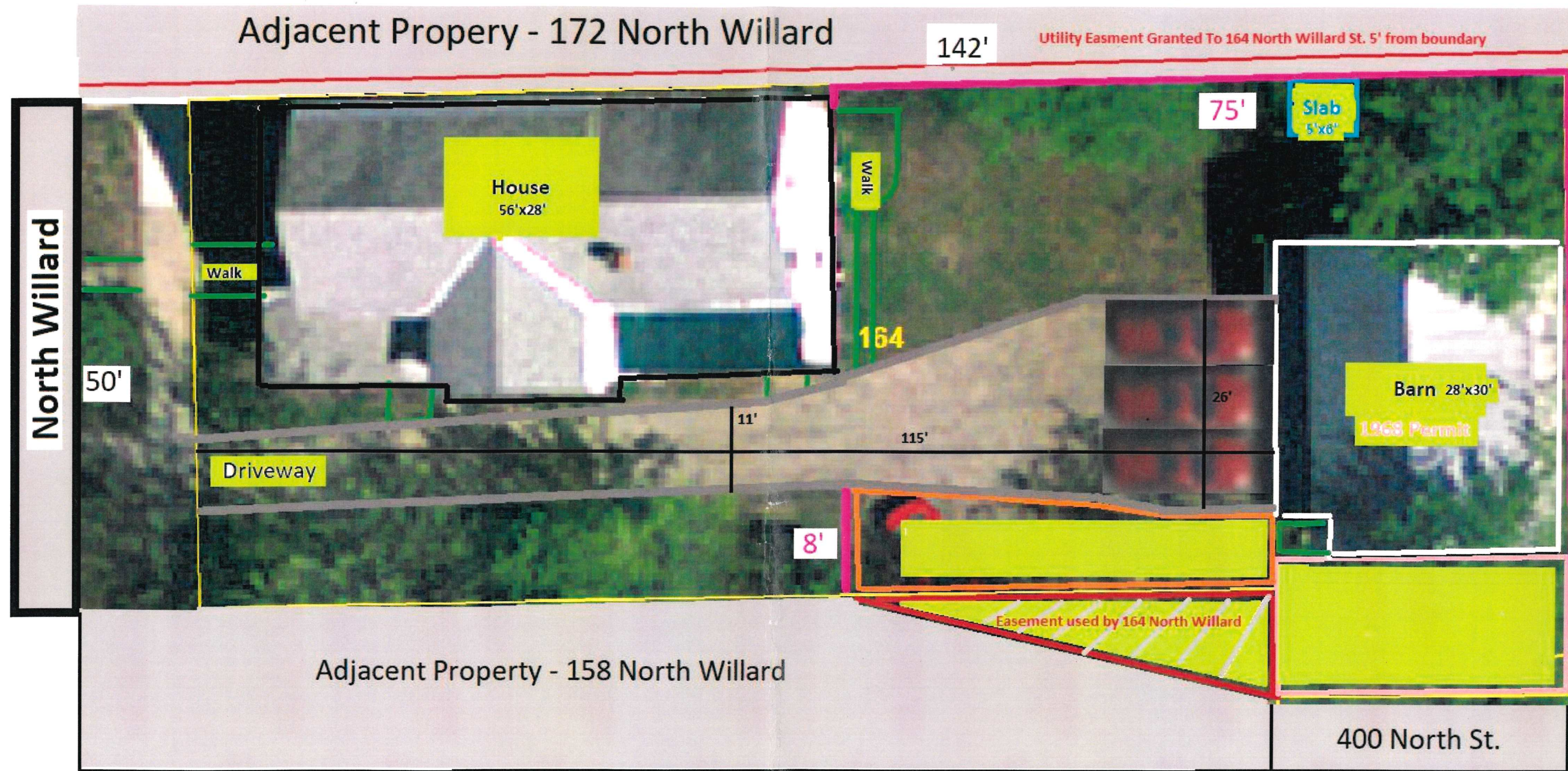
From: "Purvis, Luke" <Luke.Purvis@uvmhealth.org>
Date: April 1, 2021 at 3:20:29 PM EDT
To: lpurvis78@yahoo.com
Subject: Fence Permit Revision 164 North Willard St.

Luke Purvis

Business Intelligence Developer
UVMHN Data Management Office
Luke.Purvis@uvmhealth.org

The University of Vermont Health Network
UVMHealth.org

This message and any attachments may contain information that is confidential, privileged and/or protected from disclosure under state and federal laws. If you received this message in error or through inappropriate means, please reply to this message to notify the Sender that the message was received by you in error, and then permanently delete this message from all storage



Scale: 1cm = 3.4 ft

164 North Willard St.
Burlington VT 05401

Prepared By: Luke Purvis
On: 2/28/2021

Proposed
Fence Line
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APR 02 2021

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JUL 14 2020

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ZONING INFORMATION		
SPACE	EXISTING AREAS	PROPOSED AREAS
PROPERTY: LOTS 260, 264, 272, AND 280	30,851 SQ. FT.	30,851 SQ. FT.
EXISTING STRUCTURES	3484 SQ. FT.	3484 SQ. FT.
NEW UNITS - LOT COVERAGE INCLUDING DECKS AND STAIRS	—	2550 SQ. FT.
WALKWAYS	320 SQ. FT.	321 SQ. FT.
DRIVEWAY	4323 SQ. FT.	6625 SQ. FT.
TOTAL	8127 SQ. FT.	12980 SQ. FT.
TOTAL LOT COVERAGE	26.3%	42%

NOTES:
SITE PLAN BASED ON INFORMATION PROVIDED BY
'CIVIL ENGINEERING ASSOCIATES'
DRAWING C1.0 - 'EXISTING CONDITIONS SITE PLAN'
C1.0 BISONETTE PROPERTIES. THIS PLAN IS NOT A BOUNDARY
SURVEY AND IS NOT INTENDED TO BE USED AS ONE

SITE PLAN

ZONING PERMIT 2020 06 24

JRMA
DESIGN STUDIO
175 SUMMIT CIRCLE
SHELBURNE VERMONT 05482
802-985-9363

JOB_NO. 2010-141
DRAWN_BY WJR
DATE JUNE-24-2020
SCALE 1"=30'-0"

MANHATTAN DRIVE TOWNHOUSES
BURLINGTON, VERMONT
SITE PLAN

L-1

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BURLINGTON
PERMITTING & INSPECTIONS



VIEW FROM MANHATTAN DRIVE LOOKING NORTHWEST



VIEW FROM MANHATTAN DRIVE LOOKING NORTHEAST

PRELIMINARY - 2020 06 24

JOB_NO.	2010-141
DRAWN_BY	WJR
DATE	JUNE-24-2020
SCALE	N/A

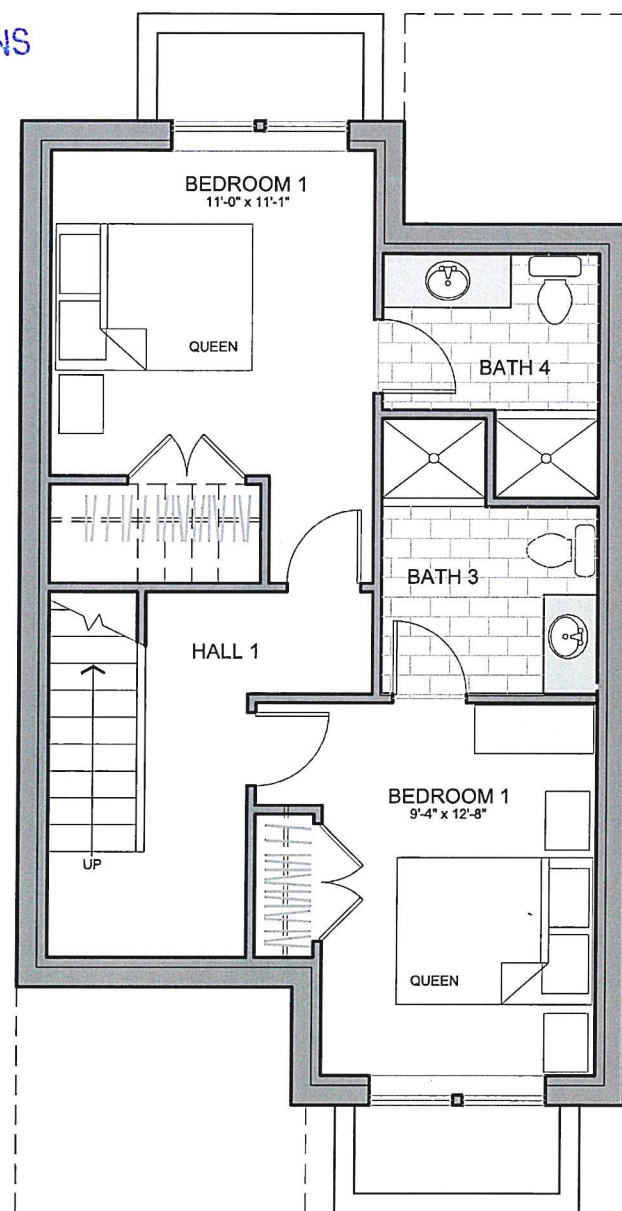
MANHATTAN DRIVE TOWNHOUSES
BURLINGTON, VERMONT
EXISTING SITE PHOTOGRAPHS

EX-1

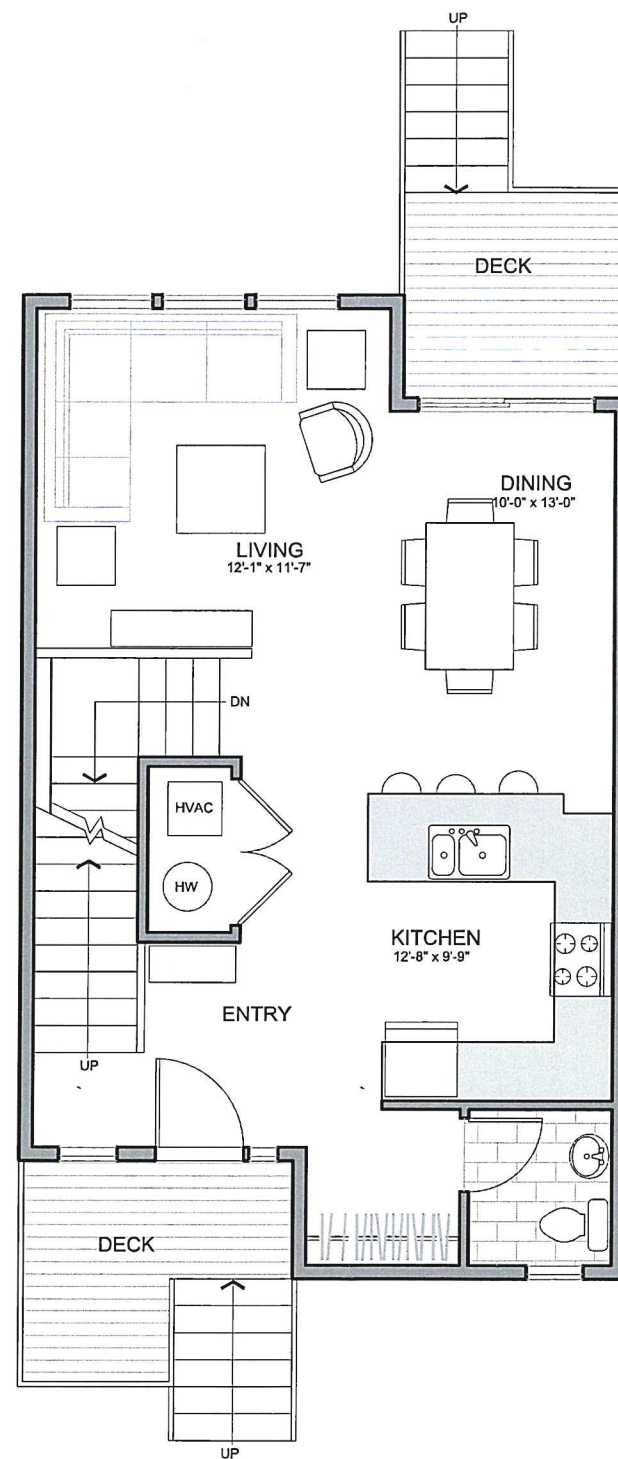
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JUL 14 2020

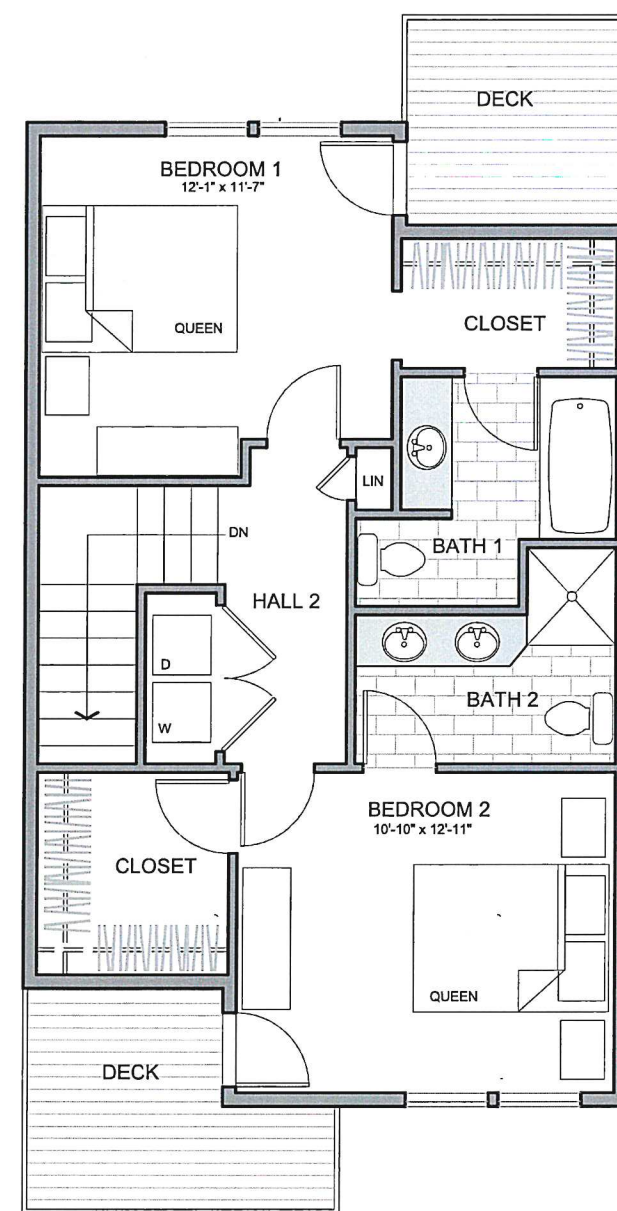
BURLINGTON
PERMITTING & INSPECTIONS



lower level floor plan
3/16" = 1'-0"



first floor plan
3/16" = 1'-0"



second floor plan
3/16" = 1'-0"

UNIT SIZE: 1884 SQ. FT.
DECKS: 297 SQ. FT.

PRELIMINARY - 2020 06 24

MANHATTAN DRIVE TOWNHOUSES
BURLINGTON, VERMONT
FLOOR PLANS

JOB_NO.	2010-141
DRAWN_BY	WJR
DATE	JUNE-24-2020
SCALE	3/16"=1'-0"

A-1

RECEIVED

JUL 14 2020

BURLINGTON
PERMITTING & INSPECTIONS

Manhattan Drive Townhouses

BURLINGTON, VERMONT

ZONING PRESENTATION APRIL 14 2020

BILL BISSONETTE PROPERTIES



perspective
overview from southeast

CONCEPTUAL DESIGN | APRIL 14 2020

MANHATTAN DRIVE TOWNHOUSES - BURLINGTON VERMONT

RECEIVED

JUL 14 2020

BURLINGTON
PERMITTING & INSPECTIONS



south elevation

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west elevation



east elevation

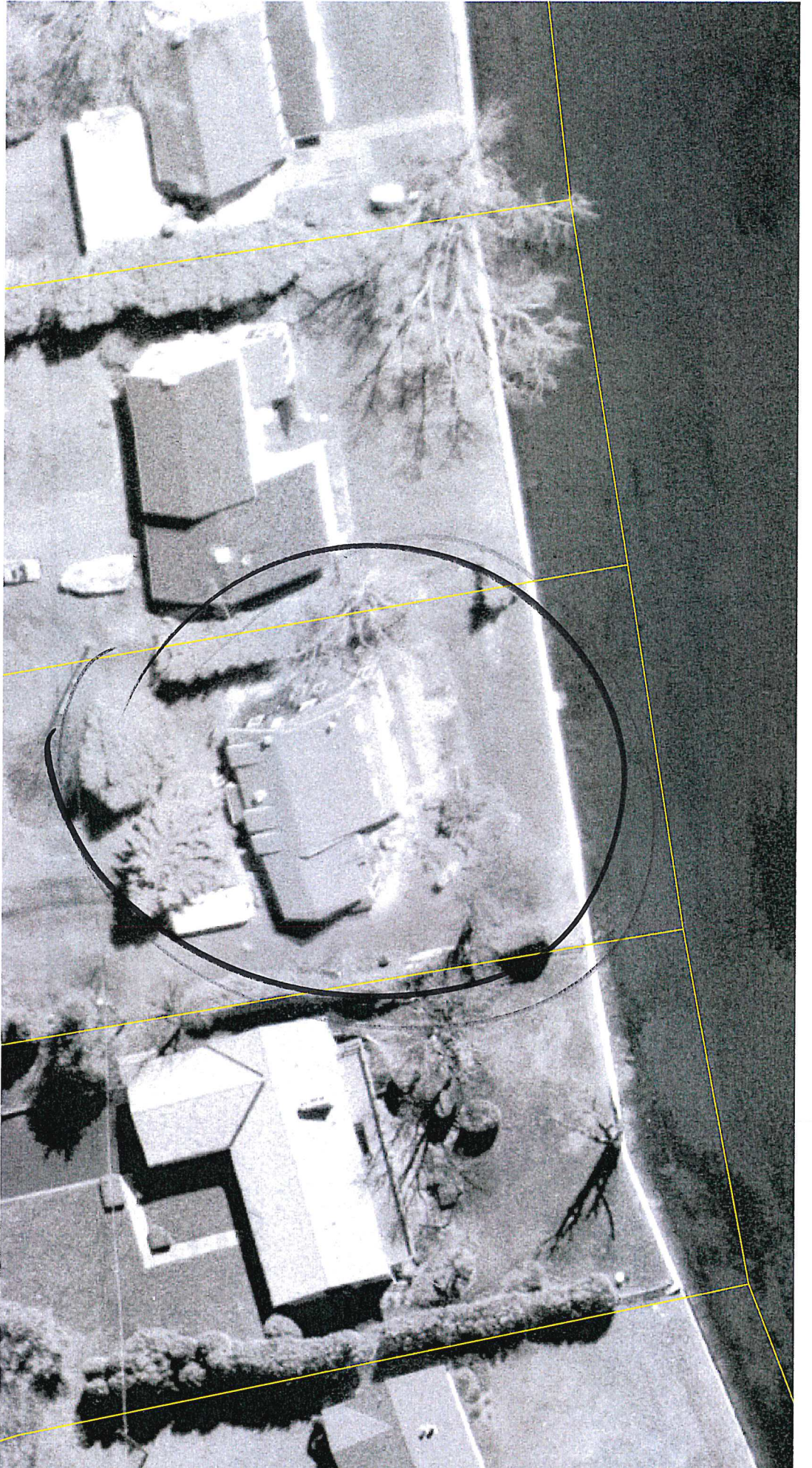
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north elevation

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2000



2004





2013

2019



Joseph C. McNeil (1919-1978)
Joseph E. McNeil
John T. Leddy
Nancy G. Sheahan
William F. Ellis
Susan Gilfillan
Joseph A. Farnham
Colin K. McNeil
Michael J. Leddy
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July 1, 2020

Burlington Development Review Board
City of Burlington, Vermont

Re: Burton/Higher Ground Performing Arts Center Conditional Use Application
20-0854CA/CU; 266 Queen City Park Rd (ELM, Ward 5S) Burton Corporation

Dear Members of the Burlington Development Review Board:

The Law Firm of McNeil, Leddy and Sheahan, P.C. represents the South Burlington City Council ("SB Council") and submits this correspondence on their behalf.

The SB Council thanks the Burlington Development Review Board ("DRB") for the opportunity to provide input on the pending performing arts center conditional use application of Burton/Higher Ground.

As proposed, the location of the performing arts center on Queen City Park Road would be immediately adjacent to the border between Burlington and South Burlington. South Burlington's Red Rocks Park is across the street, as is South Burlington's Queen City Park Neighborhood (a Residential Zoning District under South Burlington's Land Development Regulations). In addition, the portion of Queen City Park Road that runs along the site's western boundary is in South Burlington.

Accordingly, although this proposed use will be located in Burlington, the SB Council has an interest in ensuring that the proposed use harmoniously fits in with the surrounding area, especially with regard to South Burlington residents and the property of the City of South Burlington.

The SB Council has several concerns that remain unaddressed in the application materials submitted by Burton/Higher Ground: noise, traffic, parking, safety, protection of Red Rocks Park and staffing/personnel levels are all issues that require further attention. The SB Council is currently engaged in discussions with Burton/Higher Ground to address these concerns in the hope that collaborative solutions can be achieved. Until then, the SB Council feels it important to enumerate its concerns.

The SB Council takes each up as listed and not in order of importance (the SB Council recognizes that many of these concerns overlap):

- 1) **Noise**. The SB Council is concerned for those South Burlington residents whose homes lie near the proposed site. As the site has previously been utilized for manufacturing during the day with very limited evening/night use, adjacent residents who have not experienced evening/night time sound could potentially be exposed to disturbing event performance sounds. There are two components to this SB Council concern: a) event performance sound; and b) event attendee sound.
 - a) **Event Performance Sound**:

This concern relates directly to sounds from the performances themselves. The SB Council requests that if this application is approved, that any approval be conditioned on the requirement that no event sound be permitted to travel beyond the site boundary. While Burton/Higher Ground has admittedly performed studies, there are no assurances in the proposal that if such disturbing noise is able to be heard that corrective measures will be required. Further, the SB Council requests that at a minimum, sound monitoring in the Queen City Park neighborhood, particularly on Maple Avenue, be required for at least five performances following the opening of the performing arts center financed by Burton/Higher Ground. If such monitoring evidences the detection of disturbing event sound emitting from the performing arts center, such sound will be a violation of any granted permit condition that can be enforced.
 - b) **Event Attendee Sound**:

The SB Council is concerned with the noise that will result from attendees arriving, attending and leaving events at the performing arts center. As stated, this is a quiet area in the evening/night. The introduction of potentially several hundred attendees and cars to this area possibly multiple times a week at hours when there is traditionally little other sound will undoubtedly have an adverse impact on the area and its residents. Considering the fact that attendees will be attending music performances where alcohol will be served, the potential for disturbing noise is that much greater. The SB Council asks the DRB to please consider any/all enforceable measures to reduce/minimize/eliminate such sounds and to consider this issue and its impact when deciding whether the application should be granted.
- 2) **Traffic**. The SB Council's primary concerns relating to traffic are: a) ensuring that no event attendees intentionally or inadvertently use Central Avenue; b) ensuring that safety/emergency vehicles can access the Queen City Park Neighborhood at all times; and c) ensuring that Queen City Park residents and visitors can access the neighborhood at all times and are not prevented or hindered in doing so by attendees arriving and leaving events at the performing arts center.

The SB Council believes that some approval conditions may be able to moderately alleviate these concerns. As proposed, however, Burton/Higher Ground's plans do not go far enough and are not enforceable. Currently, Burton/Higher Ground commits that only during large events (over 1,000 attendees) will personnel be posted at the southwest exit to monitor and direct vehicle traffic. Otherwise, for events with 750–1,000 attendees, a sign would be placed at the entrance to Central Avenue discouraging access and no measures will be taken for events with less than 750 attendees. The SB Council insists that Burton/Higher Ground be required to actively undertake efforts to prevent all

attendees, regardless of event size, from utilizing Central Avenue and the roads of the Queen City Park neighborhood. An approval condition requiring Burton/Higher Ground to prevent its attendees from using Central Avenue and allowing residents to do so could be enforced to ensure that any undertaken measures are working properly. The SB Council further requests that if this application is approved, an approval condition be imposed requiring Burton/Higher Ground personnel to actively assist emergency vehicles in accessing/departing the Queen City Park neighborhood.

- 3) **Parking**. If this application is approved, the SB Council would like Burton/Higher Ground to be required to make all efforts to ensure that parking for events be on the Burton property only and not on South Burlington Streets, at Red Rocks Park or in the Queen City Park neighborhood. The SB Council is concerned that the venue's location adjacent to the City of South Burlington property line will entice event attendees to utilize parking at Red Rocks Park or on South Burlington Streets. The SB Council accordingly requests, if this application is approved, that an enforceable approval condition be imposed that no event parking shall be allowed on City of South Burlington Streets or at Red Rocks Park.
- 4) **Safety**. The SB Council is concerned that the number of personnel for events, although subject to minimums based on event size, is solely in the discretion of Burton/Higher Ground and is insufficient for the safety of event attendees, neighboring residents and Red Rocks Park for many of the events that will occur at the venue. The proposed venue is larger than previous Higher Ground venues and the SB Council is worried that the proposed minimums are derived from Higher Ground's experience at its current and past locations. Higher Ground is currently located on Williston Road in South Burlington and was previously located on a main thoroughfare in Winooski. Both of those areas are/were heavily trafficked with a police presence. The proposed location is neither on a main thoroughfare or in an area customarily patrolled by police. Further, the location is far away from both the Burlington Police Station and the South Burlington Police Station. This being the case, the safety of event attendees, residents of the surrounding neighborhood(s) and South Burlington's Red Rocks Park will largely be left in the hands of Burton/Higher Ground personnel. The SB Council recognizes that different events require different staffing levels, however, the SB Council requests that, if this application is approved, more stringent personnel requirements be put in place for any event that concludes at 10:00 pm or later. Further, for any event that ends at or after 10:00 p.m., Burton/Higher Ground be required to pay the cost of at least one law enforcement officer with a patrol car on sight to monitor event closure and egress of attendees. This requirement could be for a law enforcement officer from either Burlington Police Department or the South Burlington Police Department.
- 5) **Protection of Red Rocks Park**. The SB Council is concerned that there are simply no enforceable components of Burton/Higher Ground's plan that ensure the protection of Red Rocks Park. It is the goal of the SB Council to see every effort be made by Burton/Higher Ground to ensure that the park and its users are protected. With the approval of the performing arts center, several hundred event attendees will regularly be introduced to the currently not-heavily-trafficked area. This will potentially result in an increase of park users attributable to Higher Ground events. Red Rocks Park has fragile ecosystems that are put at risk through heavy usage and off-trail use. Acknowledging that

Red Rocks is a public park, the SB Council is concerned that the park could quickly be overwhelmed by event patrons who elect to picnic and/or tailgate in the park either before or after events. The Council is also concerned that after events could cause nighttime disturbances and present a nuisance to Queen City Park residents abutting the Park or result in harm to nighttime visitors of the park. The SB Council believes that Burton/Higher Ground's plan following only large events to discourage event attendees from entering the park is insufficient. The SB Council requests that if this application is approved, conditions be put in place that require Burton/Higher Ground to provide staff, monetary assistance, or other adequate protections to the City of South Burlington for the purpose of enforcing park rules when the park is open and prevent entry into the park when the park is closed.

- 6) **Staffing/Personnel Levels.** As has been outlined above, the SB Council would like Burton/Higher Ground to be required to have sufficient personnel and security to address all of the above-raised concerns. While Burton/Higher Ground has proposed minimum staffing and security based on number of attendees to an event, the Council is concerned that this number is insufficient for many of the events that will take place at the site and there is no enforcement mechanism if an event is understaffed. Due to the site's remote location and greater capacity (over current and past Higher Ground venues), the SB Council requests that the number of event attendees triggering staffing levels be reduced (ex. under 500, 500-750 and 750+). In addition, if this application is approved, SB Council requests additional conditions requiring increased staffing levels for any event ending at 10:00 p.m. or later.

The SB Council respectfully asks that the Burlington DRB take these identified concerns into account when analyzing this application under its Comprehensive Development Ordinance and conditional use review standards. In so doing, the SB Council believes the DRB will find that as currently proposed, the performing arts center will negatively affect the character of the area, will impose nuisance impacts from noise and vibrations that are greater than typically permitted by other permitted uses in the same zoning district at the time they are occurring, and that it is questionable whether the transportation system is capable of supporting the proposed use in addition to the existing uses in the area.

The South Burlington City Council appreciates your consideration of its concerns. Thank you all for your time and effort.

Sincerely,



Colin K. McNeil
McNeil, Leddy and Sheahan, P.C.
Attorneys for the South Burlington City Council

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July 1, 2020

TO: BURLINGTON DEVELOPMENT REVIEW BOARD

Re: Burton Hub: 180 and 266 Queen City Park Road

Ladies and Gentlemen:

Below is a summary of the major objections of CRZ Group to the Burton Hub project, focused primarily on the proposed new concert venue. An expanded discussion of these objections will be provided at the hearing,

1. In addition to the Conditional Use criteria, the project should be reviewed under the Major Impact standards of the CDO. Under CDO section 3.5.2 (b), because the previous multi-acre site plan project was initiated within the same 12-month period, and because the current application includes the construction of new floor area (a balcony seating area of approximately 2,500 square feet), they must be considered together for the purpose of major impact analysis. (None of the exemptions of section 3.5.3 (b) apply.)
2. The applicant cannot demonstrate the absence of an **undue adverse effect on public safety services and on the City's investment in those services**. (Conditional Use Standard 1 and Major Impact Review Standards 7 and 9.) This is especially so in light of the recent action of the City Council, which will reduce police manpower by 30% over the next two years. In the best case scenario, based on the operator's track record, the venue will require an increase of at least several hundred service calls per year while (according to recent news reports) it is projected that the capacity of the BPD to respond will decline by 6,000 calls per year as a result of the force reduction.

The problems presented by the venue are well-described in Chief Morrison's initial review letter of April 17, 2020 (attached); they will be severely exacerbated by the planned reduction in force. Reliance on private operational management of the issues is unrealistic.

3. The applicant cannot demonstrate the absence of an **undue adverse effect arising from noise and vibrations**. (Conditional Use Standards 3 and 6 and Major Impact Review Standard 1). According to the applicant's Noise Assessment, the venue will generate both concert noise and exterior noise that will be "plainly audible" after 10 PM across the

property line. (See Noise Assessment, pages 16 and 17.) Therefore it will violate the Burlington Noise Ordinance (Code of Ordinances Sec. 21-13 (b) (1). Moreover, the applicant's Noise Assessment makes unjustified assumptions and fails to present material data. Most glaringly, the Noise Assessment fails to provide any data or projections on the instantaneous noise ("Lmax") that the venue will produce, focusing solely on "average" noise ("Leq"). See In Re Application of Lathrop, 2015 VT 49. For local permitting purposes, a noise assessment is fatally defective if it provides no information on "the frequency of loud noise" affecting "the use and enjoyment of nearby residences." In Re John A. Russell Corp., 176 VT 520 520, 527 (1973). Other faulty premises undermine the reliability of the report, including the modeling assumption that nighttime temperatures will be 50 degrees Fahrenheit. (See Noise Assessment, page 34, Table 6, which lists the temperature input as "10° C.") That assumption obviously does not reflect reality in South Burlington for most of the year.

4. The applicant cannot demonstrate the absence of an **undue adverse effect on the transportation system**. (Conditional Use Standard 4 and Major Impact Standard 5.) The applicant's Traffic Impact Study ("TIS") makes unjustified and arbitrary assumptions and fails to provide material information. Even if the TIS is assumed to be reliable, at least until the Champlain Parkway is built, a dangerous bottleneck is inevitable at the one-lane bridge on Queen City Park Road and service levels at significant intersections will be degraded. For example, southbound traffic at Home and Pine – already at LOS "F" – will be further delayed by 100 seconds. Moreover, bicycle and pedestrian conditions will be rendered inadequate by the absence of bike lanes and sidewalks around most of the affected area.

After the Champlain Parkway is built, unacceptable service levels will be generated at the intersection of Home and the Parkway, for which no mitigation strategy is proposed.

5. The applicant cannot demonstrate the absence of an **undue adverse effect on the City's ability to dispose of wastewater** in organic loading or wet conditions. (Conditional Use Standard 1). (See DPW letter of November 26, 2019, attached.)

Thank you for your careful consideration of these points.

Respectfully submitted,

s/Frank Kochman

Frank Kochman, Attorney for CRZ Group

Attachments

Department of Permitting & Inspections

Zoning Division
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Layne Darfler, Planning Technician
Alison Davis, Zoning Clerk
Ted Miles, Zoning Specialist
Charlene Orton, Permitting & Inspections Administrator



MEMORANDUM

To: Development Review Board
From: Ryan Morrison
Date: July 7, 2020
RE: ZP20-0794SN (AP); 66 North Avenue

Note: These are staff comments only. Decisions on projects are made by the Development Review Board, which may approve, deny, table or modify any project. THE APPLICANT OR REPRESENTATIVE MUST ATTEND THE MEETING.

File: ZP20-0794SN Appeal

Location: 66 North Avenue

Zone: RM **Ward:** 3N

Date appeal accepted: April 28, 2020

Date of administrative decision: April 17, 2020

Date of application: March 17, 2020

Appellant / Owner: Duncan Wisniewski Architecture / Sara Holbrook Center

Request: Appeal of Administrative Denial of a request to install an awning/canopy sign at the newly remodeled Sara Holbrook Community Center.

Background:

- **Zoning Permit 20-0794SN;** new signage. Denied April 17, 2020. (Subject of this appeal.)
- **Zoning Permit 20-0793FC;** new fence. Approved March 24, 2020.
- **Zoning Permit 19-0749LL;** lot line adjustment with 56 & 58 North Avenue. Approved April 12, 2019.
- **Zoning Permit 18-0899CA/MA;** combine three parcels and expand Sara Holbrook Community Center at 66 North Avenue, demolish a duplex and garage at 58 North Avenue, and demolish a duplex and shed at 56 North Avenue. Approved July 17, 2018.
- **Non-Applicability of Zoning Permit 18-0277NA;** replacement of current sign and temporary banner. Approved September 12, 2017.
- **Sketch Plan 16-0811SP;** sketch plan review to demolish two existing duplex residential buildings at 56 and 58 North Avenue and build an addition to the existing Sara Holbrook Community Center.
- **Sketch Plan 15-0263SP;** sketch plan review to combine three parcels (56, 58 and 66 North Ave.), demolish one house, relocate one house, expand community center and construct new attached building for six apartments.
- **Zoning Permit 04-595;** replace existing playground structure. Approved May 13, 2004.
- **Zoning Permit 04-447;** replace existing playground structure. Approved March 23, 2004.
- **Zoning Permit 01-029;** replace existing window sash for the community center, and repair stucco. Approved July 18, 2000.

- **Zoning Permit 94-395**; rear two story addition to the existing community center. Approved April 28, 1994.

Overview:

Zoning application 20-0794SN, to install an awning/band sign at the newly remodeled Sara Holbrook Community Center was denied on April 17, 2020 for reasons outlined below. On April 28, 2020, the appellants filed a timely appeal within the 15-day appeal period.

Recommendation: Uphold zoning permit denial based on the following findings.

I. Findings

Timeline:

- **March 17, 2020** – Application ZP20-0794SN submitted.
- **April 3, 2020** – Application ZP20-0794SN deemed complete.
- **April 17, 2020** – Decision of Denial for ZP20-0794SN.
- **April 28, 2020** – Appeal of administrative denial submitted.

Reason for Denial:

Application ZP20-0794SN (subject of this appeal) was **denied April 17, 2020 for the following reasons:**

The applicant proposes a canopy sign on the front canopy of the Sara Holbrook Community Center. Table 7.2.1-B, Sign Types Permitted by Form/Zoning Districts, specifically prohibits a number of sign types in the Residential zoning districts, including awning and canopy signs in the residential – medium density zoning district – which the subject property is in. As a result, the application cannot be approved.

The appellants have provided a detailed statement addressing why the denial should be overturned. See attached memo dated April 29, 2020.

Appellant's Arguments and City Responses:

Appellant's arguments are in *italics*, the City responses are not.

1. *Although SHC (Sara Holbrook Center) is located in an RM district, it very nearly borders an NMU district, with much different sign regulations, and the proximity of this lot to that district diminishes the feeling that the SHC is actually in the RM district. Opportunities Credit Union is only separated from SHC by one lot, across the street is Star Press, the Old Northender Pub abuts SHC on its north boundary, Brian's North End Auto is just up the street. The close proximity of these other businesses lends a slightly different feel to the local environment, such that a sign that is different from the sign requirements in an RM district is worthy of consideration. The denial characterizes the proposed sign as an "Awning or Canopy Sign", which is a permitted type in the NMU district, and is also permitted in an RH district.*

While the property is indeed near properties zoned NMU, the undeniable fact is that the property is specifically located within the RM zoning district. Table 7.2.1-B specifically prohibits "Awning & Canopy Signs". Allowing prohibited signage to be erected simply because the subject property is

in close proximity to a zoning district that does allow for such signage is not allowed by the Comprehensive Development Ordinance. The district boundaries are clear and have implications as to what is allowed and where within the city. Zoning ordinances regulate what is and what isn't permitted within specifically zoned districts. The RM zoning district is specifically identified as one such district that prohibits awning & canopy Signs.

2. *The sign in our sign permit application is the same sign that was presented as part of our original zoning application (ZP18-0899CA/MA). Even though we knew a separate permit application would be required, no mention was made at the time by staff or the DRB that such a sign would not be allowed.*

At the time ZP18-0899CA/MA was approved, staff had no knowledge that such signage would be prohibited by the new Sign ordinance that was adopted on November 27, 2019 (first public hearing with the Planning Commission – November 27, 2018). Had such changes been aware of, it is likely that staff would have encouraged the applicant to submit their sign permit application so it would be permitted under the previous Sign ordinance. Condition #18 of ZP18-0899CA/MA stated “Any outdoor signage will require a separate sign permit.” This condition alone signified the fact that any signage included within the plans for ZP18-0899CA/MA was not approved and would be subject to a separate permit of its own.

3. *It is our belief that the proposed sign effectively communicates and supports the presence of the institution and supports it to achieve the mission to develop responsible and productive children, youth and families through social development, educational and recreational opportunities.*

While the mission of the community center is not in question, a variety of sign types are allowed within the RM zone including: blade sign, directory sign, freestanding yard sign, wall sign, and window sign.

4. *Its size and appeal are appropriate to improve visibility for passing traffic and create awareness of our location for services and programs to serve the community.*

The forward-most (closest to the front of the property) allowed sign type in the RM zone that could suit the community center is the freestanding yard sign, which takes into account traffic visibility. Specifically, Sec. 7.2.7 states “No part of a Freestanding Yard Sign may encroach or overhang a public right-of-way, clear sight triangle, driveway, parking area, or walkway.” This type of sign allows for up to 20 sf of signage (not including supports), and can be located in a manner that minimizes visibility obstructions for passing traffic while providing adequate awareness of the community center's location.

5. *The proposed sign adheres to Sec. 7.1.1 Authority and Intent of Article 7: Signs.*

Staff would agree that the proposed awning/canopy sign would adhere to Sec. 7.1.1. However, so would the other sign types listed in #3 above. The reason why the awning/canopy sign was denied

is because it has been specifically identified under Table 7.2.1-B as a prohibited sign in the RM zoning district.

6. *If the appeal is granted, it will meet the criteria of Sec. 7.1.11 Alternative Compliance.*

- *the relief sought is necessary in order to accommodate a unique circumstance or opportunity;*
- *will yield a result equal to or better than strict compliance with the standard being relieved;*
- *is the minimum variation necessary from the applicable standard to achieve the desired result;*
- *will not impose an undue adverse burden on adjacent properties; and*
- *the remainder of the sign will be developed consistent with all other applicable sign and size conditions.*

Sec. 7.1.11, Alternative Compliance, allows for minor variation and relief from non-numerical and numerical standards, subject to review and approval by the Design Advisory Board and Development Review Board. Such review has not taken place. In this case, the variation is non-numerical; however, it is a significant variation – approval of an expressly prohibited sign type is sought. Whether signage is possible or not is not in question here. Several different types of exterior signs may be permitted subject to the standards in place. There is no compelling reason to approve a prohibited sign type.

Summary

The property is within the RM zoning district. Table 7.2.1-B strictly prohibits awning/canopy signs within the RM zoning district. Approval of a prohibited sign type because of the property's proximity to a different zone that allows it is not contemplated or permitted by the Comprehensive Development Ordinance.

II. Recommended Motion:

Uphold the denial of zoning application 20-0794SN

Department of Permitting & Inspections

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Charlene Orton, Permitting & Inspections Administrator



MEMORANDUM

To: Development Review Board
From: Ryan Morrison
Date: July 7, 2020
RE: ZP20-0792CA (AP); 291 Appletree Point Road

Note: These are staff comments only. Decisions on projects are made by the Development Review Board, which may approve, deny, table or modify any project. THE APPLICANT OR REPRESENTATIVE MUST ATTEND THE MEETING.

File: ZP20-0792CA Appeal
Location: 291 Appletree Point Road
Zone: RL-W **Ward:** 4W
Date appeal accepted: April 20, 2020
Date of administrative decision: April 15, 2020
Date of application: March 17, 2020
Appellant / Owner: Gordon Maher
Request: Appeal of Administrative Denial of a request to permit an after-the-fact deck.

Background:

- **Zoning Permit 20-0792CA;** after-the-fact patio removal and replacement with a deck on a different footprint. Denied April 15, 2020. (Subject of this appeal.)
- **Non-Applicability of Zoning Permit 16-0459NA;** new vent for dryer and boiler from existing basement window. Approved October 7, 2015.

Overview:

Zoning Permit 20-0792CA, to permit an after-the-fact patio removal and replacement deck on a different footprint, at 291 Appletree Point Rd, was denied on April 15, 2020 for reasons outlined below. On April 20, 2020, the appellant filed a timely appeal within the 15-day appeal period.

Recommendation: Uphold zoning permit denial based on the following findings.

I. Findings

Timeline:

- **March 17, 2020** – Application ZP20-0792CA submitted.
- **March 24, 2020** – Application ZP20-0792CA deemed complete.
- **April 15, 2020** – Decision of Denial for ZP20-0792CA.
- **April 20, 2020** – Appeal of administrative denial submitted.

Reason for Denial:

Application ZP20-0792CA (subject of this appeal) was **denied April 15, 2020 for the following reasons:**

The applicant proposes replacing a lakeside patio with a deck that has a different footprint and encroaches closer to the waterfront. Table 4.4.5-3 sets a minimum waterfront setback of 75 ft from the ordinary high water mark of Lake Champlain in the RL-W zone. Section 4.4.5 (d) (1) (B) (ii) allows for the averaging of waterfront setbacks based on neighboring principal structures within 150 ft of either side of a property. Averaging the waterfront setbacks of homes within 150 ft of the subject property (both sides) does not aid in a setback reduction for the new deck. According to the applicant, the pre-existing patio (per historic imagery) was removed in two portions in 2017 and 2018. The patio was within the 75 ft waterfront setback. The patio is considered a nonconforming structure.

The applicant proposes replacing the patio with a deck that not only changes the footprint, but also encroaches closer to the ordinary high water mark of Lake Champlain – with a new setback of 28.5 ft from an existing lake wall. Sec. 5.3.5 (b) allows for nonconforming structures to ‘be replaced by a new structure retaining the same degree of nonconformity as the original structure.’ The section continues: ‘Zoning permit application for the replacement structure shall be completed within 1 year of demolition of the nonconforming structure; failure to do so shall result in the loss of the ability to retain the nonconformity.’

The applicant states that the replacement decking and patio removal was conducted in two phases – in 2017 and 2018. More than 1 year has passed since the removal of the nonconforming patio, thus rendering the possibility of obtaining a zoning permit for its replacement void. Additionally, the replacement deck encroaches closer to the ordinary high water mark of Lake Champlain than the previous patio, thus increasing the nonconformity.

The new deck is in violation of Table 4.4.5-3 and Sec. 5.3.5 (b) of the Burlington Comprehensive Development Ordinance.

The appellant has not provided an argument as to why the denial was issued in error and should be overturned. Conversation with the appellant simply revolved around his request for a variance to the waterfront setback requirement to accommodate the new deck. No variance has actually been sought or obtained.

Property History and the Replacement Deck:

According to the Assessor’s Office database, and from conversation with the appellant, the following information is known:

- The existing home was built in 1925, and is located within the 75 ft waterfront setback.
- The appellant stated that the previous lakeside patio was there for 50 years ago. Aerial photos from 2000, 2004 and 2013 show the previous patio. Earlier aerials are too unclear to see the patio.
- The 2019 aerial photo shows the new deck in a different footprint than the previous patio.
- The appellant stated that he removed the patio in two phases – in 2017 and 2018 and concurrently built the deck – a 12’x12’ portion in 2017, and a 12’x15’ portion in 2018. It is important to note that no zoning permits were obtained for the removal of the patio and for the construction of the deck.

- The previous patio would have been considered an existing nonconformity, and its replacement with a deck would have likely been permitted if: 1) the deck maintained the same degree (or less) of setback nonconformity; and 2) if the applicable zoning permit(s) for the patio replacement was obtained within one year from the date of patio removal.
- The new deck is setback from the waterfront a distance of 28.5 ft. The previous patio had a setback of approximately 30 ft. The new deck is not only in a different footprint, but it also increases the waterfront setback nonconformity.
- In accordance with Sec. 5.3.5 (B), because the previous patio was removed in 2017 and 2018, it lost its standing as an existing nonconforming use that could be replaced since a permit was not sought for its replacement within a year of the patio removal. Essentially, the zoning ordinance would consider there to be no existing patio at the time of the submittal of ZP20-0792CA, and would view the ‘replacement’ deck as an entirely new structure.
- Sec. 4.4.5 (d) (1) (B)(ii) states *“If the waterfront setback of existing principal structures within a distance of one hundred fifty (150) feet on either or both sides of a lot is less than the required setback, the setback may be reduced to the average alignment of such structures.”* The average setback of the adjoining homes/structures to the 100’ lake elevation is 48’ (based off aerial photos). The new deck (and previous patio) is well within the average 48’ waterfront setback – with a setback of 28.5 ft.
- Removal of the patio in 2017/2018 precludes any claim to grandfathered nonconformity or to the 15-year statute of limitations.

Summary

The previous patio was removed in two phases – in 2017 and 2018. An after-the-fact permit application (ZP20-0792CA) was submitted on March 17, 2020 – more than a year after the patio was removed. Section 5.3.5 (B) considers the previous nonconforming patio as having lost its ability to be replaced since a zoning permit was not sought within a year of its removal. As a result, the replacement deck is considered an entirely new structure. The new deck has a smaller waterfront setback (28.5 ft) compared to the average setbacks established on the adjoining lots – 48 ft, and is thus in violation of Sec. 4.4.5 (d) (1) (B)(ii) CDO.

II. Recommended Motion:

Uphold the denial of zoning application 20-0792CA

7/6/2020

Hello Scott:

Thanks for providing us with a copy of your Staff Comments as well as copies of the letters from CRZ and COSB summarizing their respective concerns. Here are our responses to all, including:

RESPONSES TO STAFF COMMENTS

1. **Hours of Operation: Clarifications are needed for Opening hours: 6pm for a 7pm show / Daytime Use**
 - Response: We understand staff's request that events do not overlap with the weekday commuter peak times, so would be agreeable to a condition that prohibits high trip generation during the commuter peak hours.
 - Any events over 300 people will have door opening times of 7:00 PM or later on weekdays (and any time on weekends).
 - Weekday events could still occur in the space if the events are not greater than 300 people and the entrance and exiting times do not overlap with the peak periods (before 9:00 AM or between 4:00 and 6:00 PM).
2. **Site Plan:** The site plan submitted for the CU application contains minor details that conflict with the site plan approved by the DRB for the storm water enhancement project and approved by the DRB months ago.
 - Response: We have clarified the site plan submitted for the Conditional Use application (see attached plan annotated w/notes to answer your comments)
3. **Section 5.5.2 Outdoor Lighting:** Details are needed for new lighting that will illuminate the walkway beneath the canopy.
 - Response. Cut sheets and illumination levels have been added to the architectural plans submittal (see attached TCA submittal)
4. **Section 6.3.2 (h) Screening of New Rooftop HVAC Equipment:** Roof plan showing new HVAC equipment and screening from QCPR needs to be included.
 - Response: See revised Architectural plan submittal including Roof Plan showing new HVAC equipment, and screening on Building Elevations.
5. **Section 8.1.8 Parking / Parking Waiver.** Parking supply counts in the TIS (496 spaces) are inconsistent with submitted site plan data (416 spaces). Further, a parking waiver is needed to close the gap between the required number of parking spaces required under the CDO (459 spaces) and the on-site parking supply as shown on Project site plan (416 spaces).
 - Response. Due to either a typo or reliance on an earlier plan, the quantity of on-site parking supply has been misstated, however, the error is immaterial in the context of the TIS. The applicant will develop a parking management plan that will address existing and proposed strategies to limit and manage single occupancy vehicular traffic to the site, including:
 - Remote Working by Burton Staff
 - Multi-modal transportation (bus / bicycle)
 - Temporary Use of neighboring private properties
6. **Section 8.2.5 Bicycle Parking (p9):** Zoning requires one (1) long term (enclosed; lockable) bike parking and eight (8) short term (can be open) parking spaces:

- Response: Plan will be revised to include bike racks as required.

RESPONSE to CRZ LETTER

FL KOCHMAN - 7/1/20

A summary of major objections contained in Mr. Kochman's letter dated 7/1/20 include:

1. **Major Impact Development**: CRZ states that application should be reviewed under additional criteria under Section 3.5.2 (b)
 - Response: Zoning Administrator has ruled the application does not meet the minimum requirements for MID review and is therefore exempt.
2. **Adverse Impact - Public Safety**: CRZ states PAC will place an undue adverse impact on Burlington Police Department's ability to provide service to the Site.
 - Response: Application contains 4/30/20 correspondence from Deputy Chief Jon Murad offering "unconditional support" for Burton's Conditional Use application
3. **Adverse Impact - Noise**: CRZ claims the application cannot demonstrate the absence of undo adverse effect arising from noise
 - Response: The analysis by the Applicant's consultant, RSG, confirms the noise impacts resulting from proposed use meet accepted community standards, and will not result in greater impacts typical of other permitted uses in the E-LM zone district.
4. **Adverse Impact - Traffic**: CRZ claims the application cannot demonstrate the absence of undo adverse impact of the Project on the transportation system.
 - Response: An analysis of the proposed Project's impact on local traffic network has been submitted by the Applicant's consultant, VHB, which has been reviewed by both the City traffic engineers at DPW, and its traffic consultant, CHA. Both DPW and CHA concur with the TIS findings (i.e., the traffic impacts are both reasonable and manageable)
5. **Adverse Impact - Wastewater**: CRZ claims the application cannot demonstrate the absence of undo adverse impact of the Project on the transportation system.
 - Response: The Water Department approval letter dated 11/26/19 contains standard boilerplate language which qualifies the City's ability to serve the Project. This language has been clarified in an email to me dated 7/2/20 which I will send separately to you. With regards to the two issues raised in the CRZ letter, the clarification is as follows:
 - **Organic Loading**: This boilerplate language is meant to address capacity requests from users that could discharge high organic loads to our wastewater plants. This will not be an issue for the proposed Performing Arts Venue with flow primarily from bathrooms.
 - **Combined Sewer Policy**: While this policy is still in draft form the intent is to have new users remove stormwater input to offset proposed new wastewater flows. This policy applies to new flows over 1000 gpd (like Higher Ground) and requires either removing 0.5SF impervious per wastewater gpd request or if not technically feasible on-site then payment of a Combined Sewer Offset Mitigation fee equal to \$1.84 per gpd

request. These funds are placed in a special account to be used for public combined sewer mitigation projects.

RESPONSE to CITY OF SOUTH BURLINGTON LETTER

COLIN McNEIL, ESQ. - 7/1/20

Response. Over the past six months (and as recently as June 30, 2020), the Applicant and team members have maintained an ongoing dialogue with the City of South Burlington, including discussions with City Manager Kevin Dorn, Director of Planning Paul Conner, and City Council Members Helen Riehle, Tom Chittenden, Tim Barritt and David Kaufman. The 7/1 letter from the City Council's attorney Colin McNeil was already finalized and does not reflect the discussions and agreements from the 6/30/20 meeting with city councilors, which includes:

1. City Council to assess signage on Central Ave, including for Red Rocks Park parking area
2. Burton and Higher Ground committed to enforcing no tailgating policy
3. Burton and Higher Ground committed to Operational Management Plan enforcement, including directing traffic away from Central Ave and Red Rocks Park
4. Burton and Higher Ground committed to following through on monitoring plan for one-way bridge, and moving forward with further controls if deemed necessary
5. Burton and Higher Ground to measure exterior noise levels after installation of additional soundproofing materials to ensure Noise Ordinance standards are not exceeded

I think this should address most/all of the open items on your list. Thanks again for your help in processing this application. Justin and I look forward to chatting w/you again tomorrow at 9:30AM. -john

--

John Caulo

61 Central Avenue
Burlington, VT 05401
Mobile: 802/233-6640

john.caulo@gmail.com



City of Burlington
Department of Public Works

Water Resources Division
234 Penny Lane
Burlington, VT 05401
802.863.4501 P
www.burlingtonvt.gov/DPW

Chapin Spencer
PUBLIC WORKS DEPARTMENT DIRECTOR

Megan Moir
WATER RESOURCES DIVISION DIRECTOR

November 26, 2019

John Caulo
LANDPLAN
61 Central Ave
Burlington, VT 05401

Re: Water and Wastewater Allocation Request for Change of Use at 266 Queen City Park Road (Burton Campus)

Dear John,

This letter is to inform you, your client, the State of Vermont Environmental District and other interested parties that the City of Burlington's water and wastewater facilities have sufficient capacity to handle flows associated with a Performing Arts Venue at the above address. We have reserved 7,500 gpd (gals/day) for both water and sewer. This is based on a maximum of 1500 persons at 5 gpd per person.

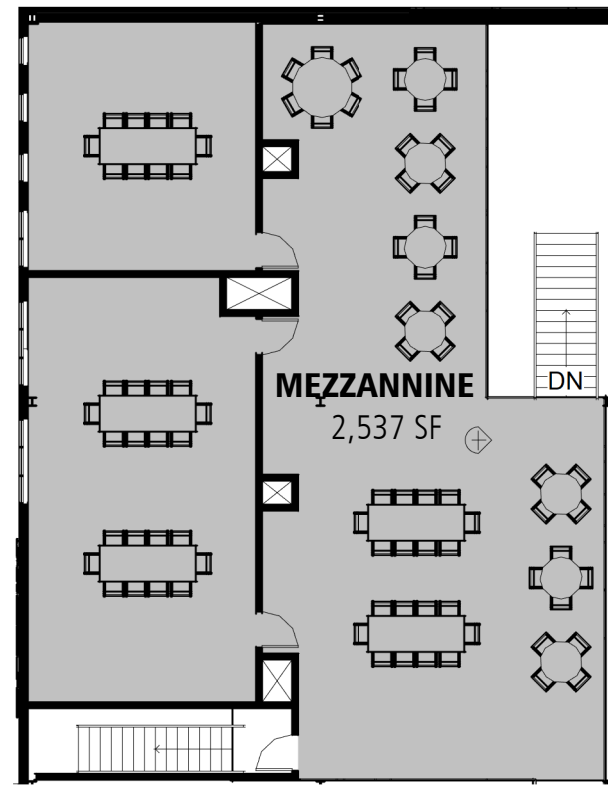
Wastewater flow from this area is treated at our Main Wastewater Plant on Lavalley Lane. It is important to note that this letter only addresses dry weather treatment plant and not organic loading or wet weather collection system capacities. Our collection system serving this area is a combined sewer system (CSS) and our efforts over many years has been to remove stormwater input to the CSS. We are in draft stages of a combined sewer policy that eventually will require customers connected to our combined sewer to either remove stormwater input or offset increased wastewater baseflow. We reserve the right to contact you/your client regarding a potential offset project after a formal policy has been approved.

This letter is good for three (3) years from the date of writing. If this letter is not filed with the proper offices, or if the proper permits are not obtained within that year, you will need to reapply. Any changes in flow estimates or property usage also requires reapplication. Please feel free to call me at 343-0125 if you have any questions.

Sincerely,

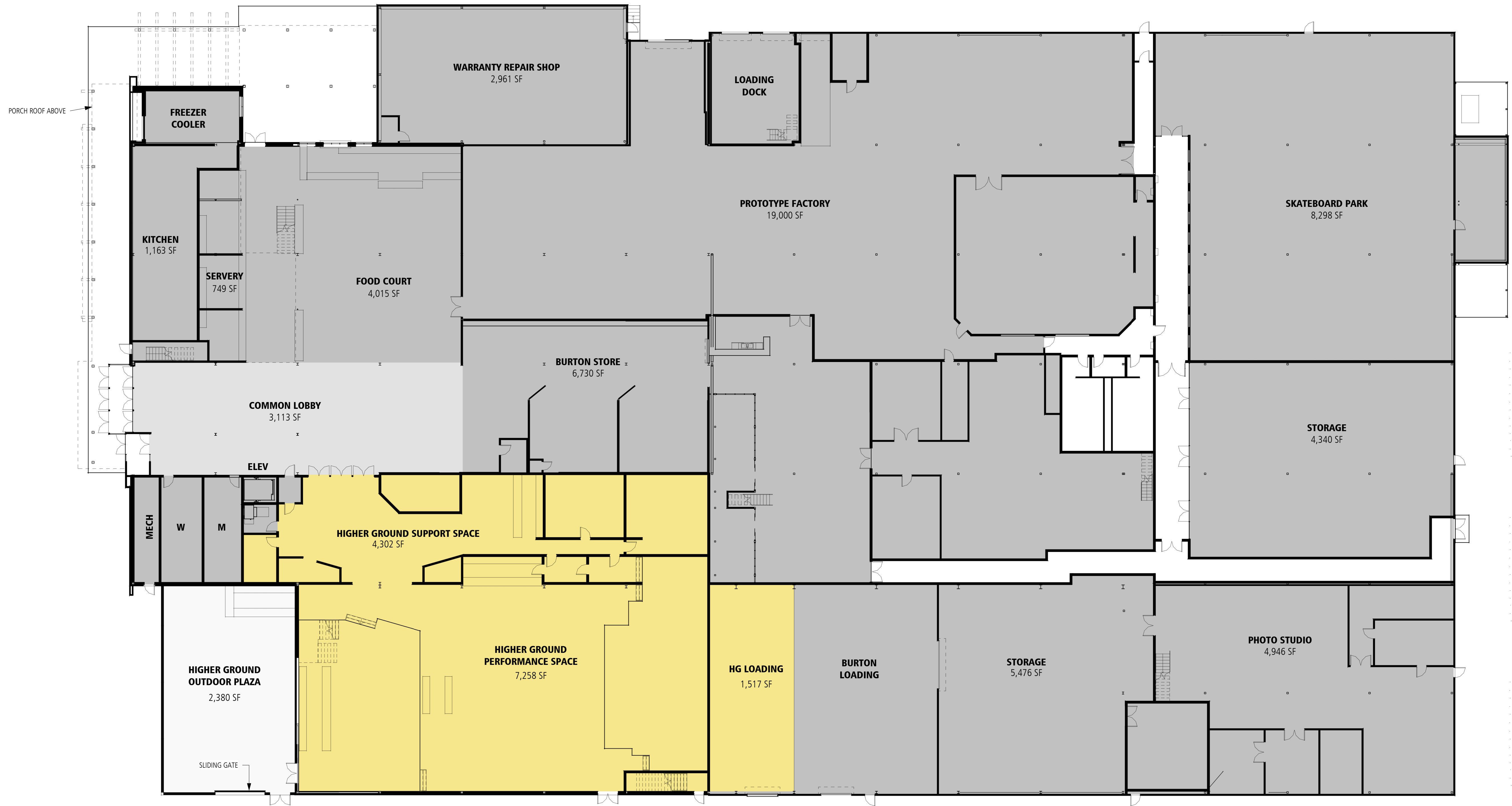
Steve Roy, P.E.
Project Engineer
Burlington Public Works





2 MEZZANINE
1/16" = 1'-0"

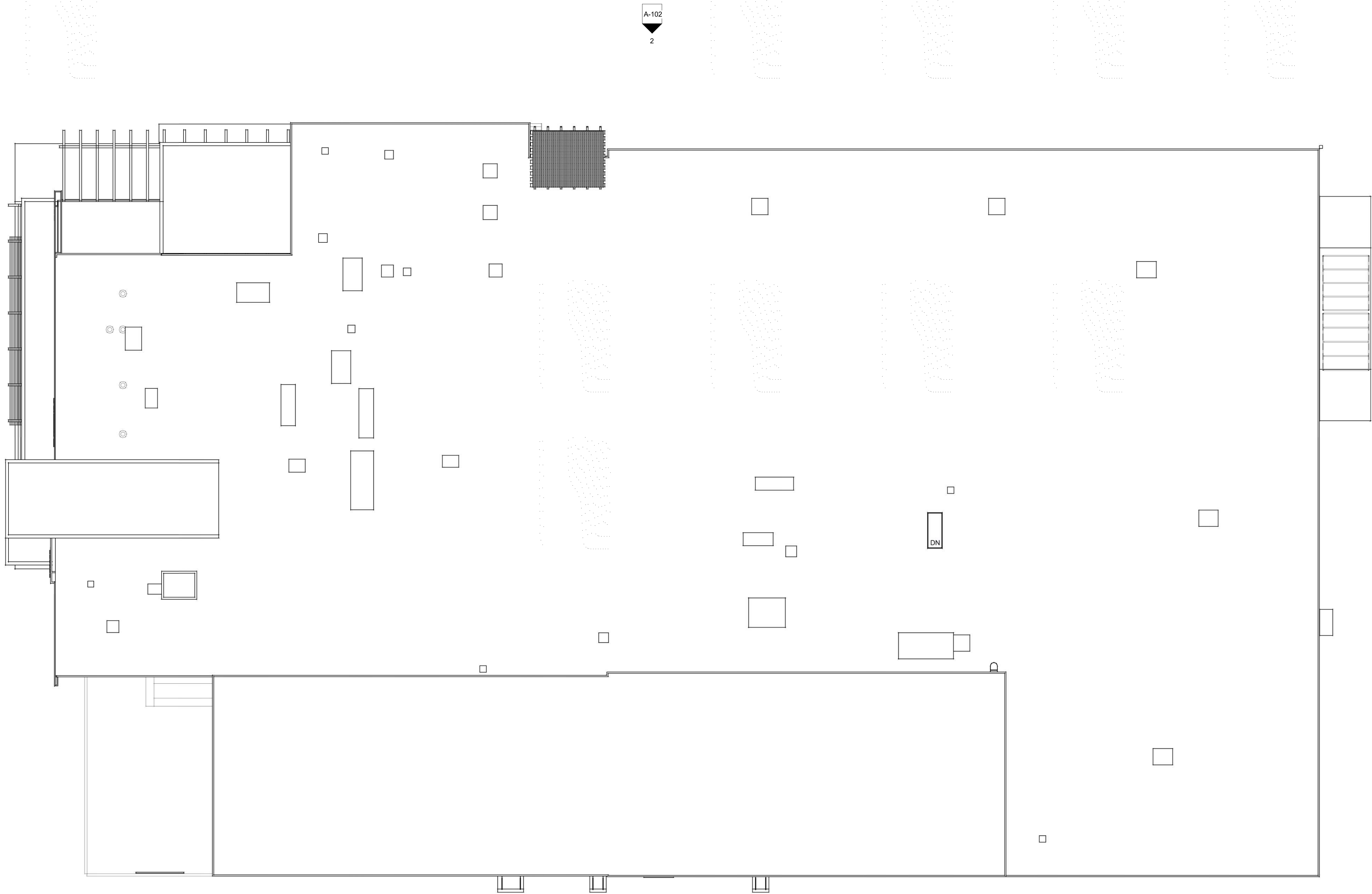
A-102 1



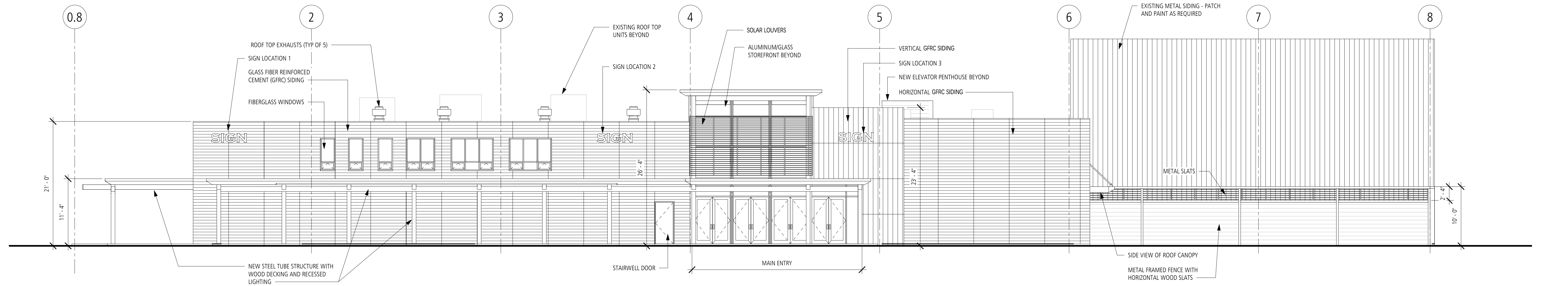
1 FIRST FLOOR PLAN
1/16" = 1'-0"

HIGHER GROUND AREA - 11,560 SF (13.6%)
TOTAL BUILDING AREA - 85,036 SF (100.0%)

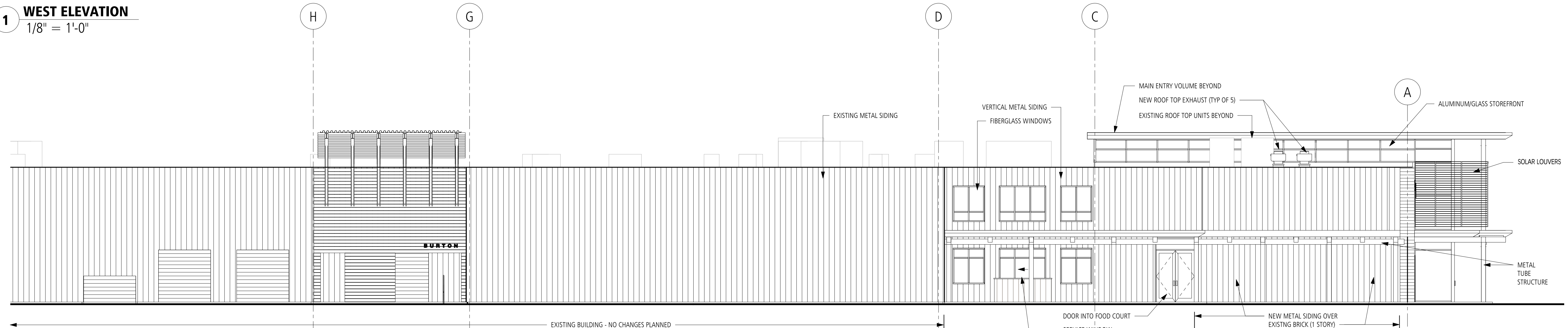
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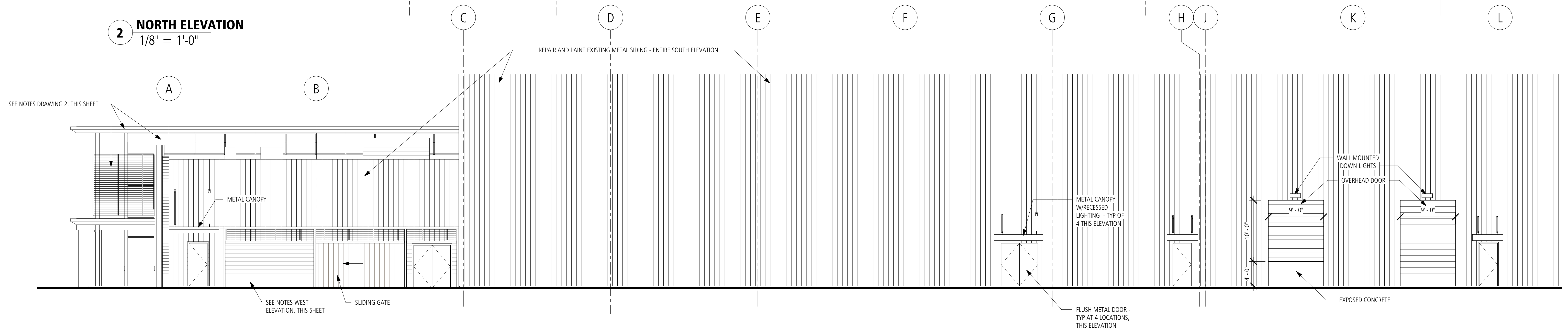
1 ROOF PLAN
1/16" = 1'-0"



1 WEST ELEVATION
1/8" = 1'-0"



2 NORTH ELEVATION
1/8" = 1'-0"



3 SOUTH ELEVATION
1/8" = 1'-0"



RENDERINGS COURTESY OF WAGNER HODGSON ASSOCIATES



FACADE SLATS MADE OF GLASSFIBRE REINFORCED CONCRETE

öko skin

With öko skin, Rieder offers concrete facades in a slatted design. The various surfaces create a lively interplay of colour. The slats can be mounted with little effort and are, unlike wood, maintenance free.

▼ SIZES ▼ COLOURS AND SURFACES ▼ ÖKO SKIN STRIPES

▼ ÖKO SKIN HIDDEN FIX

GLASS FIBER REINFORCED CONCRETE (GFRC) PLANK SIDING

Louver Materials & Finishes

SHADOTIMBER

Shadotimber are fixed or operable exterior solar shading louver systems that incorporate a unique, alternate solar shading solution. It consists of timber wood louvers, usually western red cedar which, if left untreated, ages to a silvery-grey tone. The louvers can be installed either horizontally or vertically on the building's façade.

Alternatively, a simulated wood appearance can be provided on shadometal louvers through a dye-sublimation process which will remain colorfast at the original appearance.

This type of system is generally intended for shorter spans without the need for additional supporting framework.

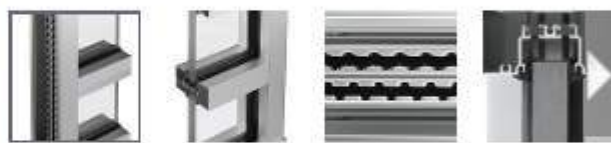
Features and benefits

- Although normally western red cedar, other types of timber wood can be provided.
- Ideal for shorter spans and thinner louvers.
- All principal support components are manufactured from corrosion-resistant extruded aluminum alloy with stainless steel fixings.
- Fully operable or fixed.



Products ▶ Trifab™ 451UT Framing System

ADDITIONAL PRODUCT INFO
OVERVIEW
PROJECT REPORTS
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Product Features

Trifab 451UT (Ultra Thermal) Framing System provides improved thermal performance to increase energy efficiency by employing a "dual" Isoloc(MC) thermal break.

Key Features Include:

- Trifab 451UT is 4-1/2" deep with a 2" sightline
- Center Plane glass application
- Flush glazed from either the inside or outside
- Screw Spline fabrication
- Dual Isoloc™ lanced and debridged thermal break
- Infill options up to 1-1/8" fineness
- Permanodic™ anodized finishes in 7 choices
- Painted finishes in standard and custom choices

Optional Features:

- High performance flashing
- Acoustical rating per AIAA 1901 and ASTM E 1425
- Project specific U-factors (See thermal charts in Architectural Detail Manual)

Product Applications:

- Storefront, Ribbon Window or Punched Openings
- Single-span
- Integrated entrance framing allowing Kawneer standard entrances or other specialty entrances to be incorporated
- Kawneer windows or GLASSvent™ are easily incorporated

Awning
Projected window hinged at the top is the only window style that keeps the rain out while allowing fresh air in.

Casement
Projected window hinged at the jamb (opening up to 90 degrees) which provides the most optimal air ventilation.

Awning, Casement

ADC 325 Series Standard Features

- Sealant: Low VOC (environmentally friendly).
- Standard 3 1/4" closed-back insulated frame. Standard insulated close-back sash.
- Available in standard white, custom, split-finish, and/or veneer wrap (oak, fir, others).
- Standard rollover operators with standard collapsible handles.
- Standard multi-point locks where applicable (19" nominal height).
- Standard concealed hinges – tamper resistant for added security.
- Sash unlooks for interior service if necessary.
- Paint & Finish: Advanced polyurethane baked on or electrostatically applied finish.
- Frame & Sash: Pultruded 0.090" nominal wall fiberglass (52-42% glass fibers + 35-45% resin + 7-13% filler).
- Insect Screen: Standard full screen. Removable stamped aluminum frame with black fiberglass mesh.
- Insulation: Expanded Poly Styrene (EPS) Type 1.
- Weatherseal: Santoprene Rubber Seals (main, secondary, spline), glazing tape, dust.
- Frame and corners are mechanically secured and joined at 45 angle.
- Exterior glazed window with aluminum stops.
- Please contact an Accurate Dorwin Window representative for sizing options.

#	DATE	REVISIONS	#	DATE	REVISIONS
01			08		
02			09		
03			10		
04			11		
05			12		
06			13		
07			14		

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+/- 1/2" ± 1.5mm
DATE: 3/1/16

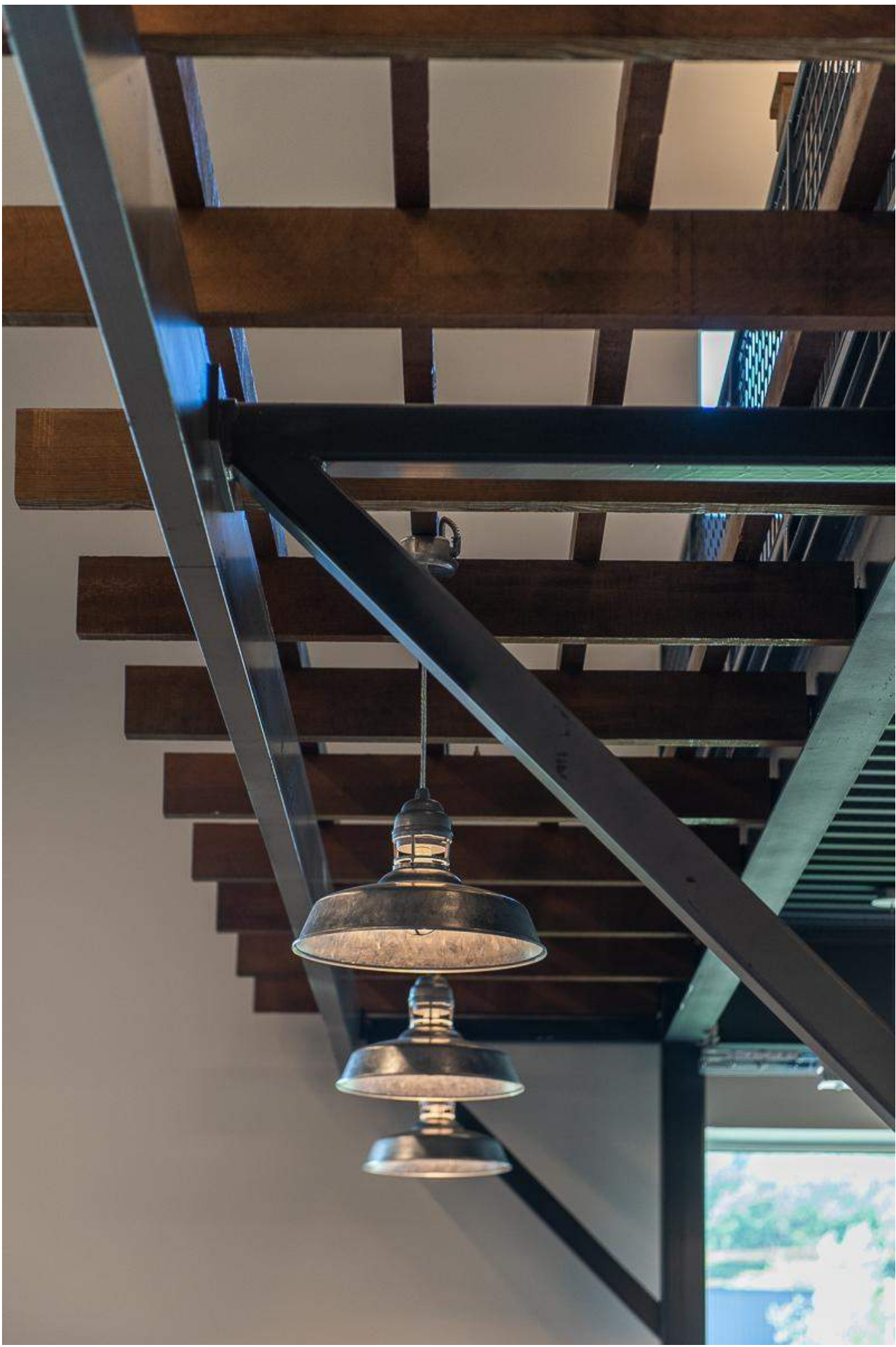
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AWNING

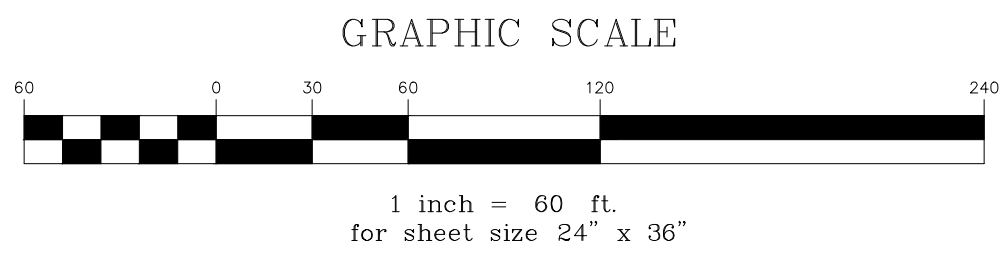
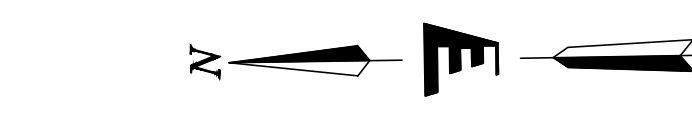
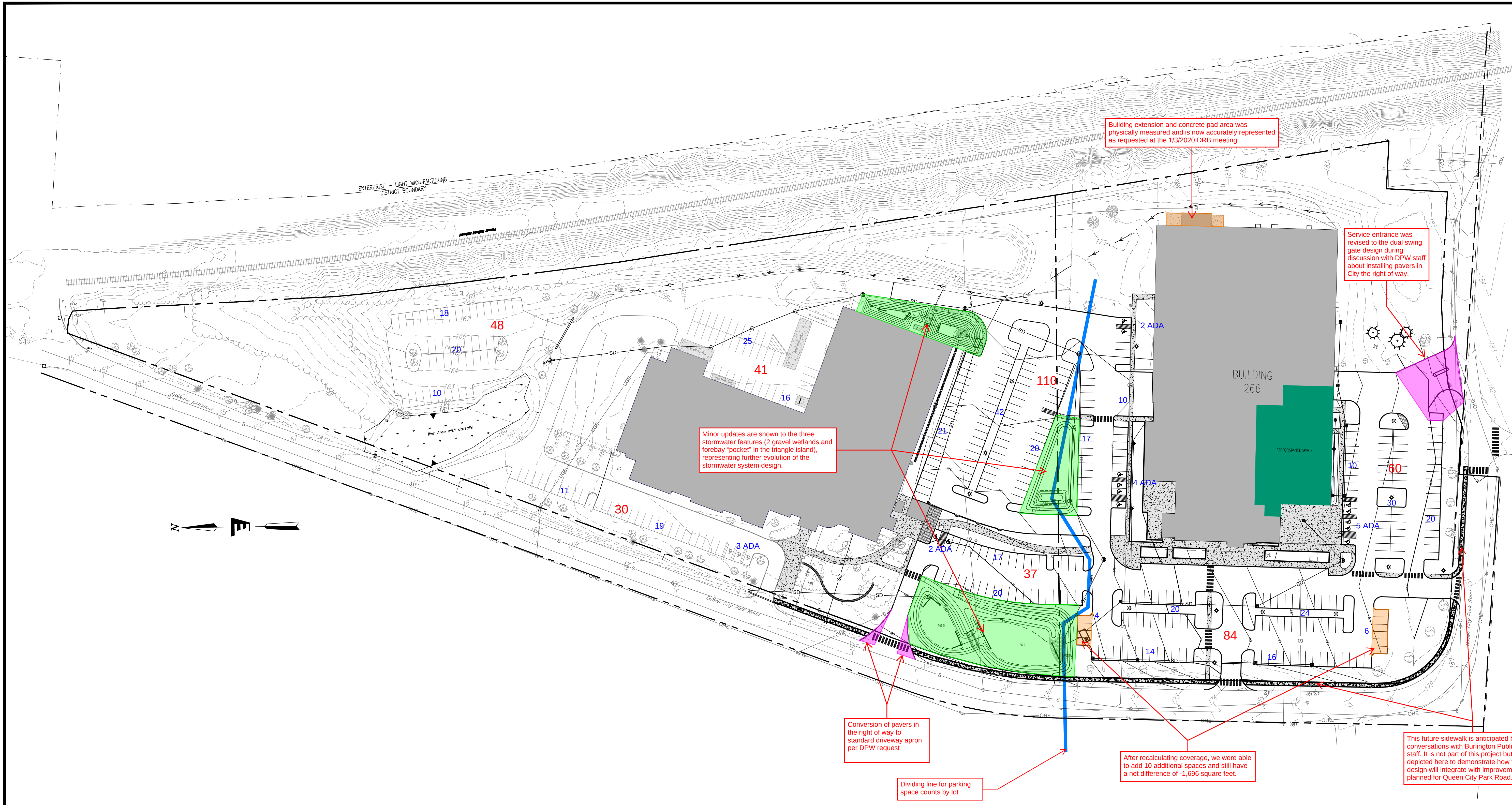
accurate dorwin

GLASS • WINDOWS • DOORS

FIBERGLASS WINDOWS



METAL STRUCTURE WITH WOOD SLATS



Existing Coverage		Proposed Coverage	
180 Queen City Park (North)		180 Queen City Park (North)	
Lot Area	375,252 ft ²	Lot Area	375,252 ft ²
Buildings	68,356 ft ²	Buildings	68,356 ft ²
Sidewalks	6,889 ft ²	Sidewalks	7,052 ft ²
Roads and Parking	122,472 ft ²	Roads and Parking	110,359 ft ²
Total Lot Coverage	52.7%	Total Lot Coverage	49.5%
Parking Count	236	Parking Count	244

266 Queen City Park (South)		266 Queen City Park (South)	
Lot Area	300,974 ft ²	Lot Area	300,974 ft ²
Buildings	83,075 ft ²	Buildings	82,690 ft ²
Sidewalks	11,777 ft ²	Sidewalks	18,525 ft ²
Roads and Parking	86,340 ft ²	Roads and Parking	90,231 ft ²
Total Lot Coverage	60.2%	Total Lot Coverage	63.8%
Parking Count	180	Parking Count	172

Existing Parking Total		416
Proposed Parking Total		416

Existing Parking Total		416 (7 ADA spaces included)
Proposed Parking Total		426 (16 ADA spaces included)
		This total includes the additional 10 spaces shaded orange above

Existing Impervious Area		378,909 ft ²
Total Proposed Impervious Area		377,213 ft ²
Net Change		-1,696 ft ²

Zoning District		Enterprise - Light Manufacturing
Setbacks		
Front	5 ft	
Side	0 ft	
Rear	10 %	
Max Coverage		80 %

After recalculating coverage, we were able to add 10 additional spaces and still have a net difference of -1,696 square feet.

Conversion of pavers in the right of way to standard driveway apron per DPW request

Dividing line for parking space counts by lot

This future sidewalk is anticipated based on conversations with Burlington Public Works staff. It is not part of this project but is depicted here to demonstrate how the site design will integrate with improvements planned for Queen City Park Road.

Service entrance was revised to the dual swing gate design during discussion with DPW staff about installing pavers in City the right of way.

Building extension and concrete pad area was physically measured and is now accurately represented as requested at the 1/3/2020 DRB meeting

Minor updates are shown to the three stormwater features (2 gravel wetlands and forebay "pocket" in the triangle island), representing further evolution of the stormwater system design.

Stamp

Chkd.	Rev. No.	Description	11-14-2019
PB	1	REVISIONS TO PROPOSED PARKING LAYOUT	
PB	2	SIGHT LINES, REVISED WEST AND SOUTH ENTRANCES	12-6-2019
PB	3	REVISED SOUTH EAST ENTRANCE AND COVERAGE TABLE	1-3-2020
PB	4	REVISED COVERAGE TABLE	1-31-2020
PB	5	HIGHLIGHTED EVENT SPACE	2-11-2020

ENGINEERING VENTURES PC

208 Flynn Avenue, Suite 2A, Burlington, VT 05401
tel. 802.863.6225 • fax 802.863.6306
85 Mechanic Street, Suite 350A, Lebanon, NH 03766
tel. 603.442.9333 • fax 603.442.9331
www.EngineeringVentures.com

Client:

Burton Snowboards

180 Queen City Park Road
Burlington, Vermont

Sheet Title:

PROPOSED CONDITIONS PLAN

PARKING LOT AND STORMWATER IMPROVEMENTS

Burlington, Vermont

Project Title:

PROPOSED CONDITIONS PLAN

PARKING LOT AND STORMWATER IMPROVEMENTS

Burlington, Vermont

Designed By:

Checked By:

Drawn By:

Scale:

Date:

PB

PB

TLB

As Noted

Nov 4, 2019

C0.3

EV#18174

Scott Gustin

From: David Zacharis <david@zacharis.com>
Sent: Monday, July 06, 2020 7:10 PM
To: Scott Gustin
Subject: Support for Burton's Conditional Use Application

[WARNING] External Message

Hello Scott,

I'm writing to share my support for Burton's conditional use application. We think it will be transformative, a giant net positive for our neighborhood and the Burlington Arts Scene. My wife and I live in the South End. Since we bought our house, we have watched the South End, it has become a vibrant place to live. We often walk our dog on Queen City Park Road. Just this weekend we daydreaming about the day that we could walk the shows there. We are looking forward to having a world class performing arts center in a location that is easy to get to, either by bike or on foot.

I enthusiastically endorse Burton's conditional use application. I have full confidence in Burton and Higher Ground to responsibly manage the venue based on their extensive concert and event experience, and their longstanding commitment to our community.

best regards,

David



David Zacharis

zacharis.com | about.me/davidzacharis

RECEIVED
JUL 06 2020
BURLINGTON
PERMITTING & INSPECTION

Scott Gustin

From: John Boone <jbgoode@gmail.com>
Sent: Monday, July 06, 2020 6:28 PM
To: Scott Gustin
Subject: please approve the Burton/Higher Ground project!

[WARNING] External Message

Hi there, my name is John Boone and I've been a Burlington resident for just over 20 years now. My older son is a recent BHS graduate who is attending UVM next year, and my younger son is a rising sophomore at BH. My wife and I have owned our home in the New North End for most of those 20 years, and I care deeply about Burlington and our place in the larger community of Vermont and Northern New England.

I'm writing to support the proposal to allow Burton and Higher Ground to create an arts venue on Queen City Park Road. I think it's a fantastic idea! The live music scene in town has always thrived in smaller Church Street clubs and other places around town, but with Memorial Auditorium on ice for the foreseeable future, this project really fills a void that we are missing. Burlington has always been the arts and culture mecca for a large area around, and this project would bring in people from all over Northern New England for shows.

Our family has been involved in the local theater arts and music world for years, and it's hard to overstate the positive impact the arts have on a community. They bring us together, they challenge us together, and they make our town a better place to live. The fact that this will be bikeable to everyone in town will be awesome. And it will be even more easily driveable once the Champlain Parkway is done.

From what I can tell, Burton and HG have done their homework to address important neighborhood concerns, and both have been Burlington institutions for years. They have extensive experience with concert and event management, so will be able to run the venue in a way that makes it a good part of the community.

I think the vast majority of Burlington residents agree with me. In any conversation I've had with my town friends about it, the reaction is universally, "really? that would be amazing!" So let's make it happen!

Scott Gustin

From: Bill Keogh <bkeoghsr@yahoo.com>
Sent: Monday, July 06, 2020 4:22 PM
To: Scott Gustin
Subject: Burton

WARNING: External Message

Scott...I'm on the perimeter of Burton, which plans to host Higher Ground on its campus. I've attended many meetings on this and believe it would be a valuable addition to the South End. It would be a fine attraction to the City. Sure there will be some traffic as there would be any other business addition. The Parkway will absorb most of it, thus sparing nearby neighbors. I hope the DRB supports the proposal.....Finally, Burton has proven to be a responsible employer over the years. It is to assume that any resulting problems will be dealt with responsibly by Burton.

Buton

Sent from Mail for Windows 10

Scott Gustin

From: Anthony Flynn <anthonysflynn@gmail.com>
Sent: Monday, July 06, 2020 4:17 PM
To: Scott Gustin
Subject: Higher Ground in the south end

[WARNING] External Message

Hello,

I am a resident of Burlington and a full supporter of Burton's project to build a performing arts center on Quaker City Park Road.

Adding a music venue and hub of entertainment and food will be a great addition to the south end. As an engineer who is involved in the design and construction business, I have no doubt that the noise will not be an issue assuming they build in the proper sound proofing as part of the renovation, as they have promised.

The opposition feels like a typical "not in my backyard" argument, one which we should be careful to give too much credit. Please help make this a reality for Burlington and its residents!

Thank you,
Anthony

Scott Gustin

From: Colin Alger <ColinA@burton.com>
Sent: Monday, July 06, 2020 9:13 AM
To: Scott Gustin
Subject: South End Updates - Higher Ground

[WARNING] External Message

Hello!

I'm a full supporter of Burton's project to build a world class performing arts center on Queen City Park Road that I can walk or bike to. I love everything else about the Hub idea too. Please help consider pushing this project through as there is so much potential and opportunity that awaits....

Regards
Colin Alger

Scott Gustin

From: Brett Smith <aaron_05401@yahoo.com>
Sent: Monday, July 06, 2020 12:43 PM
To: Scott Gustin
Subject: In support of Burton performing arts zoning permit (20-0854CA/CU 266 Queen City Park Rd)

[WARNING] External Message

Hello Scott.

I have lived at 209 Austin Drive, as a neighbor of Burlington's industrial zone for roughly twenty years.

I am writing to share that my family (wife and 3 kids) supports the addition of the performing arts space in the industrial zone.

I think this is a positive step in the evolution of Burlington and its south end that feels in line with other things that make us love where we live: improvements to our parks and bike paths, having a nice grocery store in the South End, the addition of Talent Skatepark at Burton, (hopefully) the expansion of a rock gym, etc. These changes make the south end vibrant and livable for families.

I trust that noise and traffic will be considered and managed appropriately by DRB/zoning and the businesses themselves.

My observation over 20 years is that Queen City Park Road businesses have been *good* neighbors. For example, the Burton Summer Sale and Rhino's fund raising events have added value to our neighborhood. We certainly would prefer to see arts and snowboards compared to most other types of manufacturing (after all when I moved here the space in question was a munitions manufacturer).

Brett

Sent from my phone.

Scott Gustin

From: Sara Jacobi <jacobi.sara@gmail.com>
Sent: Monday, July 06, 2020 12:35 PM
To: Scott Gustin
Subject: Higher Ground @ Burton

[WARNING] External Message

Hello,

I'm a resident of Burlington and a full supporter of Burton's project to build a performing arts center on Queen City Road. We live right on the bike path and biking down to a show & getting some dinner sounds like a great way to spend an evening! I love everything else about the Hub idea too - it will be an added "landmark" for people visiting Burlington to come check out when they are in the area, which is great for the city. Please don't let a small but vocal group of neighbors dominate the conversation - after all, they live in a city and there are a lot of places in Vermont by lakes that are not near a concert venue, and even so, impacts to neighbors will be extremely minimal. If I lived in the South End, I would be equally as psyched about this.

Thanks,
Sara

Scott Gustin

From: Jason LaMonde <jlamonde@gmail.com>
Sent: Monday, July 06, 2020 11:23 AM
To: Scott Gustin
Subject: In Support of the Burton / Higher Ground Project

WARNING: External Message

Hi Scott - Sending a note of full fledged support for the Burton / Higher Ground project and approving the conditional use application. I have lived in Burlington's South End for 14 years and would absolutely love live music and event venue that is easily accessible by car, foot, or bike via Pine Street and the bike path. In 14 years I have seen the South End blossom in so many ways! I see this project as such a natural continuation making it a vibrant destination for dining, retail, and the arts!

Thanks,
Jason LaMonde
47 Catherine Street
Burlington, VT 05401

Scott Gustin

From: Eric Bergstrom <ericb48@gmail.com>
Sent: Monday, July 06, 2020 11:14 AM
To: Scott Gustin
Subject: Burton x Higher Ground Support

[WARNING] External Message

Hello Mr. Gustin,

I am writing to give my full support to Burton's conditional use permit application. I believe that the mixed space Burton is looking to create will be something unique and positive for the greater Burlington community. Through my travels I've seen similar spaces converted into multi-use, including a performance element, that bring vitality to areas of cities that otherwise may sit under utilized.

The space will be easy to get to by walking or bicycle riding for many people living in Burlington and South Burlington. Seeing what Higher Ground is currently doing with their Drive-In concerts in Essex, I am confident that they will operate the performing center in a way that is respectful and addresses any neighborhood concerns.

Please consider this email from an enthusiastic supporter of the Burton x Higher Ground project.

Thank you,

Eric Bergstrom
South Burlington

Scott Gustin

From: chris fidler <fidler.awesome@gmail.com>
Sent: Monday, July 06, 2020 10:17 AM
To: Scott Gustin
Subject: Growing South End

[WARNING] External Message

Hi Scott - As a long time south end resident I wanted to send you a quick note regarding the plan Burton has put into place for their South End hub. It has been incredible to see the south end continue to grow and thrive over the last decade, I am on my second home in this area and love that it continues to become more of an access point. We have easy access to so much more than we did 10 years ago (Zero Gravity, Great Northern, Pizzeria City Market, etc..... and this would help continue to expand options for everyone in the south end. I am in full support of their proposal and I am excited to see the continued transformation into a neighborhood with all of local options within walking distance.

Thanks for your time!
Chris

Scott Gustin

From: Jesse Dawson <dawson.jesse@gmail.com>
Sent: Monday, July 06, 2020 9:36 AM
To: Scott Gustin
Subject: Higher Ground + Burton

[WARNING] External Message

Hello!

I live in the Oakledge area, on Harrison Ave, and can't wait for the new project with Burton + Higher Ground to be completed. I think it will bring wonderful culture and business to the area. I fully support this move and the city does too.

Best,
Jesse Dawson

Scott Gustin

From: Sadie Harris <sadie.h.05401@gmail.com>
Sent: Friday, July 03, 2020 11:29 AM
To: Scott Gustin
Subject: Concerts in South end

[WARNING] External Message

Hi!

I'm writing to share my excitement about Burton's and Higher Ground's plans to create a concert venue. It would be so great and in a place that many could walk and bike to!

Taking a facility that used to make military equipment and converting it to a place to make music and art so amazing! They have a great plan and it would make the south end an even better place.

Sadie

Scott Gustin

From: Carolyn Bates <cbatesbt@gmail.com>
Sent: Friday, July 03, 2020 11:58 AM
To: Scott Gustin
Subject: Burton and Higher Ground

[WARNING] External Message

I'm a full supporter of Burton's conditional use application. They have done their homework to build a great plan, and I have full confidence in Burton and Higher Ground to responsibly manage the venue based on their extensive concert and event experience, and their long-standing commitment to our community.

carolyn
20 caroline st
burl
july 3, 2020

--

802-238-4213
carolynbates.com
po box 1205,
burlington, vt 05402

Scott Gustin

From: Andrew Mack <BCSsingers@comcast.net>
Sent: Friday, July 03, 2020 4:36 PM
To: Scott Gustin
Cc: Kevin Walker
Subject: Proposed concert venue by HG-Burton collaboration

[WARNING]: External Message

Scott

The Burlington Choral Society (BCS) has been interested in this concert venue collaboration since the idea was germinated. I am hoping that we can be present when the space is designed, to offer advice on what will be need to make it a classical music venue, if possible. There are quite a few local organizations that cry out for an affordable venue suitable for classical music, especially choral, that will seat a larger audience. Presently, we struggle at a maximum of 300-350 seats, but cannot afford the Flynn at over 1,400. Also, if this is successful, HG will be able to present attractions that require a larger audience than the Lane Series can provide at UVM.

Justin has assured me in the past that we can be included in the planning. If that happens as proposed, I offer our support for this project. If not, it will not be relevant to our needs.

Although my term as President of the BCS has expired, I have been authorized by the Board of Directors to be the person for this project. The current BCS President is Kevin Walker.

Regards, Andrew

--

Andrew Mack - BCS Board of Directors

Scott Gustin

From: David Means <means.davidlee@gmail.com>
Sent: Saturday, July 04, 2020 7:53 AM
To: Scott Gustin
Subject: Burton/Higher Ground music venue

[WARNING]: External Message

Hello,

I am a long-time Burlington resident (Hill Section) and am writing to express my full and complete support for this project. I have closely followed the on-going narrative, both positive and negative, and believe that this project is in the best interest of Burlington and its citizens. Having a well-run, professional music/arts venue on the south side will go a long way to making our great city even better and encourage continued commercial growth in the area. I attend a lot of concerts at Higher Ground, The Flynn and others theaters around the area and believe the Burton project to be one of the most exciting opportunities to come around in a long time.

David Means
80 Prospect Pkwy
Burlington, VT. 05401

Scott Gustin

From: Jabez Boyd <jabezboyd@gmail.com>
Sent: Saturday, July 04, 2020 11:27 AM
To: Scott Gustin
Subject: Support for Burton and Higher Ground

[WARNING]: External Message

Hi,

I am writing to share my support of the Burton and Higher Ground project. I live at 10 Dunder Rd in Burlington's South Cove neighborhood and believe the project would be a fantastic addition to the South Ends existing arts and culture scene. I am not concerned about traffic or noise being an issue.

Thank you,

Jabez Boyd

Scott Gustin

From: Stacey Steinmetz <stacey@threeneeds.net>
Sent: Saturday, July 04, 2020 11:49 AM
To: Scott Gustin
Subject: Burton/Higher Ground Project

WARNING: External Message

Hello from 295 South Cove Road in the South End.

I am sending this note to you in full support of the Burton Project on so many levels:

- Burton is a great community member, and I see this project as a springboard for so much good for our community as this becomes a world-class headquarters for an amazing brand that emulates the values of our community
- The ability to be able to bike so easily for cultural experiences – great food, art, music etc. only enhances our living experience in the south end.
- This concept is something I have seen in other forward thinking communities and cities. They are filled with joy, and the essence of community coming together.
- The music element will be handled by experienced professionals and not newcomers testing a concept. Higher Ground has proven their ability to anticipate needs and proactively accommodate for seamless execution, no matter the venue, as illustrated by experiences they have created at the Shelburne Museum, Essex Expo, So Burlington Higher Ground, not to mention experience with larger events throughout the northeast. What an opportunity to bring this experience to Burlington.
- As a homeowner and a Burlington Business owner, who experiences increases in property taxes and constant increase to rooms and meals taxes to meet city shortfalls, I am delighted to welcome this community hub that will be a new source for our tax base.

I am a full supporter for Burton's Conditional Use permit.

Many thanks.

Stacey Steinmetz

Scott Gustin

From: Robert Foley <rob@foleyvt.com>
Sent: Sunday, July 05, 2020 8:53 AM
To: Scott Gustin
Subject: Support for Zoning Application of Higher Ground and Burton

WARNING: External Message

Hi Scott. As a resident of Burlington I just wanted to express my support for the zoning application of Higher Ground and Burton. As a City and community we are going to face many upcoming economic challenges and we must do everything we can to ensure the long term viability of our City. This project will make Burlington a more appealing place to live and work. It will also bring in much needed tax dollars including additions to the local option sales tax.

I realize that many people are scared of venues that attract groups of people right now. However, the current public health environment is going to change (probably quicker than most people anticipate) and when it does we need to be positioned as a community and local economy to take advantage of that. This project will allow us to do so.

Thank you very much and feel free to add this email to the public comments for their application.

Scott Gustin

From: Trinka Kerr <trinkakerr@gmail.com>
Sent: Sunday, July 05, 2020 11:42 AM
To: Scott Gustin
Cc: justinw@burton.com
Subject: Burton Higher Ground Project, 7/7/20 meeting

[WARNING]: External Message

Hello Burlington Development Review Board, I am writing to express my support for the development of a concert venue (and cool restaurants!) at the Burton facility on Queen City Park Road. I live in Queen City Park, and have lived here for almost forty years. During that time QCP has changed quite a bit. It's time for the industrial area near the entrance to QCP to change as well.

I know some of my neighbors have some concerns about this proposal. However, to me the idea of having great music and food within walking distance of my home sounds exciting and fun. And way better than having an empty warehouse sitting by the entrance to QCP.

Because the proposal only allows indoor music, I don't expect the decibel level from the concerts themselves to disturb my neighborhood. If noise from vehicles or rowdy concert goers do disturb my neighbors, I expect Higher Ground to address that appropriately. Perhaps there should be a review after a few months which includes the surrounding community to assess any adverse impacts, and figure out ways to fix them.

I urge the Review Board to approve the proposal.

Sincerely,
Trinka Kerr

Scott Gustin

From: Richard White <ricobtico@gmail.com>
Sent: Sunday, July 05, 2020 1:15 PM
To: Scott Gustin
Subject: Burton Higher Ground Project

[WARNING] External Message

Hello Burlington Development Review Board,

I am writing to express my opposition to the development of a concert venue and food hub at the Burton Facility on Queen City Park Road, as it is now proposed.

As proposed minimal mitigation of sound and traffic impact on the local neighborhoods has been developed. Additionally Burton /Higher ground have offered no thoughts or willingness to consider mitigations. Nor do they exhibit consideration of the impact their development is likely to have.

There are numerous examples of mitigations being executed throughout the country as responsible developers work with the local neighbors to make sound and traffic less invasive and bothersome.

Most recently I recall working with the Lowe's franchise when they moved into our neighborhood off Shelburne Road. They did make some mitigations for which I am very thankful.

I am sure that there is a responsible way to make this work for our community.

I have found Burton, and Higher Ground resistant to working with us to make things work well.

Since they have not, I oppose granting your approval for this project, as it now stands, and urge you to reject it.

Sincerely,

Richard White
56 Central Avenue
S . Burlington, VT

Scott Gustin

From: Shannon Cunniff <secunniff@gmail.com>
Sent: Sunday, July 05, 2020 2:46 PM
To: Scott Gustin
Subject: Burton

WARNING: External Message

I'm writing to let you know of my support for Burton's conditional use application. By teaming up, Burton Higher Grounds will repurpose an aging industrial building for a new use that will enhance Burlington as a vibrant place to live, providing positive transformation throughout the South End. We need more music and with easy bicycle access -- I intend to ride my bike there from the Old North End. We need to repurpose facilities and infill and at the same time discourage sprawl -- this will make our town more sustainable, more walkable and bike-able, and improve the quality of life in myriad ways for all Burlingtonians and beyond. Thank you.

-- Shannon

Scott Gustin

From: Cliff Rader <cliffnader@gmail.com>
Sent: Sunday, July 05, 2020 4:35 PM
To: Scott Gustin
Cc: JustinW@burton.com; Alan Newman
Subject: Burton Hub Conditional Use Permit Application

[WARNING] External Message

Dear Steve -

I want to let you know that I fully support the Burton Hub Project, and am particularly excited by the partnership with Higher Ground.

I have read over the material provided by the project sponsors, as well as the other documents provided on the DRB Agenda website. I have to say I think the sponsors have done an excellent job at responding to all concerns raised during the planning process.

To me, this project is what makes Burlington special, and will help to ensure that Burlington can maintain an economic base that is sustainable, and frankly, world-class.

If you or your staff have additional concerns, I am positive that the project sponsors can work to address them. Burlington needs projects like this one; let's not squander such a wonderful opportunity.

Thanks,

Cliff Rader
135 Lakeview Terrace
Burlington, VT 05401



Scott Gustin

From: Ted Castle <TCastle@rhinofoods.com>
Sent: Sunday, July 05, 2020 5:48 PM
To: Scott Gustin
Subject: Burlington Development Review Board - Burton

WARNING: External Message

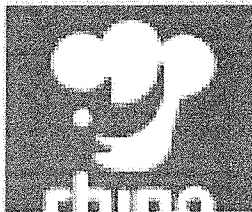
To Whom it may concern,

I'm writing to share my support for Burton's conditional use application. Burton and HG will team up to repurpose an aging industrial building for a new use that will enhance Burlington as a vibrant place to live. This will be another great example of a positive transformation throughout the South End.

I am the owner of Rhino Foods and the building on 179 Queen City Park Rd. and also the open lot at 2 Queen City Park Rd between Rhino and Edlund Co. I believe the Burton project is well thought out and provide the south end a unique opportunity to continue to prosper in a manner that enhances the city our neighborhood. We are fortunate that Burton has the foresight and the wherewithal to bring such a valuable opportunity to the city.

Sincerely,

Ted



Ted Castle
CEO and President

Rhino Foods, Inc.

www.rhinofoods.com

📞 802.861.7980 📞 802.882.02

Note: our street address has changed, but our physical location has not.



Scott Gustin

From: Eli Lesser-Goldsmith <powereli@gmail.com>
Sent: Sunday, July 05, 2020 10:15 PM
To: Scott Gustin
Subject: Higher Ground / Burton Project

WARNING: External Message

Scott, please help progress this project. Vermont NEEDS development like this for a number of reasons. It's massively important to help recruit new Vermonters to move and live here, and to help grow the tax base. It's a rad project that most people support, except for a very vocal minority.

Two thumbs UP!

Eli

Eli Lesser-Goldsmith
222 Dorset Street | South Burlington, VT 05403
802 - 863 - 9111 | Direct

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Scott Gustin

From: Dave Gurtman <dave.gurtman@gmail.com>
Sent: Monday, July 06, 2020 8:38 AM
To: Scott Gustin
Subject: 20-0854CA/CU; 266 Queen City Park Road Public Comment

WARNING: External Message

Hi Scott and members of the Burlington DRB,

My name is Dave Gurtman. I live in the Queen City Park neighborhood of South Burlington, work in Burlington and own a business and real estate in Burlington. I am also a former member of the Burlington Planning Commission.

I'm writing to support the Conditional Use Application for 20-0854CA/CU; 266 Queen City Park Road.

I trust the professionals on staff at Planning and Zoning to review the aspects of the project and I am hopeful that it will receive approval. I also trust the professionals engaged by the applicant to ensure that its design is compatible with zoning requirements.

I disagree with many of my neighbors who have NIMBY concerns with this change (traffic, noise, crime) as I believe these concerns can be capably dealt with by the applicant as presented in their application.

One point that I think is also lost here is that the ELM already has permitted uses that could (or do) create more of an impact with respect to the NIMBY concerns including manufacturing, lumber yards and public transit terminals. And these are not even conditional uses. Though surrounded by residential neighborhoods, most if not all of those residents moved in knowing that they were neighboring an industrial park that would have uses that might generate noise or traffic. As a community, we can't shut the door behind us. We live in the state's largest cities and need to welcome individuals and businesses that want to invest in revitalizing underutilized space in an industrial park.

Lastly, I urge the DRB to consider adopting a growth mindset, not in the absolute sense of growth but in the sense of adding density/uses/development but in the sense described in *planBTV*. The City needs to adapt and change over time. For me, in its most basic sense, we are talking about a land use change allowing the adaptive reuse of a underused factory/manufacturing plant to a performing arts venue and, to me, it seems an easy choice.

I hope you enjoyed the long holiday weekend and thank you for your service!

Dave

Scott Gustin

From: Cory Sweitzer <corys@burton.com>
Sent: Monday, July 06, 2020 8:56 AM
To: Scott Gustin
Subject: Burton Hub - Conditional Use Permit

[WARNING] External Message

Dear Mr. Gustin,

I'm writing to share my support for Burton's conditional use application. Burton and HG will team up to repurpose a aging industrial building for a new use that will enhance Burlington as a vibrant place to live. This will be another great example of a positive transformation throughout the South End. What's better than taking a facility that used to make military equipment and converting it to a place to make music and art! It will be a huge miss if Burlington passes over this opportunity.

Thanks for your time.

Cory Sweitzer
Senior Video Editor
Burton Snowboards
w. 802.652.6701
e. corys@burton.com

Mary O'Neil

From: Chris Lane <clane@vermonthabitat.org>
Sent: Tuesday, June 30, 2020 2:45 PM
To: Mary O'Neil
Subject: Re: construction hours

External Message

Yes, we would like the ability to work 8-3 on Saturdays. It is supposed to be vinyl siding. Evergreens are 3

Get [Outlook for Android](#)

From: Mary O'Neil <MCOneil@burlingtonvt.gov>
Sent: Tuesday, June 30, 2020 1:41:51 PM
To: Chris Lane <clane@vermonthabitat.org>
Subject: construction hours

Chris,

In the past, Habitat has requested Saturday construction hours as they rely on volunteers. Is this the case for the Elmwood Avenue property, and what hours would you need?



Mary O'Neil, AICP
Principal Planner
Coordinator, Certified Local Government Program
645 Pine Street
Burlington, VT 05401
mconeil@burlingtonvt.gov
802.865.7188 office
802.865.7556 direct
802.863-0466 fax

Please note! Our offices have moved to 645 Pine Street as of December 2, 2019.

**** Please note** that this electronic message may be subject to disclosure as a public record under the Vermont Public Records Act.

Please note that this communication and any response to it will be maintained as a public record and may be subject to disclosure under the Vermont Public Records Act.

291 Appletree Point Road



d

Department of Permitting and Inspections

Zoning Division
149 Church Street
Burlington, VT 05401

<http://www.burlingtonvt.gov/PZ/>

Telephone: (802) 865-7188
(802) 865-7195 (FAX)

William Ward, Director
Theodore Miles, Interim Code Compliance Officer
Charlene Orton, Permitting and Inspections Administrator
Scott Gustin, AICP, CFM, Principal Planner
Mary O'Neil, AICP, Principal Planner
Ryan Morrison, Associate Planner
Layne Darfler, Planning Technician
Alison Davis, Zoning Clerk



MEMORANDUM

To: Development Review Board
From: Mary O'Neil, AICP, Principal Planner
Date: July 7, 2020
RE: ZP20-0820CA; 44 Lakeside Avenue [Building 32]

Note: These are staff comments only. Decisions on projects are made by the Development Review Board, which may approve, deny, table or modify any project. THE APPLICANT OR REPRESENTATIVE MUST ATTEND THE MEETING.

File: ZP20-0820CA

Location: 44 Lakeside Avenue, Building 32

Zone: E-LM **Ward:** 5S

Parking District: Shared Use

Date application accepted: April 13, 2020

New Plans Submitted: June 15 and 21, 2020.

Applicant/ Owner: LandPlan-John Caulo / Lakeside Ovens, LLC (Russ Scully)

Request: Demolition of existing two level 9,200 sf office building and construction of a *three* level, 14,450 sf office building on existing foundation.



Background:

Building 32 is one of several buildings on a 14.89-acre site that includes Buildings 32, 44, 50, a parking lot and at least 4 small waterfront “pavilions”. Permitting for Building 32 has generally fallen under the 44 Lakeside Avenue address:

- **Zoning Permit 20-0707CA;** Construction of seasonal bathhouse at the north end of site with two (2) toilet stalls and two (2) outdoor showers. March 2020.
- **Non-Applicability of Zoning Permit Requirements 19-0492NA;** rooftop solar. January 2019.
- **Zoning Permit 19-0202CA/MA;** Renovate buildings for assembly, office, and seasonal recreational use. Rework parking and circulation. Merge north and south lots into one. November 2018.
- **Zoning Permit 19-0011CA;** New windows, exterior entry doors and roof for existing office building. Demolition of existing loading dock on east side of building; reduction of gross floor area. July 2018.
- **Zoning Permit 18-0865A;** Construct one storage structure to match others built under zoning permit 18-0232CA. Also, construct a pavilion and wooden gate within the existing chain link fence along the bike path. Establish a boat rental use associated with the structures. May 2018.
- **Zoning Permit 18-0232CA;** Construct three outbuildings for storage, to be placed outside of lakeshore buffer. September 2017.
- **Zoning Permit 17-0315CA;** Renovation of interior commercial space for conversion to office use. [Building 32] September 2016.
- **Zoning Permit 13-0682CA;** Install new gas piping on roof beside existing piping. Intall four new roof mounted exhaust fans. January 2013.
- **Zoning Permit 10-0144CA;** Construct addition to link two existing commercial buildings. September 2009.
- **Zoning Permit 06-489CA;** Replace two windows, north facade with two new paired windows. Erect 12 ft x 5 ft 6 in. balcony, install door, west side. [Building 32] February 2006.
- **Zoning Permit 06-379CA;** Fit up for Coffee Enterprises. [Building 32] New steel egress door added to south elevation. December 2005.

- **Zoning Permit 05-171CU**; Change from office space to manufacturing space, add 800 amp of power, add heat to entire building. October 2004. Permit relinquished.
- **Zoning Permit 96-283**; Installation of a seasonal dock for recreational use of blodgett employees. January 1996.
- **Zoning Permit 96-048 / MA96-007**; Installation of a seasonal dock for recreational use of Blodgett employees. August 1995.
- **Non-Applicability of Zoning Permit Requirements**; Blodgett no longer utilizing space with Blodgett Oven expanding into area. Use remains the same; storage, testing, sales, support offices. March 1991.
- **Zoning Permit 78-465**; Blodgett Supply Co. to erect a 12' high by 210' long block wall to enclose the loading platform, install three dock levelers and erect one office. December 1977.

Overview: The office building at the terminus of Lakeside Avenue is proposed to be demolished and replaced with a *three*-level office building on the same footprint (original application was for a four-story building). The building is not listed on the state or National Register of Historic Places, and was not included in the Lakeside Historic District. The Assessor's Database has a construction date of 1945. The Vermont Division for Historic Preservation has issued a decision of "No Undue Adverse Effect" relative to the redevelopment plan under Act 250 review.

The **Design Advisory Board** reviewed the application at their May 26, 2020 meeting (when the initial proposal was for a four-story building.) Their vote was unanimous to move the application to the DRB with a recommendation for approval as submitted.

The **Conservation Board** review the application at their June 2, 2020 meeting and moved to recommend approval of the application in a 6-1 vote, conditioned upon the following:

1. Patio pavers be permeable; and
2. If additional landscaping is proposed, native plantings be used with some kind of habitat or ecological benefit.

Recommended motion: Certificate of Appropriateness **Consent Approval**, per the following findings and conditions:

I. Findings

Article 3: Applications and Reviews

Part 3: Impact Fees

Impact fees are assessed for the net new square foot area of the office use. Based on the submission of net new 5,250 sf (14,450 – 9,200 existing), Impact Fees will be:

SF of Project 5,250

Department	<u>Offices & Other</u>	
	Rate	Fee
Traffic	0.686	3,601.50
Fire	0.202	1,060.50
Police	0.356	1,869.00
Parks	0.425	2,231.25
Library	0.000	0.00
Schools	0.000	0.00
Total	1.669	\$ 8,762.25

Section 3.3.8 Time and Place of Payment

Impact fees must be paid to the city's chief administrative officer/ city treasurer according to the following schedule:

(a) New Buildings: Impact fees must be paid at least seven (7) days prior to occupancy of a new building or any portion thereof.

Affirmative finding as conditioned.

Article 4: Maps & Districts

Section 4.4.3 Enterprise Districts

(a) Purpose

(1) Light Manufacturing (E-LM)

The subject property is located in the E-LM zone that is intended as the primary commercial/industrial center of Burlington. The proposed office space is consistent with the existing use and variety of commercial uses allowed in this zone. **Affirmative finding.**

(b) Dimensional Standards & Density

The addition of one more floor (a total 5,250 net new sf) increases the overall Floor Area Ratio of the entire 14.89 acre lot, but not so significantly as to come close to the 2.0 FAR limitation. Plan C1.1 defines the overall site FAR at 0.24.

Lot coverage will increase only to accommodate the 550 sf. granite patio. Engineering Ventures has recalculated lot coverage for the entire parcel (previously approved under ZP19-0202 CA/MA as 49%) and found that impervious area was overestimated in that review. A new coverage calculation is provided at 44% (Plan C-1.1 in revised planset.) As the area of redevelopment is within the lakeshore buffer, Conservation Board review was required for the addition of the west patio. The proposed lot coverage is under the maximum allowable 80% coverage.

The front yard setback along Lakeside Avenue remains unchanged. Side yard setbacks are not applicable in the E-LM zone, nor is the lakeshore setback.

Building height increases to 35.9', and with the addition of the rooftop equipment falls well within the 45' height limitation of the zoning district. A mechanical screen encloses rooftop mechanical equipment, which is exempt from height measurement limitations as it does not exceed 15' in height and occupies less than 20% of the roof area per Section 5.2.6 (b) 4.

Affirmative finding.

(c) Permitted & Conditional Uses

General office is a permitted use in the E-LM zone. **Affirmative finding.**

(d) District Specific Regulations

Not applicable.

Section 4.5.4 Natural Resource Protection Overlay District

(c) District Specific Regulations: Riparian and Littoral Conservation Zone

Almost the entire parcel is affected by the Riparian and Littoral Conservation Zone, an overlay that extends 250' inland from the 95.5' elevation along the lakeshore. This overlay zone establishes criteria for tree clearing and stormwater management. The Conservation Board reviewed the project under these standards and recommended approval with conditions that the patio pavers be pervious and native plantings are employed if further landscaping is proposed.

Affirmative finding as conditioned.

Article 5: Citywide General Regulations

Section 5.2.3 Lot Coverage Requirements

See Section 4.4.3 (b) above.

Section 5.2.4 Buildable Area Calculation

Not applicable.

Section 5.2.5 Setbacks

See Section 4.4.3 (b) above.

Section 5.2.6 Building Height Limits

See Section 4.4.3 (b) above.

Section 5.2.7 Density and Intensity of Development Calculations

See Section 4.5.3 (b) above.

Section 5.5.1 Nuisance Regulations

Nothing in the proposal appears to constitute a nuisance under this criterion.

Affirmative finding.

Section 5.5.2 Outdoor Lighting

Under canopy can lights are proposed on the east elevation. Existing, approved pole lamps will be relocated along the reconstructed interior sidewalk. **Affirmative finding.**

Section 5.5.3 Stormwater and Erosion Control

A parcel-wide stormwater management plan and Erosion Control plan was reviewed and approved under ZP19-0202CA/MA. Engineering Ventures prepared updated Stormwater and Erosion Prevention and Sediment Control plans relative to the replacement of Building 32. The approval of that updated plan by Stormwater Engineering program was received effective June 1, 2020. **Affirmative finding.**

Article 6: Development Review Standards

Part 1: Land Division Design Standards

No land division is proposed within this application. Building 32 remains part of the overall 44/50 Lakeside Avenue parcel.

Part 2: Site Plan Design Standards

Sec. 6.2.2 Review Standards

(a)Protection of Important Natural Features:

The existing building is built into the embankment along Lake Champlain, the most notable natural feature. The existing steel sea wall that will not be disturbed. As the replacement building is proposed on the same footprint with the addition of a 550 sf patio on the west, no additional impact is proposed or anticipated. **Affirmative finding.**

(b) Topographical Alterations:

The new building will be built upon the existing foundation. No topographical alterations are proposed. **Affirmative finding.**

(c)Protection of Important Public Views:

There are no protected views from or through this site. As the building is proposed on the same footprint as the existing building, little alteration will be made of existing views from Lakeside Avenue. **Affirmative finding.**

(d) Protection of Important Cultural Resources:

Burlington's architectural and cultural heritage shall be protected through sensitive and respectful redevelopment, rehabilitation, and infill. Archeological sites likely to yield information important to the city's or the region's pre-history or history shall be evaluated, documented, and avoided whenever feasible. Where the proposed development involves sites listed or eligible for listing on a state or national register of historic places, the applicant shall meet the applicable development and design standards pursuant to Sec. 5.4.8(b).

Not applicable.

(e) Supporting the Use of Renewable Energy Resources:

Building 32 will be heated and cooled using geothermal energy, utilizing systems developed during the permitting of 44/50 under ZP19-0202 CA/MA. Although a solar array is not immediately planned for implementation, the redevelopment plan will include installation of two

(2) empty conduits connecting the roof surface to the Building Electrical Closet; allowing future installation. **Affirmative finding.**

(f) Brownfield Sites:

Identified as Site 20154612, The property is listed under 34/44/50 Lakeside Avenue on the Vermont DEC website. <https://anrweb.vt.gov/DEC/ERT/Brownfields.aspx>

The project is enrolled in Brownfields Reuse and Environmental Liability Limitation Program (BRELLA), Two Phase I's have been submitted; two Phase II's completed. A Supplemental Phase II completed. A CAP (corrective action plan) was approved 3/19/19.

https://anrweb.vt.gov/PubDocs/DEC/Hazsites/20154612.0412.19.Final.Approved.17-070_Lakeside.Ave.CAP_031119.pdf

An excerpt from that approved CAP specific to Building 32 notes Recognized Environmental Conditions (RECs):

1.4.1. Weston & Sampson Phase I ESA, September 18, 2015

Weston & Sampson conducted a Phase I ESA of the Site on behalf of Malone Properties, Inc. in accordance with ASTM Standard Practice E1527-13. Weston & Sampson identified the following recognized environmental conditions (RECs) associated with the Site:

32 Lakeside Avenue

- The unknown outlet location of and historic release of boiler blow down and potentially hazardous materials to the floor drain in the utility room can result in a release to the environment and represents a REC.
- The apparent presence of a >50-year old fuel oil underground storage tank (UST) with fluid remaining in it represents a material threat for a release and is a REC.
- The potential for release of PCB containing window glazing and caulking to the soils surrounding the building is a REC.

Subsequent correspondence with Vermont DEC and Lee Rosberg of Stone Environmental provided the following directives¹:

[Lee Rosberg, Stone Environmental]:

The property owner has mentioned that they eventually intended to demolish the 32 building to the foundation and construct a building in the same footprint on the existing foundation. Stone [Environmental] has advised them:

- 1) *There are PCBs (<50 ppm) in the window caulk and some adjoining masonry that will require removal and disposal as bulk product waste in the same manner as the windows that were removed from the 50 building. Since this is a bulk product waste a cleanup plan in accordance with 40 CFR 761.61 is not required.*
- 2) *There are low level PCBs (< 1 ppm and < non-resident VSS) in soil below each window and that these soils will either need to stay in place or be managed for disposal during construction. The last we discussed, Lakeside Ovens intended to leave soil in place. Attached, please find a map with caulk, masonry, and soil sample locations and corresponding analytical summary tables. These were included in the CAP, which was prepared prior to the 2019 IRule update so soil results are compared to previous VT soil*

¹ Email from Michael B. Smith, Vermont Department of Environmental Conservation; April 24, 2020.

standards in the table. However, there are no exceedances of the PCB non-resident soil standard (0.68 ppm) in soil near the 32 building.

- 3) *A UST just off the northeast corner of the foundation was assessed and closed in place last year. The closure report was submitted to the UST Program and SMS.*
- 4) *A hazardous building materials assessment (lead, asbestos, etc.) should be conducted.*

This permit is conditioned to follow the protocols identified within the Corrective Action Plan and the guidance of the environmental consulting firm, noted above. **Affirmative finding as conditioned.**

(g) Provide for nature's events:

Special attention shall be accorded to stormwater runoff so that neighboring properties and/or the public stormwater drainage system are not adversely affected. All development and site disturbance shall follow applicable city and state erosion and stormwater management guidelines in accordance with the requirements of Art 5, Sec 5.5.3.

A stormwater management plan was submitted and approved by the Stormwater Engineering Division June 1, 2020.

Design features which address the effects of rain, snow, and ice at building entrances, and to provisions for snow and ice removal or storage from circulation areas shall also be incorporated.

The applicant has ample on-site room for snow storage across the overall complex. Building entrances provide a manner of shelter during inclement weather.

Affirmative finding.

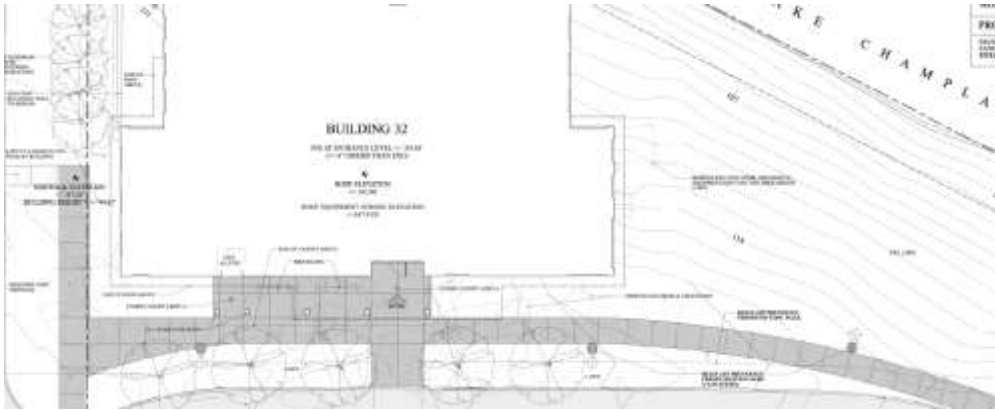
(h) Building Location and Orientation:

The proposed building will be similarly reconstructed on the same foundation footprint, oriented toward Lakeside Avenue with presentation toward the overall parcel access avenue and the lake. **Affirmative finding.**

(i) Vehicular Access:

Building 32 is part of a larger parcel, with a vehicular access and parking facilities approved under ZP19-0202CA/MA. **Affirmative finding as conditioned.**

(j) Pedestrian Access:



A pedestrian walkway will continue along Lakeside Avenue, and connect to the front of 32 Lakeside, continuing through the overall parcel. Any work proposed within the public ROW will require approval of the Department of Public Works and potentially City Council.

Affirmative finding as conditioned.

(k) Accessibility for the Handicapped:

The new building will be completely accessible. The south parking lot for Building 32 will provide one accessible and one van accessible handicap parking spaces. See Plans L-1.0 and L-1.1 for parking. **Affirmative finding.**

(l) Parking and Circulation:

Parking was approved under ZP19-0202CA/MA for the larger parcel. A total of 381 parking spaces were approved (273 spaces (10 EV), and an additional 108 tandem spaces). Including all uses on the site (office, maker spaces and seasonal surf club), **309 spaces are required.**

This application has minor modifications to the parking plan, appending the surface parking to 386 parking spaces (+5 over 19-0202 approval). See Plan L-1.1, with mark-up. The additional spaces include one conventional space (total 274) and 4 more tandem spaces (total 112.) **The surfeit on the overall lot is 77 spaces; easily accommodating the additional 11 parking spaces required of the new building.** (Proposed building 14,450 sf – existing building 9,200 sf = 5,250 sf @ 2/1000 in Shared Use district; 11 new parking spaces required.) Approval of the Parking Management Plan was within ZP19-0202CA/MA, including tenant managed parking assignment. A condition of approval will adopt conditions associated with that Parking Management Plan, to assure success of the plan and to prevent any on-street neighborhood parking with the expanded office building.

See Plan L-1.0 for a breakdown of parking requirements, Plan L-1.1 for identification of parking layout. **Affirmative finding as conditioned.**

(m) Landscaping and Fences:

There is an existing cedar hedge on the south side of the project site, which is proposed to be retained or replaced-in-kind if disturbed during construction activities. These are not on the subject parcel (as the sidewalk extension south of the site.) If any other changes (other than replacement landscaping) are proposed on the abutting property, the abutting property owner must submit a permit application. The applicant submitted new plans (received 5.14.2020) to

condense the Limit of Development (LOD). Any alterations within the Right-of-Way requires prior approval by the Department of Public Works.

Existing trees to the east of the building will be removed, to be replaced with five new Thornless Honeylocust between the pedestrian way and the access road. Existing, approved pole lights will be relocated along the pedestrian path. A 550 sf terrace is proposed on the west of the building. As this is within the 250' lakeshore buffer, the Conservation Board reviewed the application and recommended approval with conditions. **Affirmative finding as conditioned.**

(n) Public Plazas and Open Space:

There are no public plazas here, but the first and second floor decks and terraced area will provide an opportunity for outdoor space for building tenants. **Affirmative finding.**

(o) Outdoor Lighting:

Where exterior lighting is proposed the applicant shall meet the lighting performance standards as per Sec 5.5.2.

The plan indicates relocation of existing, approved walkway pole lighting. Under canopy can lights are proposed for the easterly entrance. (Information on the canopy lighting is on Plan L-1.0, upper left hand corner of the sheet.) **Affirmative finding.**

(p) Integrate infrastructure into the design:

Exterior storage areas, machinery and equipment installations, service and loading areas, utility meters and structures, mailboxes, and similar accessory structures shall utilize setbacks, plantings, enclosures and other mitigation or screening methods to minimize their auditory and visual impact on the public street and neighboring properties to the extent practicable.

Utility and service enclosures and screening shall be coordinated with the design of the principal building, and should be grouped in a service court away from public view. On-site utilities shall be place underground whenever practicable. Trash and recycling bins and dumpsters shall be located, within preferably, or behind buildings, enclosed on all four (4) sides to prevent blowing trash, and screened from public view.

Any development involving the installation of machinery or equipment which emits heat, vapor, fumes, vibration, or noise shall minimize, insofar as practicable, any adverse impact on neighboring properties and the environment pursuant to the requirements of Article 5, Part 4 Performance Standards.

Mechanical equipment is proposed on the roof-top, enclosed on all sides with a pre-finished vertical metal siding equipment screen. Electrical service is currently undergrounded (E1). DPW has identified electric conduit in close proximity to a hydrant and has conditioned that if not relocated, it must be installed to curve around the hydrant. See Plan C-1.2 for utility arrangement. **Affirmative finding as conditioned.**

(b) Protection of Important Architectural Resources:

Burlington's architectural and cultural heritage shall be protected through sensitive and respectful redevelopment, rehabilitation, and infill. Where the proposed development involves buildings listed or eligible for listing on a state or national register of historic places, the applicant shall meet the applicable development and design standards pursuant to Sec. 5.4.8. The introduction of new buildings to a historic district listed on a state or national register of historic places shall make every effort to be compatible with nearby historic buildings.

Not applicable.

(c) Protection of Important Public Views:

There are no protected views from or through this site. **Affirmative finding.**

(d) Provide an active and inviting street edge:

The building is attractively arranged and composed on all four elevations; the east (street front) elevation clearly articulated with a central entrance, balanced fenestration, interesting and durable materials, and accessible bike racks. **Affirmative finding.**



(e) Quality of materials:

All development shall maximize the use of highly durable building materials that extend the life cycle of the building, and reduce maintenance, waste, and environmental impacts. Such materials are particularly important in certain highly trafficked locations such as along major streets, sidewalks, loading areas, and driveways. Efforts to incorporate the use of recycled content materials and building materials and products that are extracted and/or manufactured within the region are highly encouraged.

Reference is made to plan A-2.0 for specifics on materials proposed. The rich and diverse collection of sheathing materials are durable and appropriate for new construction. **Affirmative finding.**

(f) Reduce energy utilization:

All new construction shall meet the Guidelines for Energy Efficient Construction pursuant to the requirements of Article VI. Energy Conservation, Section 8 of the City of Burlington Code of Ordinances.

The building will profit from the installation of geothermal wells installed as part of the overall complex redevelopment (ZP 0202CA/MA, 2019). Although not immediately proposed, the building will have the integral ability to adopt solar infrastructure in the future. **Affirmative finding as conditioned.**

(g) Make advertising features complementary to the site:

Any signage will require a separate zoning permit. **Affirmative finding as conditioned.**

(h) Integrate infrastructure into the building design:

See Section 6.2.2. (p), above.

(i) Make spaces secure and safe:

Redevelopment is subject to all applicable building and life safety codes as defined by the Burlington's Building Inspector and the Fire Marshal.

Redevelopment shall be consistent with the requirements of the Corrective Action Plan approved March 2019, or any supplement to that document that addresses disposition or disturbance of soils and building materials specific to Building 32. **Affirmative finding as conditioned.**

Article 8: Parking

Section 8.1.8, Minimum Off-Street Parking Requirements

The minimum parking requirement is based on general office use. The proposed replacement building will be 14,450 sf of office space; deducting the existing 9,200 sf results in 5,250 sf new. The office space requires 11 new parking spaces (2 spaces per 1,000 sf.) Zoning Permit 19-0202CA/MA acknowledged the requirement of at least 282 onsite parking spaces (2 spaces per 1,000 sf) and 4 spaces for manufacturing/maker space (1 space per 1,000 sf). The total required parking was 286 spaces for these two uses. A total of 381 parking spaces was approved under the Parking Management Plan associated with ZP19-0202CA/MA; 273 conventional and 108 tandem.

This application will includes a gain of 5 parking spaces. See Plan L-1.1 dated 4.10.2020.

Parking analysis, 44 Lakeside complex			
Permit #	Use	Area	Requirement
ZP19-0202CA/MA	Office use	141,200 sf	282 spaces (2/1,000 sf)

	Manufacturing/Maker Space	3,900 sf	4 spaces (1/1,000 sf)
Total required			286 spaces
Total provided			381 spaces • 273 conventional • 108 tandem* As approved in Parking Management Plan.

ZP18-0865CA	Boat rental		10
Total required			286 + 10 = 296
Surplus spaces			381 - 296 = 85 spaces

ZP20-0674CU*	Change of use: Mixed office to Trade school		+1
Total site requirements*			296 + 1 = 297 spaces
*Approved by DRB at their June 2, 2020 agenda.			

ZP20-0820CA See Plan L-1.0	Office use	5,250 net new	+11 spaces
Total required			297 + 11 = 308
Total provided			386 spaces • 274 conventional (10EV) • 112 tandem
Total surplus			386 provided -308 required = 78

Affirmative finding as conditioned.

Section 8.1.9 Maximum Parking Spaces

Surface parking is limited to 125% of the Neighborhood Parking District minimum parking requirement. In this case, the maximum permissible parking for *office use* is 366 spaces (141,200 office + 5,250 s net new = 146,450 sf. Neighborhood parking calc. = 293 spaces x 1.25 = 366 parking spaces); for the *manufacturing use* approved in ZP19-02020CA/MA 6 spaces. Discounting the 10 seasonal spaces for the boat rental, the 386 onsite parking spaces exceed the 372 maximum parking space limit by 14 spaces.

Within the total onsite parking provided, there are 10 EV spaces and 6 car-share spaces. These 16 spaces are exempt from the maximum parking limitation per Section 8.1.9 (a) 3. (*Carshare*

Parking) and 4. (*Alternative Fueled Vehicle Parking*) of this section. Deducting these 16 spaces from the total results in a compliant parking maximum.

Confirmation of maximum permissible parking spaces (limited to 125% of parking requirement)

Office requirement	282 + 11 (Building 32) = 293	X 1.25 = 366 maximum
Manufacturing/maker	4	X 1.25 = 6 maximum
Maximum permissible parking		372
Parking proposed		386
Elimination of EV and Carshare spaces		-16
Allowable maximum		370 < 372 maximum allowable. ✓

Affirmative finding as conditioned.

Section 8.1.10 Off-Street Loading Requirements

This section requires an onsite loading area be provided of new structures intended for nonresidential construction, located outside of the Downtown parking district. Building 32 directly abuts the access drive to the overall parcel, and the terminus of Lakeside Avenue. Sidewalks link the building to both locations. As existing vehicular loading areas, both will suffice for the limited purposes of this office building. **Affirmative finding.**

Section 8.1.11 Parking Dimensional Requirements

The overall parking layout has been previously approved under ZP19-0202CA/MA. Five new spaces have been added; notably two accessible spaces immediately east of this building in the parking area south of Building 50. See Plan L-1.1 for identification of new spaces. Drive aisles and parking space sizes remain acceptable. **Affirmative finding.**

Section 8.1.12 Limitations, Location, Use of Facilities

(a) Offsite parking facilities

Not applicable.

(b) Downtown street level setback

Not applicable.

(c) Front yard parking restricted

Not applicable.

(d) Shared parking in the Neighborhood Parking Districts

All of the uses on onsite will share the onsite parking facilities.

(e) Single story structures in Shared Use Districts

The replacement building will be three stories. Not applicable.

(e) Joint use of facilities

Parking for all of the all uses will share spaces within the onsite parking areas.

(f) Availability of facilities

None of the proposed parking will be used for the storage or display of vehicles or materials by offsite users. Parking will be for employees and visitors.

(g) Compact car parking

The tandem and compact car parking spaces were previously approved under ZP19-0202CA/MA. The limitation on compact parking spaces pertains only to parking garages.

Affirmative finding.

Section 8.1.13 Parking for Disabled Persons

Little change is evident in the site plan, which depicts several clusters of handicap parking spaces in close proximity to building entries. The building inspector has jurisdiction for ADA compliance within the building permit process. **Affirmative finding as conditioned.**

Section 8.1.14 Stacked and Tandem Parking Restrictions

A number of tandem parking spaces (2-deep) were approved as part of a Parking Management Plan under ZP19-0202. Some of them are needed in order to meet the onsite minimum parking requirement. This application increases the tandem space count from 108 to 112. (+4 spaces) A parking management plan relative to the tandem spaces was approved under previous permitting. See Section 8.1.15 below.

Affirmative finding as conditioned.

Section 8.1.15 Waivers from Parking Requirements / Parking Management Plans

While *more* than the minimum required parking will be provided onsite, tandem spaces are needed in order to meet the minimum parking requirement. As such, they are not considered as conventional spaces and triggered the need for a parking management plan to demonstrate how parking will work for onsite users. This application requests consideration of an additional 4 tandem spaces.

The parking management plan that was approved included measures to reduce onsite parking demand such as potential CATMA membership, bike parking, and dedicated car-pool spaces and related incentives. As to the tandem spaces, they will be allocated on a per-tenant basis and managed by those tenants. Two separate tenants will not use the same tandem spaces. As previously approved, the solution is manageable and enforceable per the conditions of the original permit. **Affirmative finding as conditioned.**

Section 8.2.5 Bicycle Parking Requirements

For Building 32, 3 Long Term spaces are required (1/5000 sf), and 1 short term spaces (1/10,000 sf.) 20 covered and combined long and short term spaces are provided. See Plan L-1.0.

Affirmative finding.

II. Conditions of Approval

1. Based on revised plans received 6.15.2020, the following Impact fees shall be due:

SF of Project 5,250

Department	<u>Offices & Other</u>	
	Rate	Fee
Traffic	0.686	3,601.50
Fire	0.202	1,060.50
Police	0.356	1,869.00
Parks	0.425	2,231.25
Library	0.000	0.00
Schools	0.000	0.00

2. Impact fees must be paid at least seven (7) days prior to occupancy of a new building or any portion thereof.
3. All requirements of the Corrective Action Plan (approved 3/19/2019) shall remain in effect. The applicant/owner are responsible for appropriate site remediation specific to the replacement of Building 32 as articulated in the Stone Environmental report and any subsequent addendum to the Corrective Action Plan.
4. All permit conditions of ZP19-0202CA/MA not specifically altered in this review shall remain in effect. Failure to adhere to the approved parking management plan (Condition #7 of the 19-0202CA/MA) will result in enforcement action. Tenant-managed parking assignments, as previously approved, remain acceptable but the burden of compliance will remain with the property owner.
5. New electrical service shall be undergrounded. Per comments of the Department of the Public Works, electric conduit in proximity to an existing hydrant shall either be relocated or altered to bend around the hydrant.
6. Any work outside of this parcel may require additional permitting. Any work within the Right-of-Way requires review and approval of the Department of Public Works and potentially City Council.
7. All new construction shall meet the Guidelines for Energy Efficient Construction pursuant to the requirements of Article VI. Energy Conservation, Section 8 of the City of Burlington Code of Ordinances.
8. Any signage will require a separate zoning permit.
9. Redevelopment is subject to all applicable building and life safety codes as defined by the Burlington's Building Inspector and the Fire Marshal.
10. Standard Permit Conditions 1-15.

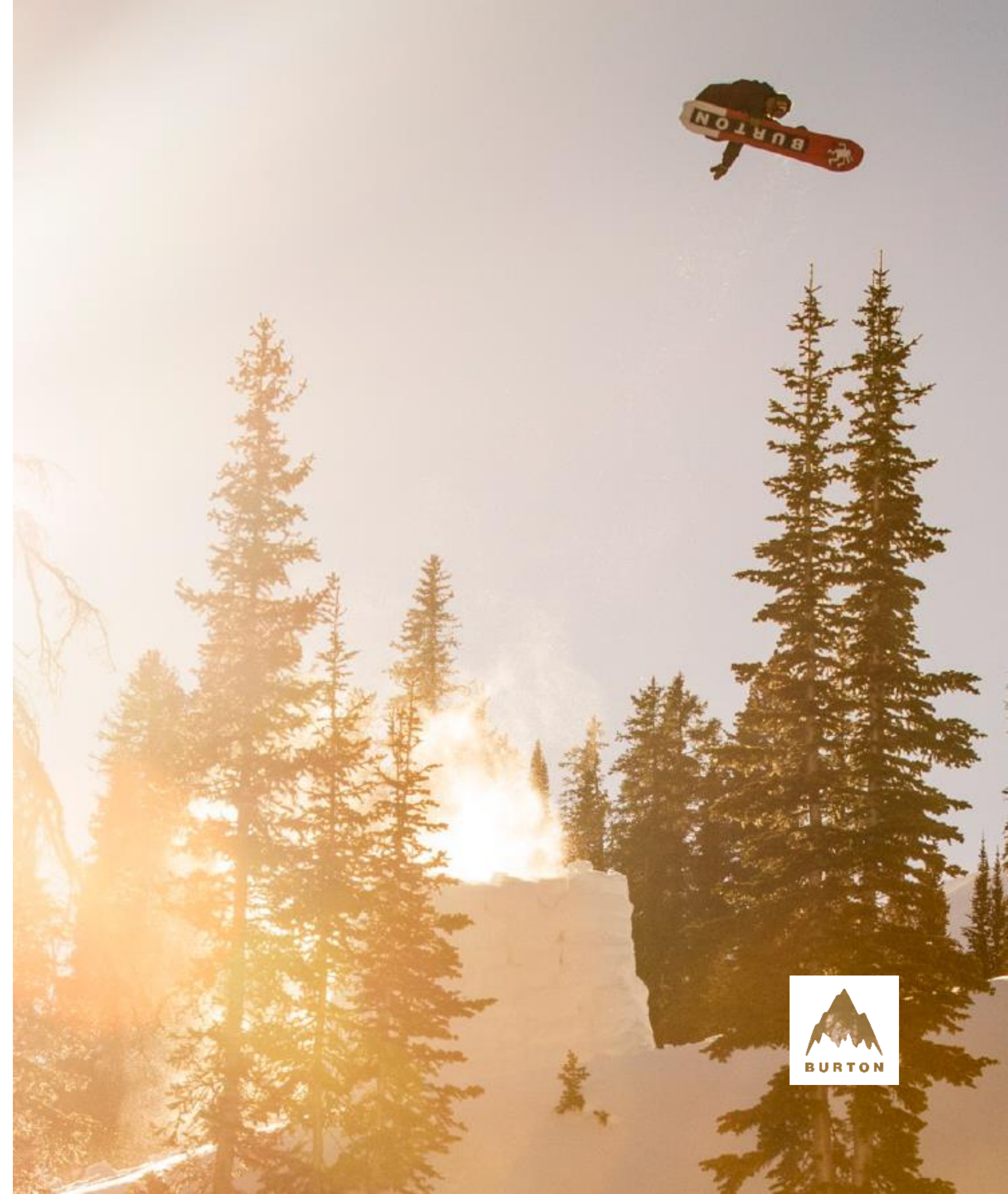
NOTE: These are staff comments only. The Development Review Board, who may approve, table, modify, or deny projects, makes decisions.

● ● ● ●

Burton Hub

Performing Arts Center CU Application

07.07.20



Outline

01.

Intro and Overview

By Justin Worthley, Senior Vice President, Burton

02.

Performing Arts Center Operations

By Alex Crothers, Founder/Co-Owner, and Mark Balderston, General Manager, Higher Ground

03.

Conditional Use Criteria

By Justin Worthley, Eddie Duncan, INCE Bd. Cert., RSG, and Jenn Conley, VHB

04.

Response to Staff Comments, CRZ letter, City of South Burlington letter

By John Caulo, Project Manager, LandPlan, Justin Worthley

01. INTRO & OVERVIEW



ABOUT BURTON

Founded in Manchester, Vermont in 1977 by Jake Burton Carpenter
Global HQ moved to Burlington in 1992, 180 Queen City Park Road
HQ Expansion to 266 Queen City Park Road in 2007
1,000+ global employees, 400 in Burlington
63 office and retail locations globally
B Corp Certified

SYDNEY, AUSTRALIA

TOKYO, JAPAN

BEIJING, CHINA

INNSBRUCK, AUSTRIA

ZURICH, SWITZERLAND

MUNICH, GERMANY

BURLINGTON, VERMONT

MONTREAL, CANADA

DENVER, COLORADO



ABOUT QUEEN CITY PARK ROAD



ABOUT QUEEN CITY PARK ROAD



ABOUT THE BURTON HUB

Burton

Craig's Prototype Center
Test/Development Labs
Warranty Center
Flagship Retail Store
EXPANDED Factory Tour & Museum

Partners

Chill Foundation Global Headquarters
Talent Skatepark
Higher Ground
Misery Loves Company + Mad Taco Cafe



OUR TEAM'S WORK, INCLUDING EXTENSIVE PUBLIC ENGAGEMENT

10+ information and Q&A sessions

25+ group tours

Three presentations at the Ward 5 NPA, most recently on June 16, 2020

Extensive discussions with staff from various Burlington and South Burlington departments and elected officials

Ongoing discussions with representatives from the Citizens for Responsible Zoning, including in-person or zoom meetings on February 12, March 13, April 3, April 30, May 12, and May 28

02. Performing Arts Center Operations



02. Performing Arts Center Operations

BURTON

ABOUT THE PERFORMING ARTS CENTER

It all starts with the space – high ceilings, open span, raw industrial space (i.e. not new construction or footprint expansion)

Flexible for a range of events and configurations, capacity of a few hundred up to 1,500 (subject to fire department certification)

Intended uses include community events (Burton hosts many now in a smaller space), private events, concerts

One of the best operators in the business... Higher Ground

- Alex Crothers, Founder/Co-Owner
- Mark Balderston, General Manager

**HIGHER
GROUND**

DRIVE-IN @ CHAMPLAIN VALLEY FAIRGROUNDS

BURLINGTON WATERFRONT

CONCERTS AT SHELBURNE MUSEUM

PORTLAND STATE THEATER

HIGHER GROUND ON WILLISTON ROAD

AND MORE...

03. Conditional Use Criteria



IMPACT ANALYSIS

1. “Existing or planned public utilities, facilities or services are capable of supporting the proposed use in addition to the existing uses in the area”
2. “The character of the area affected as defined by the purpose or purposes of the zoning district(s) within which the project is located, and specifically stated policies and standards of the municipal development plan”
3. “The proposed use will not have nuisance impacts from noise, odor, dust, heat, and vibrations greater than typically generated by other permitted uses in the same zoning district”
4. “The transportation system is capable of supporting the proposed use in addition to the existing uses in the area. Evaluation factors include street designations and capacity; level of service and other performance measures; access to arterial roadways; connectivity; transit availability; parking and access; impacts on pedestrian, bicycle and transit circulation; safety for all modes; and adequate transportation demand management strategies”
5. “The utilization of renewable energy resources”

 Justin Worthley

 Eddie Duncan, RSG

 Jenn Conley, VHB

CRITERIA 1 – PUBLIC UTILITIES, FACILITIES AND SERVICES

Letters of Service submitted by:

- Burlington Fire Department
- Burlington Police Department
- Burlington Department of Public Works regarding wastewater and traffic
- Burlington Electric Department

Discussions with City of South Burlington:

- Chief of Police Shawn Burke
- Planning Department
- Department of Public Works
- City Manager
- City Council Members

03. Conditional Use Criteria

CRITERIA 2 – CHARACTER OF THE AREA

Enterprise-Light Manufacturing (E-LM) Zoning District – allows a variety of industrial and arts uses and accompanying traffic/noise/odor impacts

Long-established Industrial Park with 24-hour manufacturing and industrial operations

Burlington Zoning Ordinance accommodates Performing Arts Center uses up to 15,000 square feet in the E-LM south of Home Avenue, approved by City Council by 10-1 vote

The Performing Arts Center will not result in greater impacts typical of other uses in the E-LM zoning district



CRITERIA 5 – RENEWABLE ENERGY RESOURCES

Sustainability is a priority for Burton and Higher Ground

Significant stormwater collection and treatment upgrade planned (permitted separately)

Dedicated on-site parking for bikes (covered) and electric vehicles (with charging stations)

Improved bike and pedestrian access facilitated by City infrastructure projects (Champlain Parkway and QCP Road rebuild)

Significant energy efficiency upgrades to be completed

Initial discussions completed with GMT, Champlain College and UVM regarding bus/shuttle service

Evaluation of rooftop solar expansion (317 KW array already in service on 180 roof)

CRITERIA 3 – NOISE

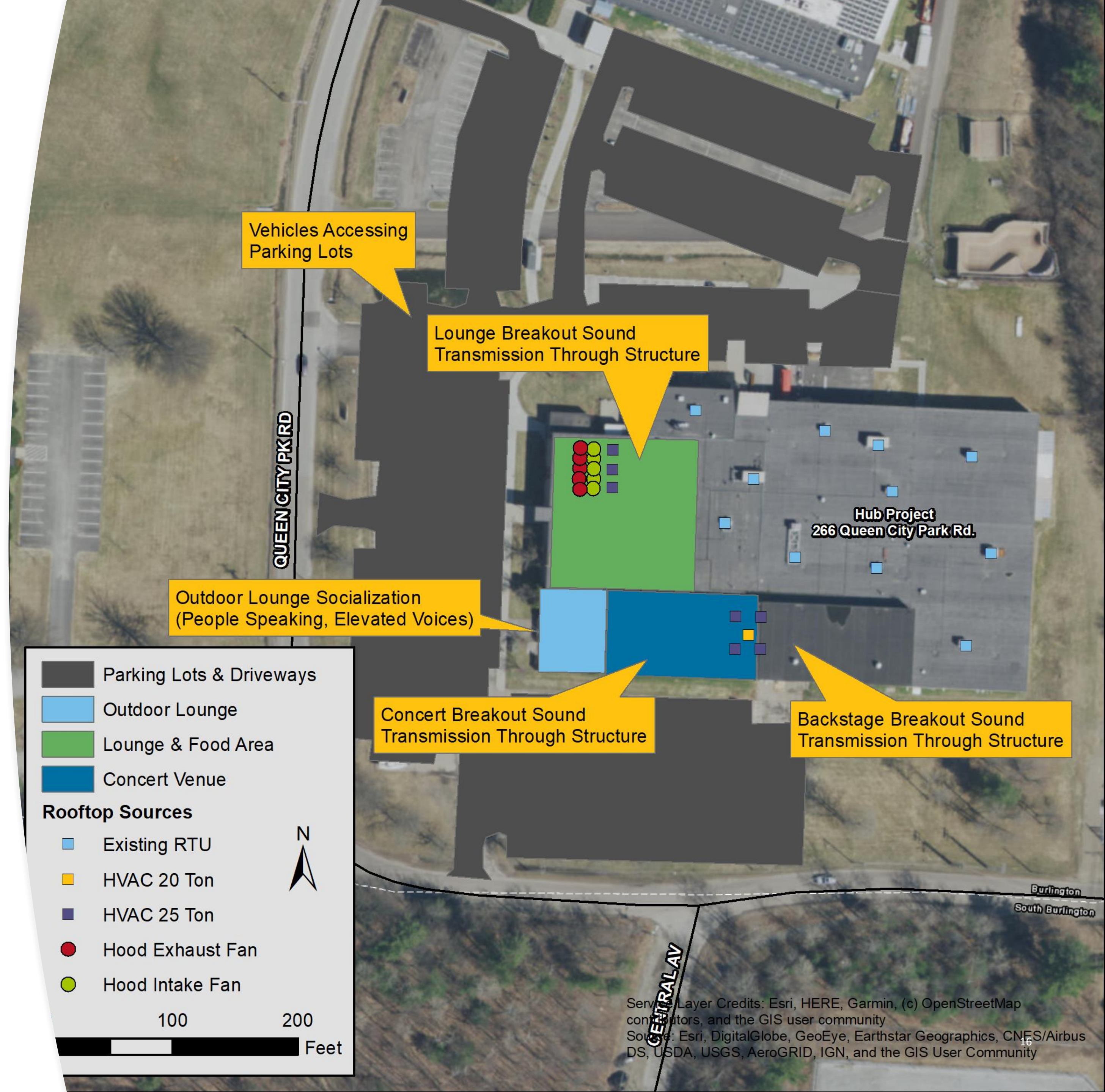
Eddie Duncan, INCE Bd. Cert., RSG



Sound Sources & Noise Management

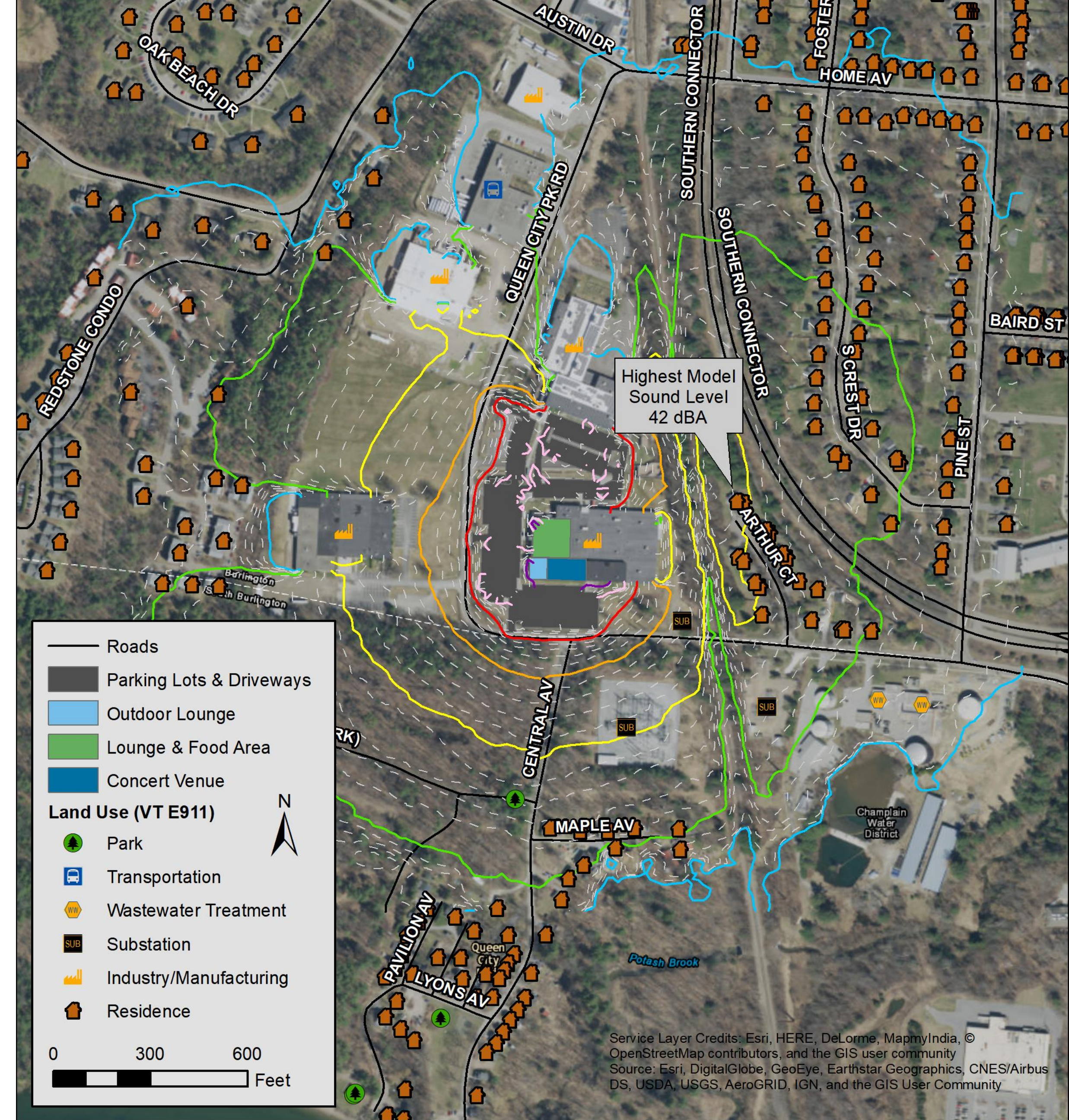
- **Management & Mitigation**

- Improved sound attenuation of building shell
- Pre-concert queue in lobby, not outside.
- No tail-gating
- Sound locked using double sets of doors.

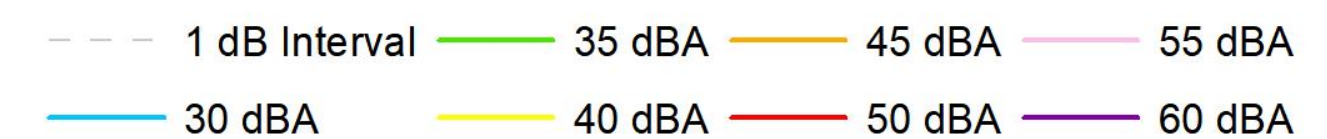




Concert Sound Level Map

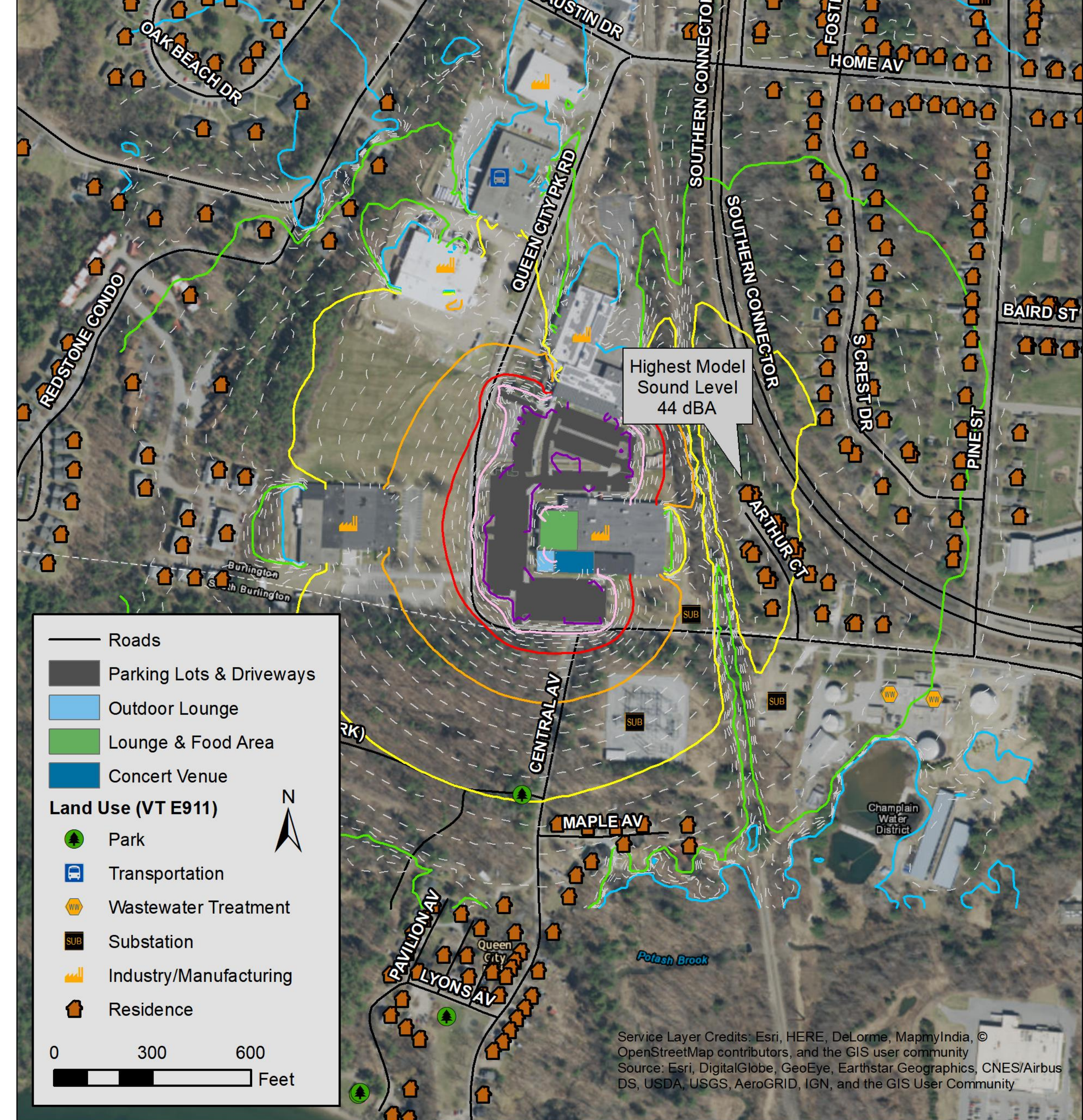


Sound Pressure Levels

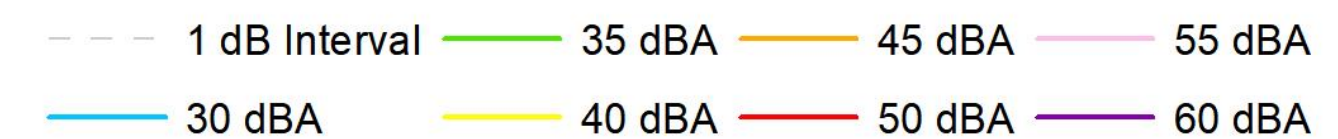




End of Concert Sound Level Map



Sound Pressure Levels



Background Sound & Community Noise Guidelines

Noise Standards & Guidelines	
City of Burlington	"It shall be unlawful for any person to make or cause to be made any loud or unreasonable noise. Noise shall be deemed to be unreasonable when it disturbs, injures or endangers the peace or health of another or when it endangers the health, safety or welfare of the community. Any such noise shall be considered to be a noise disturbance and a public nuisance."
World Health Organization	55 dBA $L_{eq(16-hr)}$ to protect against serious annoyance (7 AM to 11 PM)
	50 dBA $L_{eq(16-hr)}$ to protect against moderate annoyance (7 AM to 11 PM)
	45 dBA $L_{eq(8-hr)}$ to protect against sleep disturbance (11 PM to 7 AM)
ANSI S12.9 Part 5: Sound Level Descriptors for Determination of Compatible Land Use	55 dBA DNL is compatible with urban/suburban areas
	60 dBA DNL is marginally compatible with urban/suburban areas

Existing Background Sound Levels in Project Vicinity	
Daytime	Average sound levels generally between 47 and 52 dBA (L_{eq})
Nighttime	Average sound levels generally between 40 and 45 dBA (L_{eq})

Projected Sound Levels from Project at Worst-Case Receptor	
During Concert	42 dBA $L_{eq(1-hr)}$ at Arthur Court
End of Concert	44 dBA $L_{eq(1-hr)}$ at Arthur Court



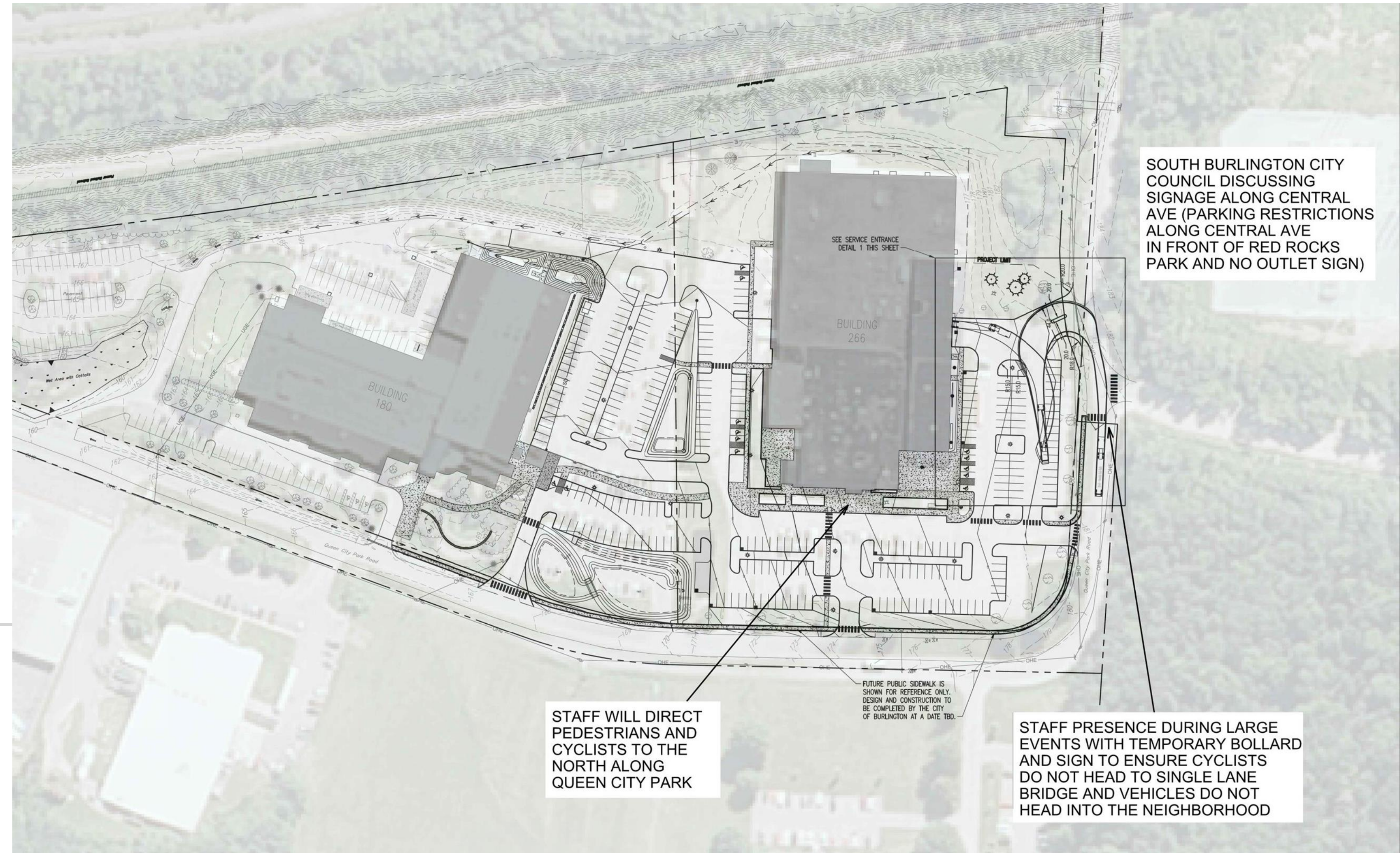
CRITERIA 4 – TRANSPORTATION SYSTEM

Jenn Conley, VHB

Project Study Area



Traffic Controls in the Operational Management Plan



04.

Response to Staff Comments, CRZ letter, City of South Burlington letter



JOHN CAULO – PROJECT MANAGER, LANDPLAN

Hours of Operation (p5; #3)

Site Plan (p6)

Section 5.5.2 Outdoor Lighting (p7)

Section 8.1.8 Parking (p8)

Section 8.1.15 Waivers from Parking Requirements/Parking Management Plans (p9)

Section 8.2.5 Bicycle Parking (p9)

JOHN CAULO – PROJECT MANAGER, LANDPLAN

Major Impact standards

Public safety service

Noise and vibration

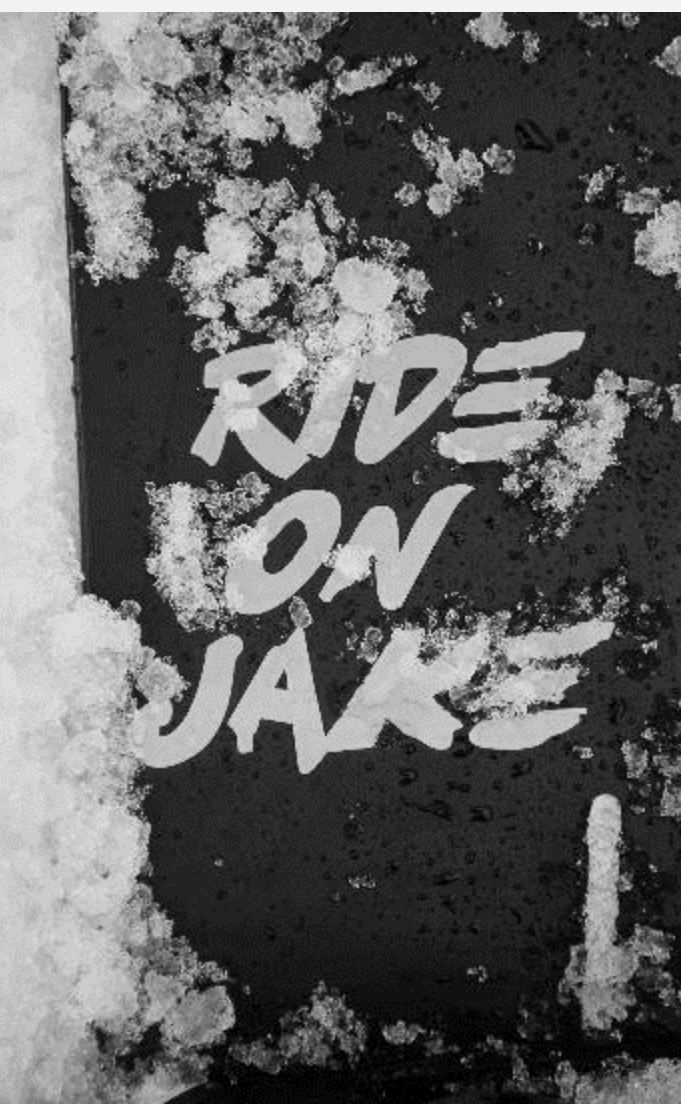
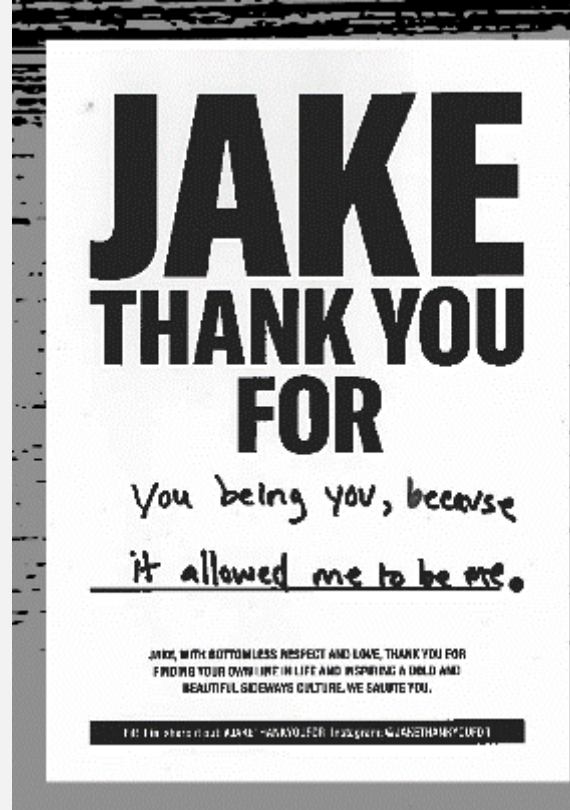
Transportation systems

Wastewater

JUSTIN WORTHLEY

Our Team has been in ongoing dialogue with the City of South Burlington, including a discussions with City Manager Kevin Dorn, Director of Planning Paul Conner, and City Council Members Helen Riehle, Tom Chittenden, Tim Barritt and David Kaufman, including on June 30, 2020 with many of these members (July 1 letter from City Council was already finalized at that time). Discussion and agreements included:

1. City Council to assess signage on Central Ave, including for Red Rocks Park parking area
2. Burton and Higher Ground committed to enforcing no tailgating policy
3. Burton and Higher Ground committed to Operational Management Plan enforcement, including directing traffic away from Central Ave and Red Rocks Park
4. Burton and Higher Ground committed to following through on monitoring plan for one-way bridge, and moving forward with further controls if deemed necessary
5. Burton and Higher Ground to measure exterior noise levels after installation of additional soundproofing materials to ensure Noise Ordinance standards are not exceeded



A DAY FOR JAKE



7/7/20 Email

Hello,

I'm a resident of Burlington's south end since 2008; prior to that I lived for 5 years in Queen City Park. I'm writing to enthusiastically support the Higher Ground Hub project. I'm a business owner in Burlington (at the Skinny Pancake and at CashorTrade, a tech company in the South End). If I still lived in Queen City Park, I'd be ecstatic about this project.

Both of these organizations have a long track record of socially responsible and regulation-compliant practices. When people cite why Burlington is an awesome place to live and work, it's because of experiences like Burton and Higher Ground have created. This is a brilliant use of available space and will add to the vibrancy of the area just as all of these companies' endeavors have over recent decades.

The traffic in and out of the area is predominantly in the evening, when there is little other traffic. Just as concert-goers efficiently come and go from the current Higher Ground, Flynn or Shelburne Museum, they can do so from the Higher Ground Hub. Shelburne Museum concerts dump more than double the concert-goers one-way onto Bostwick Rd, a small side road that connects to route 7. If it works down there, it can work easily up here, where drivers can exit in 2 separate directions.

The vast majority of my fellow residents live here because our little city has incredible businesses and resources like the Higher Ground Hub project. No doubt, these many residents support this project too and will be thankful to have it when it's complete. Please don't let a very vocal and small minority drive the agenda with what amount to selfish NIMBY motivations.

Sincerely,

Jonny Adler
195 Howard St
Burlington

7/7/20 Email

Dear Design Review Board,

I'm writing with an enthusiastic endorsement of Burton's conditional use application. A concert venue is a perfect complimentary use for the building with easy access by foot, by bike, or by car with lots of existing parking. Burton and HG will team up to repurpose an aging industrial building for a new use that will enhance Burlington as a vibrant place to live.

I live in the Red Rocks condo community and believe this will be a good addition to my neighborhood and look forward to living close by.

Further, I think it is really important for Burlington to continue to grow and be a place where people would like to move and live. In order to do all the important things a city must do a time like this, we need to continue to have a vibrant and growing tax base. That's why I'm in favor of smart growth and this project is just such an example. Without that, we will see a downward spiral. I've lived in another neighborhood in Burlington and believe all of the areas of the city need to do their fair share of contributing to the health of our community. This part of the city is not immune from the need to do our part.

Thank you,

Lisa Gibbons

161 Austin Drive # 18

Burlington, VT

7/7/20 Email

Good afternoon all,

I'm writing to share my support for Burton's conditional use application. Burton and Higher Ground are both long-standing responsible community partners who are well positioned to repurpose an aging industrial space to new use that will enhance Burlington as a vibrant place to live, work, and play.

I was a vocal supporter of the project while on the City Council and was deeply involved in the balancing of interests while serving on the Council's Ordinance Committee. The parameters established in the zoning took into account the broad range of potential concerns of neighbors and planning professionals.

The Development Review Board's critical review is essential in ensuring that the partners meet the zoning standards. I'm confident they have and hope you do as well. I encourage you to support the project. Burton and Higher Ground have helped set the bar for how to be responsible and engaging throughout a development process.

I will do my best to participate in the call this afternoon, but please accept this note as my public comment if I am not able.

Thank you all for your important work for the City of Burlington.

My best,

--

Adam Roof
802.777.3255

7/7/20 Email

Mr. Gustin,

I'm a full supporter of Burton's conditional use application. They have done their due diligence to build a great complex, and I have full confidence in Burton and Higher Ground to responsibly manage the venue based on their extensive concert and event experience, and their long-standing commitment to our community. I live in the Ledgewood Condos in the south end and having seen how Flynn Ave has been repurposed and developed, it only makes sense to allow the same for the Burton / HG complex. This will be a benefit to property values and a wise use of space. Thank you for your time.

Mark Taylor

Burlington, VT

Hey Scott:

Here is the email from Steve Roy clarifying his earlier letter about wastewater capacity. Please let me know if you have any questions. thanks! -john

----- Forwarded message -----

From: **Steve Roy** <SRoy@burlingtonvt.gov>

Date: Thu, Jul 2, 2020 at 4:00 PM

Subject: FW: Water & Wastewater Allocation Request for 266 Queen City Park Road

To: john.caulo@gmail.com <john.caulo@gmail.com>

Hey John,

Thanks for your call yesterday afternoon. I pulled up our 11/26/19 allocation letter to you and have answers to questions raised in the second paragraph of this letter.

Organic Loading: This boilerplate language is meant to address capacity requests from users that could discharge high organic loads to our wastewater plants. This will not be an issue for the proposed Performing Arts Venue with flow primarily from bathrooms.

Combined Sewer Policy: While this policy is still in draft form the intent is to have new users remove stormwater input to offset proposed new wastewater flows. This policy applies to new flows over 1000 gpd (like Higher Ground) and requires either removing 0.5 sqft impervious per wastewater gpd request or if not technically feasible on-site then payment of a Combined Sewer Offset Mitigation fee equal to \$1.84 per gpd request. These funds are placed in a special account to be used for public combined sewer mitigation projects.

I believe that no stormwater from the Burton campus enters our combined sewer system, however the wastewater flows does plus is also upstream from an active Combined Sewer Overflow (CSO) point, so most likely payment of \$13,800 will satisfy our requirements.

Steve

Steve Roy, PE

Senior Water Resources Engineer

Burlington Public Works

53 Lavalley Lane

Burlington, VT 05401

C: 802.343.0125

Burlington Development Review Board

645 Pine Street

Permitting & Inspections

Burlington, VT 05401

www.burlingtonvt.gov/DPI/DRB

Telephone: (802) 865-7188

Fax (802) 863-0466

Brad Rabinowitz

AJ LaRosa

Springer Harris

Geoff Hand

Brooks McArthur

Kienan Christianson

vacant

Sean McKenzie, (Alternate)

Ravi Venkataraman, (Alternate)



BURLINGTON DEVELOPMENT REVIEW BOARD

Tuesday July 7, 2020, 5:00 PM

Remote Meeting

Zoom: <https://us02web.zoom.us/j/85200949242?pwd=V1EzNnhqeJNOYlJvNUpSbFVzQTBFQT09>

Webinar ID: 852 0094 9242

Password: 842557

Call in telephone: US: +1 301 715 8592 or +1 312 626 6799 or +1 929 205 6099 or +1 253 215 8782 or +1 346 248 7799 or +1 669 900 6833

Minutes

Board Members Present: Brad Rabinowitz, Geoff Hand, Brooks McArthur, Kienan Christianson, AJ LaRosa, Ravi Venkataraman (Alt), Sean McKenzie (Alt)

Board Members Absent: Springer Harris

Staff Present: Scott Gustin, Ryan Morrison, and Alison Davis

I. Agenda

B. Rabinowitz: No changes to the agenda

II. Communications

B. Rabinowitz: Asks if anything came in today

S. Gustin: Have posted everything except for a few last minute emails

B. Rabinowitz: Asks if they will be part of the record

S. Gustin: Yes, they will be part of the record

III. Consent

1. 20-0820CA; 44 Lakeside Ave (ELM, Ward 5S) Lakeside Ovens, LLC

Demolish existing office building and replace with new 4-story office building on existing foundation. Add five parking spaces to overall parking count (Project Manager: Mary O'Neil)

John Caulo appeared on behalf of applicant

No public provided testimony

Geoff Hand recused from item

M. O'Neil: The applicant revised the application to build a three-story building, which the staff report reflects

B. Rabinowitz: Asks applicant if they have read the staff recommendations for approval

J. Caulo: Yes, I have

B. McArthur: Motion to approve application and adopt staff findings and recommendations

R. Venkataraman: Seconds motion

6-0-0

2. 20-0858CA; 225 Elmwood Ave (RM, Ward 3C) Green Mountain Habitat for Humanity

Demolish existing single family home and build replacement single family home
(Project Manager: Mary O'Neil)

David Mullin and Chris Lane appeared on behalf of project
John Smyrski provided public testimony
Geoff Hand recused from item

M. O'Neil: Requesting Saturday construction hours 8 am - 3 pm because they rely on volunteer help. Posted late on webpage.

B. Rabinowitz: Asks Board if anyone opposed to treating this as a consent item

AJ LaRosa: Asks when this change happened. Asks if it was before or after it was posted as consent, if public had notice of the change

M. O'Neil: Yes, was posted in the beginning

Moves item to public hearing for question from abutting neighbor who has questions about tree removal

C. Lane: On the property line along the sidewalk there is a large, 4' diameter, pine tree that has damage from storms, intruding power lines. Plan is to remove tree along Elmwood Avenue, another small 8" tree, not touching any trees along John's property lines. Nothing is growing straight, efforts to clean up property lines. Trying to create a property that a homeowner can maintain without a high cost.

J. Smyrski: Does not want the lot to be clear-cut

B. Rabinowitz: The one tree out front is the only large tree coming down. Closes public hearing.

IV. Public Hearing

1. 20-0792CA; 291 Appletree Point Rd (RL-W, Ward 4N) Gordon M. Maher

Appeal of an administrative denial for an after-the-fact patio removal and replacement with deck on different footprint (Project Manager: Ryan Morrison)

Gordon Maher and Dave Chenette appeared on behalf of appeal

R. Morrison: Explains reasoning for denial. Application was for an after-the-fact deck, aerial images could make out a patio that ran along the lakeside of the house. Application was to replace that patio with the new deck. The new deck was on a different footprint. Application mentioned he had removed the patio in 2017-2018, which nonconforming structures renders it void as an existing use after 12 months of discontinued use that nonconforming use loses its existing status. The ability to replace that in that footprint goes away. Applicant is seeking an after-the-fact permit to allow for the already existing new deck. Deck does encroach into the lakefront setback more than the patio did.

B. Rabinowitz: Asks if stonework falls into the same criteria that a deck does

R. Morrison: It does

G. Maher: Clarifies that there was an existing patio along the backside of the house that were water pebbles that you could see in the aerial photos. Patio was overgrown when they moved in, had to dig up pebbles, and are left there. Built floating deck on top of that. Clarifies that he did not remove the existing patio, but did not get a permit when new deck was built over that. Deck that was built was larger in length than the patio. Appealing because this deck was needed.

B. Rabinowitz: Asks to clarify photo

G. Maher: Clarifies questions about photos of property, patio and deck

R. Morrison: Points to older photos that were submitted about patio existence

D. Chenette: Deck does go towards the lake more than the stone pebbles did, but they did go across the entire back of the house, so with those gone, the overall square footage would be less.

B. Rabinowitz: Asks if the deck encroaches towards the lake more than the patio did.

G. Maher: Yes, it does

G. Hand: Asks about solutions

R. Morrison: Since the older patio is existing nonconforming, then it would have to maintain the same footprint

K. Christianson: Mentions construction phases mentioned in denial letter and asks why appellant did not apply for a permit during that time

G. Maher: Just did not apply for the permit

B. Rabinowitz: Closes public hearing

2. 20-0794SN; 66 North Ave (RM, Ward 3C) Sarah M. Holbrook Community Center

Appeal of an administrative denial for a proposed new sign (Project Manager: Ryan Morrison)

Bob Duncan appeared on behalf of the item

R. Morrison: Sarah Holbrook remodel was approved by the Board in 2018, among that they showed a canopy sign on the front of the building, but there was a condition to get a sign permit because they are issued and reviewed separately. The sign ordinance has changed, specifically about canopy/awning signs in the RM zone district, they are strictly prohibited. There are other signs models that can be approved in the RM district.

G. Hand: Clarifies that Board has approved the architectural component of this sign as part of the building. Interprets that putting up signage would be installing the letters on the sign.

S. Gustin: Canopy was part of the design and included in approval, but Ryan points out that the actual signage, is always handled separately. Not saying that the awning is the problem, saying that the signage going on the awning is the problem.

R. Venkataraman: Asks if the original approval included anything about signage, in the staff report

R. Morrison: Yes, condition 18

B. Duncan: Yes, in RM district, originally showed sign that was allowable in this district, but then ordinance changed. Would have been allowed with the original submission. We knew a sign permit was required, but showed the sign plan from the beginning. Never knew the ordinance was changing. This property is in the RM zone, but it is next to RH and NMU districts. This sign plan makes sense with the location and use of property.

G. Hand: Asks if the concrete grey stripe along front of the building comes out from the façade of the building where the proposed lettering is going

B. Duncan: Where proposed sign location on face of entry canopy. Clarifies Geoff Hand's question about façade

B. Rabinowitz: Asks if there are any other questions for applicant or staff. Closes public hearing

3. 20-0854CA/CU; 266 Queen City Park Rd (ELM, Ward 5S) Burton Corporation

Conditional use application to create 11,560 SF Performing Arts Center use within an existing 85,000+ SF structure; proposed façade improvements to existing building exterior (Project Manager: Scott Gustin)

Justin Worthley, John Caulo, Mike Crother, Mark Balderston, Jenn Conley, Eddie Duncan, Brian Dunkiel appeared on behalf of the application

Geoff Hand recused from item

Laurie Smith, CRZ Group (15 people), provided public testimony

B. Rabinowitz: Likely to not finish project presentation tonight, does not want to go past 7:30 PM. Limiting time for each public comment to three minutes. Five minutes for representing a group of people. Issues on this item seem to center around traffic and noise, maybe start with overall presentation, but want to get to that focus at some point

J. Worthley: Introduces Burton and gives overview of the company and history with property. Explains details about Burton properties, both 180 and 266 Queen City Park Road. Shows where space of performing arts center will be located within building as well as offsite parking. Provides overall vision for Burton Hub.

AJ LaRosa: Clarifies that no food production is included in this application

J. Worthley: Correct. Explains more details about vision for the performing arts center and Higher Ground.

A. Crothers: Gives history and background details about Higher Ground as well as future visions for company.

M. Balderston: Gives details about operational plan and crowd and event management plan.

J. Worthley: Explains impact analysis and conditional use criteria. Criteria 1- public utilities, facilities, and services. Criteria 2- character of the area. Criteria 3- renewable energy resources.

E. Duncan: Explains noise assessment, sound sources, and noise management plan. Sound management and mitigation.

B. Rabinowitz: Asks about person capacity of waiting area

J. Worthley: Explains queue timing and waiting of people.

A. Crothers: Explains queue, people come in waves, sprinkle in. Our goal is to get people in as quickly as possible

E. Duncan: Continues explaining sound movement and control. Explains concert sound level map. Explains details on background sound and community noise guidelines, noise standards and guidelines.

AJ LaRosa: Has questions about sound analyses. Asks about entrance of building and if the doors will be open or closed. Asks about the after-concert scenario and modeling instantaneous noises. Asks if they modeled car horns or door slamming.

E. Duncan: Responds to questions about sound analyses.

J. Conley: Explains details about Criteria 4- transportation systems. Evaluated with and without the Champlain Parkway being built. Working with South Burlington on signage for

directing cars for after events, discouraging travel down residential side streets. Explains traffic controls in the operational management plan.

AJ LaRosa: Asks for clarification about traffic movement near Home Ave and Pine Street intersection.

J. Conley: Discusses traffic modeling and analyses.

K. Christianson: Asks about solutions for mitigating tailgating and socializing in parking lots.

M. Balderston: Explains method and process of mitigating scenarios like tailgating. Explains crowd control, pinpoints, and concentric circle methods during end of event to assess intoxication of event goers.

J. Worthley: Explains the importance of pre-event planning and coordination with the Police

J. Caulo: Responds to staff comments. Hours of operation, site plan, outdoor lighting, parking, waivers from parking requirements/parking management plans, bike parking. Responds to CRZ letter, major impact studies, public safety service, noise and vibration, transportation systems, wastewater

J. Worthley: Reponds to South Burlington City Council letter about signage and signage for parking, enforcing no tailgating policy, directing traffic, committing to following through on monitoring plan for one-way bridge, and measuring exterior noise levels

L. Smith: Asks to present full presentation for CRZ Group at continued date.

AJ LaRosa: Motion to continue hearing until August 4th.

K. Christianson: Seconds motion

B. Rabinowitz: Closes public hearing

V. Adjournment

Meeting adjourned 7:30 PM

 _____ Bradford L. Rabinowitz, Chair of Development Review Board	Feb 2, 2021 _____ Date
 _____ Alison Davis, Zoning Clerk	_____ Date

Plans may be viewed upon request by contacting the Department of Permitting & Inspections between the hours of 8:00 a.m. and 4:30 p.m. Participation in the DRB proceeding is a prerequisite to the right to take any subsequent appeal. Please note that ANYTHING submitted to the Zoning office is considered public and cannot be kept confidential. This may not be the final order in which items will be heard. Please view final Agenda, at www.burlingtonvt.gov/dpi/drbb/agendas or the office notice board, one week before the hearing for the order in which items will be heard.

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