DRAFT
VTrans Thetford Park and Ride Scoping Report
CMG PARK(43)

Prepared for:
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February 17, 2017

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1.0 INTRODUCTION

In response to transportation costs and a renewed interest in mass transit, park and ride facilities have gained increasing interest and usage over the last 10 years. Vermont has been no exception. Currently, the Vermont Agency of Transportation (VTrans) operates 27 park and ride facilities statewide and there are approximately 21 municipal park and ride facilities. More on Vermont park and rides can be found here; http://www.connectingcommuters.org/park-ride-locations/.

This scoping report evaluates the need and the potential alternatives for an expanded and/or new park and ride facility in the I-91, Exit 14 area of Thetford.

The existing facility is a 23 space lot that is located approximately 350 feet south of I-91 Exit 14 on Vermont Route 113. It is on a land parcel that is owned by State of Vermont that was acquired as part of the I-91 construction. Given a portion of existing park and ride in on private land and the existing facility is in need of improvements, VTrans desires to investigate the existing conditions and develop potential solutions. VTrans contracted with Stantec Consulting Services Inc. (Stantec) to develop a scoping report.

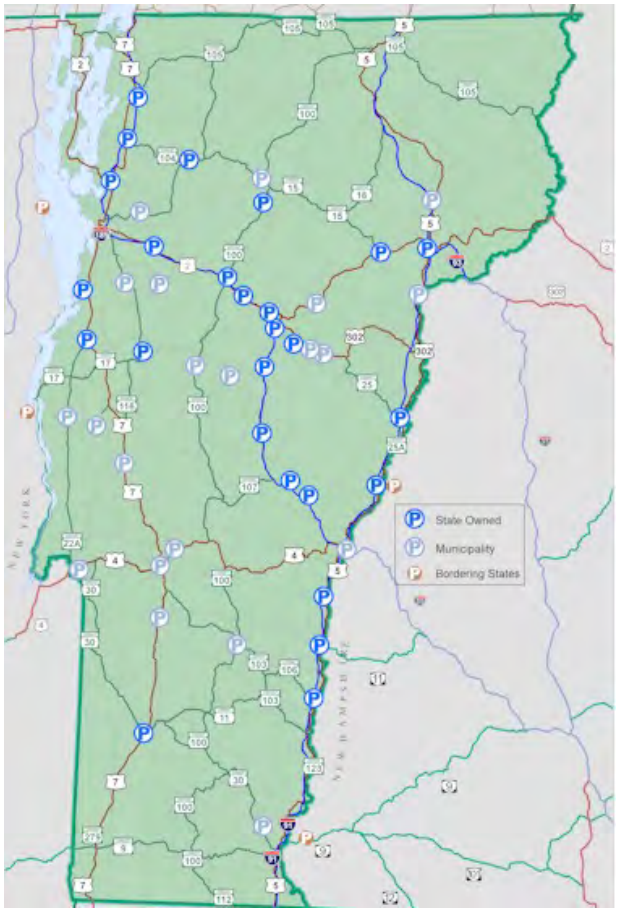


Figure 1 VTrans Park and Ride Locations

The scoping process includes assessing existing conditions, soliciting public input, establishing the project purpose and needs, evaluating alternatives, and seeking selection of a preferred alternative.

A project committee was formed to provide input and guidance throughout the process. Committee members included:

- Wayne Davis – Vermont Agency of Transportation
- Rota Seto, Two Rivers-Ottauquechee Regional Commission (TRORC)
- Greg Edwards, Erik Alling – Stantec

The following report is the result of these scoping efforts.

2.0 BACKGROUND INFORMATION

2.1 EXISTING FACILITY

The existing facility has the following characteristics:

- Spaces: 23
- Handicap Spaces: Yes- 1
- Surface: Gravel
- Lined spaces: No
- Lighted: Minimum
- Shelter: No
- Bike Rack: Yes
- Telephone: No
- Transit Service: Yes
- Distance to I-89: 500 ft.
- Pedestrian Access: N/A
- Extend into private property
- Bordered by wetland and conserved land
- Difficult transit circulation due to limited size
- Limited landscaping

2.2 EXISTING USAGE

The TRORC provided usage counts for the seven VTrans park and ride facilities in their area. The counts were performed on Tuesday October 27, 2015 and Thursday, October 29, 2015. The Thetford Park and ride had 26% and 43% occupancy rates respectively on those dates. The next closest park and ride was Bradford, I-91 exit 17, and it was at 51% capacity on October 27, 2015. When Stantec visited the site on Thursday, February 18, 2016, there were 12 vehicles or at 52% capacity. VTrans has received calls indicating security is a concern at the Thetford Park and ride and users are reluctant to use it.

2.3 EXISTING TRANSIT OPERATIONS

Stagecoach Transportation Services, Inc. (STSI) provides transportation services to the elderly, persons with disabilities, and general public across a 29 town area of northern Windsor and

Orange Counties. It operates a route called the River Route commuter and serves the Thetford Park and Ride at Exit 13. A bus schedule is in Appendix A.

Currently, STSI operates a 30 foot, 20-24 passenger vehicle. The bus company must be contacted 24 hours in advance to schedule a pick up at this location. Typically, the bus is full and will not take on any more passengers when it arrives at the park & ride. Due to demand, it is reasonable to consider that a 40 to 45-foot bus may be used in the near future.

2.4 PARKING DEMAND

To estimate the park and ride lot size, an Institute of Transportation Engineers (ITE) formula was applied. Using traffic volumes projected ahead 20 years from a May 2013 count and using the 10% VTrans interstate projection, and a 3% primary and secondary projection, the formula produced a demand of 27 vehicles per day. See Appendix A for calculations.

It is VTrans' intent to construct a lot with approximately 50 spaces. A lot of this size should prove to provide space for the future projections and account for additional transit users with improved services and any unforeseen increases in usage. Ideally, park and ride facilities would have the opportunity to expand in the future to accommodate additional growth.

2.5 TOWN PLAN AND ZONING REGULATIONS

The Town plan was re-adopted on May 14, 2012. Pertinent goals and objectives of the Town plan include:

- Encourage businesses that do not endanger natural resources and place them in areas that do not detract from the rural character of the Town and its villages.
- Encourage use of public transit and ridesharing.
- Protect important agricultural lands from development that would destroy their future use for crops.
- Allow development only if the development is sensitive to and considerate of Thetford's natural resources.
- Transportation projects should minimize negative impacts on natural resources, historic, scenic, or other community values, while also providing reasonable roadway widths, grades, sight distances, etc.
- Promote and implement strategies to encourage ridesharing, public transit, bicycling, and walking.

There is no specific mention in the town plan of the I-91 interchange area but the area's land use is regulated by zoning ordinance and subdivision regulations.

Based on the Zoning District Map dated October 17, 2011 and developed by the TRORC, the I-91 interchange area is in the Rural Residential District. This district does change to a Village

Residential District along VT 113 starting at the I-91 southbound ramps and extending westward to Thetford Hill.

The Rural Residential District was created to maintain low-density rural character primarily as a district of farms, residences, and woodlands. The minimum lot size in this district is 80,000 square feet. The permitted use in this district include all of the permitted uses in the Village Residential District and cemeteries, fairs, auctions, farms, libraries, and other cultural facilities, produce stands, riding stables and travel trailer camps. Conditional uses include all of the conditional uses in the Village Residential District, auto mobile service and repair stations, commercial recreation facilities, health care facilities, mobile home parks, planned unit developments, junk yards, local district landfills, retail sales of antiques, art pieces and handicrafts when accessory to a residence and any other commercial or industrial use located on a lot not less than five acres in size.

The Village Residential district was created to encourage the development of residential centers on land suitable for building development. This district will be a nucleus for future residential growth of the Town. The minimum lot size in this district is 20,000 square feet. The residential character of these centers is reinforced because residential uses, home occupations, churches and customary accessory uses are the only permitted uses. Conditional uses include civic and institutional uses, apartments and business use, limited to convenience-type retail shops, personal service shops, professional offices when accessory to a residence cultural facilities and restaurants.

While there are no specifics in the ordinance regarding park and ride lots, there are general standards and requirements that all apply to all development.

Development is subject to Subdivision Regulations dated, adopted Jul18, 1974 and most recently amended March 7, 1995. These regulations set the process and standards for subdivisions including compliance with Zoning Regulations.

3.0 PROJECT PURPOSE AND NEED

3.1 PROJECT PURPOSE

The purpose of this project is to provide a safe and convenient parking facility to encourage the consolidation of travelers and the reduction of single occupancy vehicles on the roads.

3.2 PROJECT NEEDS

- Provide adequate parking capacity to meet future needs. Currently facility is in poor condition and may be unappealing to prospective users.
- Provide accommodations for public transit and transit riders, such bus access and shelter.
- Locate facilities for visibility and for safe and efficient access by bus and I-91 commuting traffic.
- Provide a safe and secure environment by considering lighting, activities near the location and providing landscaping that discourages crime.
- Provide expansion capabilities for potential future user growth.
- Minimize environmental impacts including grading, stormwater runoff, wetlands, floodplains and cultural resources.

4.0 LOCAL CONCERNS MEETING

A Local Concerns Meeting was held on January 25, 2016. The purpose of the meeting was to provide collected information and solicit input on the existing conditions of the Thetford Park and Ride as well as discuss potential upgrades and alternate locations.

In general, those in attendance were in favor of addressing the poor condition of the existing facility. Representatives reflected concern over the amount of crime and littering that occur at the site. They believe the site should be upgraded and maintained to discourage crime and encourage more people to use the facility. It was also pointed out the transit provider currently only stops when contacted due to the bus often being full by the time it arrives in Thetford.

More detailed meeting notes are in Appendix B.

5.0 ALTERNATIVES

The Vermont Agency of Transportation program will develop the park and ride facility. It will be constructed, owned, and maintained by the State of Vermont. Typically, federal transportation funds are used for these projects and their development is subject to Federal Regulations such as NEPA and the Uniform Relocation Act.

Following the Local Concerns Meeting, Stantec reviewed the town land records, and field reviewed various sites. Based on this information, 6 potential sites were identified for consideration and brought to the project committee for discussion to determine which should be brought forward for further evaluation. The following location plan illustrates the 6 sites.

February 17, 2017

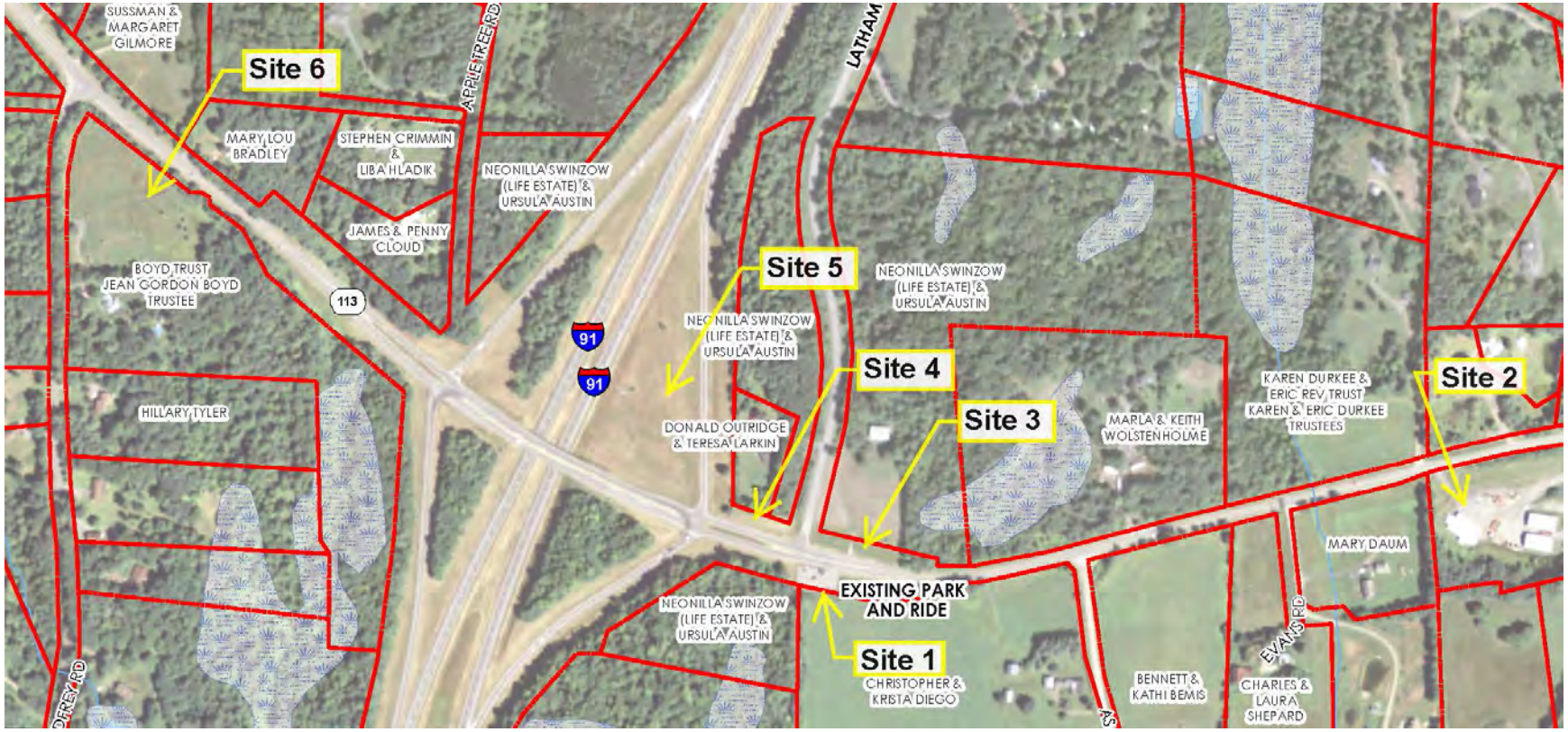


Figure 3 Alternative Location Plan

The following table provides some preliminary information for each site. This information was reviewed with the project team and the three sites were carried forward for further evaluation including performing field resource review, and developing a site plan sketch indicating how a park and ride facility may fit on the site.

Table 1 Summary of Alternative Sites

Site	Name	Owner	Tax Parcel #	Acres	Comments
1A	Expand Existing location within State ROW	State of Vermont		~0.25	State owned property, limited impact to environmental and historic resources. Does not increase the lot size.
1B	Expand at Existing P&R Location	State of Vermont	10-03-23 (Swinzow) & 10-03-22 (Burton)	3.8 Swinzow & 12.8 (Burton)	Potential impacts to wetlands. Likely impacts to Swinzow and/or Burton properties.
2	VTrans Maintenance District 4 – Thetford Garage	State of Vermont	11-02-02	8.1	Located 6/10 miles from I-91 exit 14. Potential security issues regarding District equipment and buildings. Vermont113 is steeply sloped from west to east in this area so grading a lot entrance may prove challenging. There are two residences directly across from the District garage.
3	Swinzow Property	Neonilla Swinzow (Life Estate) & Ursula Austin	10-02-87	19	Site includes an existing residence. Land owner likely has no interest in accommodating a facility
4	Outridge Property	Donald Outridge & Tresa Larkin	10-02-58 (Swinzow) 10-02-86 & (Outridge/Larkin)	4.5 (Swinzow) & 1.3 (Outridge/Larkin)	Site includes an existing residence. Previous park and ride was adjacent to this property and relocated due to issues with adjacent residence. Land owner likely has no interest in accommodating a facility
5	I-91 Exit 14 Infield	State of Vermont		~4	Flat and open large State owned property ideally located for high-visibility and easy access from interstate but FHWA approval will be needed as it will require modification of interstate access.
6	Boyd Property	Boyd Trust, Jean Gordon Boyd Trustee	10-03-17	14.9	Vermont 113 is steeply sloped from west to east and the lot is moderately sloped from south to north which would make grading the lot difficult. There are residences nearby which is not ideal.

The VTrans Maintenance Garage site was discarded from further evaluation due to its distance from Exit 14 and limited available area to develop. The Swinzow and Outridge sites also were discarded from further evaluation due to the owner's likely lack of interest in accommodating a facility and therefore these have a potential to require property condemnation.

The following sections provide an evaluation of the 3 remaining sites, the Existing Facility and the I-91 Exit 14 Infield and Boyd site. For these sites, the natural resources were identified by Stantec. Archaeological resource and historic preservation assessments are currently being completed. Given the disturbance and setting of these sites, cultural resources are not anticipated to be an issue but this would need to be verified prior to preliminary design. The northern long-eared bat has been listed as threatened by the U.S. Fish and Wildlife Service in May 2015 and while it is not anticipated that this species is present due to the previous clearing and current use of the sites, the current requirements and necessary actions for construction a park and ride facility will be followed during design.

The alternatives evaluated consisted of the following:

- Alternative 1: Expand Existing Site within Highway ROW
- Alternative 2: Expand Existing Site
- Alternative 3: I-91 Ramp Infield with VT 113 Entrance
- Alternative 4: I-91 Ramp Infield with Ramp Entrance
- Alternative 5: Boyd Site

Using the available aerial orthophotos and field survey, a base map was developed for each site. The GIS tax parcel information was added. A park and ride facility of approximately 50 spaces was shown on each site. Based on these sketch plans, the following is a description of each alternative and their attributes and constraints.

5.1 ALTERNATIVE 1: EXPAND EXISTING SITE WITHIN HIGHWAY ROW

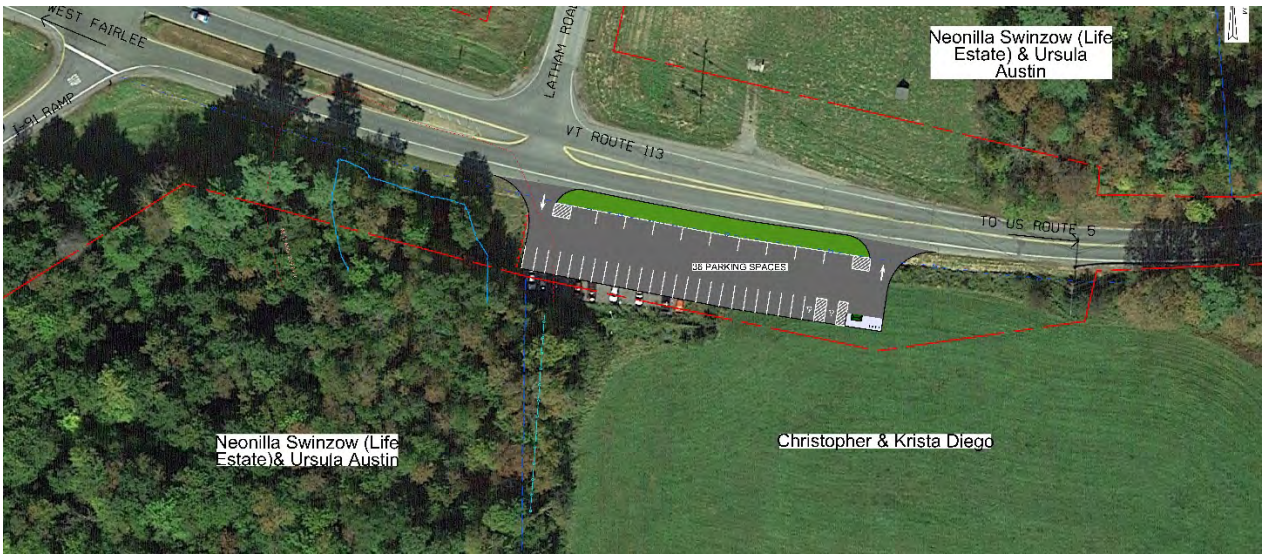


Figure 4 Alternative 1

The existing site is located on the south side of VT 113 approximately 350 feet east of the I-91 Northbound ramps. The existing highway ROW on the south side of VT 113 approximately 50 feet wide from the edge of pavement. This area is relatively level and is bordered by a class 2 wetland to the west. The wetland's 50-foot buffer extends into the existing facility. Bordering the highway ROW to the south is a privately owned farmed parcel with a dwelling owned by Chris and Krista Diego. Their land adjacent to the park and ride is conserved by the Upper Valley Land Trust. Considering these restrictions, the above figure provides a 36 space facility adjacent to VT 113 and within the existing highway ROW. It does require easements, temporary and permanent on the Diego conserved land. It also requires removal/replacement of screening vegetation on the Diego property. There are two accesses proposed to provide circulation for a transit bus. There is no opportunity to expand the facility in the future without impacting the class 2 wetland.

The total impervious area of the park and ride facility is less than 1 acre. This will not require a Vermont Agency of Natural Resource Operations Stormwater Discharge Permit and does not strictly require stormwater treatment. It is proposed that stormwater best management practices be included in the final design and include the area east of the facility and within the existing highway ROW for this purpose. Additional permit/clearances requirements are as follows:

- NEPA Categorical Exclusion (CE)
- Vermont Construction General Permit
- U.S. Fish and Wildlife Service Section 7 Consultation

Some clearing will be required along the west end side of the facility to address security concerns.

The estimated cost is as follows:

Description	Cost
Construction Cost	$390,000
Preliminary Engineering (15%)	$59,000
Construction Engineering (10%)	$39,000
Right-of-Way*	$4,000
Total Cost	**$492,000**

* Right-of-way is an estimated ballpark amount so as the needed easements are accounted for. Actual ROW cost will be based on an appraisal and negotiations.

5.2 ALTERNATIVE 2: EXPAND EXISTING SITE

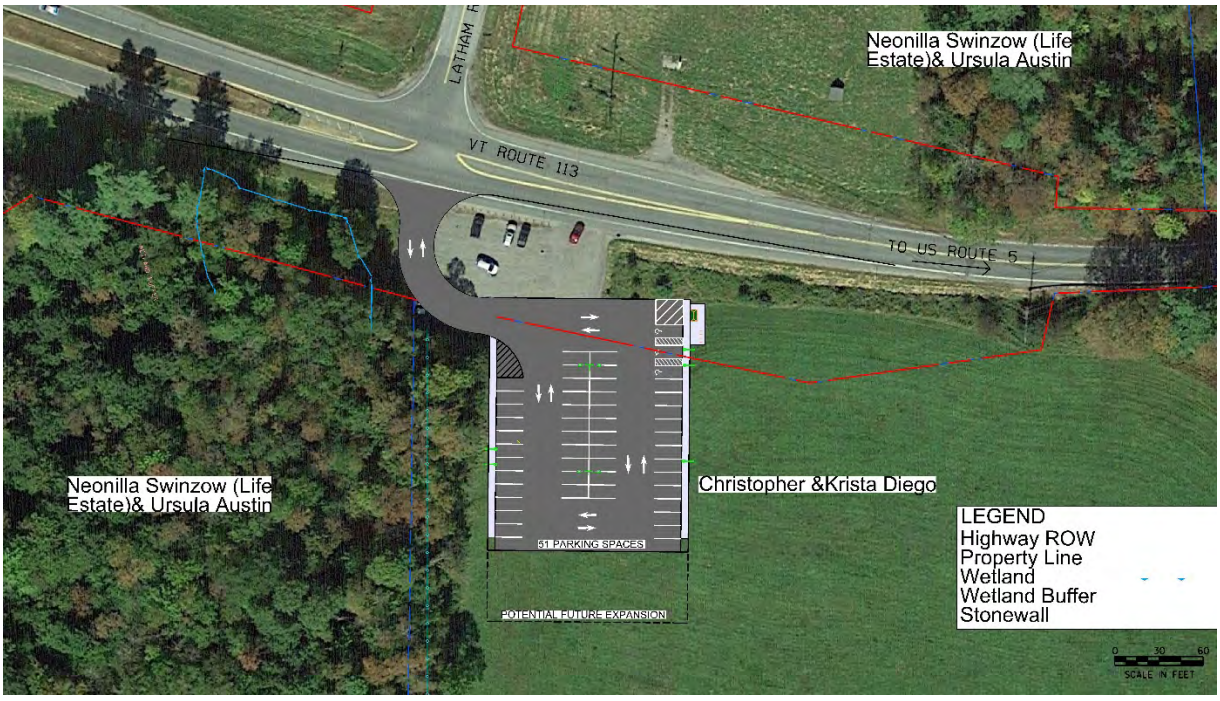


Figure 5 Alternative 2

Alternative Site 2 is a facility at the existing site but requires acquisition of approximately one acre from the Diego parcel. As indicated earlier this land is conserved through the Upper Valley Land trust. The large advantage of this alternative is that is provides for future expansion. It

avoids the wetland to the west and aligns the entrance with Latham Road. The area is relatively level and no steep slopes or retaining walls are anticipated. The area does not include any environmental resources of concern except the soils are mapped as "prime agricultural soils", and the area is currently farmed.

The total impervious area of the park and ride facility, and access drive relocation is less than 1 acre. This will not require a Vermont Agency of Natural Resource Operations Stormwater Discharge Permit and does not strictly require stormwater treatment. It is proposed stormwater best management practices be included in the final design and the concept includes an area between VT 113 and the facility or this purpose. Additional permit/clearances requirements are as follows:

- NEPA Categorical Exclusion (CE)
- Vermont Construction General Permit
- U.S. Fish and Wildlife Service Section 7 Consultation

The estimated cost is as follows:

Description	Cost
Construction Cost	$440,000
Preliminary Engineering (15%)	$66,000
Construction Engineering (10%)	$44,000
Right-of-Way*	$40,000
Total Cost	**$590.000**

*Right-of-way cost is an estimated ballpark amount so as the needed easements are accounted for. Actual ROW cost will be based on an appraisal and negotiations.

5.3 ALTERNATIVE 3: I-91 RAMP INFIELD WITH VT 113 ENTRANCE

This alternative is located between the I-91 northbound bound and the I-91 northbound on ramp. The area is relatively level and does not include any environmental resources of concern except the soils are mapped as "prime agricultural soils", although the area is not farmed. The area is open and provides good visibility. The area is sufficiently large and level to readily accommodate the 50 space facility and provides for future expansion. The layout provides for transit bus circulation within the facility. The access for this alternative is proposed to be from VT 113 approximately 330 feet from the I-91 northbound on and off ramps. This location requires extending the VT 113 eastbound left turn lane westward, relocating a portion of the existing sloped curb median and constructing an opening in the median. The VT 113 westbound left turn lane for the I-91 southbound on ramp is shortened by approximately 195 feet but still provides 145 feet for the left turn lane. The taper and storage will meet VTrans standards for a 40 mph operating speed. A traffic analysis of this access and the access for the other alternatives is included in the evaluation of alternatives section. The existing north side guardrail of the VT 113 Bridge over I-91 would be terminated at the park and ride access drive. No widening of VT 113 is needed.

There is an existing aerial power distribution line through the site within one utility pole. The pole would require relocation and could provide the power source for the facility lighting.

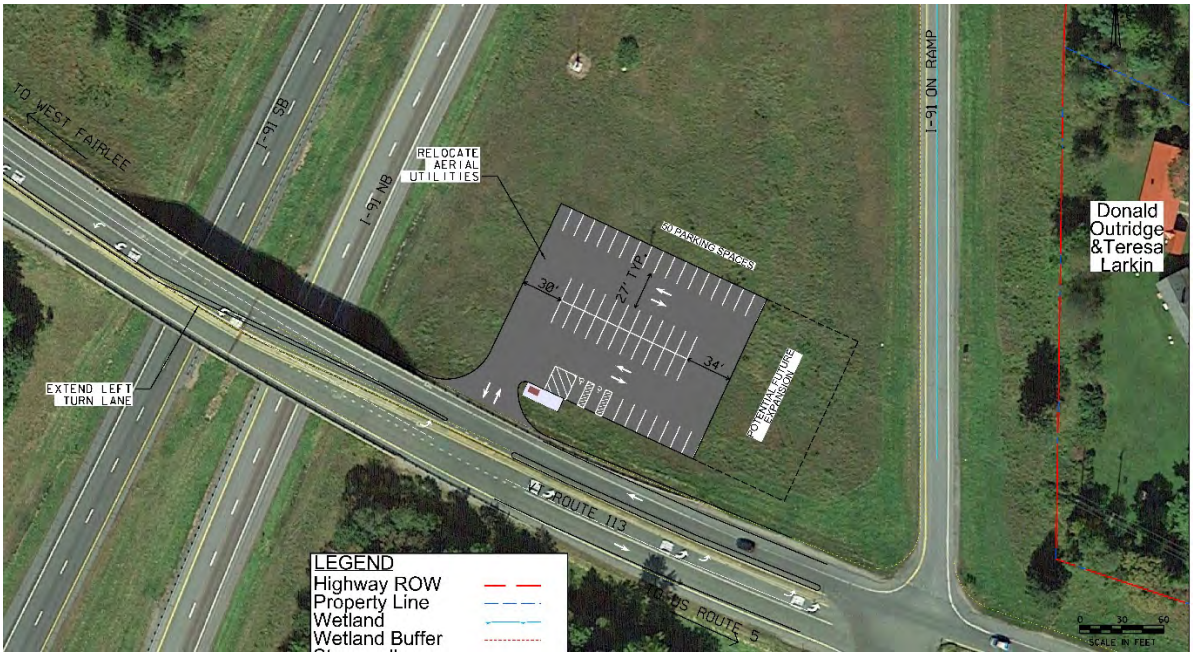


Figure 6 Alternative 3

The total impervious area of the park and ride facility, and access drive relocation is less than 1 acre. This will not require a Vermont Agency of Natural Resource Operations Stormwater Discharge Permit and does not strictly require stormwater treatment. It is proposed stormwater best management practices be included in the final design and the alternative includes adequate space for this purpose. Additional permit/clearances requirements are as follows:

- NEPA Categorical Exclusion (CE)
- Vermont Construction General Permit

The estimated cost is as follows:

Description	Cost
Construction Cost	$480,000
Preliminary Engineering (15%)	$72,000
Construction Engineering (10%)	$48,000
Right-of-Way	$0
Total Cost	**$600,000**

5.4 ALTERNATIVE 4: I-91 RAMP INFIELD WITH RAMP ENTRANCE

Figure 7 Alternative 4

This alternative is located in the same area as alternative 3. It provides a 52 space facility with the ability to accommodate future expansion. This facility provides for transit bus circulation and includes a bus shelter. Access is provided off the I-91 Northbound on ramp. The ramp is widened between VT 113 and the park and ride access drive to include two way operations in this area. There is a stop condition for vehicles exiting the facility at the intersection with the ramp and at the intersection with VT 113. The area is relatively level and does not include any environmental resources of concern except the soils are mapped as "prime agricultural soils", although the area is not farmed. A traffic analysis of this access and the access for the other alternatives is included in the evaluation of alternatives section.

There is an existing aerial power distribution line through the site within one utility pole. The pole will require relocation and can provide the power source for the facility lighting.

The total impervious area of the park and ride facility, and access drive relocation is less than 1 acre. This will not require a Vermont Agency of Natural Resource Operations Stormwater Discharge Permit and does not strictly require stormwater treatment. It is proposed stormwater best management practices be included in the final design and the alternative includes adequate space for this purpose. Additional permit/clearances requirements are as follows:

- NEPA Categorical Exclusion (CE)
- Vermont Construction General Permit

The estimated cost is as follows:

Description	Cost
Construction Cost	$580,000
Preliminary Engineering (15%)	$87,000
Construction Engineering (10%)	$58,000
Right-of-Way	$0
Total Cost	**$725,000**

5.5 ALTERNATIVE 5: BOYD SITE

Figure 8 Alternative 5

Alternative 5 is located approximately 1600 feet west of I-91 on the south side of VT 113 and 400 feet east of Godfrey road. It is on a 14.9 acre parcel owned by the Boyd Trust and contains a dwelling. Constructing on this parcel this would require a subdivision of parcel and acquiring approximately 3 acres of the parcel. The area is relatively flat but slopes upward from North to south. The access is off VT 113 but is more secluded and less visible that other sites. The facility will be visible from the Boyd dwelling. The area does not include any environmental resources of concern except the soils are mapped as "prime agricultural soils", and the area is currently farmed. This site is in the Village Residential Zoning district.

The total impervious area of the park and ride facility, and access drive relocation is less than 1 acre. This will not require a Vermont Agency of Natural Resource Operations Stormwater Discharge Permit and does not strictly require stormwater treatment. It is proposed stormwater best management practices be included in the final design and the concept includes an area between VT 113 and the facility or this purpose. Additional permit/clearances requirements are as follows:

- NEPA Categorical Exclusion (CE)
- Vermont Construction General Permit
- U.S. Fish and Wildlife Service Section 7 Consultation

The estimated cost is as follows:

Description	Cost
Construction Cost	$450,000
Preliminary Engineering (15%)	$68,000
Construction Engineering (10%)	$45,000
Right-of-Way*	$40,000
Total Cost	$603,000

*Right-of-way cost is an estimated ballpark amount so as the needed easements are accounted for. Actual ROW cost will be based on an appraisal and negotiations.

5.6 ALTERNATIVES EVALUATION

The traffic operations of the alternatives were evaluated and a report is included in Appendix G. In summary, the proposed development of a new park and ride lot at the I-91/VT 113 interchange will have a nominal impact on traffic operations. In part this is due to the relatively low traffic volumes on VT 113 (3200 AADT in 2012) and the low projected peak hour trips of the facility. As such, "mitigation" for the alternative proposals is limited to those roadway changes necessary to accommodate safe site access. For Alternatives 1, 2 and 5, each of which is located outside of the interchange, required roadway improvements would be limited to constructing the site driveway and installing a STOP sign on the driveway. For Alternative 3, which is located within the northeast quadrant of the interchange infield, a portion of the existing median on Route 113 would need to be reconstructed to provide a left-turn lane and median break for site access. With the required changes the existing left-turn lanes to the I-91 on-ramps would be shortened but still have adequate capacity to serve projected left-turn demands. For Alternative 4, which is also located within the interchange infield except with access at the I-91 Northbound On-ramp, a portion of the existing ramp would need to be widened and reconstructed to accommodate two-way traffic.

An alternative evaluation and scoring matrix was developed for this project. A similar method was utilized on previous park and ride facility studies and has been adapted to reflect the issues with this facility. It is not intended that this be the only resource to define the preferred alternative, but to highlight the benefits and limitations of each site and provide a readily comprehensive comparison. Based on this, Alternative 3 site scored highest. The Evaluation Matrix and assumptions can be found in Appendix F.

Table 2 Alternative Evaluation Matrix

Item	Alternative				
	Alternative 1: Existing Site within Existing ROW	**Alternative 2: Expand Existing Site**	**Alternative 3: I-91 Ramp Infield w/VT113 Entrance**	**Alternative 4: I-91 Ramp Infield w/Ramp Entrance**	**Alternative 5: Boyd Site**
Economics (33%)					
Ease of Acquisition	Easements required. Conserved land.	Conserved land acquisition required	No acquisition required	No acquisition required	Condemnation may be required
Points (20 max)	10	0	20	20	0
Site Development Costs	$492,000	$590.000	$600,000	$725,000	$603,000
Points (20 max)	20	10	10	0	10
Total Points Economics	**30**	**10**	**30**	**20**	**10**
Location (33%)					
Proximity to I-91	>500 ft.	>500 ft.	<500 ft.	<500 ft.	>1000 ft.
Points (20 max)	10	10	20	20	0
Transit Service Access	Greater distance	Greater Distance	Closest	Closest	Greatest distance
Points (10 max)	5	5	10	10	0
Visibility / Security	Visible	Visible	Very visible	Very visible	Not as visible
Points (10 max)	5	5	10	10	0
Total Points – Location	**20**	**20**	**40**	**40**	**0**
Site (33%)					
Impacts to Resources	Farmed	Farmed	Non farmed	Non farmed	Farmed
Points (10 max)	0	0	10	10	0
Compatibility / Affects to Adjacent Property	Some effects	More effects	No effects	No effects	More effects
Points (10 max)	5	0	10	10	0
Number of Spaces & Expansion	Doesn't meet need	Provides Expansion	Provides Expansion	Provides Expansion	Provides Expansion
Points (40 max)	0	40	40	40	40
Total Points – Site	**5**	**40**	**60**	**60**	**40**
Weighted Average % of Maximum	**44%**	**47%**	**92%**	**83%**	**31%**

6.0 ALTERNATIVES PRESENTATION

To be updated once Alternatives Presentation Meeting occurs.

7.0 CONCLUSIONS / RECOMMENDATIONS

To be updated once Alternatives Presentation Meeting occurs.

Appendix A EXISTING INFORMATION

Appendix B CORRESPONDENCE, MEETINGS, MINUTES

Appendix C CULTURAL / ENVIRONMENTAL EXHIBITS

Appendix D PLANS

Appendix E COST ESTIMATE

Appendix F EVALUATION MATRIX AND ASSUMPTIONS

Appendix G TRAFFIC STUDY

APPENDIX A

Existing Information

River Route Schedule

River Route	AM Buses		
Stop	Trip 1	Trip 2	Trip 3
Wells River Savings Bank	X	6:00 AM	6:20 AM
Newbury Village Store	X	6:08 AM	6:28 AM
Newbury P&R LOT	X	X	6:30 AM
"Bottle Shop" Bradford	6:15 AM	6:20 AM	6:45 AM
Bradford P&R Lot	6:20 AM	6:25 AM	6:50 AM
Fairlee P&R Lot	6:30 AM	6:35 AM	7:00 AM
Thetford P&R Lot	6:40 AM	6:45 AM	7:10 AM
Main Street, Hanover (AT)	7:00 AM	7:05 AM	7:35 AM
VA Hospital WRJ (AT)	X	7:20 AM	X
Gilman Center, WRJ (AT)	X	7:25 AM	X
Colburn Hill	7:10 AM	X	7:45 AM
DHMC East Entrance (AT)	7:15 AM	X	7:50 AM
DHMC Heater Road	7:20 AM	X	7:55 AM

River Route	PM Buses		
Stop	PM Bus 1	PM Bus 2	PM Bus 3
DHMC Heater Road	X	4:35 PM	5:05 PM
Colburn Hill	X	4:43 PM	5:13 PM
DHMC East Entrance (AT)	4:10 PM	4:45 PM	5:15 PM
Colburn Hill	4:12 PM	X	X
DHMC Heater Road	4:20 PM	X	X
Gilman Center, WRJ (AT)	4:30 PM	X	X
VA Hospital WRJ (AT)	4:35 PM	X	X
Maynard St., Hanover (AT)	X	4:55 PM	5:25 PM
Parkhurst St.,Hanover (AT)	X	4:57 PM	5:27 PM
Norwich Inn (AT)	4:50 PM	5:05 PM	5:35 PM
Thetford P&R Lot	5:05 PM	5:20 PM	5:50 PM
Fairlee P&R Lot	5:15 PM	5:30 PM	6:00 PM
Bradford P&R Lot	5:25 PM	5:40 PM	6:10 PM
"Bottle Shop" Bradford	5:30 PM	5:45 PM	6:15 PM
Newbury P&R Lot	5:40 PM	5:55 PM	6:25 PM
Newbury Village	5:47 PM	6:02 PM	6:32 PM
Wells River Savings Bank	5:55 PM	6:10 PM	6:40 PM

Stantec

THETFORD P&R DEMAND ESTIMATE
PROJECT 195310892 TASK 205.100

THETFORD P&R

LOCATION: VT 113 NEAR I-91 EXIT 14

ORANGE COUNTY AVERAGE COMMUTE = 27 MINUTES

SOUTH TO WRJ, HARTFORD, HANOVER (20-25 MINUTES)

NORTH TO ST JOHNSBURY (46 MINUTES)

ITE PARK & RIDE DEMAND FORMULA = 4% PRIME + 1% PEAK

POTENTIAL P&R DEMAND

① VT 113 TO I-91 SB - PRIME SOURCE
ASSUME 4% OF AM PEAK HOUR (1.5)
(INCLUDE BOTH EASTBOUND & WESTBOUND ON RAMP VOLUME)

② VT 113 TO I-91 NB - PEAK SOURCE
ASSUME 1% OF AM PEAK HOUR (1.5)
(INCLUDE BOTH EASTBOUND & WESTBOUND ON RAMP VOLUME)

③ I-91 SB - PEAK SOURCE
ASSUME 1% OF AM PEAK HOUR

④ I-91 NB - UNLIKELY SOURCE

① 175 + 109 (1.5 to include 15 MIN before & after PH) × 0.04 = 17
② 25 + 12 (1.5) × 0.01 = = 1
③ 11,700/2 = 5,850 (OF 12) = 702 × 0.01 = 7
ESTIMATED EXISTING DEMAND 25

PROJECTED 20 YEAR GROWTH
VT 113: 3% (RURAL PRIMARY & SECONDARY) 18 × 0.03 = 1
I 91: 10% (INTERSTATE) 7 × 0.10 = 1
ESTIMATED FUTURE DEMAND 27*
* NOT INCLUDING TRANSIT

Designed by: DSD 9/3/14 Checked by:

The market area population demand estimation technique provides a relatively simple approach, which may be most appropriate for use in developing an initial estimate or in combination with another technique. It is also appropriate for use in estimating the demand for shared-use and small exclusive lots. The market area population methodology assumes that demand is equal for all activity centers being served. Estimating the demand for multiple activity centers requires the use of the modal split model described next.

Modal Split. This methodology takes the market area approach one step further by examining the portion of the market area population traveling to the various activity centers to be served by the facility. Thus, it attempts to account for the fact that different parts of the potential service area have different attraction rates to the various activity centers. This procedure requires that the percentage of the market area population working in each activity center be identified and analyzed to estimate the potential demand for the park-and-ride facility. Obtaining this information may be difficult, which makes this methodology more cumbersome and time consuming. The results should provide a more accurate estimate of the potential demand for a given facility, however.

Institute of Transportation Engineers Model. The Institute of Transportation Engineers (ITE) model is based on the assumption that park-and-ride demand is a direct function of peak-period traffic on adjacent travel facilities *(12)*. A further assumption is made that commuters will not make major changes from their normal travel routes to reach a park-and-ride lot but will divert from adjacent streets. As a result, potential users will be commuters who were already passing the park-and-ride location in their normal travel routes. Demand is therefore estimated as a percentage of peak-period trips on adjacent streets that will divert into the lot. The formula used for the ITE model is:

$$\text{Demand} = a\,(\text{Peak}) + b\,(\text{Prime}) \qquad (3)$$

where:

Peak = Total peak-period traffic on adjacent facilities (including the prime facility);

Prime = Peak-period traffic on the prime facility; and

a, b = Diversion factors for total traffic and prime facility traffic, respectively.

The prime facilities are identified as the major arterial streets or freeways used by commuters as part of their normal travel route adjacent to the park-and-ride lot location being considered. There may be more than one prime facility, such as a potential site located at the intersection of two major roadways. The adjacent facilities represent the other roadways in the area but not directly next to the proposed site.

Diversion factors of one percent for total area traffic and an additional three percent for traffic on the prime facility have been recommended for use with this model. In general, the ITE technique is easy to use, requiring only peak-period traffic volumes on the major travel facilities. The approach has limitations however, in that no attempt is made to distinguish between commuting and non-commuting trips or among trips to different destinations.

King County Metro. A procedure for estimating park-and-ride demand for the King County Metro service area has been developed. Five model equations were developed after studying the demand characteristics at 31 park-and-ride lots in the service area. The model utilizes the following site descriptive variables that are combined differently to estimate the demand:

- Service area population
- Ratio of auto to transit costs
- Distance from the park-and-ride lot to a major employment center
- Number of buses in the morning peak period

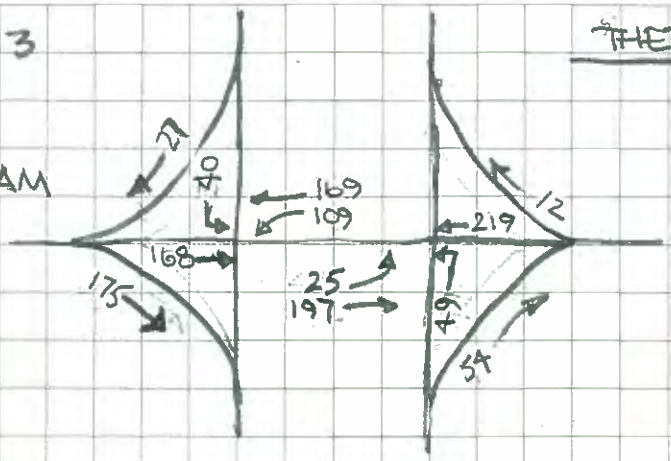
Stantec

I-91

5/28/2013

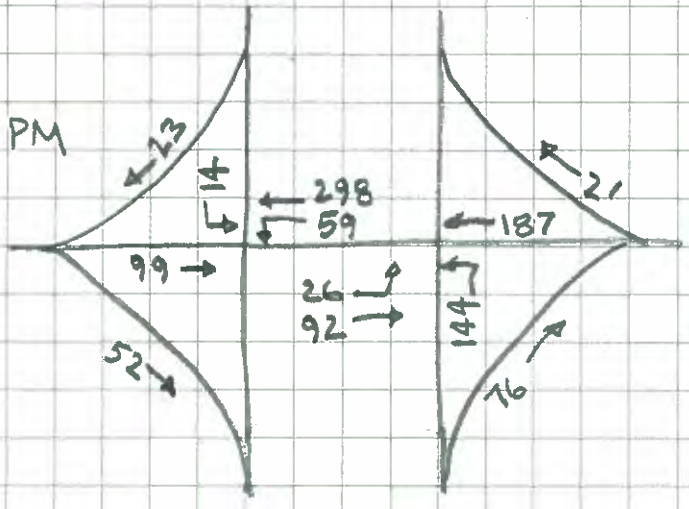
THETFORD

7:15 - 8:15 AM
PEAK HOUR



RTE 113

4:45 - 5:45 PM
PEAK HOUR



I-91 ADT
11,700 vpd

Designed by:

Checked by:

VTrans

Counter: TU 0118
Counted by: J Gosselin
Weather: Sunny, hot
Town: 91-14 Thetford

File Name : 91-14Npm13
Site Code : 30911905
Start Date : 5/28/2013
Page No : 1

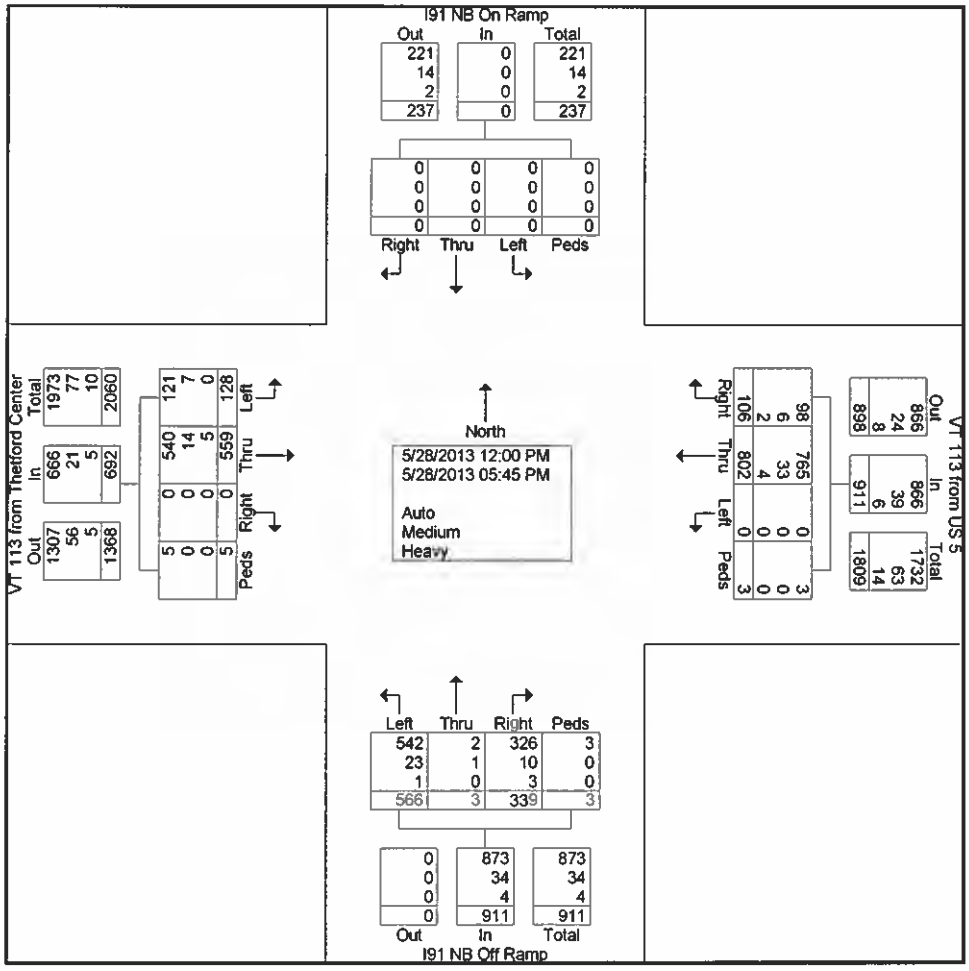
Groups Printed- Auto - Medium - Heavy

	I91 NB On Ramp From North				VT 113 from US 5 From East				I91 NB Off Ramp From South				VT 113 from Thetford Center From West				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
12:00 PM	0	0	0	0	0	13	2	0	8	0	6	0	1	27	0	0	57
12:15 PM	0	0	0	0	0	21	4	0	17	0	7	0	1	17	0	0	67
12:30 PM	0	0	0	0	0	25	2	0	11	1	3	0	6	27	0	1	76
12:45 PM	0	0	0	0	0	21	1	0	20	0	7	0	6	16	0	0	71
Total	0	0	0	0	0	80	9	0	56	1	23	0	14	87	0	1	271
01:00 PM	0	0	0	0	0	19	2	0	9	0	7	0	3	19	0	0	59
01:15 PM	0	0	0	0	0	26	0	0	10	0	7	0	8	10	0	0	61
01:30 PM	0	0	0	0	0	24	3	1	18	0	11	0	6	15	0	0	78
01:45 PM	0	0	0	0	0	21	4	0	7	0	8	0	3	28	0	0	71
Total	0	0	0	0	0	90	9	1	44	0	33	0	20	72	0	0	269
02:00 PM	0	0	0	0	0	26	7	0	18	0	8	0	7	33	0	0	99
02:15 PM	0	0	0	0	0	37	2	0	17	0	18	0	0	20	0	0	94
02:30 PM	0	0	0	0	0	38	2	0	25	0	23	0	7	24	0	1	120
02:45 PM	0	0	0	0	0	35	3	0	20	0	12	0	3	20	0	0	93
Total	0	0	0	0	0	136	14	0	80	0	61	0	17	97	0	1	406
03:00 PM	0	0	0	0	0	43	7	0	26	0	20	0	15	43	0	0	154
03:15 PM	0	0	0	0	0	33	6	0	18	0	11	0	7	25	0	0	100
03:30 PM	0	0	0	0	0	32	6	0	28	0	16	0	6	24	0	1	113
03:45 PM	0	0	0	0	0	47	8	1	26	1	14	0	9	21	0	0	127
Total	0	0	0	0	0	155	27	1	98	1	61	0	37	113	0	1	494
04:00 PM	0	0	0	0	0	45	8	0	43	0	19	0	6	28	0	1	150
04:15 PM	0	0	0	0	0	48	7	0	37	0	20	0	1	26	0	0	139
04:30 PM	0	0	0	0	0	31	8	0	32	0	24	0	3	31	0	0	129
04:45 PM	0	0	0	0	0	45	5	0	34	0	20	0	6	29	0	1	140
Total	0	0	0	0	0	169	28	0	146	0	83	0	16	114	0	2	558
05:00 PM	0	0	0	0	0	49	4	0	42	1	21	3	6	21	0	0	147
05:15 PM	0	0	0	0	0	53	7	1	29	0	17	0	9	23	0	0	139
05:30 PM	0	0	0	0	0	40 187	5 21	0	37 144	0	18 76	0	5 26	19 92	0	0	124
05:45 PM	0	0	0	0	0	30	3	0	34	0	22	0	4	13	0	0	106
Total	0	0	0	0	0	172	19	1	142	1	78	3	24	76	0	0	516
Grand Total	0	0	0	0	0	802	106	3	566	3	339	3	128	559	0	5	2514
Apprch %	0	0	0	0	0	88	11.6	0.3	62.1	0.3	37.2	0.3	18.5	80.8	0	0.7	
Total %	0	0	0	0	0	31.9	4.2	0.1	22.5	0.1	13.5	0.1	5.1	22.2	0	0.2	
Auto	0	0	0	0	0	765	98	3	542	2	326	3	121	540	0	5	2405
% Auto	0	0	0	0	0	95.4	92.5	100	95.8	66.7	96.2	100	94.5	96.6	0	100	95.7
Medium	0	0	0	0	0	33	6	0	23	1	10	0	7	14	0	0	94
% Medium	0	0	0	0	0	4.1	5.7	0	4.1	33.3	2.9	0	5.5	2.5	0	0	3.7
Heavy	0	0	0	0	0	4	2	0	1	0	3	0	0	5	0	0	15
% Heavy	0	0	0	0	0	0.5	1.9	0	0.2	0	0.9	0	0	0.9	0	0	0.6

VTrans

Counter: TU 0118
Counted by: J Gosselin
Weather: Sunny, hot
Town: 91-14 Thetford

File Name : 91-14Npm13
Site Code : 30911905
Start Date : 5/28/2013
Page No : 2

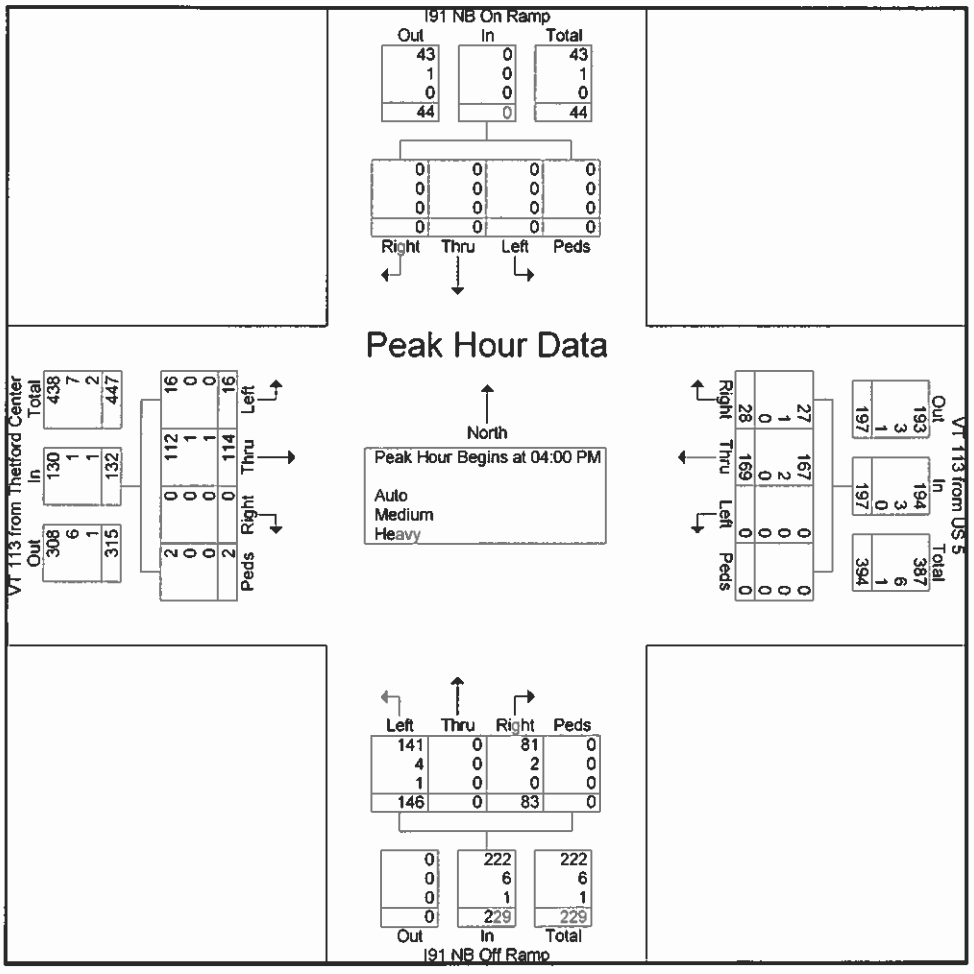


VTrans

Counter: TU 0118
Counted by: J Gosselin
Weather: Sunny, hot
Town: 91-14 Thetford

File Name : 91-14Npm13
Site Code : 30911905
Start Date : 5/28/2013
Page No : 3

	I91 NB On Ramp From North					VT 113 from US 5 From East					I91 NB Off Ramp From South					VT 113 from Thetford Center From West					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	45	8	0	53	43	0	19	0	62	6	28	0	1	35	150
04:15 PM	0	0	0	0	0	0	48	7	0	55	37	0	20	0	57	1	26	0	0	27	139
04:30 PM	0	0	0	0	0	0	31	8	0	39	32	0	24	0	56	3	31	0	0	34	129
04:45 PM	0	0	0	0	0	0	45	5	0	50	34	0	20	0	54	6	29	0	1	36	140
Total Volume	0	0	0	0	0	0	169	28	0	197	146	0	83	0	229	16	114	0	2	132	558
% App. Total	0	0	0	0		0	85.8	14.2	0		63.8	0	36.2	0		12.1	86.4	0	1.5		
PHF	.000	.000	.000	.000	.000	.000	.880	.875	.000	.895	.849	.000	.865	.000	.923	.667	.919	.000	.500	.917	.930
Auto	0	0	0	0	0	0	167	27	0	194	141	0	81	0	222	16	112	0	2	130	546
% Auto	0	0	0	0	0	0	98.8	96.4	0	98.5	96.6	0	97.6	0	96.9	100	98.2	0	100	98.5	97.8
Medium	0	0	0	0	0	0	2	1	0	3	4	0	2	0	6	0	1	0	0	1	10
% Medium																					
Heavy	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	2
% Heavy	0	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0.4	0	0.9	0	0	0.8	0.4



VTrans

Counter: TU 0118
Counted by: J Gosselin
Weather: Sunny, hot
Town: 91-14 Thetford

File Name : 91-14Nam13
Site Code : 30911905
Start Date : 5/29/2013
Page No : 1

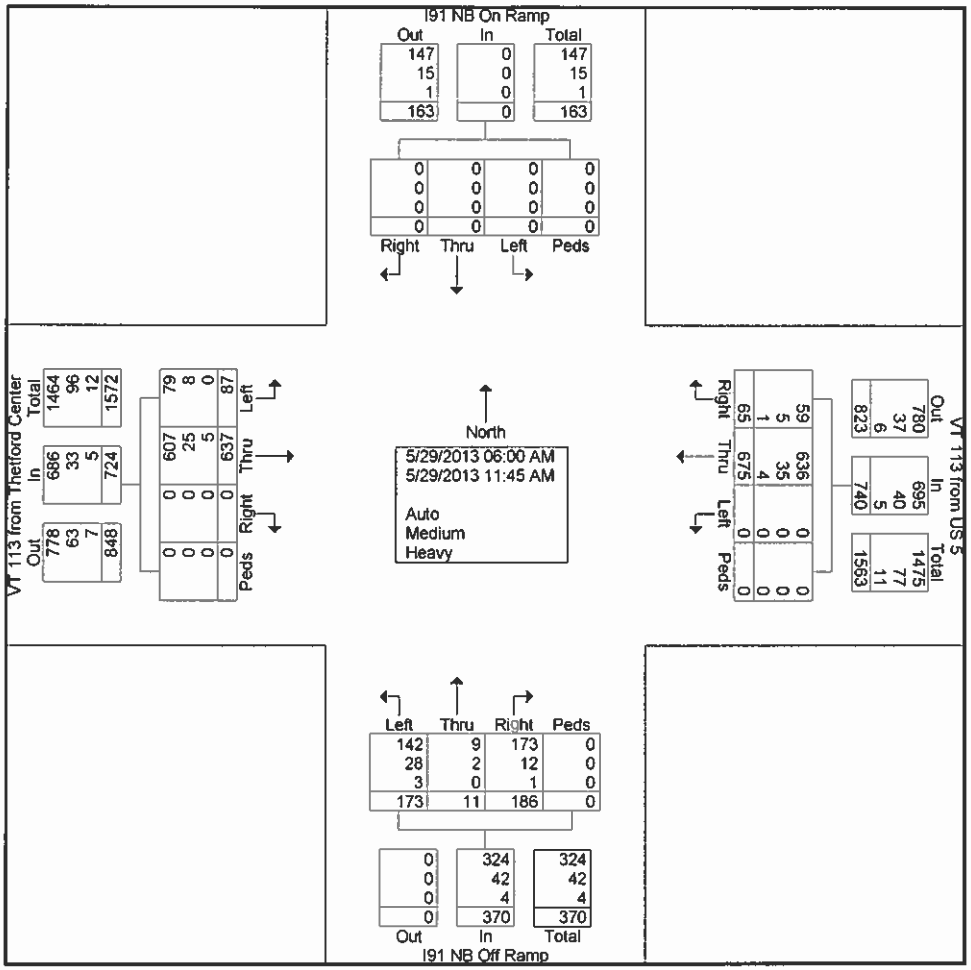
Groups Printed- Auto - Medium - Heavy

	I91 NB On Ramp From North				VT 113 from US 5 From East				I91 NB Off Ramp From South				VT 113 from Thetford Center From West				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00 AM	0	0	0	0	0	12	1	0	5	0	5	0	1	13	0	0	37
06:15 AM	0	0	0	0	0	17	1	0	3	0	3	0	2	20	0	0	46
06:30 AM	0	0	0	0	0	28	2	0	2	0	6	0	5	26	0	0	69
06:45 AM	0	0	0	0	0	25	3	0	6	0	2	0	3	40	0	0	79
Total	0	0	0	0	0	82	7	0	16	0	16	0	11	99	0	0	231
07:00 AM	0	0	0	0	0	26	1	0	4	5	6	0	8	34	0	0	84
07:15 AM	0	0	0	0	0	81	1	0	14	0	10	0	8	50	0	0	164
07:30 AM	0	0	0	0	0	45	0	0	13	0	8	0	9	66	0	0	141
07:45 AM	0	0	0	0	0	48	3	0	9	0	23	0	5	44	0	0	132
Total	0	0	0	0	0	200	5	0	40	5	47	0	30	194	0	0	521
08:00 AM	0	0	0	0	0	45	8	0	13	1	13	0	3	37	0	0	120
08:15 AM	0	0	0	0	0	38	4	0	7	0	14	0	6	31	0	0	100
08:30 AM	0	0	0	0	0	30	2	0	7	0	3	0	3	31	0	0	76
08:45 AM	0	0	0	0	0	21	9	0	5	0	5	0	7	21	0	0	68
Total	0	0	0	0	0	134	23	0	32	1	35	0	19	120	0	0	364
09:00 AM	0	0	0	0	0	23	1	0	6	0	8	0	2	16	0	0	56
09:15 AM	0	0	0	0	0	21	3	0	5	0	8	0	2	27	0	0	66
09:30 AM	0	0	0	0	0	21	1	0	8	1	9	0	6	16	0	0	62
09:45 AM	0	0	0	0	0	23	2	0	7	0	5	0	0	17	0	0	54
Total	0	0	0	0	0	88	7	0	26	1	30	0	10	76	0	0	238
10:00 AM	0	0	0	0	0	22	0	0	9	0	6	0	2	11	0	0	50
10:15 AM	0	0	0	0	0	21	1	0	5	0	5	0	3	16	0	0	51
10:30 AM	0	0	0	0	0	18	6	0	5	1	2	0	1	14	0	0	47
10:45 AM	0	0	0	0	0	17	3	0	10	0	11	0	2	23	0	0	66
Total	0	0	0	0	0	78	10	0	29	1	24	0	8	64	0	0	214
11:00 AM	0	0	0	0	0	21	4	0	6	1	8	0	5	26	0	0	71
11:15 AM	0	0	0	0	0	22	5	0	11	0	9	0	3	19	0	0	69
11:30 AM	0	0	0	0	0	20	2	0	6	1	11	0	1	20	0	0	61
11:45 AM	0	0	0	0	0	30	2	0	7	1	6	0	0	19	0	0	65
Total	0	0	0	0	0	93	13	0	30	3	34	0	9	84	0	0	266
Grand Total	0	0	0	0	0	675	65	0	173	11	186	0	87	637	0	0	1834
Apprch %	0	0	0	0	0	91.2	8.8	0	46.8	3	50.3	0	12	88	0	0	
Total %	0	0	0	0	0	36.8	3.5	0	9.4	0.6	10.1	0	4.7	34.7	0	0	
Auto	0	0	0	0	0	636	59	0	142	9	173	0	79	607	0	0	1705
% Auto	0	0	0	0	0	94.2	90.8	0	82.1	81.8	93	0	90.8	95.3	0	0	93
Medium	0	0	0	0	0	35	5	0	28	2	12	0	8	25	0	0	115
% Medium	0	0	0	0	0	5.2	7.7	0	16.2	18.2	6.5	0	9.2	3.9	0	0	6.3
Heavy	0	0	0	0	0	4	1	0	3	0	1	0	0	5	0	0	14
% Heavy	0	0	0	0	0	0.6	1.5	0	1.7	0	0.5	0	0	0.8	0	0	0 8

VTrans

Counter: TU 0118
Counted by: J Gosselin
Weather: Sunny, hot
Town: 91-14 Thetford

File Name : 91-14Nam13
Site Code : 30911905
Start Date : 5/29/2013
Page No : 2

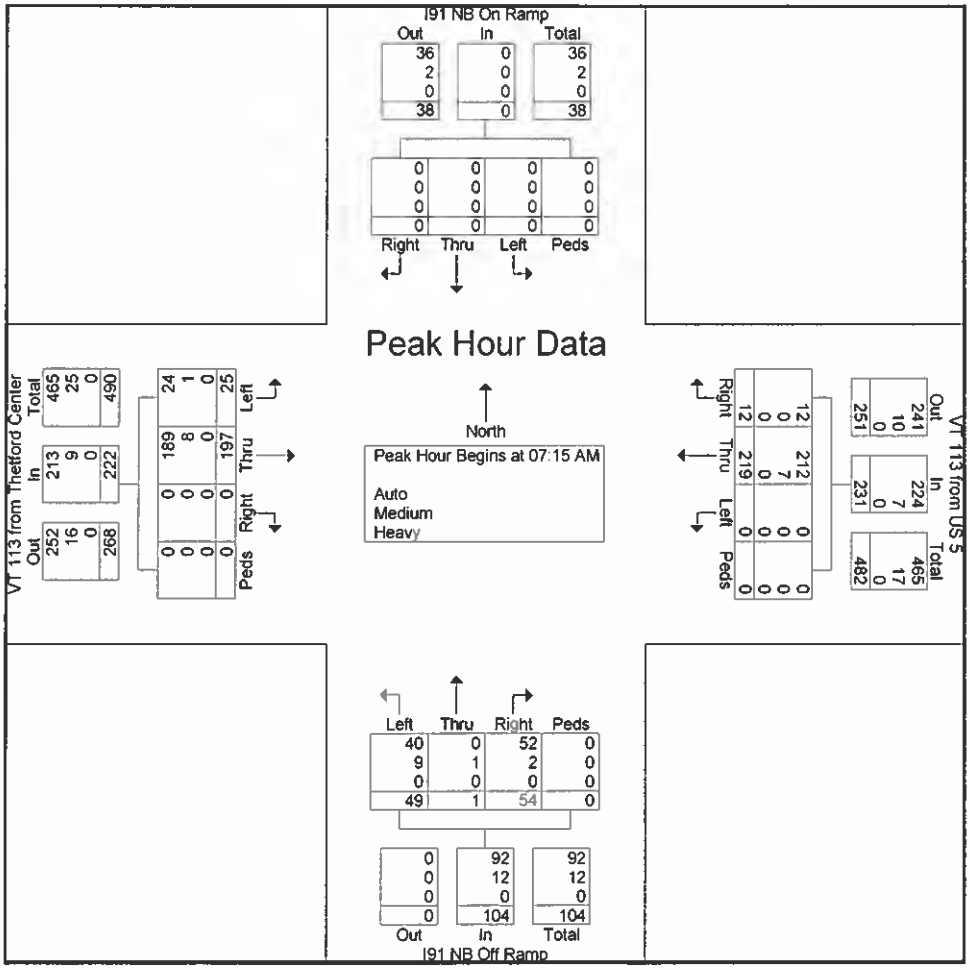


VTrans

Counter: TU 0118
Counted by: J Gosselin
Weather: Sunny, hot
Town: 91-14 Thetford

File Name : 91-14Nam13
Site Code : 30911905
Start Date : 5/29/2013

	I91 NB On Ramp From North					VT 113 from US 5 From East					I91 NB Off Ramp From South					VT 113 from Thetford Center From West					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	0	0	0	0	0	81	1	0	82	14	0	10	0	24	8	50	0	0	58	164
07:30 AM	0	0	0	0	0	0	45	0	0	45	13	0	8	0	21	9	66	0	0	75	141
07:45 AM	0	0	0	0	0	0	48	3	0	51	9	0	23	0	32	5	44	0	0	49	132
08:00 AM	0	0	0	0	0	0	45	8	0	53	13	1	13	0	27	3	37	0	0	40	120
Total Volume	0	0	0	0	0	0	219	12	0	231	49	1	54	0	104	25	197	0	0	222	557
% App. Total	0	0	0	0		0	94.8	5.2	0		47.1	1	51.9	0		11.3	88.7	0	0		
PHF	.000	.000	.000	.000	.000	.000	.676	.375	.000	.704	.875	.250	.587	000	.813	694	.746	.000	.000	.740	.849
Auto	0	0	0	0	0	0	212	12	0	224	40	0	52	0	92	24	189	0	0	213	529
% Auto	0	0	0	0	0	0	96.8	100	0	97.0	81.6	0	96.3	0	88.5	96.0	95.9	0	0	95.9	95.0
Medium	0	0	0	0	0	0	7	0	0	7	9	1	2	0	12	1	8	0	0	9	28
% Medium											18.4	100	3.7	0	11.5	4.0	4.1	0	0	4.1	5.0
Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



VTrans

Counter: TU1171
Counted by: R Hicks
Weather: Sunny
Town: 91-14 Thetford

File Name : 91-14Spm13
Site Code : 30911905
Start Date : 5/28/2013
Page No : 1

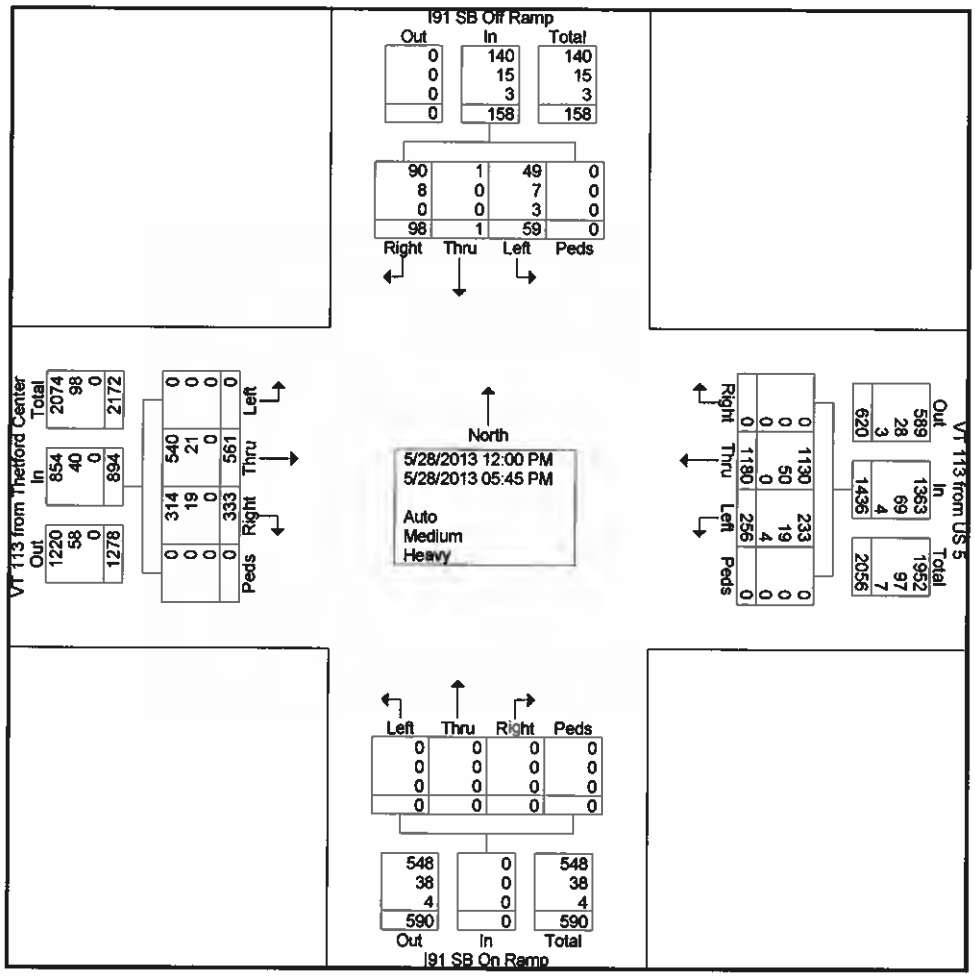
Groups Printed- Auto - Medium - Heavy

	I91 SB Off Ramp From North				VT 113 from US 5 From East				I91 SB On Ramp From South				VT 113 from Thetford Center From West				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
12:00 PM	2	0	3	0	9	20	0	0	0	0	0	0	0	14	7	0	55
12:15 PM	2	0	2	0	7	28	0	0	0	0	0	0	0	13	8	0	60
12:30 PM	4	0	1	0	10	22	0	0	0	0	0	0	0	31	11	0	79
12:45 PM	1	0	3	0	6	39	0	0	0	0	0	0	0	17	9	0	75
Total	9	0	9	0	32	109	0	0	0	0	0	0	0	75	35	0	269
01:00 PM	1	0	4	0	8	29	0	0	0	0	0	0	0	17	11	0	70
01:15 PM	3	0	4	0	8	19	0	0	0	0	0	0	0	18	20	0	72
01:30 PM	2	0	4	0	10	35	0	0	0	0	0	0	0	14	9	0	74
01:45 PM	2	0	3	0	6	34	0	0	0	0	0	0	0	22	15	0	82
Total	8	0	15	0	32	117	0	0	0	0	0	0	0	71	55	0	298
02:00 PM	2	0	3	0	5	23	0	0	0	0	0	0	0	41	11	0	85
02:15 PM	2	0	6	0	11	45	0	0	0	0	0	0	0	19	21	0	104
02:30 PM	1	0	5	0	15	50	0	0	0	0	0	0	0	25	13	0	109
02:45 PM	3	0	4	0	8	50	0	0	0	0	0	0	0	22	16	0	103
Total	8	0	18	0	39	168	0	0	0	0	0	0	0	107	61	0	401
03:00 PM	4	0	7	0	7	53	0	0	0	0	0	0	0	38	20	0	129
03:15 PM	3	0	1	0	14	45	0	0	0	0	0	0	0	32	21	0	116
03:30 PM	1	0	6	0	16	52	0	0	0	0	0	0	0	25	17	0	117
03:45 PM	4	0	4	0	13	59	0	0	0	0	0	0	0	26	18	0	124
Total	12	0	18	0	50	209	0	0	0	0	0	0	0	121	76	0	486
04:00 PM	2	0	2	0	16	69	0	0	0	0	0	0	0	30	15	0	134
04:15 PM	4	1	5	0	14	78	0	0	0	0	0	0	0	22	12	0	136
04:30 PM	1	0	4	0	11	71	0	0	0	0	0	0	0	23	18	0	128
04:45 PM	5	0	11	0	10	71	0	0	0	0	0	0	0	24	10	0	131
Total	12	1	22	0	51	289	0	0	0	0	0	0	0	99	55	0	529
05:00 PM	7	0	3	0	16	69	0	0	0	0	0	0	0	23	16	0	134
05:15 PM	1	0	4	0	17	81	0	0	0	0	0	0	0	26	12	0	141
05:30 PM	1	0	5	0	16	77	0	0	0	0	0	0	0	26	14	0	139
05:45 PM	1	0	4	0	3	61	0	0	0	0	0	0	0	13	9	0	91
Total	10	0	16	0	52	288	0	0	0	0	0	0	0	88	51	0	505
Grand Total	59	1	98	0	256	1180	0	0	0	0	0	0	0	561	333	0	2488
Apprch %	37.3	0.6	62	0	17.8	82.2	0	0	0	0	0	0	0	62.8	37.2	0	
Total %	2.4	0	3.9	0	10.3	47.4	0	0	0	0	0	0	0	22.5	13.4	0	
Auto	49	1	90	0	233	1130	0	0	0	0	0	0	0	540	314	0	2357
% Auto	83.1	100	91.8	0	91	95.8	0	0	0	0	0	0	0	96.3	94.3	0	94.7
Medium	7	0	8	0	19	50	0	0	0	0	0	0	0	21	19	0	124
% Medium	11.9	0	8.2	0	7.4	4.2	0	0	0	0	0	0	0	3.7	5.7	0	5
Heavy	3	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	7
% Heavy	5.1	0	0	0	1.6	0	0	0	0	0	0	0	0	0	0	0	0.3

VTrans

Counter: TU1171
Counted by: R Hicks
Weather: Sunny
Town: 91-14 Thetford

File Name : 91-14Spm13
Site Code : 30911905
Start Date : 5/28/2013
Page No : 2

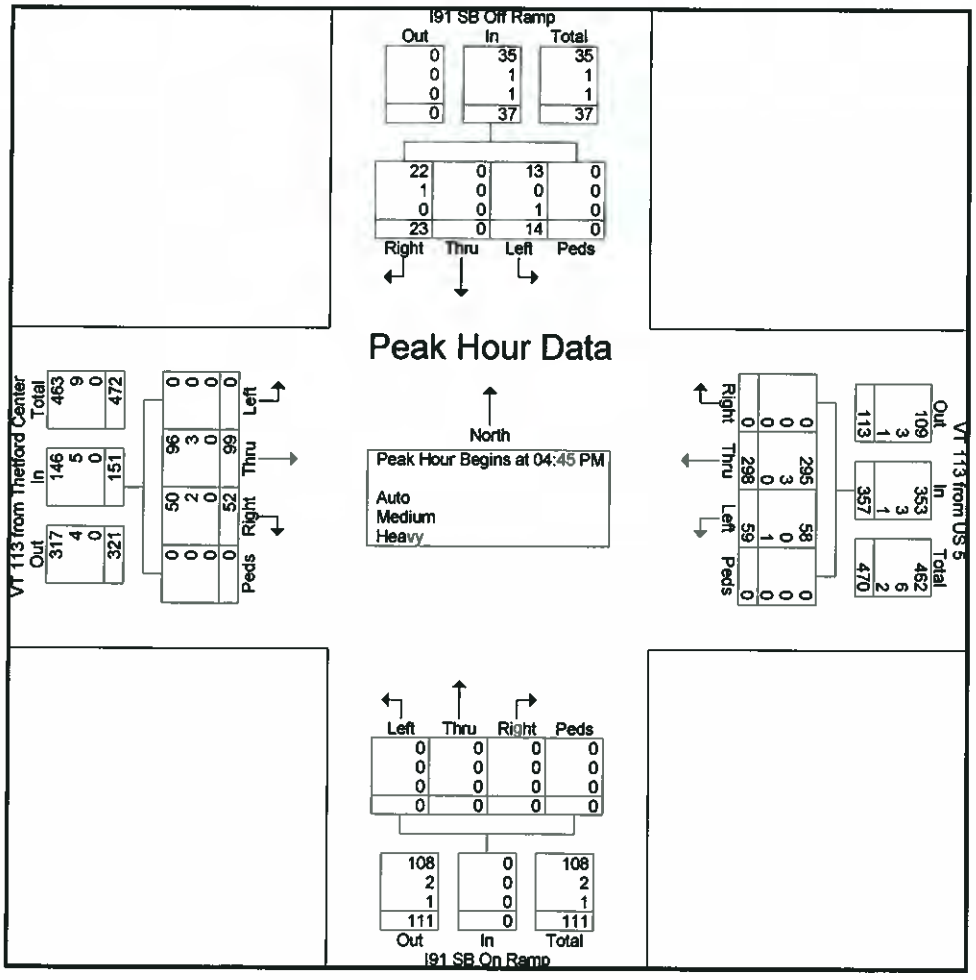


VTrans

Counter: TU1171
Counted by: R Hicks
Weather: Sunny
Town: 91-14 Thetford

File Name : 91-14Spm13
Site Code : 30911905
Start Date : 5/28/2013
Page No : 3

	I91 SB Off Ramp From North					VT 113 from US 5 From East					I91 SB On Ramp From South					VT 113 from Thetford Center From West					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	5	0	11	0	16	10	71	0	0	81	0	0	0	0	0	0	24	10	0	34	131
05:00 PM	7	0	3	0	10	16	69	0	0	85	0	0	0	0	0	0	23	16	0	39	134
05:15 PM	1	0	4	0	5	17	81	0	0	98	0	0	0	0	0	0	26	12	0	38	141
05:30 PM	1	0	5	0	6	16	77	0	0	93	0	0	0	0	0	0	26	14	0	40	139
Total Volume	14	0	23	0	37	59	298	0	0	357	0	0	0	0	0	0	99	52	0	151	545
% App. Total	37.8	0	62.2	0		16.5	83.5	0	0		0	0	0	0		0	65.6	34.4	0		
PHF	.500	.000	.523	.000	.578	.868	.920	.000	.000	.911	.000	.000	.000	.000	.000	.000	.952	.813	.000	.944	.966
Auto	13	0	22	0	35	58	295	0	0	353	0	0	0	0	0	0	96	50	0	146	534
% Auto	92.9	0	95.7	0	94.6	98.3	99.0	0	0	98.9	0	0	0	0	0	0	97.0	96.2	0	96.7	98 0
Medium	0	0	1	0	1	0	3	0	0	3	0	0	0	0	0	0	3	2	0	5	9
% Medium																					
Heavy	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
% Heavy	7.1	0	0	0	2.7	1.7	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0.4



VTrans

Counter: TU1171
Counted by: R Hicks
Weather: Rainy
Town: 91-14 Thetford

File Name : 91-14Sam13
Site Code : 30911905
Start Date : 5/29/2013
Page No : 1

Groups Printed- Auto - Medium - Heavy

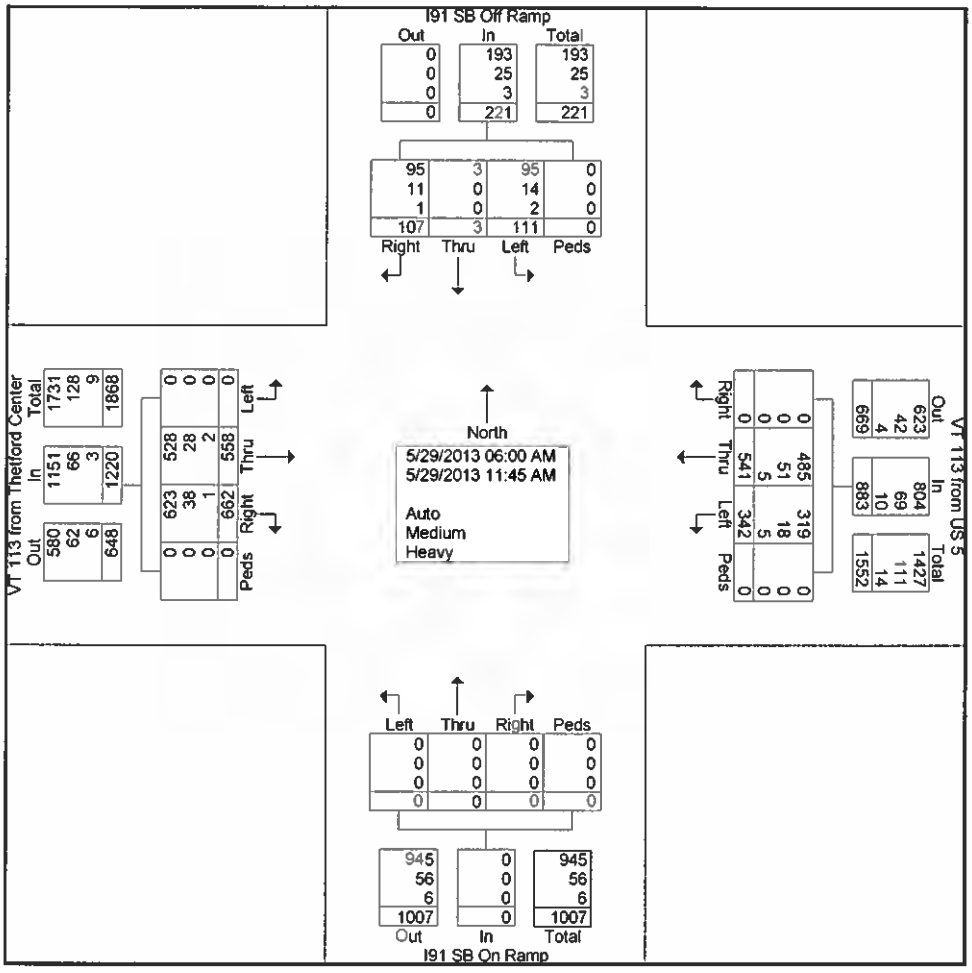
	I91 SB Off Ramp From North				VT 113 from US 5 From East				I91 SB On Ramp From South				VT 113 from Thetford Center From West				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:00 AM	2	1	2	0	10	8	0	0	0	0	0	0	0	14	18	0	55
06:15 AM	2	0	4	0	12	9	0	0	0	0	0	0	0	18	32	0	77
06:30 AM	6	0	2	0	21	9	0	0	0	0	0	0	0	25	31	0	94
06:45 AM	11	0	1	0	15	17	0	0	0	0	0	0	0	30	22	0	96
Total	21	1	9	0	58	43	0	0	0	0	0	0	0	87	103	0	322
07:00 AM	7	0	8	0	10	24	0	0	0	0	0	0	0	35	41	0	125
07:15 AM	11	0	13	0	31	64	0	0	0	0	0	0	0	46	48	0	213
07:30 AM	10	0	7	0	28	37	0	0	0	0	0	0	0	60	61	0	203
07:45 AM	8	0	3	0	27	29	0	0	0	0	0	0	0	31	38	0	136
Total	36	0	31	0	96	154	0	0	0	0	0	0	0	172	188	0	677
08:00 AM	11	0	4	0	23	39	0	0	0	0	0	0	0	31	28	0	136
08:15 AM	1	0	3	0	19	28	0	0	0	0	0	0	0	33	37	0	121
08:30 AM	3	0	7	0	13	19	0	0	0	0	0	0	0	26	51	0	119
08:45 AM	5	0	2	0	19	12	0	0	0	0	0	0	0	18	27	0	83
Total	20	0	16	0	74	98	0	0	0	0	0	0	0	108	143	0	459
09:00 AM	1	0	10	0	12	21	0	0	0	0	0	0	0	16	22	0	82
09:15 AM	5	0	3	0	9	20	0	0	0	0	0	0	0	14	29	0	80
09:30 AM	2	0	3	0	11	20	0	0	0	0	0	0	0	18	23	0	77
09:45 AM	4	0	5	0	10	16	0	0	0	0	0	0	0	13	28	0	76
Total	12	0	21	0	42	77	0	0	0	0	0	0	0	61	102	0	315
10:00 AM	3	0	6	0	14	18	0	0	0	0	0	0	0	11	15	0	67
10:15 AM	1	0	0	0	13	19	0	0	0	0	0	0	0	16	25	0	74
10:30 AM	2	1	2	0	6	14	0	0	0	0	0	0	0	14	15	0	54
10:45 AM	7	0	4	0	6	22	0	0	0	0	0	0	0	14	10	0	63
Total	13	1	12	0	39	73	0	0	0	0	0	0	0	55	65	0	258
11:00 AM	3	0	8	0	9	18	0	0	0	0	0	0	0	27	12	0	77
11:15 AM	2	0	2	0	9	25	0	0	0	0	0	0	0	19	17	0	74
11:30 AM	2	1	5	0	7	22	0	0	0	0	0	0	0	17	21	0	75
11:45 AM	2	0	3	0	8	31	0	0	0	0	0	0	0	12	11	0	67
Total	9	1	18	0	33	96	0	0	0	0	0	0	0	75	61	0	293
Grand Total	111	3	107	0	342	541	0	0	0	0	0	0	0	558	662	0	2324
Apprch %	50.2	1.4	48.4	0	38.7	61.3	0	0	0	0	0	0	0	45.7	54.3	0	
Total %	4.8	0.1	4.6	0	14.7	23.3	0	0	0	0	0	0	0	24	28.5	0	
Auto	95	3	95	0	319	485	0	0	0	0	0	0	0	528	623	0	2148
% Auto	85.6	100	88.8	0	93.3	89.6	0	0	0	0	0	0	0	94.6	94.1	0	92.4
Medium	14	0	11	0	18	51	0	0	0	0	0	0	0	28	38	0	160
% Medium	12.6	0	10.3	0	5.3	9.4	0	0	0	0	0	0	0	5	5.7	0	6.9
Heavy	2	0	1	0	5	5	0	0	0	0	0	0	0	2	1	0	16
% Heavy	1.8	0	0.9	0	1.5	0.9	0	0	0	0	0	0	0	0.4	0.2	0	0.7

PEAK HOUR

VTrans

Counter: TU1171
Counted by: R Hicks
Weather: Rainy
Town: 91-14 Thetford

File Name : 91-14Sam13
Site Code : 30911905
Start Date : 5/29/2013
Page No : 2

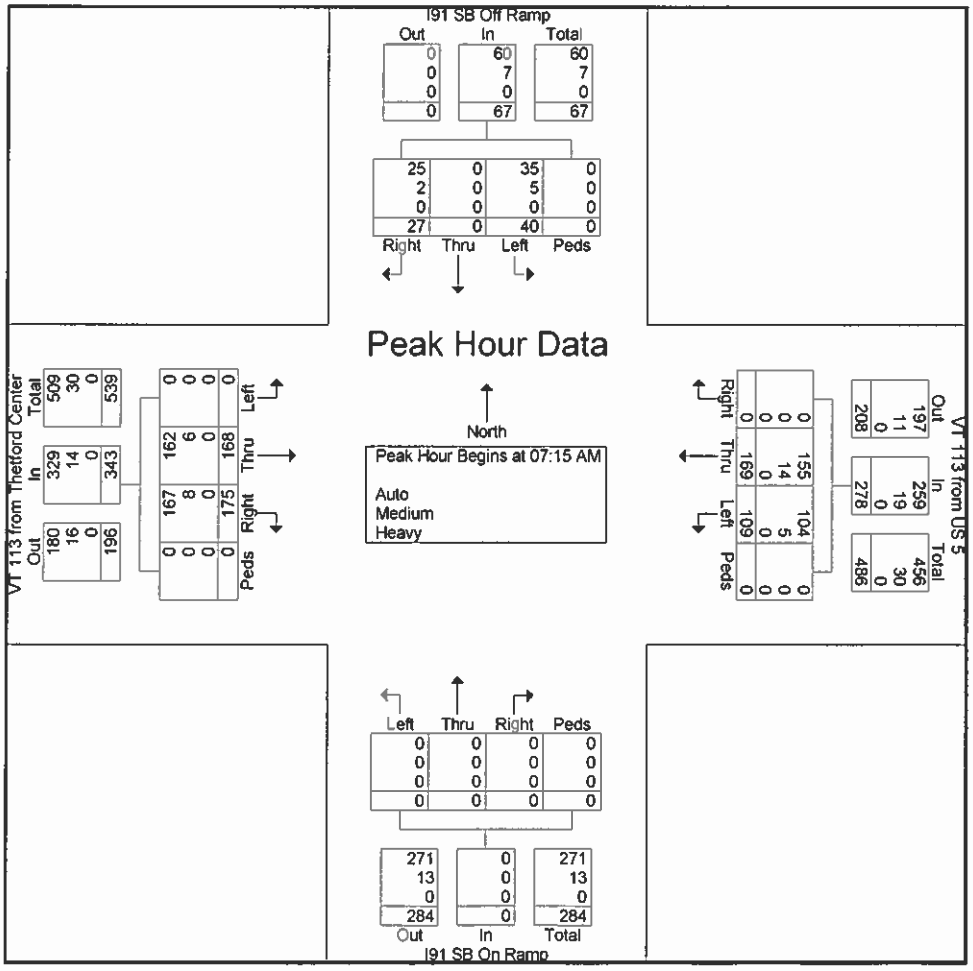


VTrans

Counter: TU1171
Counted by: R Hicks
Weather: Rainy
Town: 91-14 Thetford

File Name : 91-14Sam13
Site Code : 30911905
Start Date : 5/29/2013
Page No : 3

	I91 SB Off Ramp From North					VT 113 from US 5 From East					I91 SB On Ramp From South					VT 113 from Thetford Center From West					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	11	0	13	0	24	31	64	0	0	95	0	0	0	0	0	0	46	48	0	94	213
07:30 AM	10	0	7	0	17	28	37	0	0	65	0	0	0	0	0	0	60	61	0	121	203
07:45 AM	8	0	3	0	11	27	29	0	0	56	0	0	0	0	0	0	31	38	0	69	136
08:00 AM	11	0	4	0	15	23	39	0	0	62	0	0	0	0	0	0	31	28	0	59	136
Total Volume	40	0	27	0	67	109	169	0	0	278	0	0	0	0	0	0	168	175	0	343	688
% App. Total	59.7	0	40.3	0		39.2	60.8	0	0		0	0	0	0		0	49	51	0		
PHF	.909	.000	.519	.000	.698	.879	.660	.000	.000	.732	.000	.000	.000	.000	.000	.000	.700	.717	.000	.709	.808
Auto	35	0	25	0	60	104	155	0	0	259	0	0	0	0	0	0	162	167	0	329	648
% Auto	87.5	0	92.6	0	89.6	95.4	91.7	0	0	93.2	0	0	0	0	0	0	96.4	95.4	0	95.9	94.2
Medium	5	0	2	0	7	5	14	0	0	19	0	0	0	0	0	0	6	8	0	14	40
% Medium	12.5	0	7.4	0	10.4	4.6	8.3	0	0	6.8	0	0	0	0	0	0	3.6	4.6	0	4.1	5.8
Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Vermont Average Commute Time by County

Data Item

Average travel time to work for workers 16 years and over not working at home, 2006-2010

State

Vermont

Map | Rank | Table

Average travel time to work for workers 16 years and over not working at home, 2006-2010 - (Minutes)

County	Value
Addison	22.5
Bennington	17.6
Caledonia	21.5
Chittenden	19.6
Essex	25.1
Franklin	26.6
Grand Isle	31.1
Lamoille	24.4
Orange	27.0
Orleans	22.2
Rutland	20.0
Washington	21.3
Windham	20.4
Windsor	21.3

Value for Vermont (Minutes): 21.5

Data Item: Average travel time to work for workers 16 years and over not working at home, 2006-2010

Source: U. S. Census Bureau, American Community Survey, 5-Year Estimates. Updated every year.
http://factfinder2.census.gov

Definitions:

Travel time to work refers to the total number of minutes that it usually took the person to get from home to work each day during the reference week. The elapsed time includes time spent waiting for public transportation, picking up passengers in carpools, and time spent in other activities related to getting to work.

Data were tabulated for workers 16 years old and over--that is, members of the Armed Forces and civilians who were at work during the reference week--who reported that they worked outside their home.

Mean travel time to work is obtained by dividing the total number of minutes by the number of workers 16 years old and over who did not work at home. Mean travel time to work is rounded to the nearest tenth of a minute.

Scope and Methodology:

30	Derby	4,604	57.12	80.6
31	Georgia	4,375	45.31	96.6
32	Castleton	4,367	42.33	103.2
33	Hinesburg	4,340	39.85	108.9
34	Stowe	4,339	73.14	59.3
35	Manchester	4,180	42.08	99.3
36	Richmond	4,090	32.75	124.9
37	Rutland Town	4,038	19.58	206.2
38	Brandon	3,917	39.95	98
39	Bristol	3,788	41.21	91.9
40	Shaftsbury	3,767	43.05	87.5
41	Fairfax	3,765	40.4	93.2
42	Windsor	3,756	19.77	190
43	Poultney	3,633	44.64	81.4
44	Charlotte	3,569	50.38	70.8
45	Pownal	3,560	47.4	75.1
46	Norwich	3,544	44.86	79
47	Highgate	3,397	59.82	56.8
48	Johnson	3,274	45.21	72.4
49	Woodstock	3,232	44.37	72.8
50	Williamstown	3,225	40.33	80
51	Hartland	3,223	45.28	71.2
52	Westminster	3,210	45.24	71
53	Cambridge	3,186	63.48	50.2
54	Hardwick	3,174	38.66	82.1
55	Pittsford	3,140	43.45	72.3
56	Chester	3,044	55.9	54.5
57	Underhill	2,980	51.29	58.1
58	Fair Haven	2,928	18.22	160.7
59	Berlin	2,864	36.71	78
60	Hyde Park	2,847	39	73
61	Clarendon	2,811	31.5	89.2
62	Enosburgh	2,788	48.32	57.7
63	Weathersfield	2,788	44.02	63.3
64	Barton	2,780	44.36	62.7
65	Vergennes	2,741	2.5	1,096.4
66	Ferrisburgh	2,657	61.24	43.4
67	Putney	2,634	26.7	98.7
68	Bradford	2,619	29.93	87.5
→ 69	Thetford	2,617	44.43	58.9
70	Royalton	2,603	40.85	63.7

Vermont Towns

Ranked by Population

Area | Population Density

Area is expressed in SQUARE MILES. Density is NUMBER OF PERSONS PER SQUARE MILE

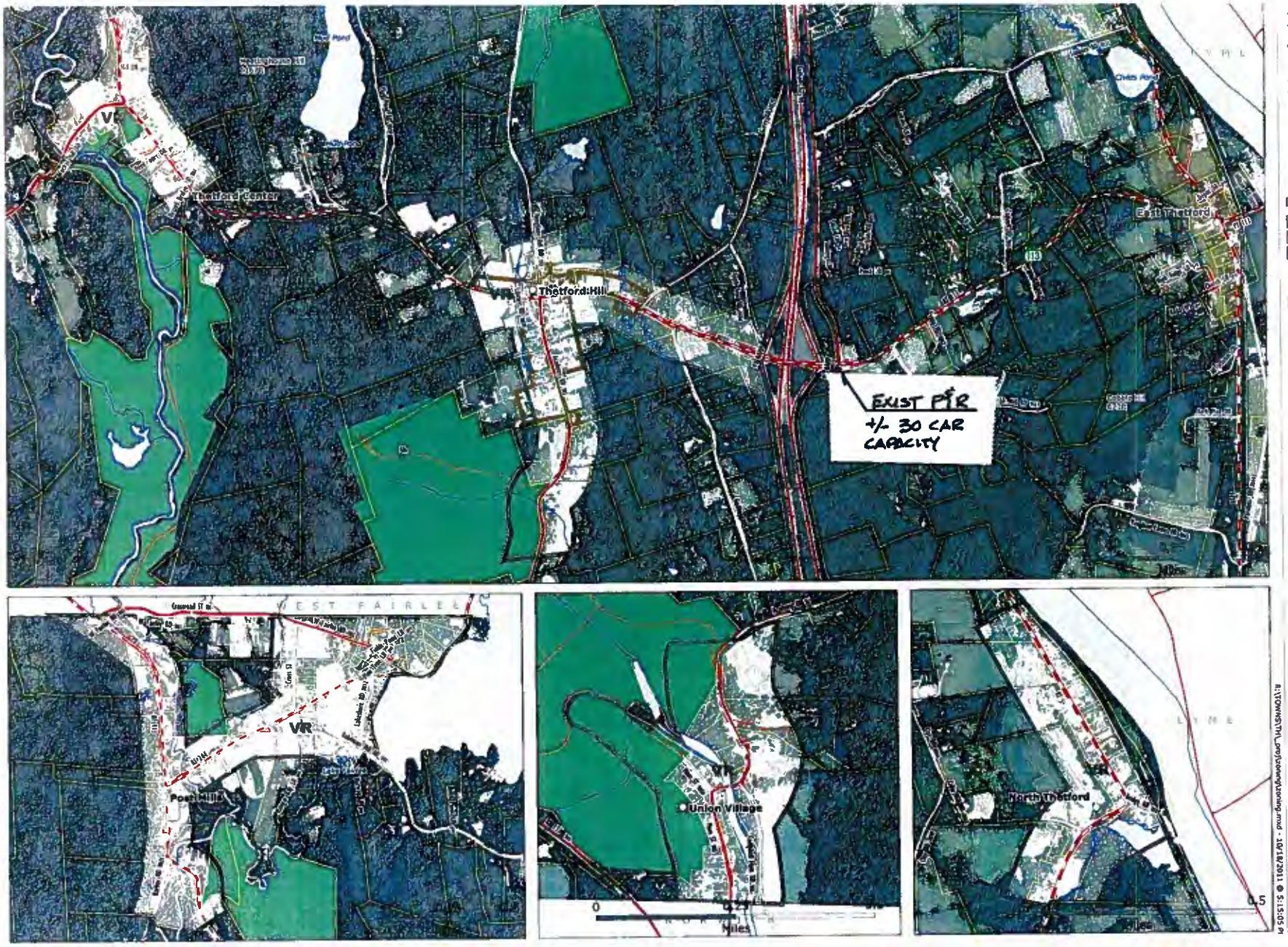
Rank	Town	Population	Area	Density
1	Burlington	38,889	15.48	2,512.2
2	Essex	18,626	39.4	472.7
3	Rutland	17,292	7.67	2,254.5
4	Colchester	16,986	60.3	281.7
5	South Burlington	15,814	30.92	511.4
6	Bennington	15,737	42.27	372.3
7	Brattleboro	12,005	32.63	367.9
8	Hartford	10,367	46	225.4
9	Milton	9,479	60.98	155.4
10	Barre	9,291	4.03	2,305.5
11	Springfield	9,078	49.6	183
12	Middlebury	8,183	39.69	206.2
13	Montpelier	8,035	10.26	783.1
14	Williston	7,650	31.1	246
15	St. Albans	7,650	1.99	3,844.2
16	Barre Town	7,602	30.73	247.4
17	St. Johnsbury	7,571	36.85	205.5
18	Shelburne	6,944	43.67	159
19	Winooski	6,561	1.39	4,720.1
20	Swanton	6,203	61.68	100.6
21	Northfield	5,791	44.82	129.2
22	Lyndon	5,448	39.69	137.3
23	Rockingham	5,309	42.11	126.1
24	Morristown	5,139	51.29	100.2
25	St. Albans Town	5,086	60.81	83.6
26	Jericho	5,015	35.56	141
27	Newport	5,005	7.78	643.3
28	Waterbury	4,915	50.38	97.6
29	Randolph	4,853	48.12	100.9

VERMONT AGENCY OF TRANSPORTATION
POLICY, PLANNING AND INTERMODAL DEVELOPMENT DIVISION
Traffic Research Unit

				BEGINNING REFERENCE:		ENDING REFERENCE:				2008	2010	2012
TYPE	NO.	NAME	FC	MM NAME	NUMBER	MM NAME	NUMBER	ATR STA	STATUS	AADT	AADT	AADT
I	91		1	70.200 HARTFORD	EXIT 11	72.010 HARTFORD	EXIT 12	Y077	H	18000 E	18200 E	19800 E
I	91		1	72.010 HARTFORD	EXIT 12	74.830 NORWICH	EXIT 13	Y060	H	17100 A	16700 E	17100 A
I	91		1	74.830 NORWICH	EXIT 13	84.210 THETFORD	EXIT 14	Y002	C/H	11600 A	11900 A	11700 A
I	91		1	84.210 THETFORD	EXIT 14	91.540 FAIRLEE	EXIT 15	N001	W/H	9200 A	9600 A	10300 A
I	91		1	91.540 FAIRLEE	EXIT 15	97.630 BRADFORD	EXIT 16	N002	C/H	7500 A	7800 A	7500 A
I	91		1	97.630 BRADFORD	EXIT 16	110.340 NEWBURY	EXIT 17	N004	H	5300 A	5300 E	5500 A
I	91		1	110.340 NEWBURY	EXIT 17	120.450 BARNET	EXIT 18	C009	H	4700 E	4700 E	5100 A
I	91		1	120.450 BARNET	EXIT 18	128.250 WATERFORD	EXIT 19	C026	H	5300 E	5300 E	5700 E
I	91		11	128.250 WATERFORD	EXIT 19	128.890 ST JOHNSBURY	EXIT 20	C027	H	8000 A	7900 E	8600 E
I	91		11	128.890 ST JOHNSBURY	EXIT 20	130.600 ST JOHNSBURY	EXIT 21	C008	H	7300 E	9100 E	7800 A
I	91		11	130.600 ST JOHNSBURY	EXIT 21	132.550 ST JOHNSBURY	EXIT 22	C006	H	9000 E	8800 E	7600 E
I	91		11	132.550 ST JOHNSBURY	EXIT 22	137.110 LYNDON	EXIT 23	C005	H	9500 E	10800 E	10900 E
I	91		1	137.110 LYNDON	EXIT 23	140.178 LYNDON	EXIT 24	C004	H	4500 E	5000 E	5200 A
I	91		1	140.178 LYNDON	EXIT 24	155.950 BARTON	EXIT 25	C002	C/H	4400 A	4600 A	4600 A
I	91		1	155.950 BARTON	EXIT 25	161.410 BARTON	EXIT 26	P002	H	5200 A	5100 E	5200 A
I	91		1	161.410 BARTON	EXIT 26	170.060 DERBY	EXIT 27	P001	H	5000 E	6600 A	6600 E
I	91		1	170.060 DERBY	EXIT 27	172.400 DERBY	EXIT 28	P213	H	4500 A	4500 E	5200 A
I	91		1	172.400 DERBY	EXIT 28	177.269 DERBY	EXIT 29	P082	C/H	3000 A	2900 A	3000 A
I	91		1	177.269 DERBY	EXIT 29	177.432 CANADIAN BORDER		P024	H	2100 A	2100 E	2100 E
INTERSTATE 93												
I	93		1	0.000 NEW HAMPSHIRE SL		7.510 WATERFORD	EXIT 1	C021	H	5600 E	6100 A	6200 E
I	93		1	7.510 WATERFORD	EXIT 1	11.104 WATERFORD	I 91 EXIT 19	C015	C/H	5400 A	5900 A	5900 A
INTERSTATE 189												
I	189		11	0.000 S BURLINGTON	EXIT 1	1.488 S BURLINGTON	I 89 EXIT 13	D099	C/H	39300 A	39800 A	40400 A

VERMONT AGENCY OF TRANSPORTATION
POLICY, PLANNING AND INTERMODAL DEVELOPMENT DIVISION
Traffic Research Unit

TYPE	NO.	NAME	FC	TOWN	BEGINNING REFERENCE: MM	NAME	NUMBER	ENDING REFERENCE: MM	NAME	NUMBER	ATR STA	STATUS	2008 AADT	2010 AADT	2012 AADT
VT	111		07	MORGAN	0.952	GORE RD	TH-2	2.806	E CHARLES RD/SIMINEAU RD	TH-3/TH-12	P303	A	1300 A	1600 A	1600 E
VT	111		07	MORGAN	2.806	E CHARLES RD/SIMINEAU RD	TH-3/TH-12	4.611	VALLEY RD	TH-1			1300 E	1600 E	1300 E
VT	111		07	MORGAN	4.611	VALLEY RD	TH-1	11.087	BRIGHTON TL		P305	H	770 E	1000 A	1000 E
VT	111		07	BRIGHTON	0.000	MORGAN TL		0.137	VT 114				770 E	1000 E	1000 E
VT ROUTE 112															
VT	112		06	HALIFAX	0.000	MASSACHUSETTS SL		2.780	BRANCH RD	TH-1	X16/140	A	1100 A	1200 A	1200 E
VT	112		06	HALIFAX	2.780	BRANCH RD	TH-1	5.846	WHITINGHAM TL		X139	A	1100 E	1100 E	1200 A
VT	112		06	WHITINGHAM	0.000	HALIFAX TL		0.061	VT 8A	TH-1			1100 E	1200 E	1200 E
VT	112		06	WHITINGHAM	0.061	VT 8A	TH-1	1.604	VT 100		X138	H	1500 A	1700 A	1600 A
VT ROUTE 113															
VT	113		07	CHELSEA	0.000	VT 110		0.077	COURT ST/PARK ST	TH-46/TH-76			1000 E	930 E	920 E
VT	113		07	CHELSEA	0.077	COURT/PARK ST	TH-46/76	3.440	VERSHIRE TL		N133	A	850 A	840 E	830 A
VT	113		07	VERSHIRE	0.000	CHELSEA TL		0.811	CORINTH RD/McIVER RD	TH-1/TH-16			850 E	840 E	830 E
VT	113		07	VERSHIRE	0.811	CORINTH RD/McIVER RD	TH-1/TH-16	7.731	W FAIRLEE TL		N134	A	1000 A	970 A	900 A
VT	113		07	W FAIRLEE	0.000	VERSHIRE TL		1.979	BEANVILLE RD/FAIRLEE HILL RD	TH-3/TH-28		H(N134	1000 E	970 E	900 E
VT	113		07	W FAIRLEE	1.979	BEANVILLE RD/FAIRLEE HILL RD	TH-3/TH-28	2.848	THETFORD TL		N135	A	1900 A	1900 A	1900 E
VT	113		07	THETFORD	0.000	W FAIRLEE TL		0.016	W VALLEY CROSS RD	TH-2			1900 E	1900 E	1900 E
VT	113		07	THETFORD	0.016	W VALLEY CROSS RD	TH-2	0.813	VT 244				1600 E	1200 E	1300 E
VT	113		07	THETFORD	0.813	VT 244		4.763	TUCKER HILL RD	TH-29	N138	A	2000 A	2000 A	2000 E
VT	113		07	THETFORD	4.763	TUCKER HILL RD	TH-29	6.247	ACADEMY RD	TH-3/TH-31	N201	A	3200 A	3400 A	3400 E
VT	113		07	THETFORD	6.247	ACADEMY RD	TH-3/TH-31	6.950	I 91 RAMPS A/C: EXIT 14				3400 E	3200 E	3200 E
VT	113		07	THETFORD	6.950	I 91 RAMPS A/C: EXIT 14		7.136	I 91 RAMPS B/D: EXIT 14				2700 E	2800 E	2800 E
VT	113		07	THETFORD	7.136	I 91 RAMPS B/D: EXIT 14		8.505	US 5 (JOINS US 5 FOR 290 FT. SPLITS)		N139	A	2700 A	2600 A	2600 E
VT	113		07	THETFORD	8.505	US 5		8.773	NEW HAMPSHIRE SL		N150	A	2100 E	2100 E	2100 A
VT ROUTE 114															
VT	114		07	LYNDON	0.000	US 5		0.603	DARLING HILL RD	TH-5			4500 E	4500 E	4500 E
VT	114		07	LYNDON	0.603	DARLING HILL RD	TH-5	3.035	BROOK RD	TH-19	C126	A	4100 A	4100 A	4100 E
VT	114		07	LYNDON	3.035	BROOK RD	TH-19	4.030	BURKE TL				3400 E	3200 E	3300 E
VT	114		07	BURKE	0.000	LYNDON TL		0.368	BURKE HOLLOW RD	TH-2	C701		3400 E	3200 E	3300 E
VT	114		07	BURKE	0.368	BURKE HOLLOW RD	TH-2	0.686	BURKE MOUNTAIN RD	TH-7	C043	A/S	3500 A	3500 A	3500 A
VT	114		07	BURKE	0.686	BURKE MOUNTAIN RD	TH-7	2.843	VICTORY RD	TH-5	C127	A	2000 A	2000 A	2000 E
VT	114		07	BURKE	2.843	VICTORY RD	TH-5	5.013	E HAVEN TL		C032	A	1800 E	1800 E	1800 E
VT	114		07	E HAVEN	0.000	BURKE TL		0.176	SCHOOL ST	TH-1			1800 E	1800 E	1800 E
VT	114		07	E HAVEN	0.176	SCHOOL ST	TH-1	2.220	NEWARK TL				970 E	1000 E	1000 E
VT	114		07	NEWARK	0.000	E HAVEN TL		5.245	BRIGHTON TL		C128/C703	A	970 A	1000 A	1000 E
VT	114		07	BRIGHTON	0.000	NEWARK TL		3.690	NEWARK RD	TH-3			970 E	1000 E	1100 E
VT	114		07	BRIGHTON	3.690	NEWARK RD	TH-3	4.472	VT 105 W (JOINS VT 105 FOR 2.1 MI)		E121	A	1100 A	1300 A	1300 E
VT	114		07	BRIGHTON	4.472	CROSS ST	VT 105 E	5.069	ALT VT 114	TH-4	E136/142	A	1800 A	1500 A	1500 E
VT	114		07	BRIGHTON	5.069	ALT VT 114	TH-4	7.227	VT 111		E117/EYAA	A	970 A	880 A	890 E
VT	114		07	BRIGHTON	7.227	VT 111		7.391	MORGAN TL				580 E	550 E	520 E



Zoning Districts
Thetford

Effective:
October 17, 2011

DISTRICTS

- Village Residential VR
- Community Business CB
- Rural

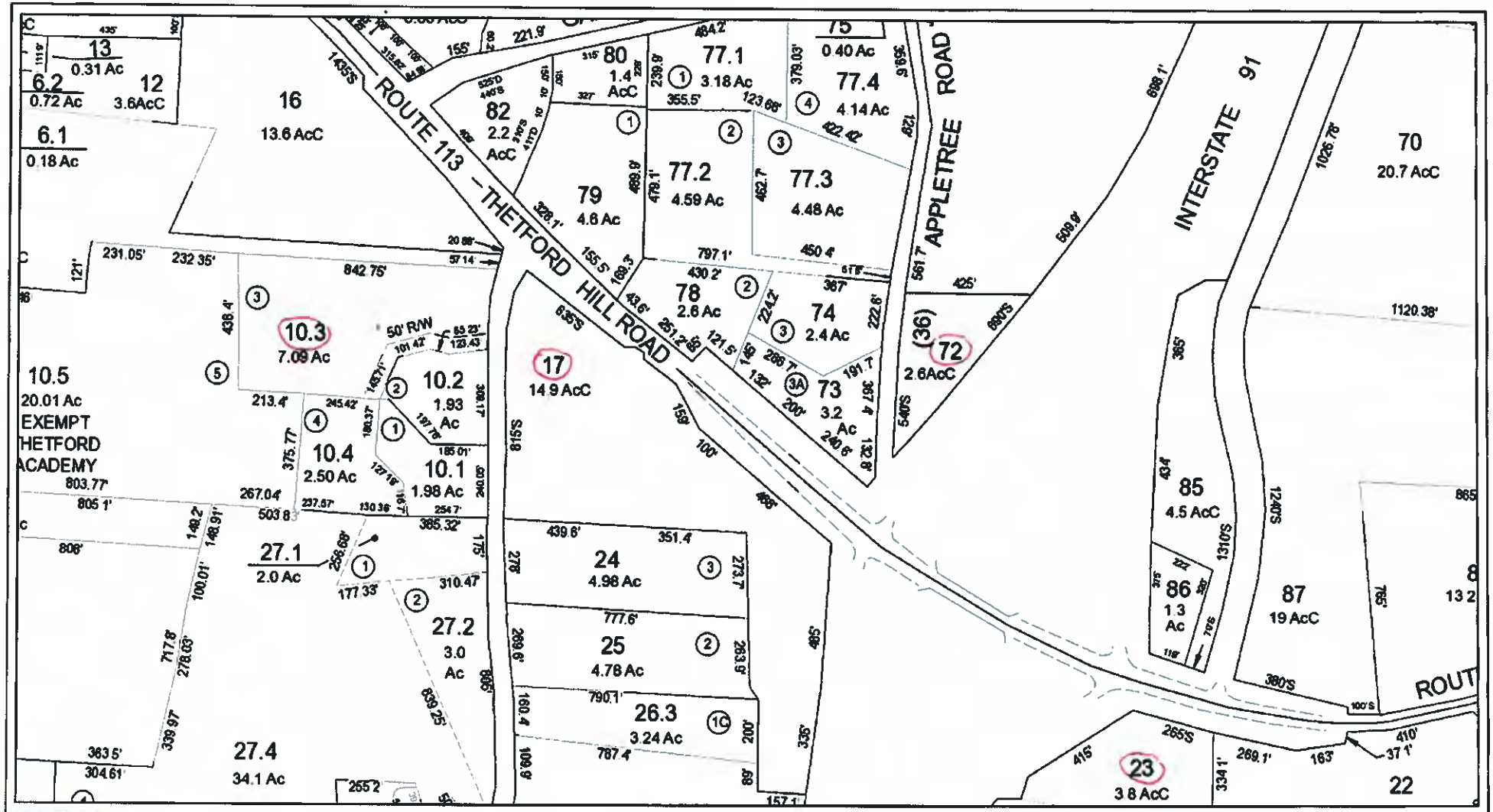
- Thetford Hill Historic Preservation Overlay

- VT route/TH cls 1
- TH cls 2
- TH cls 2 gravel
- TH cls 3
- TH cls 3 gravel
- TH cls 4
- trail
- private
- US route
- US interstate
- VT forest hwy
- addresses
- public lands
- tax parcel boundaries

2009 Aerial Photos

R:\TOWNS\TH_Core\zoning\zoning.mxd - 10/18/2011 @ 5:15:05 PM

Two Rivers-Ottauquechee
Regional Commission
GIS Service Center
3117 Rose Hill
The King Farm
Woodstock, VT 05091
802 457 3188
trorc.org



Thetford, VT

1 Inch = 300 Feet

January 22, 2014

DeBaie, Dave

From: Santy, Gary
Sent: Friday, August 15, 2014 3:01 PM
To: DeBaie, Dave
Subject: RE: Berlin & Thetford P&R Demand Evaluations
Attachments: img-815152556-0001.pdf

For Thetford, using the attached, the sites/parcels currently under consideration are:

- 23
- 72
- 17
- 10.3

Gary A. Santy, PE
Senior Principal, Transportation
Stantec
55 Green Mountain Drive South Burlington VT 05403-7824
Phone: (802) 864-0223 ext 107
Cell: (802) 324-9386
Fax: (802) 864-0165
gary.santy@stantec.com

Stantec

Celebrating 60 years of community, creativity, and client relationships.

From: DeBaie, Dave
Sent: Friday, August 15, 2014 2:51 PM
To: Santy, Gary
Subject: RE: Berlin & Thetford P&R Demand Evaluations

In Thetford…
If the alternate sites are in the immediate area with access off 113 and still within a quick "off and on" from I-91 the estimate may apply.

David J DeBaie PE, PTOE

Senior Traffic Engineer
Stantec
55 Green Mountain Drive South Burlington ,VT 05403
Phone: (802) 864-0223 ext 109
Fax: (802) 864-0165
dave.debaie@stantec.com

Stantec

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DHV Determination Method

(Based on data through 2012)

To determine the Design Hour Volume (DHV), normally the 30th highest hourly volume of the year, from the Annual Average Daily Traffic (AADT), apply the procedures outlined below in TABLE I.

Poll Group* (Seasonal Adjustment Factor Group)	Equation	"k" Factor
1. Rural Interstate	DHV = 0.1192 * AADT + 73	0.1233
2. Rural Non-Interstate	DHV = 0.1088 * AADT + 27	0.1126
3. Urban	None – Use "k" Factor	0.1059
4. Summer Recreational	$DHV = AADT^{0.7620}$	0.1326
5. Summer/Winter Recreational US and VT Routes	DHV = 0.1191 * AADT + 128	0.1398
6. Summer/Winter Recreational Town Highways	Use locally derived equations or "k" factors.	

TABLE I. DHV Calculation by Poll Group (seasonal adjustment factor group).

For poll groups 1, 2, 4 & 5, calculate DHV using both the equation and the "k" factor. Use the lower value. For poll group 3, use the "k" factor of 10.6%. For poll group 6, use locally derived equations or "k" factors. After calculation, values are to be rounded to the nearest 10 for volumes less than 1000, and to the nearest 100 for volumes greater than or equal to 1000.

Following are a series of charts illustrating the data on which these determinations are based. Each chart shows a number of parameters and a plot of the data points on which the parameters are based. The parameters include the number of data points, the "k" factor (the ratio of DHV to AADT) and the fitted curve equation. The "k" factor is derived by Linear Regression forcing the line through the origin. The fitted curve equation is derived by Linear Regression without forcing the line through the origin. Also shown is a description of the distribution of the individual "k" factors, including the minimum, maximum, mean and standard deviation. In the plot are shown the individual data points plus the fitted curve equation(s) and the "k" factor.

* If the project is located within the vicinity of a Continuous Traffic Counter (CTC), the "k" Factor for the CTC may be applied directly, rather than using the Poll Group Equation or the Poll Group "k" factor. Refer to pages 9 and 10 of this publication for a list of CTCs and their "k" factors.

2013 Growth Factors by Regression Analysis Group

A: Interstate Highways

Site ID	Route No	Town	Regression Analysis Year	20 Year GF 2013 to 2033	Short term GF 2008 to 2013
P6C002	I91	Sheffield	1994	1.12	1.06
P6C015	I93	Waterford	1994	1.35	1.05
P6D091	I89	South Burlington	1994	1.20	1.06
P6D092	I89	Colchester	1994	1.21	1.03
P6D099	I189	South Burlington	1994	1.04	1.04
P6F096	I89	Swanton	1994	1.17	1.07
P6N002	I91	Bradford	1994	1.15	0.95
P6P082	I91	Derby	1994	0.87	1.01
P6R001	US4	Fair Haven	1994	1.08	0.93
P6W002	I89	Berlin	1994	1.15	0.98
P6W089	I89	Waterbury	1994	1.17	1.03
P6X071	I91	Vernon	1994	0.92	0.96
P6X072	I91	Brattleboro	1994	0.97	0.91
P6X073	I91	Putney	1994	0.94	0.90
P6X074	I91	Rockingham	1994	1.03	0.97
P6Y001	I89	Bethel	1994	1.17	1.00
P6Y002	I91	Norwich	1994	1.15	0.97
			GROUP AVG	1.10	1.00

B: Urban

P6D001	VT127	Burlington	1994	0.72	0.96
P6D040	US7	Colchester	1994	1.16	1.01
P6D129	VT2A	Williston	1994	0.93	1.04
P6R022	US7	Rutland Town	1994	0.89	0.96
P6W004	VT62	Barre City	1994	1.04	0.81
P6W006	US302	Berlin	1994	0.88	1.10
P6W024	US2	Montpelier	1994	0.99	1.10
P6X011	US5	Brattleboro	1994	0.89	0.99
			GROUP AVG	0.94	1.00

Continued on Next Page...

...Continued from Previous Page

C: Rural Primary and Secondary

Site ID	Route No	Town	Regression Analysis Year	20 Year GF 2013 to 2033	Short term GF 2008 to 2013
P6A018	US7	Leicester	1994	1.01	0.96
P6A019	VT22A	Orwell	1994	1.12	1.00
P6A041	US7	New Haven	1994	1.05	1.01
P6B026	VT11	Winhall	1994	1.05	1.02
P6B282	US7	Shaftsbury	1994	1.05	1.08
P6C007	VT15	Hardwick	1994	1.13	1.07
P6C028	US2	Danville	1994	1.13	0.99
P6D132	US7	Charlotte	1994	1.05	1.01
P6F029	US7	Georgia	1994	1.03	1.03
P6G025	US2	Grand Isle	1994	1.15	1.00
P6L047	VT12	Elmore	1994	0.98	1.07
P6L057	VT108	Stowe	1994	1.32	1.14
P6P004	VT100	Westfield	1994	1.05	1.00
P6R005	US4	Killington	1994	0.75	0.97
P6R017	VT103	Mt Holly	1994	0.93	1.04
P6R084	US4	West Rutland	1994	1.04	0.95
P6X008	US5	Rockingham	1994	0.89	0.96
P6X027	VT9	Wilmington	1994	0.82	1.04
P6X249	VT103	Rockingham	1994	1.11	0.96
P6Y031	US5	Norwich	1994	1.00	0.97
P6Y033	VT10A	Norwich	1994	0.99	0.94
			GROUP AVG	1.03	1.01

E: Ski Stations

Site ID	Route No	Town	Regression Analysis Year	20 Year GF 2013 to 2033	Short term GF 2008 to 2013
P6C043	VT114	Burke	1994	1.06	0.94
P6D059	MC0223	Bolton	1994	1.25	0.91
P6R054	MC0159	Killington	1994	0.36	1.02
P6W055	VT17	Fayston	1994	1.07	1.05
P6W062	MC0203	Warren	1994	0.78	1.10
P6X064	VT100	Dover	1994	0.61	0.99
				NA	NA

TRORC VT State Park & Ride Usage Counts 2015-2016																
Town	Type (State)	Date of construction (Construction/ Upgrade)	Transit service (Yes/No/Limited)	Location	Total Spaces	Count Date	Tuesday October 27, 2015				Thursday October 29, 2015				Weather	Comments
							time	# of vehicles	# of hndcp spaces	% full	time	# of vehicles	# of hndcp spaces	% full	Temp/Conditions	
Hartland	State	2014	Yes	I-91 Exit 9	55	10/27/2015	10:52 AM	15	2	27%	9:30 AM	21	2	38%		
Thetford	State		Yes	I-91 Exit 14	23	10/27/2015	12:52 PM	6	3	26%	10:30 AM	10	3	43%		
Bradford	State		Yes	I-91 Exit 17	81	10/27/2015	1:06 PM	41	2	51%	10:44 AM	1	2	1%		
Sharon	State		Yes	I-89 Exit 2	25	10/27/2015	2:40 PM	22	1	88%	12:23 PM	19	1	76%		
Royalton	State		Yes	VT14/VT110	21	10/27/2015	2:50 PM	5	1	24%	12:39 PM	5	1	24%		
Randolph	State		Yes	I-89 Exit 4	89	10/27/2015	2:58 PM	20	4	22%	1:07 PM	22	4	25%		
Stockbridge	State	2014	No	VT107/VT100	11	10/27/2015	10:10 AM	1	1	9%	1:39 PM	1	1	9%		

TRORC VT Municipal Park & Ride Usage Counts 2015-2016																
Town	Type (Municipal)	Date of grant award	Transit service (Yes/No/Limited)	Location	Total Spaces	Count Date	Tuesday October 27, 2015				Thursday October 29, 2015				Weather	Comments
							time	# of vehicles	# of hndcp spaces	% full	time	# of vehicles	# of hndcp spaces	% full	Temp/Conditions	
Woodstock	Municipal	2014	Limited	Pleasant Street	21	10/27/2015	10:30 AM	3	2	14%	9:11 AM	3	2	14%		
Norwich	Municipal		Yes	Turnpike Road	30	10/27/2015	11:37 AM	3	2	10%	10:15 AM	1	2	3%		
Hartford	Municipal	2012	Yes	I-91 Exit 12	38	10/27/2015	11:25 AM	14	1	37%	10:03 AM	9	1	24%		
Hartford	Municipal		Yes	South Main St	23	10/27/2015	11:17 AM	7	2	30%	9:51 AM	8	2	35%		
Newbury	Municipal	2014	Yes	Newbury Crossing Rd / US5	20	10/27/2015	1:49 PM	4	1	20%	10:58 AM	3	1	15%		
Corinth	Municipal	2014	No	VT25/Topsham Corinth Rd	30	10/27/2015	1:21 PM	0	1	0%	11:21 AM	1	1	3%		
Bradford	Municipal	2014	Yes	VT25	5	10/27/2015	1:29 PM	0	1	0%	11:18 AM	1	1	20%		
Strafford	Municipal		No	VT132	20	10/27/2015	2:30 PM	1	1	5%	12:12 PM	3	1	15%		
Pittsfield	Municipal		No	VT100	19	10/27/2015	10:00 AM	0	1	0%	1:44 PM	0	1	0%		
Hancock	Municipal		No	VT100	29	10/27/2015	12:30 PM	0	1	0%	2:15 PM	0	1	0%		
West Braintree	Municipal		No	VT12A	13	10/27/2015	12:10 PM	0	1	0%	2:54 PM	0	1	0%		

APPENDIX B

Correspondence, Meeting Notes

From: Davis, Wayne
To: Edwards, Greg
Subject: FW: Thetford park and ride, exit 14.
Date: Thursday, June 30, 2016 9:23:19 AM

FYI

NOTE: Effective July 27, 2015, my new email is wayne.davis@vermont.gov

Wayne L. Davis
Project Supervisor
Municipal Assistance Bureau
Highway Division, VTrans
1 National Life Drive
Montpelier, VT 05633-5001
(802) 828-5609

From: Jason Berard [mailto:jason.berard@uvlt.org]
Sent: Friday, April 11, 2014 12:36 PM
To: Davis, Wayne <Wayne.Davis@vermont.gov>
Cc: Peter Helm <Peter.Helm@uvlt.org>; 'Santy, Gary' <GSanty@Stantec.com>
Subject: RE: Thetford park and ride, exit 14.

Thanks so much, Wayne.

We'll wait to hear back.

Take care,

Jason

From: Davis, Wayne [mailto:Wayne.Davis@state.vt.us]
Sent: Friday, April 11, 2014 12:24 PM
To: Jason Berard
Cc: Peter Helm; 'Santy, Gary'
Subject: RE: Thetford park and ride, exit 14.

Good day, Jason,

I noted that stake the other day and wondered if that is in fact a property bound or not. I will find out the answer and get back to you on it.

VTrans recognizes that the Thetford Park-and-Ride facility needs to be expanded, better lighted, etc. Our first step in this process is to make an assessment of the existing facility which is where we are at presently. In doing this we have found that the present location serves up many different issues, like boarding wetlands and conserved lands, historic, archeological, etc. There are no plans in any form at this time. In fact I was in the interchange area this past Tuesday with a

design consultant looking around at different potential sites for relocating the facility. VTrans second step after the present location assessment with all issues is identified, will be the scheduling of a Public Local Concerns Meeting, of which you will be notified and invited. So all input will be welcomed and important as VTrans explores the future of the Thetford Park-and-Ride Facility.

Wayne L. Davis
VTrans LTF Project Supervisor
1 National Life Drive
Montpelier, VT 05633-5001
(802) 828-5609

From: Jason Berard [mailto:jason.berard@uvlt.org]
Sent: Friday, April 11, 2014 10:33 AM
To: Davis, Wayne
Cc: Peter Helm
Subject: Thetford park and ride, exit 14.

Hi Wayne,

We got a call from an owner of UVLT conserved land in Thetford a few days back regarding activity at the Thetford park and ride.
He mentioned that there was a pink flagged grade stake in his field to the east of the existing park and ride, which seemed to be pretty far into his field to him.
He also mentioned that a few days ago, he encountered Vermont State Historic Preservation Officer Scott Newman looking over his property, which is how he learned of the VTRANS expansion interest and discovered that VTRANS had driven the above-mentioned marker stake into the Asa Burton Homestead field.

I went out to the field yesterday and drove some blue flagged stakes along the approximate boundary with the State east of the park and ride. The pink stake seems to be a good bit too far south (into conserved property) to be marking the boundary.

So, We were wondering if you could tell us what the plans for the park and ride are, and where in the process you are? Also, if this is in regards to a possible expansion of the park and ride, we wonder if expanding to the west instead of to the east has been explored? The easement on this property, which we call Asa Burton Homestead, was funded with help from the Thetford Historical Society and the Thetford Conservation Commission for the express purpose of protecting the scenic and historical resources of the property, so if there is a way to minimize any impacts to the conserved land by an expansion of the park and ride, we'd like to see those possibilities explored if possible.

Any information you can give us on what VTRANS is thinking about doing there would be appreciated. It may help us as we field questions from the landowner and other interested community members.

Thanks,

Jason

Jason Berard
Stewardship Coordinator
(603) 643-6626 ext. 110

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Meeting Notes

Thetford Park and Ride Local Concerns Meeting

Thetford Park and Ride Scoping Study / 195311161

Date/Time:	January 25, 2016 / 7:30 PM
Place:	Thetford Town Offices
Next Meeting:	TBD
Attendees:	Stuart Rogers (Thetford Selectboard), John Bacon (Thetford Selectboard), James Dixon (Thetford Selectboard), Jessica Eaton (Thetford Selectboard), Jim Lanctot (Thetford Selectboard), Wayne Davis (Vermont Agency of Transportation), Greg Edwards (Stantec), Erik Alling (Stantec), Rita Seto (Two Rivers-Ottauquechee Regional Commission), Don Longwell, Dan Brand, Marcia Dunning, Sue Fritz, Jim LaBelle, Bill T. Huff, Ursula Austin
Absentees:	Aaron Little (Stagecoach Transportation)
Distribution:	Thetford Selectboard, Rita Seto, Wayne Davis, Absentees

Item:	Action:
Project Introduction Greg began the meeting by giving a brief overview of the project process. This project includes collecting existing data, soliciting public input, finalizing purpose and needs, identifying potential improvements, evaluating and presenting improvements, soliciting public input again and then seeking endorsement of the improvements	
Existing Lot Expansion The Selectboard asked if there is room to expand the existing lot to make it more like the new Bradford Park & Ride.	Greg responded that there is not room at the lot's current location to do much expansion.
Lot Cameras The Selectboard asked if cameras could be installed	Wayne answered that VTrans does not currently install cameras at Park & Ride lots.
Landscaping Issues Selectboard member, and former police chief, Jim Lanctot mentioned that it is his opinion that the current landscaping leads to several negative impacts: • The tall trees and drop off at the western edge of the lot lead to a secluded	Wayne agreed that proper lighting and an open layout discourages the poor behaviors being experienced at the existing lot.

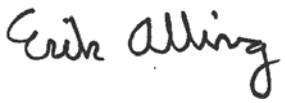
Item:	Action:
location which encourages trash dumping • The lot is poorly lit enabling dumping and vandalism • If the lot layout were open and well-lit like the Bradford and Springfield Park & Rides, it is likely that less illegal activity will take place	
Further Existing Lot Observations Members of the Selectboard made some other observations: • The existing lot is occasionally full • It is likely that potential users are avoiding the lot due to its current condition and because of the vandalism issues • The Hartland and Windsor Park & Rides are have open, well-lit layouts and have EV charging stations and are regularly filled to capacity	
Illegal Drug Transactions/Alternate Location A resident raised the issue of illegal drug transactions and stated that in the past there was a problem at the existing lot. The resident then indicated triangle-shaped infield area located between I-91 northbound, VT Route 113 and the I-91 exit 14 northbound on-ramp is where the park & ride should be. It is relatively flat and readily developed. He also asked if there were any regulations pertaining to the use of this area.	Jim Lanctot stated that the Thetford Police Department did monitor the lot and passed the information that they gathered to the Vermont Drug Task Force but it is unknown if any arrests were made. Wayne responded that that location will be investigated during scoping but that Federal Highway Administration (FHWA) approval will be needed for design to proceed. Wayne mentioned that based on prior experience, getting clearance from FHWA may be difficult.
Thetford Town Highway Garage A resident asked if the Town Highway Garage could be used as a Park & Ride location	The Selectboard replied that the location is too far away from the I-91 interchange and may not get heavily used
Expansion of Existing Lot to the West The Selectboard asked if the existing lot can be expanded toward the west and if the trees along this side can be removed	Greg answered that this alternative could be explored during the study and that the trees along the western edge of the existing lot might be able to be removed
Expansion West of I-91Exit 14 Greg asked the Selectboard and attendees if	

Item:	Action:
there were any locations to the west of exit 14.	The responses were that Route 113 gets relatively steep to the west of I-91 and that the surrounding areas are probably too wet to consider.
Bradford Park and Ride The Selectboard expressed appreciation for the Bradford Park & Ride's new design and asked how large it is	Wayne responded that there are about 83 spaces and there is room for future expansion. Wayne also mentioned that Springfield is a good example of current park & ride design.
Existing Lot Improvements The Selectboard wondered if the existing lot would overflow if it is improved on its existing footprint with lighting, pavement markings and lighting	Wayne said that this has happened at other locations and noted that there is a sentiment at this meeting that potential users are not using the current lot due to its deficiencies.
Lighting Standards The Selectboard asked about the lighting standard for parking lots	Wayne responded that the standard is 1 foot-candle which prevents the areas between light fixtures from being too dark and the common practice is to use full cut off (down casting) and energy efficient (LED) fixtures.
Existing Lot Elevation The Selectboard asked if the existing lot was at a lower elevation than Route 113 and if so, what can be done to remedy this	Wayne said that the lot is lower than Route 113 but that there is little that can be done if the lot remains at this location due to Right-of-Way constraints. He then explained that the three overall options for this project are: do nothing, improve the existing lot or find another location for a new lot.
Existing Lot Usage One resident stated that the lot does get used, during daylight and night hours, and that perhaps younger users are undeterred by the existing lot's deficiencies	
Stagecoach Bus Service A resident speculated that the Stagecoach's poor service may be having an adverse effect on the park & ride's usage. The resident elaborated that the bus company must be contacted 24 hours in advance to schedule a pick up at this location and that the bus is regularly full and will	

Item:	Action:
not take on more passengers when it arrives.	
Project Timeframe The Selectboard asked about the timeframe of this project.	Greg replied that scoping would continue and alternatives would be evaluated during the next few months and that another public meeting can be expected in about 4 months. Wayne added that Thetford is already budgeted for Preliminary Engineering and that construction could potentially be completed within about 5 years.
Lyme Park & Ride A resident mentioned his involvement with the recent Lyme, NH Park & Ride and asked the Selectboard to consider moving the existing Park & Ride to East Thetford so that it is more centrally located.	The Selectboard responded that unlike Lyme, Thetford is very spread out and disjointed and that East Thetford is likely not a great location for a State Park & Ride facility.
Observations from an Abutting Property Owner Ursula Austin, speaking on behalf of abutting property owner Neonilla Swinzow, reiterated that garbage dumped from the existing lot and onto the Swinzow property is a major issue and requested that any option that involves improvements to the lot at its current location include features to mitigate the trash. Ms. Austin also mentioned that the Park & Ride used to be on the northern side of VT Route 113 and asked for that site to be considered as a possible location.	Wayne replied that a well-lit and open lot can help reduce instances of dumping. The Selectboard mentioned that the existing lot was moved to the south side of VT Route 113 in response to noise issues at the previous location.
Park and Ride General Goals and Features Wayne closed the meeting by stating the overall goals and features associated with park & ride construction: • Room for expansion • Ability for public transportation vehicles to enter, maneuver through the lot and exit without having to turn around • Bus shelters • Bike racks • Cutoff LED lighting • Wide open layout and landscaping with no visual obstructions from knee to head height	

The meeting adjourned at 8:30
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting, Inc.



Erik Alling, PE, ENV SP
Transportation Engineer
Phone: (802) 864-0223
Erik.Alling@stantec.com

Attachment: Attendance List

c. Design File

Thetford Park and Ride
Local Concerns Meeting
1/26/2016

Name	Email Address	Phone Number
DON LONGWELL	VTLONGWELL@AOL.COM	802.785.4971
DAN BRAND	DBRAND@CRAI.COM	603-795-2432
Marcia Dunning		802-333-4340
Sue Fritz		
Jim LaBelle	jlabelle@einstein.dartmouth.edu	802 2990872
BILL T. HUFF	ehugalugskipper@gmail.com	802-785-4640
Ursula Questen	East Thetford, Vt.	ursulaquesten815@hotmail.com

Meeting Notes

Thetford Park and Ride Site Visit

Thetford Park & Ride Scoping Study / 195311161

Date/Time:	January 5, 2016 / 10:30 AM
Place:	Thetford Park & Ride
Next Meeting:	
Attendees:	Wayne Davis (VTrans), Trevor Starr (VTrans Maintenance District 4), Erik Alling (Stantec), Nora Varhue (Stantec)
Absentees:	Greg Edwards (Stantec), Rita Seto (TRORC)
Distribution:	Attendees, Absentees

Item:	Action:
Existing Park & Ride Footprint	
Expanding the lot at its existing location will likely not be possible given the site's constraints. These constraints include a wet area to the west and a historic property surrounding the remainder of the lot.	The scoping study will investigate improvements at the current site that do not include expanding the footprint.
Snow Storage	
Snow is currently pushed toward the north edge of the parking lot.	Proposed improvements should not impede the removal of snow along this side of the lot.
Lot Capacity	
According to District 4 representatives, the lot is seldom filled to capacity and typically only 7-9 cars are parked there. Wayne speculated that because of the lack of lighting and the poor overall condition of the lot, potential users may be avoiding the lot.	Stantec will perform a demand estimate to see if a larger lot may help attract potential users.
General Issues/Concerns	
Currently, the park and ride has one street light. According to the District representatives, the light gets vandalized and destroyed roughly every year. In addition to the vandalism, garbage is routinely dumped over the edge of the lot. Finally, it is suspected that illegal drug transactions occur regularly in the parking lot.	Improved lighting may help to reduce vandalism, trash dumping and illegal activity.
Paving Project on VT Route 113	
During the 2016 construction year, it is expected that VT Route 113 will be repaved. As part of this project, the	The removal of these barriers may increase the viability of other sites in the area and will be noted in the scoping

Item:	Action:
curbed center islands will be removed.	study.
Lot Surface The lot surface is comprised of asphalt grindings and is in poor condition. The surface is uneven and has several potholes. District representatives requested that if improvements are made, an asphalt surface and lined parking stalls be among them.	Stantec will recommend paving the lot's surface and adding pavement markings as part of an alternative in the report.
Existing Drainage There is a catch basin located near the park and ride entrance along the lot's northern edge	Stantec will include this CB in the scoping study. Proposed improvements to the existing site will utilize this existing drainage structure.
Alternate Sites Alternate sites were discussed during the meeting. Because of the many wet areas near Interstate 91 Exit 14, few alternative sites near the interchange are suitable. One possible site is the grass area formed by the I-91 northbound on-ramp. It is a triangular shaped plot of land surrounded by the on-ramp to the east, VT Route 133 to the south and I-91 to the west and north.	The site is ideal from a location and grading standpoint. It would be easily accessible and is relatively flat meaning that a minimal amount of earthwork would be required. The major downside of this site is that it would involve either modifying the northbound on-ramp or adding an access that would be less than the minimum 500 feet away from the existing on-ramp. FHWA has historically been unwilling to allow modifications of this type, however, a similar situation at Interstate 89, Exit 3 was recently granted approval. Stantec, along with VTrans, will find out if there is a possibility of modifying the on-ramp at this location. Stantec will include this information in the scoping study

The meeting adjourned at 11:00
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services, Inc.

Erik Alling, PE, ENV SP
Transportation Engineer
Phone: (802) 864-0223

Erik.Alling@stantec.com

Attachment:

c. Design File

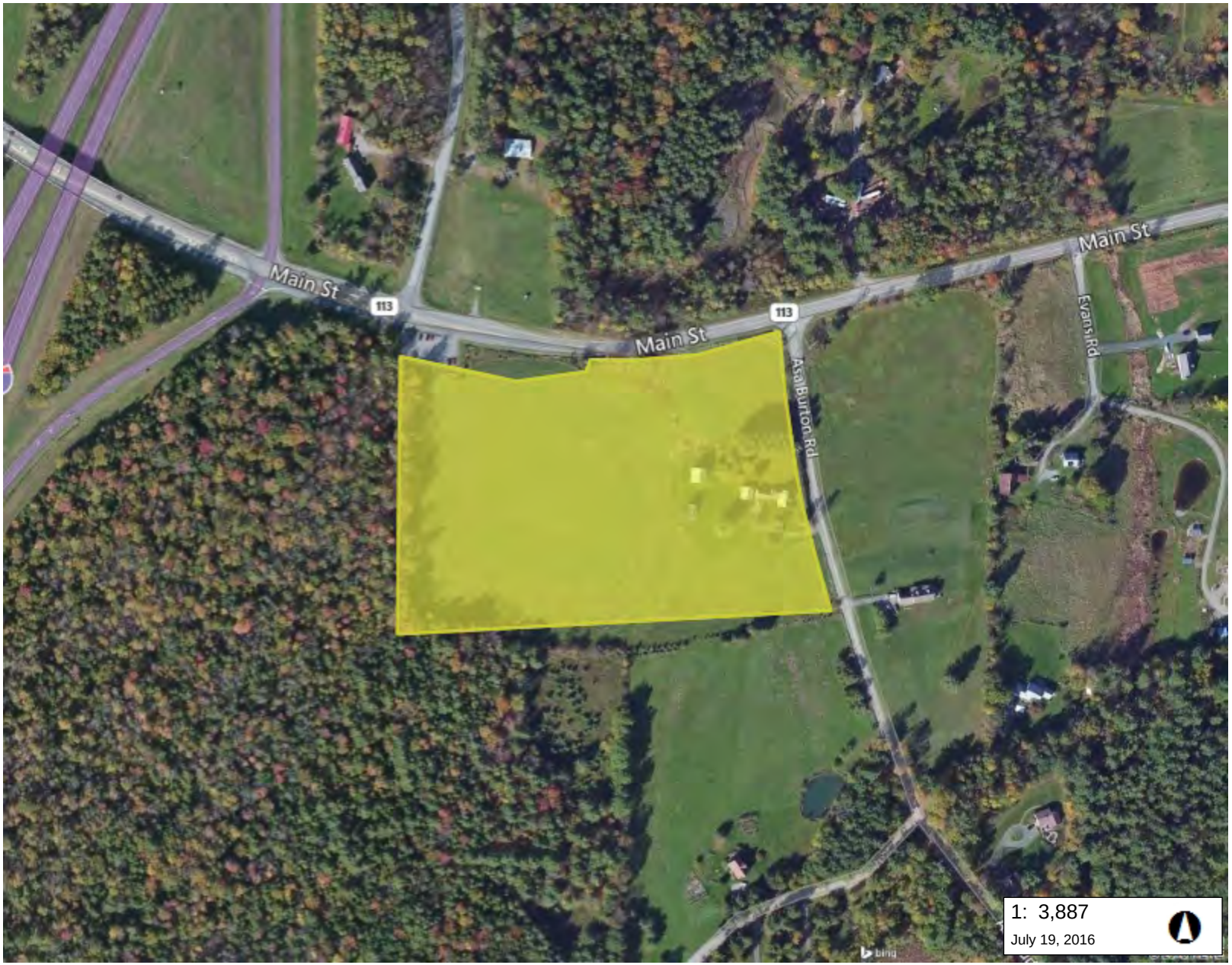
APPENDIX C

Cultural / Environmental Exhibits

Thetford P&R Conservation Easement

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- State Natural Areas
- Fragile Areas Registry
  - Physical Feature
  - Biological Feature
  - Physical and Biological Features
- Ski Area Leases
- Managed Lands
  - State Forest, Fee ownership
  - State Park, Fee ownership
  - Non-fee interest
- Congressional Areas (GMNF)
  - National Recreation Area
  - Wilderness
- Green Mountain National Fore
- Conserved Lands
  - Housing and Conservation Board
  - Local Government
  - Private Organization
  - US Dept. of Defense
  - US Fish and Wildlife Service
  - US National Park Service
  - UVM and State Colleges
  - VT Dept. Buildings and General Se
  - VT Division for Historical Preservati
- Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

197.0 0 98.00 197.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 324 Ft. 1cm = 39 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

Stantec

Memo

To:	Greg Edwards South Burlington, VT	From:	Polly Harris South Burlington, VT
File:	VTrans Thetford Park and Ride Scoping Project 195311161	Date:	August 15, 2016

Reference: VTrans Thetford Park and Ride Scoping Project
Natural Resources Review

Stantec Consulting (Stantec) conducted a preliminary review of the natural resources present within the VTrans Thetford Park and Ride (P&R) Scoping Project area in Thetford, Vermont. Specifically, as part of this investigation, Stantec identified and characterized wetlands, streams, rare, threatened or endangered (RTE) species, wildlife habitat, agricultural land, 4(f) and 6(f) public lands, and hazardous waste sites. Following is a summary of the findings.

General Site Description

Three proposed P&R locations were evaluated. Site 1, the existing VTrans Thetford P&R is located east of Interstate 91 and south of Vermont Route 113 in Thetford, Vermont. The existing P&R project area includes a paved parking lot with fencing, signage, drainage, and minimal lighting. The area surrounding this P&R lot has mixed vegetation, and includes forested habitat, shrub border, and hay field.

One alternative location evaluated as part of the review is a triangular-shaped parcel located north of Vermont Route 113 and between Interstate 91 and the northbound on-ramp. This area includes mixed grasses and forbs, and is shown on the attached figures as Site 2.

Site 3, the Boyd site, is an alternative location located south of Route 113 and east of Godfrey Road. This parcel includes a field with isolated shrubs, bordered by trees and shrubs along the roadsides.

Natural resources were reviewed within 50 feet of the three sites shown on the attached figure.

Natural Resource Review Summary – Review of Existing Materials

Stantec used the Vermont Agency of Natural Resources (ANR) Natural Resources Atlas mapping program[1] to evaluate known natural resources within the Project Areas.

Wetlands and Streams. According to the ANR program, there are no Vermont Significant Wetland Inventory (VSWI) wetlands within the Project Areas. However, a VSWI wetland as well as a "presumptive" wetland is located to the southwest of Site 1, the existing P&R lot.

RTE Review. No rare plant species or rare habitat types are mapped by ANR within the three sites.

Agricultural Soils. According to the *Natural Resources Atlas,* the soils within the existing P&R (Site 1) and the majority of Site 2 are mapped as Prime Agricultural soils, while Site 3 includes Statewide agricultural soils (see attached ANR Ag Soils Map). The Farmland Policy Protection Act does not

[1] http://anrmaps.vermont.gov/websites/anra/

apply to projects within existing road ROWs. If any work is proposed outside of existing ROW, authorization from the NRCS via form AD-1006, the Farmland Conversion Impact Rating form, may be required.

Public Lands. The Project Areas do not include public recreation lands (a Section 4(f) resource) or public lands developed with Land and Water Conservation Funds (a Section 6(f) resource). However, the parcels to the east and south of Site 1, the existing P&R, includes a conservation easement from the Upper Valley Land Trust.

Hazardous Waste Sites. The ANR mapping program was reviewed for information on Hazardous Waste Sites in the project vicinity. No active Hazardous Waste Sites or Hazardous Waste Generators are located within the Project Areas.

Natural Resource Review Summary – Site Investigation

Stantec conducted an initial site visit on September 4, 2013 and follow-up visits on May 4 and August 11, 2016 to evaluate natural resources present within the three sites.

Wetlands/Streams. One small wetland area was identified during the September 4, 2013 site investigation. Wetland boundaries were based on the technical criteria described in the 2012 Regional Supplement to the Corps of Engineers *Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*.

The wetland identified is a palustrine scrub/shrub and emergent wetland located to the west of the existing P&R lot, and is fed in part by a culvert. Dominant species present include jewelweed (*Impatiens capensis*); sensitive fern (*Onoclea sensibilis*), white turtlehead (*Chelone glabra*), and steeplebush (*Spiraea tomentosa*). Quaking aspen (*Populus tremuloides*) and red maple (*Acer rubrum*) saplings are also present. Soils sampled in the wetland area were dark grayish brown (10YR 2/1) silt loam with concretions and redoximorphic features. They were saturated at the surface during the September 4, 2013 site visit. This wetland area is hydrologically connected to the mapped Class 2 wetland, and thus would likely be considered a Vermont Class 2 wetland with a regulated 50-foot buffer.

No wetlands were identified within Sites 2 or 3, the alternative P&R locations.

RTE Species. Stantec identified no RTE species during the September 4, 2013 or May 4 or August 11, 2016 site visits. Much of the three sites have been disturbed to some degree by mowing, clearing, fill, or previous development. As a result, it is possible but unlikely that any RTE plant or animal species occur within the small undeveloped portions of the Project Areas.

Wildlife Habitat. The Project Areas provide habitat for various wildlife species common to Vermont's rural areas such as black-capped chickadee (*Poecile atricapillus*), blue jay (*Cyanocitta cristata*), raccoon (*Procyon lotor*), skunk (*Mephitis mephitis*), gray squirrel (*Sciurus carolinensis*), as well as other species that may travel through the area. The proximity to the interstate and a state road limits the value of the wildlife habitat.

Reference: Natural Resources Review

Federal and State Wetland Regulations

The US Army Corps of Engineers (Corps) regulates wetlands and streams under the provisions of Section 404 of the Clean Water Act. The Corps has issued a Programmatic General Permit for the State of Vermont. Typically, wetland and stream impacts of less than one acre may be covered by a Programmatic General Permit, with impacts of less than 3,000 s.f. often eligible for approval via a one-page Self-Verification Form.

The Vermont Agency of Natural Resources regulates Class 1 and 2 wetlands and their buffers. The wetland area identified to the west of the existing parking lot is likely connected to the mapped Class 2 wetland. Therefore, any impacts to this wetland or its 50-foot buffer would likely require authorization under the Vermont Wetland Permit or Vermont General Permit.

Summary

In summary, there is a wetland area located to the west of Site 1, the existing P&R lot. Any impacts to the wetland may require authorization from the Corps, and any impacts to the wetland or its 50-foot buffer would require authorization from ANR. In addition, the three sites include Prime Agricultural and Statewide Agricultural soils. Any impacts to these soils may require coordination with the NRCS via form AD-1006, the Farmland Conversion Impact Rating form. Finally, the parcel to the east and south of the existing P&R includes a conservation easement from the Upper Valley Land Trust.

STANTEC CONSULTING SERVICES, INC.

Polly Harris
Environmental Project Manager
Phone: (802) 497-6407
Fax: (802) 864-0165
Polly.Harris@stantec.com

Attachments: Photos, ANR Mapping

Reference: Natural Resources Review

VTrans Thetford P&R Scoping Project Area Photographs

Photo 1. View looking southeast at existing parking area (Site 1) with field in the distance. 9/4/13

Photo 2. View looking at palustrine emergent and scrub/shrub wetland at base of slope to the west of Site 1. 9/4/13

Reference: Natural Resources Review

Photo 3. View to northwest of Site 2, an alternative P&R location. 5/4/16

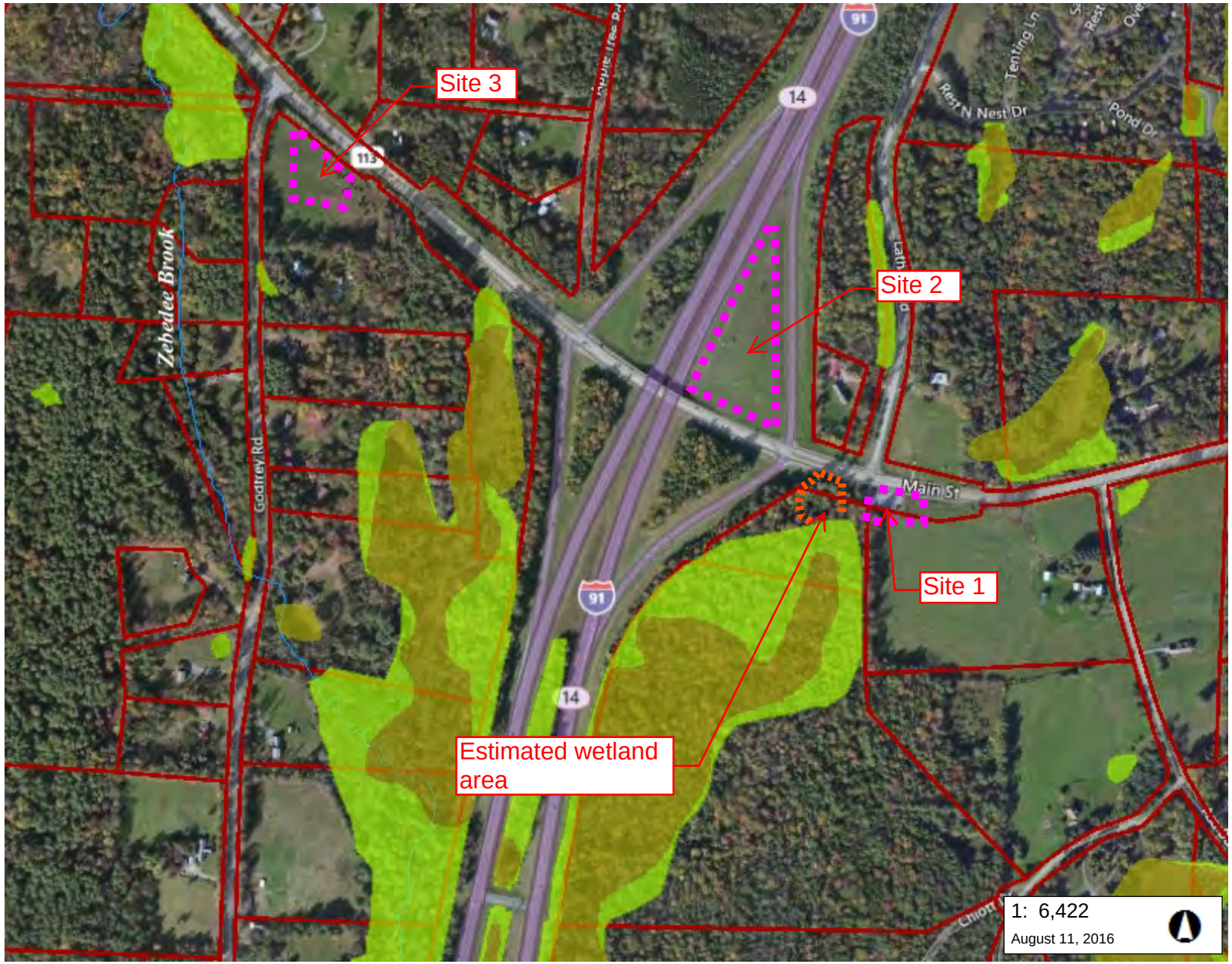
Photo 4. View to south of Site 3, the Boyd parcel. 8/11/16

VERMONT

Thetford P&R Alternatives ANR Map

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Wetlands - VSWI
  - Class 1 Wetland
  - Class 2 Wetland
- Wetlands Advisory Layer
- Stream
- Parcels (where available)
- Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

326.0 0 163.00 326.0 Meters

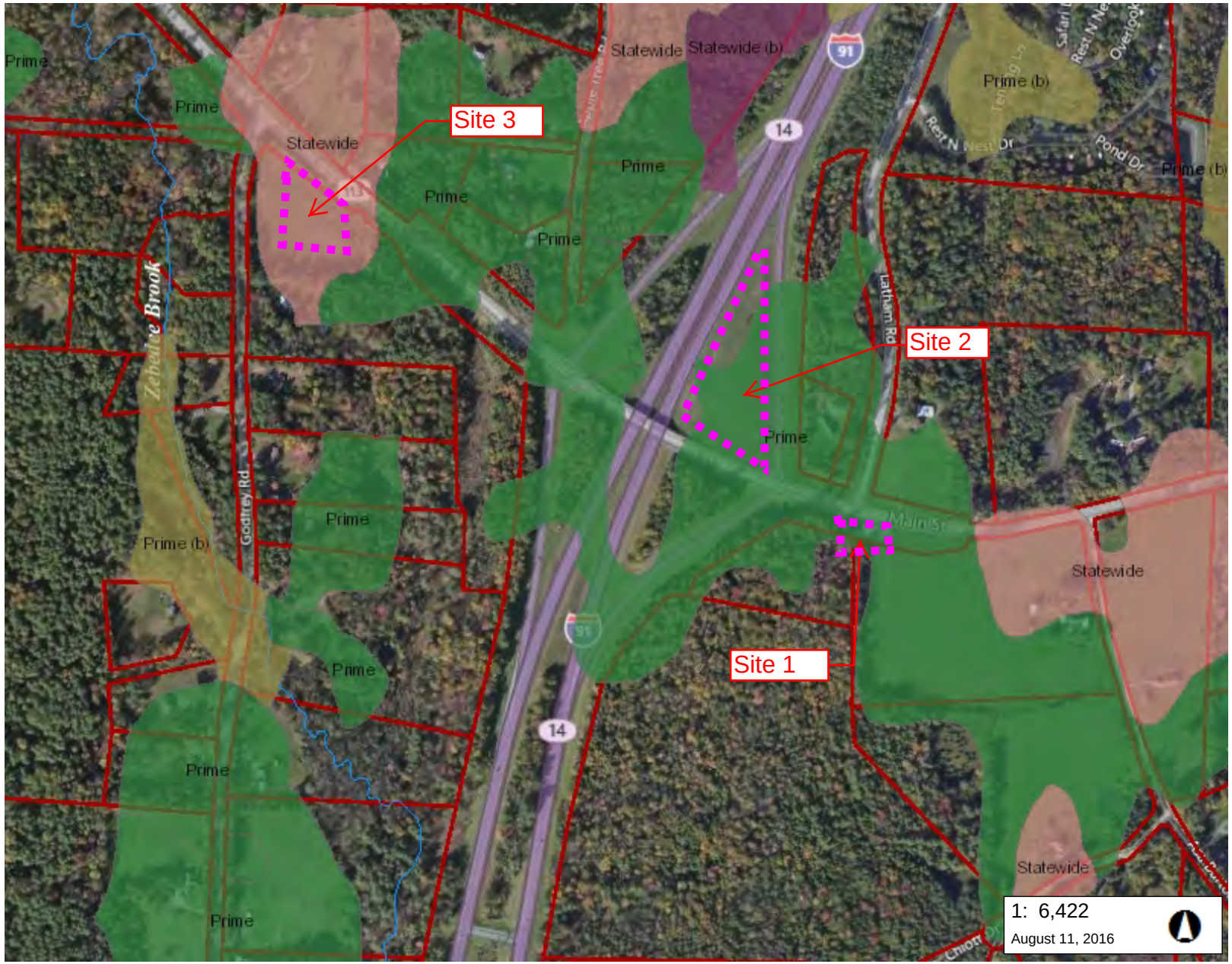
WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 535 Ft. 1cm = 64 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Thetford P&R Alternatives Ag Soils Map

Vermont Agency of Natural Resources

vermont.gov



LEGEND

Soils - Prime Agricultural

- Local
- Local (b)
- Not rated
- Prime
- Prime (b)
- Prime (f)
- Statewide
- Statewide (a)
- Statewide (b)
- Statewide (c)

Rare Threatened Endangered

- Threatened or Endangered
- Rare

- Significant Natural Community
- Stream
- Parcels (where available)
- Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

326.0 0 163.00 326.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 535 Ft. 1cm = 64 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

HARTGEN
archeological associates inc

ARCHEOLOGICAL RESOURCE AND HISTORIC PRESERVATION ASSESSMENT

Thetford Park and Ride Project
CMG PARK (43)

Town of Thetford
Orange County, Vermont

HAA # 5032-11

Submitted to:
Stantec
55 Green Mountain Drive
South Burlington, Vermont 05403

Prepared by:
Hartgen Archeological Associates, Inc.

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Putney, VT 05346
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e hartgen@hartgen.com

www.hartgen.com

An ACRA Member Firm
www.acra-crm.org

October 2016

MANAGEMENT SUMMARY

SHPO Project Review Number:
Involved State and Federal Agencies: *Vermont Agency of Transportation*
Phase of Survey: *Archeological Resource and Historic Preservation Assessment*

LOCATION INFORMATION

Municipality: *Town of Thetford*
County: *Orange County, Vermont*

SURVEY AREA

Five alternative designs in three different locations: Alternatives 1 and 2 at existing park and ride, Alternatives 3 and 4 within intersection of Route 113 and I-91, and Alternative 5 on Boyd property on Route 113 west of I-91.
Alternative 1: 337 x 88 feet (103 x 27 m); 0.59 acres (0.24 ha)
Alternative 2: 289 x 177 feet (88 x 54 m); 1.03 acres (0.4 ha)
Alternative 3: 241 x 155 feet (73 x 47 m; 0.78 acres (0.32 ha)
Alternative 4: 415 x 243 feet (126 x 74 m); 1.5 acres (0.61 ha)
Alternative 5: 280 x 141 feet (85 x 43 m); 0.8 acres (0.32 ha)

RESULTS OF RESEARCH

Archeological sites within one mile: *0*
Surveys in or adjacent: *0*
NR/NRE sites in or adjacent: *1*
Precontact Sensitivity: *Alternatives 1 and 2: moderate, Alternatives 3 through 5: low*
Historic Sensitivity: *Alternatives 1 through 5: low*

RECOMMENDATIONS

If Alternative 1 or 2 are chosen, Phase IB archeological survey is recommended for the pasture area that will be disturbed. Alternatives 3, 4 and 5 are considered to have low archeological potential and no further archeological review is recommended for those sites.

Historic preservation concerns primarily consist of visual effects of the project on surrounding historic properties. In particular, Alternatives 1 and 2 will have visual effects to the Asa Burton farmstead. In addition, a stone wall adjacent to the existing park and ride lot should be avoided. Alternatives 3 and 4 would also require some sort of screening from the adjacent historic properties to the east. There are no historic preservation concerns associated with Alternative 5.

Report Authors: *Thomas R. Jamison and Walter R. Wheeler*
Date of Report: *October 2016*

TABLE *of* CONTENTS

Map List

Photograph List

Table List

ARCHEOLOGICAL RESOURCE AND HISTORIC PRESERVATION ASSESSMENT

1 Introduction

Hartgen Archeological Associates, Inc. (Hartgen) conducted an Archeological Resource and Historic Preservation Assessment for the proposed Thetford Park and Ride CMG PARK (43) project (Project) located in the Town of Thetford, Orange County, Vermont (Map 1). The Project requires approvals by Vermont Agency of Transportation (VTrans). This investigation was conducted to comply with Section 106 of the National Historic Preservation Act of 1966, as amended, and/or Act 250, Vermont's Land Use Law will be reviewed by the Vermont Division for Historic Preservation (VDHP). This investigation adheres to the Vermont State Historic Preservation Office's (SHPO) *Guidelines for Conducting Archeology in Vermont* (2002).

2 Project Information

A site visit was conducted by Thomas R. Jamison on August 24, 2016 to observe and photograph existing conditions within the Project Area. The information gathered during the site visit is included in the relevant sections of the report.

2.1 Project Location

The project is located at three different parcels along Route 113 extending from directly east of the intersection with I-91 to a parcel west of I-91 (Map 2).

2.2 Description of the Project

The project is intended to expand the park and ride capacity in the Thetford area. Three locations have been identified for five alternative designs. The alternatives range in size from 50 to 52 parking spaces and include a bus shelter and four of the alternatives include areas of potential expansion. The alternative plans are included as Appendix 1.

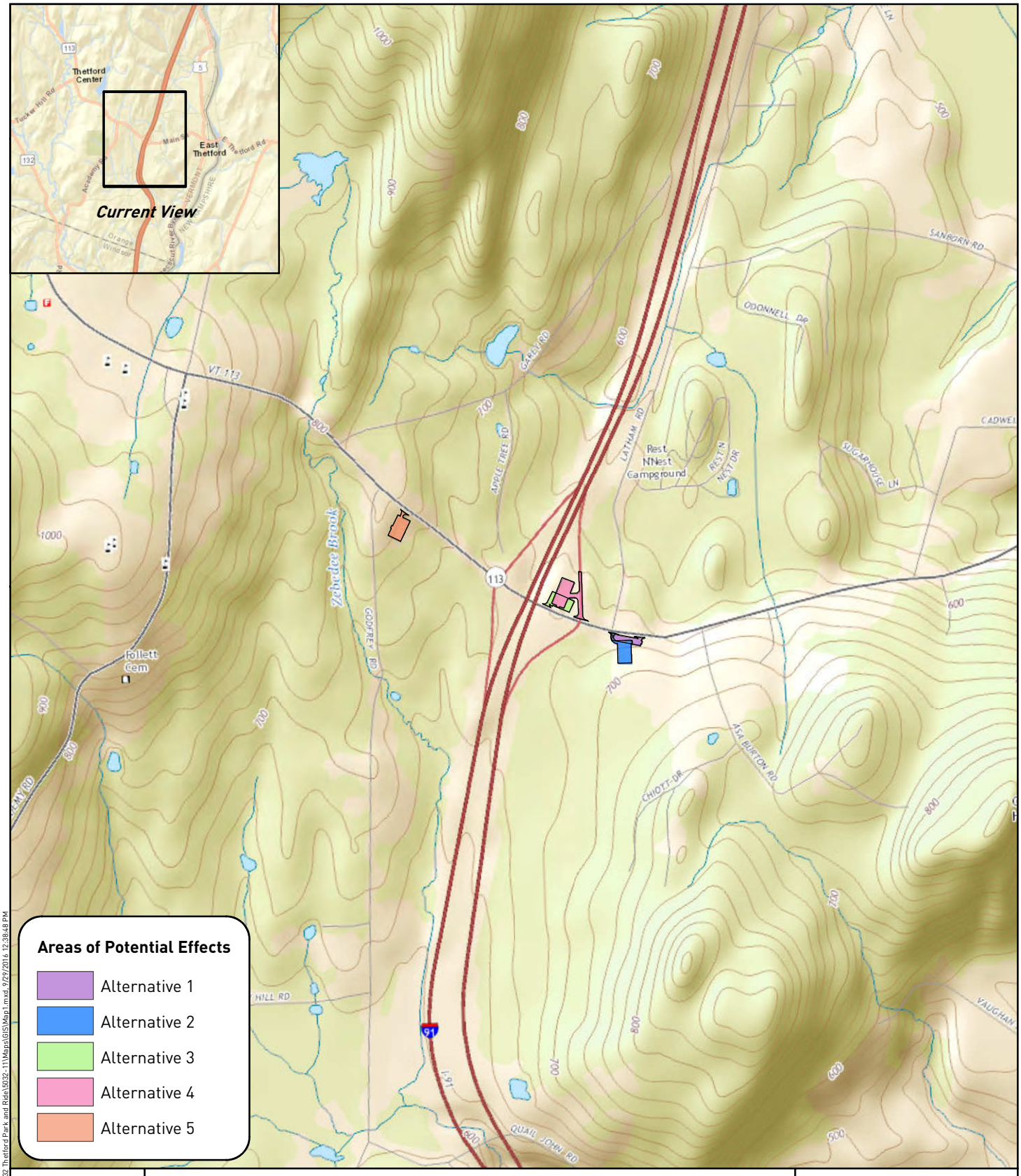
2.3 Description of the Area of Potential Effects (APE)

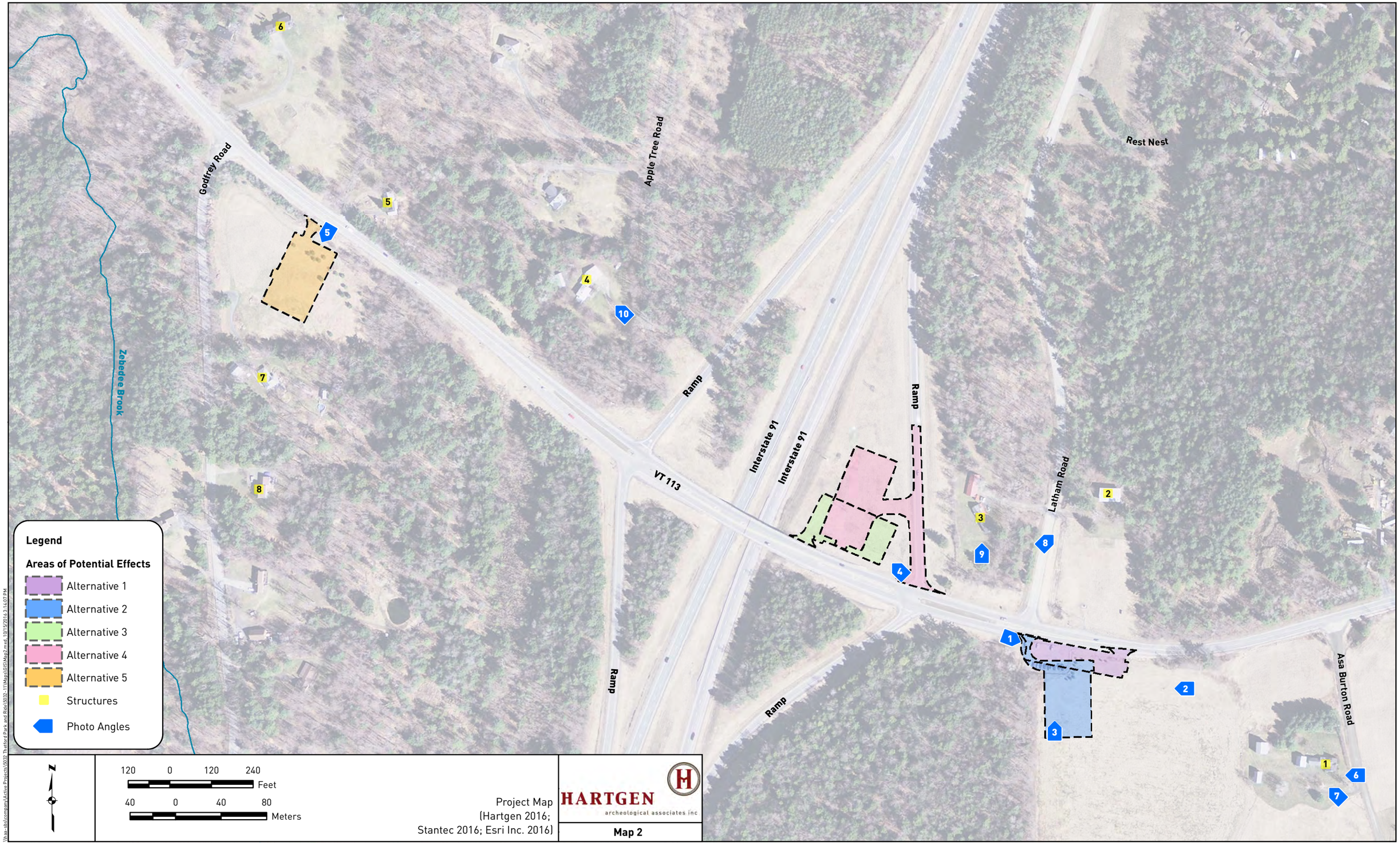
The area of potential effects (APE) includes all portions of the property that will be directly or indirectly altered by the proposed undertaking. The APE encompasses five alternative designs in three different locations: Alternatives 1 and 2 at an existing park and ride, Alternatives 3 and 4 within the intersection of Route 113 and I-91, and Alternative 5 on the Boyd property on Route 113 west of I-91. The APE for each alternative is estimated as follows:

- Alternative 1: 337 x 88 feet (103 x 27 m); 0.59 acres (0.24 ha)
- Alternative 2: 289 x 177 feet (88 x 54 m); 1.03 acres (0.4 ha)
- Alternative 3: 241 x 155 feet (73 x 47 m; 0.78 acres (0.32 ha)
- Alternative 4: 415 x 243 feet (126 x 74 m); 1.5 acres (0.61 ha)
- Alternative 5: 280 x 141 feet (85 x 43 m); 0.8 acres (0.32 ha)

3 Environmental Background

The environment of an area is significant for determining the sensitivity of the Project Area for archeological resources. Precontact and historic groups often favored level, well-drained areas near wetlands and waterways. Therefore, topography, proximity to wetlands, and soils are examined to determine if there are landforms in the Project Area that are more likely to contain archeological resources. In addition, bedrock formations may contain chert or other resources that may have been quarried by precontact groups. Soil conditions can provide a clue to past climatic conditions, as well as changes in local hydrology.


Current View
Thetford Center
East Thetford
VT 113
Zebedee Brook
Follett Cem
Rest N Nest Campground
Areas of Potential Effects
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
0.25 0 0.25
Miles
200 0 200 400
Meters
Note: Contour interval is 20 feet.
Project Location (USGS 2016)
HARTGEN
archeological associates inc
Map 1


Godfrey Road
Apple Tree Road
Rest Nest
Zebedee Brook
Ramp
Interstate 91
Interstate 91
Ramp
VT 113
Latham Road
Ramp
Ramp
Asa Burton Road
6
5
5
4
10
7
8
2
3
9
8
4
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6
7
Legend
Areas of Potential Effects
Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
Structures
Photo Angles
N
120 0 120 240
Feet
40 0 40 80
Meters
Project Map
(Hartgen 2016;
Stantec 2016; Esri Inc. 2016)
HARTGEN
archeological associates inc
Map 2

3.1 Present Land Use and Current Conditions

The current land use and existing conditions of the three parcels is as follows:

3.1.1 Alternatives 1 and 2

The APE for Alternatives 1 and 2 includes the paved and disturbed existing lot and extends to the east within the Route 113 right of way for Alternative 1 and extends south into the pasture of Christopher and Krista Diego for Alternative 2 (Photos 1 to 3). The existing lot is highly disturbed by the original construction. The proposed expansion areas are pasture that exhibits little disturbance. Along Route 113, there has been some ditching and cutting but most of the Alternative 1 expansion area is within undisturbed pasture.

Photo 1. Existing Park and Ride lot, part of Alternatives 1 and 2. Alternative 1 extends into the background along Route 113 beyond the existing lot while Alternative 2 extends into the pasture to in the right background. The red barn in the background is one of the structures at the State Register listed Asa Burton Farm (VHSSS #0911-84). View to the east/southeast.

Photo 2. Alternatives 1 and 2. Alternative 1 extends toward the photographer from treeline in the background. Alternative 2 extends into the pasture along the treeline. The existing park and ride lot is located at the treeline adjacent to Route 113 on the right. View to the west/northwest.

Photo 3. Alternative 2. Note pasture in foreground where Alternative 2 would expand the existing lot that is located in the background. View to the north.

3.1.2 Alternatives 3 and 4

The parcel where Alternatives 3 and 4 are located is a triangular area bounded on the south by Route 113, on the east by the I-91 access ramp and on the west by I-91 (Photo 4). This area is currently open and grass covered. An overhead power line crosses the southern end of the area and some sort of monitoring station outside of the APE is located to the north.

Photo 4. Alternatives 3 and 4. Note grass covered parcel and Route 113 crossing over I-91 to the left and the I-91 access ramp to the right. View to the northwest.

3.1.3 Alternative 5

Alternative 5 is located on an open field associated with a house along Godfrey Road (Photo 5). The field is somewhat rolling and slopes to the southeast with the house in a wooded area at the back of the parcel along Godfrey Road. There has been some modification of the landscape related to gardens and access.

Photo 5. Alternative 5. Note open field with treeline in the background hiding Godfrey Road. View to the southwest.

3.2 Soils

Soil surveys provide a general characterization of the types and depths of soils that are found in an area. This information is an important factor in determining the appropriate methodology if and when a field study is recommended. The soil type also informs the degree of artifact visibility and likely recovery rates. For example, artifacts are more visible and more easily recovered in sand than in stiff glacial clay, which will not pass through a screen easily.

The soils of the project area are mapped as Buckland stony loam at 3 to 8 percent slopes, Cabot very stony silt loam at 3 to 15 percent slopes and Colrain stony fine sandy loam at 8-15% (USDA 2016). These soils formed on glacial till and have no potential for deeply buried archeological deposits. Judging by the surficial geological mapping of the state, however, a glacial lake appears to have once extended into the vicinity of Alternatives 1 through 4 (Stewart 1956-1966).

Table 1. Soils in Project Area

Symbol	Name	Textures	Slope	Drainage	Landform
BuB	Buckland	Stony loam	3-8%	Moderately well drained	Glacial till
CbB	Cabot	Very stony silt loam	3-15%	Poorly drained	Glacial till
CoC	Colraine	Stony fine sandy loam	8-15%	Well drained	Glacial till

3.3 Bedrock Geology

The bedrock of the project area is the Ammonoosuc Volcanics that include metamorphized andesitic and balsitic tuff. To the east of the APE is the Littleton formation of slate and quartzite and to the west is the Meeting House slate and phyllite member of the Gile Mountain formation and small areas of the Clough quartzite (Ratcliffe 2011). None of these formations were typically sought out for use in stone tool manufacture, although the quartzite and other materials could have been exploited to some extent, most likely for expedient tools.

3.4 Physiography and Hydrology

The Alternatives 1 and 2 project area generally slopes down from south to north. Surrounding the alternatives to the north and southeast are areas of Peacham soils and Muck (USDA 2016) defined as depressions in drainages on the glacial till that have accumulated organic deposits and retain paludal marsh/wetlands (Doll, et al. 1970). In addition, within the APE, directly west of the existing park and ride lot, is an area of wetland that may be part of this complex (Map 2). These areas would have contained many resources that may have been exploited by precontact groups in the area. The Alternatives 3 and 4 site is generally level with drainage to I-91 drainage systems. The Alternative 5 site slopes to the southeast and is adjacent to the drainage of the Zebedee Brook that flows to the south.

4 Documentary Research

Hartgen conducted research at the Vermont Division for Historic Preservation (VDHP) to identify previously reported archeological sites, State and National Register (NR) properties, properties determined eligible for the NR (NRE), and previous cultural resource surveys.

4.1 Archeological Sites

An examination of the archeological site files at the Vermont Division for Historic Preservation (VDHP) identified no reported archeological sites within a mile (1.6 km) of the project area. One site over a mile to the west (VT-OR-0024) consists of a cluster of historic foundations along the Ompomponoosuc River near Thetford Center. An electric transmission line survey recently recorded several historic sites to the north, east and south, further than a mile from the APE. These sites consist of 19th and 20th-century dumps (VT-OR-099, VT-OR-101 and VT-OR-102) and an abandoned bridge abutment (VT-OR-100). Although other sites have not been reported in the project vicinity, the lack of reported sites is probably due to the limited archeological survey in the area as opposed to a true lack of archeological sites.

4.2 Historic Properties

A search of the files at VDHP identified one property surveyed by the Vermont Historic Sites and Structures Survey (VHSSS) located directly adjacent to the Alternatives 1 and 2 site. Eleven other VHSSS properties are located within a mile (1.6 km) of the Alternatives 1 through 4 sites with one additional VHSSS property located slightly further west within a mile of Alternative 5. Two of those properties are listed on the National Register as well. The locations and a brief description of these properties are provided below in Table 2.

The APE of Alternatives 1 and 2 extends to the east and south of the existing park and ride onto the property of the Asa Burton Farm (VHSSS 0911-84). The associated house and several outbuildings are located on the northeast corner of the property, but the property does extend to the existing park and ride lot as an open field (Photos 1 to 3).

Table 2. NR Properties and VHSSS Inventoried Buildings within One Mile of the Project Area

VHSSS Number	Property Name	Status	Description	Location and Proximity to Project Area
0911-01	Thetford Hill Historic District	NRL 10/27/88	Late 18th-20th-century village	0.15 mi/0.24 km to NW of Alt 5

VHSSS Number	Property Name	Status	Description	Location and Proximity to Project Area
0911-31	Chamberlain Farm		c. 1850 Italianate/Greek Revival farm house	0.89 mi/1.43 km to S of Alts 1 and 2
0911-74	Closson-Farnsworth House		c. 1852-1858 Italianate house	0.49 mi/0.79 km to NW of Alt 5
0911-75	Asa Poor-Sayer House		c. 1835 Cape Cod-Federal house	0.81 mi/1.3 km to NW of Alt 5
0911-76	Farr-Lewis House		c. 1850 vernacular Gothic Revival house	0.34 mi/0.55 km to NW of Alt 5
0911-77	Ranstead House		c. 1820 Federal Classic Cottage	0.15 mi/0.24 km to NW of Alt 5
0911-78	Francisco-Carpenter House		c. 1824 Federal house	0.42 mi/0.67 km to W of Alt 5
0911-79	Rosenbloom Estate		1828 Federal house	0.64 mi/1.04 km to SW of Alt 5
0911-82	Lightner House (Bradley Residence)		c. 1810 Cape Cod/Federal house	400 ft/122 m to NE of Alt 5
0911-83	Emma Coombs House		c. 1840 Federal house	0.3 mi/0.49 km to NW of Alt 5
0911-84	Asa Burton Farm		1779 Cape Cod farmhouse and outbuildings	Within the E end of the APE of Alts 1 and 2
0911-85	The Barn Museum		Mid-19th-century barns	0.27 mi/0.43 km to NW of Alt 5
0911-86	Yarington-Worcester House		c. 1820 Federal (Cape Cod) house	0.45 mi/0.73 km to NW of Alt 5

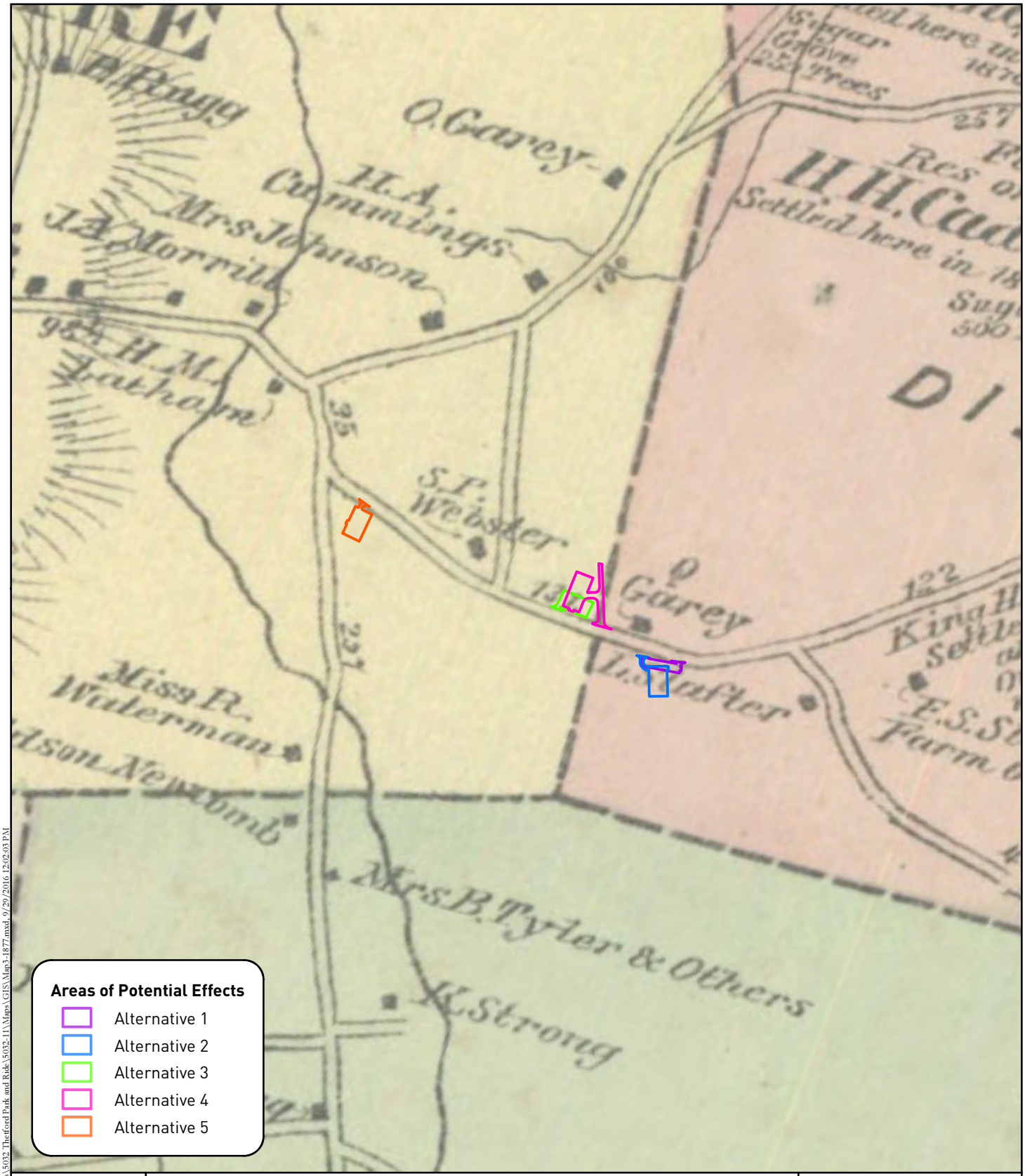
4.3 Previous Surveys

There have been no previous surveys in the project vicinity. A survey for a TransCanada electric transmission line along the Connecticut River east of the APE was conducted within the past few years and identified several historic sites as outlined above. The report for that work was not available at VDHP and no other previous surveys were identified in the project vicinity.

5 Historical Map Review

Aside from the insertion of Route I-91, the historical maps of the project area do not exhibit much change over the years. The 1858 Walling map shows the Asa Burton property adjacent to Alternatives 1 and 2 as occupied by L. Slafter. A house across Route 113 from the existing park and ride is labeled A. G. Howard. In 1877, the Beers atlas labeled the Howard house as Q. Garey, while the Burton house was still occupied by Slafter (Map 3). No structures are shown in the area of Alternatives 3, 4 or 5 in either 1858 or 1877. The 1933 USGS quadrangle shows the two houses adjacent to and across Route 113 from the existing park and ride. It also shows a structure that may have been on the Alternative 5 property but outside of that park and ride APE (Map 4).

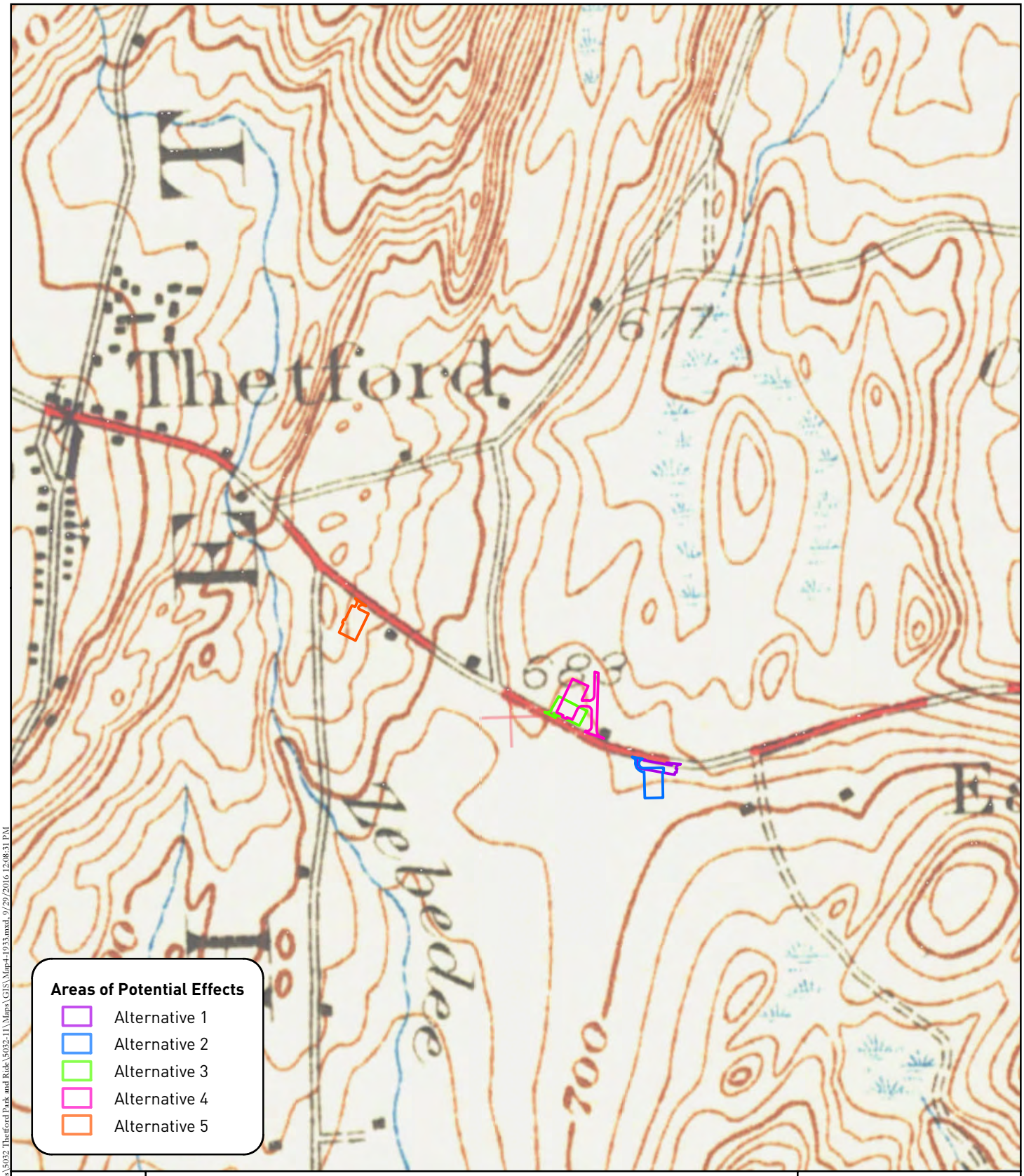
All of the historic maps show the Howard/Garey house adjacent to the north side of Route 113 (Maps 3 and 4). However, it is currently set back from the road and accessed from Latham Road that was constructed when I-91 was put in and Route 113 widened. The house currently has a concrete foundation with a cellar, possibly indicating it is not on the original foundation. Therefore, it appears that house may have been moved back from Route 113 sometime after 1933, possibly when I-91 was constructed. This scenario could result in the original site of the house and associated archeological deposits being directly adjacent to (and possibly partially under) Route 113, across from Alternatives 1 and 2.



HARTGEN archeological associates inc

Map 3

\\haa-sbs\company\Active Projects\5032 Thetford Park and Ride\5032-11\Maps\GIS\Map3-1877.mxd 9/29/2016 12:02:03 PM



\\haa-sbs\company\Active Projects\5032 Thetford Park and Ride\5032-11\Maps\GIS\Map4-1933.mxd 9/29/2016 12:08:31 PM

6 Architectural Discussion

6.1 Historic Context

The APEs for all project alternatives are located in a rural context. The village of Thetford Hill is located to the west. Eighteenth and 19th-century vernacular dwellings with associated outbuildings typified the settlement pattern within the project APEs previous to the construction of interchange 14 and completion of I-91 in the late 1960s (Photos 6 and 9). The construction of the interchange has spurred construction of suburban homes along Route 113, with examples of cape, classic cottage and other vernacular typologies represented.

6.2 Survey

Two properties within or adjacent to the project APEs have previously been surveyed. The Asa Burton house (VHSSS 0911-84, Photos 6 and 7) is believed to be one of the oldest homes in the area; its earliest section dates to 1779. The house, occupied initially by prominent theologian Burton, has been altered and expanded a number of times, as have its associated outbuildings. Although not extant when the house was surveyed in 1979, historic orthoimagery available on Google Earth indicates that the present park and ride facility was in place by 1992. The construction of the park and ride removed the northern portion of a stone wall on the property. The same orthoimagery source documents the removal or modification of the large barn on the Burton farmstead, which occurred sometime between 1992 and 2003.

The second previously surveyed property, 2048 Route 113 (VSSS 0911-82), was identified by a previous survey as dating to c. 1810. The materials used in the construction of the house, including a concrete foundation, and the fact that it doesn't appear in mapping published as late as 1933 (Map 4), argue for it having been constructed in the 20th-century. Rather, it appears to be a reproduction, apparently constructed c. 1970.

The Burton house (Structure 1; Photos 6 and 7) and two other structures (Structures 2 and 3; Photos 8 and 9) were included in a survey for an ARA report for the park and ride in 2013 (Hartgen 2013). An additional five previously unsurveyed structures are located within or adjacent to one of the APEs for the five project alternatives (Table 3). One of these is in excess of 50 years in age (Photo 10). Captioned photographs of all four structures located within or adjacent to the APE, and more than 50 years in age, are included in this report (Photos 6 thru 10).

Table 3. Properties within or adjacent to the APE

Structure# (Map 2)	Photo #	Address	Name	Status	Description of Building	Location	50 or More
1	6 and 7	80 Asa Burton Road	Asa Burton farm	VHSSS 0911-84	The Asa Burton farm, built 1779. The house is a one-and-a-half story wood-frame classic cottage with later additions; associated outbuildings represent later additions to the property	Adjacent, to the east, to Alternatives 1 and 2	x
2	8	58 Latham Road	Swinzow residence		A banked foundation ranch-style home sheathed with vertical boards, constructed c.1960.	Across Route 113 from Alternatives 1 and 2	x
3	9	59 Latham Road	Howard/Garey House (Outridge residence)		A one-and-a-half story mid-19th-century wood-framed vernacular house with two one-story wood-framed additions, all with gable roofs and sheathed with vinyl siding.	Across Route 113 from Alternatives 1 and 2 and across I-91 access ramp from Alternatives 3 and 4	x
4	10	274 Apple Tree Road	Cloud residence		A one-and-one-half story wood-frame, cape style dwelling, built c. 1965, with attached garage and breezeway.	Across Route 113 from Alternative 5	x

Structure# (Map 2)	Photo #	Address	Name	Status	Description of Building	Location	50 or More
5	-----	2048 Route 113	Bradley residence	VHSSS 0911-82	A reproduction cape style vernacular wood-frame dwelling with attached garage and connector, built c. 1970.	Across Route 113 from Alternative 5	
6	-----	2132 Route 113	Sussman/Gilmore residence		A one-and-a-half style cape style vernacular wood-frame dwelling with two-bay garage and connector, built c. 1980.	Across Route 113 from Alternative 5	
7	-----	139 Godfrey Road	Boyd residence		A one-and-a-half story wood-frame side-gable vernacular dwelling, built c. 1985.	Within Alternative 5	
8	-----	203 Godfrey Road	Tyler residence		A two-story wood-frame side-gable vernacular house with second floor overhang, attached two-car garage, built c. 1990.	Adjacent to Alternative 5	

6.3 Associated Landscape Features

6.3.1 Sidewalks and Curbs

There are no sidewalks or curbs within the APEs for any of the five project alternatives.

6.3.2 Retaining walls, Street Furniture

There are no retaining walls, street furniture (including carriage steps, hitching posts, benches, light standards, etc.) within or adjacent to any of the five project alternative APEs.

6.3.3 Historic Plantings and Landscape Features

Alternatives 1 and 2 propose impacts, in the form of paving, to the agricultural landscape associated with the Asa Burton farmstead. Stone walls located within the landscape associated with the Asa Burton farmstead will also likely be impacted; the scale and scope of impacts to these walls presented by project Alternatives 1 and 2 is not known.

6.4 Architectural Recommendations

Project Alternatives 1 and 2 propose substantial impacts to the northwest corner of the landscape associated with Asa Burton farmstead. Because of its age and historical associations, this property, including its outbuildings and landscape, may be eligible for listing on the Vermont State and/or National Register.

A stone wall that extends north to south on the property, south of the existing park and ride lot, is an historic feature that should be preserved if possible. Impacts to this feature and the landscape of the Burton farmstead should be avoided if at all possible, or minimized by plantings and realignment of the stone wall, if impacts are unavoidable.

Visual impacts to the Howard-Garey and Swinzow houses, located to the north and east of Alternatives 1, 2, 3 and 4, could be minimized by a screen of plantings and/or other landscape treatments, such as berms.

Photo 6. Structure 1, 80 Asa Burton Road, the Asa Burton house, built 1779, looking west-northwest.

Photo 7. Structure 1, 80 Asa Burton Road, the Asa Burton house, built 1779, looking northwest.

Photo 8. Structure 2, 58 Latham Road, built c. 1960, view looking northeast.

Photo 9. Structure 3, 59 Latham Road, the Howard-Garey house, built in the mid-19th century, looking northeast.

Photo 10. Structure 4, 274 Apple Tree Road, built c. 1965, looking northwest.

7 Archeological Discussion

7.1 Precontact Archeological Sensitivity Assessment

Completion of the VDHP Environmental Predictive Model provides a measure of the precontact archeological sensitivity of the project area (Appendix 1). The Alternatives 1 and 2 site is sensitive for proximity to a head of draw, wetlands and glacial lake shoreline, resulting in a score of 52. The Alternatives 3 and 4 site is sensitive for proximity to a head of drainage, wetlands and glacial lake shoreline. However, the score was reduced due to the heavy disturbance of the area associated with the construction of I-91, resulting in a score of 20. The Alternative 5 site is sensitive for proximity to Zebedee Brook and the associated natural travel corridor, resulting in a score of 18. A score of 32 and above is considered to indicate precontact sensitivity, therefore, this model only identifies the Alternatives 1 and 2 site as sensitive for precontact occupation.

7.2 Historic Archeological Sensitivity Assessment

The historic sensitivity of an area is based primarily on proximity to previously documented historic archeological sites, map-documented structures, or other documented historical activities (e.g. battlefields).

Based on the historic maps of the project vicinity, several structures were once in the vicinity of the project alternatives. The Shafter structure depicted appears on all the historic maps and remains standing as the Asa Burton house (Structure 1). Although within the Alternatives 1 and 2 APE for visual effects, the structure is set off some distance from the APE for direct effects. The Howard and Garey structures depicted on the 1858 and 1877 maps appear to represent the property where Structure 3 is now located, adjacent to and within the APE for visual effects of Alternatives 1 and 2 and Alternatives 3 and 4 (Map 3). Otherwise, a structure appears on a historic map close to Alternative 5. In that case, the 1933 USGS quadrangle depicts a structure located a short distance to the east of the Alternative 5 APE (Map 4).

These few structures in the vicinity of, but set off from, the various alternatives suggest the sensitivity of each alternative is low for historic deposits and features.

7.3 Archeological Potential

Archeological potential is the likelihood of locating intact archeological remains within an area. The consideration of archeological potential takes into account subsequent uses of an area and the impact those uses would likely have on archeological remains.

The archeological potential of the three sites for the various alternatives varies. The Alternatives 1 and 2 site is partially disturbed by the existing park and ride lot, but both alternatives extend into undisturbed pasture with archeological potential to the south and east. The Alternatives 3 and 4 site has been heavily disturbed by construction of I-91. Soil coring indicates the area has been heavily graded and probably filled destroying any archeological potential. The Alternative 5 site is somewhat sloped and has been partially disturbed by landscape modification related to establishment of gardens and access into the property. The low precontact archeological sensitivity and distance from the structure that appears on the 1933 USGS map indicates the archeological potential is low.

7.4 Archeological Recommendations

If Alternative 1 or 2 are chosen, Phase IB archeological survey is recommended for the pasture area that will be disturbed. Alternatives 3, 4 and 5 are considered to have low archeological potential and no further archeological review is recommended for those sites.

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Appendix 1: Alternatives 1 through 5 Plans

Thetford Park and Ride
Alternative 1: Expand Exisiting within ROW

TO WEST FAIRLEE

I-91 RAMP

LATHAM ROAD

VT ROUTE 113

TO US ROUTE 5

Neonilla Swinzow (Life Estate)& Ursula Austin

WETLAND BUFFER

52 PARKING SPACES

N

VT STATE PLANE GRID

Datums: Horizontal - NAD 83 (2011) SPC (4400 VT) sFT
Vertical - NAVD 88 (GEOID12A) FT

Neonilla Swinzow (Life Estate)& Ursula Austin

Christopher &Krista Diego

LEGEND

- Highway ROW
- Property Line
- Wetland
- Wetland Buffer
- Stonewall

0 30 60

SCALE IN FEET

PROJECT NAME:	THETFORD PARK AND RIDE
PROJECT NUMBER:	CMG PARK(43)
FILE NAME: Alt1_Expand Existing within ROW.dgn	PLOT DATE: 6/30/2016
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
EXISTING SITE WITHIN ROW	SHEET OF 1

Stantec

Thetford Park and Ride
Alternative 2: Expand Existing

TO WEST FAIRLEE

I-91 RAMP

LATHAM ROAD

VT ROUTE 113

TO US ROUTE 5

Neonilla Swinzow (Life Estate)& Ursula Austin

WETLAND BUFFER

N

VT STATE PLANE GRID

Datums: Horizontal - NAD 83 (2011) SPC (4400 VT) sFT
Vertical - NAVD 88 (GEOID12A) FT

Neonilla Swinzow (Life Estate)& Ursula Austin

51 PARKING SPACES

POTENTIAL FUTURE EXPANSION

Christopher &Krista Diego

LEGEND

- Highway ROW
- Property Line
- Wetland
- Wetland Buffer
- Stonewall

0 30 60
SCALE IN FEET

Stantec

PROJECT NAME:	THETFORD PARK AND RIDE
PROJECT NUMBER:	CMG PARK(43)
FILE NAME: Alt 2_Expand Existing Site.dgn	PLOT DATE: 6/30/2016
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
WITHIN EXISITING LOT ALTERNATIVE	SHEET OF 1

Thetford Park and Ride
Alternative 3: Infield with VT113 Entrance

TO WEST FAIRLEE

I-91 SB

I-91 NB

RELOCATE AERIAL UTILITIES

50 PARKING SPACES

30'

27' TYP.

34'

POTENTIAL FUTURE EXPANSION

I-91 ON RAMP

N

VT STATE PLANE GRID

Donald Outridge &Teresa Larkin

EXTEND LEFT TURN LANE

VT ROUTE 113

TO US ROUTE 5

LEGEND

- Highway ROW
- Property Line
- Wetland
- Wetland Buffer
- Stonewall

0 30 60

SCALE IN FEET

PROJECT NAME: THETFORD PARK AND RIDE
PROJECT NUMBER: CMG PARK(43)

FILE NAME: Alt 3&4_infield.dgn
PROJECT LEADER: ------
DESIGNED BY: ------
ROUTE 113 ENTRANCE

PLOT DATE: 6/30/2016
DRAWN BY: ------
CHECKED BY: ------
SHEET 1 OF 1

Stantec

Thetford Park and Ride
Alternative 4: Infield with Ramp Entrance

N

VT STATE PLANE GRID

Neonilla Swinzow (Life Estate)& Ursula Austin

Donald Outridge &Teresa Larkin

I-91 SB

I-91 NB

I-91 ON RAMP

TO WEST FAIRLEE

POTENTIAL FUTURE EXPANSION

RELOCATE AERIAL UTILITIES

36'

2'

12'

4'

27' TYP.

36'

52 PARKING SPACES

VT ROUTE 113

TO US ROUTE 5

0 30 60

SCALE IN FEET

LEGEND

- Highway ROW
- Property Line
- Wetland
- Wetland Buffer
- Stonewall

Stantec

PROJECT NAME:	THETFORD PARK AND RIDE
PROJECT NUMBER:	CMG PARK(43)
FILE NAME: Alt 3&4_Infield.dgn	PLOT DATE: 6/30/2016
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
I-89 RAMP ENTRANCE	SHEET 1 OF 1

Thetford Park and ride
Alternative 5:Boyd Site

Howard Sussman &
Margaret Gilmore

Mary Lou Bradley

Thetford Academy

Boyd Trust Jean
Gordon Boyd Trustee

GOFFERY RD

TO WEST FAIRLEE

VT ROUTE 113

TO US ROUTE 5

50 PARKING SPACES

POTENTIAL
FUTURE
EXPANSION

LEGEND

Highway ROW	
Property Line	
Wetland	
Wetland Buffer	
Stonewall	

0 30 60
SCALE IN FEET

Stantec

PROJECT NAME:	THETFORD PARK AND RIDE
PROJECT NUMBER:	CMG PARK(43)

FILE NAME: Alt 5_Boyd.dgn	PLOT DATE: 6/30/2016
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
ROUTE 113 ENTRANCE	SHEET 1 OF 1

Appendix 2: VDHP Environmental Predictive Model

VERMONT DIVISION FOR HISTORIC PRESERVATION

Environmental Predictive Model for Locating Precontact Archeological Sites

Project Name Thetford P&R, Alts 1 and 2 **County** Orange **Town** Thetford
DHP No. _____ **Map No.** _____ **Staff Init.** _____ **Date** _____
Additional Information _____

Environmental Variable	Proximity	Value	Assigned Score
A. RIVERS and STREAMS (EXISTING or RELICT):			
1) Distance to River or Permanent Stream (measured from top of bank)	0- 90 m 90- 180 m	12 6	_____
2) Distance to Intermittent Stream	0- 90 m 90-180 m	8 4	_____
3) Confluence of River/River or River/Stream	0-90 m 90 –180 m	12 6	_____
4) Confluence of Intermittent Streams	0 – 90 m 90 – 180 m	8 4	_____
5) Falls or Rapids	0 – 90 m 90 – 180 m	8 4	_____
6) Head of Draw	0 – 90 m 90 – 180 m	8 4	8
7) Major Floodplain/Alluvial Terrace		32	_____
8) Knoll or swamp island		32	_____
9) Stable Riverine Island		32	_____
B. LAKES and PONDS (EXISTING or RELICT):			
10) Distance to Pond or Lake	0- 90 m 90 -180 m	12 6	_____
11) Confluence of River or Stream	0-90 m 90 –180 m	12 6	_____
12) Lake Cove/Peninsula/Head of Bay		12	_____
C. WETLANDS:			
13) Distance to Wetland (wetland > one acre in size)	0- 90 m 90 -180 m	12 6	12
14) Knoll or swamp island		32	_____
D. VALLEY EDGE and GLACIAL LAND FORMS:			
15) High elevated landform such as Knoll Top/Ridge Crest/ Promontory		12	_____
16) Valley edge features such as Kame/Outwash Terrace**		12	_____

-over-

17) Marine/Lake Delta Complex**		12	_____
18) Champlain Sea or Glacial Lake Shore Line**		32	32
E. OTHER ENVIRONMENTAL FACTORS:			
19) Caves /Rockshelters		32	_____
20) [ ] Natural Travel Corridor [ ] Sole or important access to another drainage [ ] Drainage divide		12	_____
21) Existing or Relict Spring	0 – 90 m 90 – 180 m	8 4	_____
22) Potential or Apparent Prehistoric Quarry for stone procurement	0 – 180 m	32	_____
23)) Special Environmental or Natural Area, such as Milton acquifer, mountain top, etc. (these may be historic or prehistoric sacred or traditional site locations and prehistoric site types as well)		32	_____
F. OTHER HIGH SENSITIVITY FACTORS:			
24) High Likelihood of Burials		32	_____
25) High Recorded Site Density		32	_____
26) High likelihood of containing significant site based on recorded or archival data or oral tradition		32	_____
G. NEGATIVE FACTORS:			
27) Excessive Slope (>15%) or Steep Erosional Slope (>20)		- 32	_____
28) Previously disturbed land as evaluated by a qualified archeological professional or engineer based on coring, earlier as-built plans, or obvious surface evidence (such as a gravel pit)		- 32	_____

**** refer to 1970 Surficial Geological Map of Vermont**

Total Score: 52

Other Comments :

0- 31 = Archeologically Non- Sensitive
32+ = Archeologically Sensitive

VERMONT DIVISION FOR HISTORIC PRESERVATION

Environmental Predictive Model for Locating Precontact Archeological Sites

Project Name Thetford P&R, Alts 3 and 4 **County** Orange **Town** Thetford
DHP No. _____ **Map No.** _____ **Staff Init.** _____ **Date** _____
Additional Information _____

Environmental Variable	Proximity	Value	Assigned Score
A. RIVERS and STREAMS (EXISTING or RELICT):			
1) Distance to River or Permanent Stream (measured from top of bank)	0- 90 m 90- 180 m	12 6	_____
2) Distance to Intermittent Stream	0- 90 m 90-180 m	8 4	_____
3) Confluence of River/River or River/Stream	0-90 m 90 –180 m	12 6	_____
4) Confluence of Intermittent Streams	0 – 90 m 90 – 180 m	8 4	_____
5) Falls or Rapids	0 – 90 m 90 – 180 m	8 4	_____
6) Head of Draw	0 – 90 m 90 – 180 m	8 4	8
7) Major Floodplain/Alluvial Terrace		32	_____
8) Knoll or swamp island		32	_____
9) Stable Riverine Island		32	_____
B. LAKES and PONDS (EXISTING or RELICT):			
10) Distance to Pond or Lake	0- 90 m 90 -180 m	12 6	_____
11) Confluence of River or Stream	0-90 m 90 –180 m	12 6	_____
12) Lake Cove/Peninsula/Head of Bay		12	_____
C. WETLANDS:			
13) Distance to Wetland (wetland > one acre in size)	0- 90 m 90 -180 m	12 6	12
14) Knoll or swamp island		32	_____
D. VALLEY EDGE and GLACIAL LAND FORMS:			
15) High elevated landform such as Knoll Top/Ridge Crest/ Promontory		12	_____
16) Valley edge features such as Kame/Outwash Terrace**		12	_____

-over-

17) Marine/Lake Delta Complex**		12	_____
18) Champlain Sea or Glacial Lake Shore Line**		32	32
E. OTHER ENVIRONMENTAL FACTORS:			
19) Caves /Rockshelters		32	_____
20) [ ] Natural Travel Corridor [ ] Sole or important access to another drainage [ ] Drainage divide		12	_____
21) Existing or Relict Spring	0 – 90 m 90 – 180 m	8 4	_____
22) Potential or Apparent Prehistoric Quarry for stone procurement	0 – 180 m	32	_____
23)) Special Environmental or Natural Area, such as Milton acquifer, mountain top, etc. (these may be historic or prehistoric sacred or traditional site locations and prehistoric site types as well)		32	_____
F. OTHER HIGH SENSITIVITY FACTORS:			
24) High Likelihood of Burials		32	_____
25) High Recorded Site Density		32	_____
26) High likelihood of containing significant site based on recorded or archival data or oral tradition		32	_____
G. NEGATIVE FACTORS:			
27) Excessive Slope (>15%) or Steep Erosional Slope (>20)		- 32	_____
28) Previously disturbed land as evaluated by a qualified archeological professional or engineer based on coring, earlier as-built plans, or obvious surface evidence (such as a gravel pit)		- 32	-32

**** refer to 1970 Surficial Geological Map of Vermont**

Total Score: 20

Other Comments :

0- 31 = Archeologically Non- Sensitive
32+ = Archeologically Sensitive

VERMONT DIVISION FOR HISTORIC PRESERVATION

Environmental Predictive Model for Locating Precontact Archeological Sites

Project Name Thetford P&R, Alt 5 **County** Orange **Town** Thetford
DHP No. _____ **Map No.** _____ **Staff Init.** _____ **Date** _____
Additional Information _____

Environmental Variable	Proximity	Value	Assigned Score
A. RIVERS and STREAMS (EXISTING or RELICT):			
1) Distance to River or Permanent Stream (measured from top of bank)	0- 90 m 90- 180 m	12 6	6
2) Distance to Intermittent Stream	0- 90 m 90-180 m	8 4	_____
3) Confluence of River/River or River/Stream	0-90 m 90 –180 m	12 6	_____
4) Confluence of Intermittent Streams	0 – 90 m 90 – 180 m	8 4	_____
5) Falls or Rapids	0 – 90 m 90 – 180 m	8 4	_____
6) Head of Draw	0 – 90 m 90 – 180 m	8 4	_____
7) Major Floodplain/Alluvial Terrace		32	_____
8) Knoll or swamp island		32	_____
9) Stable Riverine Island		32	_____
B. LAKES and PONDS (EXISTING or RELICT):			
10) Distance to Pond or Lake	0- 90 m 90 -180 m	12 6	_____
11) Confluence of River or Stream	0-90 m 90 –180 m	12 6	_____
12) Lake Cove/Peninsula/Head of Bay		12	_____
C. WETLANDS:			
13) Distance to Wetland (wetland > one acre in size)	0- 90 m 90 -180 m	12 6	_____
14) Knoll or swamp island		32	_____
D. VALLEY EDGE and GLACIAL LAND FORMS:			
15) High elevated landform such as Knoll Top/Ridge Crest/ Promontory		12	_____
16) Valley edge features such as Kame/Outwash Terrace**		12	_____

-over-

17) Marine/Lake Delta Complex**		12	_____
18) Champlain Sea or Glacial Lake Shore Line**		32	_____
E. OTHER ENVIRONMENTAL FACTORS:			
19) Caves /Rockshelters		32	_____
20) [X] Natural Travel Corridor [ ] Sole or important access to another drainage [ ] Drainage divide		12	12
21) Existing or Relict Spring	0 – 90 m 90 – 180 m	8 4	_____
22) Potential or Apparent Prehistoric Quarry for stone procurement	0 – 180 m	32	_____
23)) Special Environmental or Natural Area, such as Milton acquifer, mountain top, etc. (these may be historic or prehistoric sacred or traditional site locations and prehistoric site types as well)		32	_____
F. OTHER HIGH SENSITIVITY FACTORS:			
24) High Likelihood of Burials		32	_____
25) High Recorded Site Density		32	_____
26) High likelihood of containing significant site based on recorded or archival data or oral tradition		32	_____
G. NEGATIVE FACTORS:			
27) Excessive Slope (>15%) or Steep Erosional Slope (>20)		- 32	_____
28) Previously disturbed land as evaluated by a qualified archeological professional or engineer based on coring, earlier as-built plans, or obvious surface evidence (such as a gravel pit)		- 32	_____

**** refer to 1970 Surficial Geological Map of Vermont**

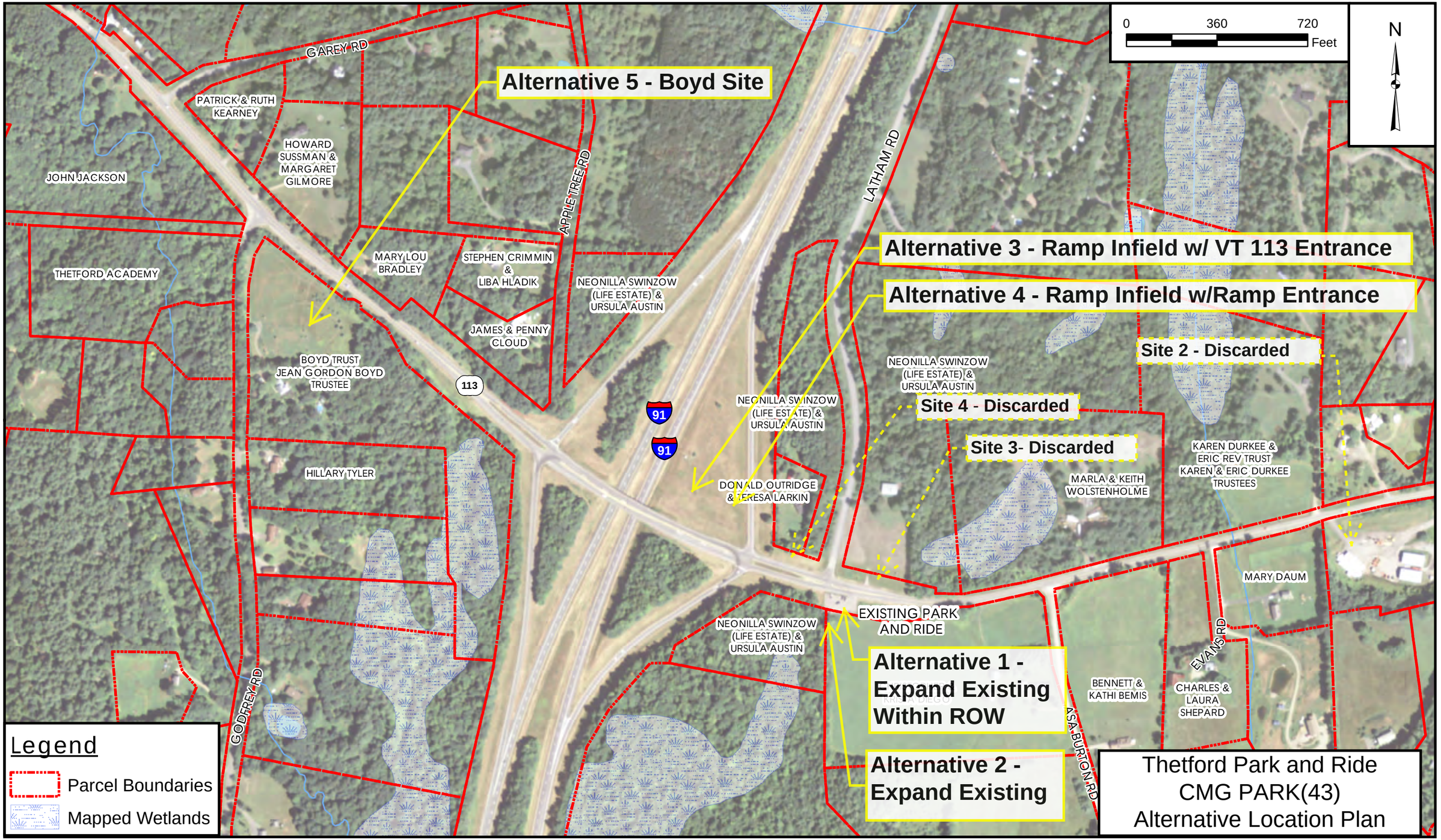
Total Score: 18

Other Comments :

0- 31 = Archeologically Non- Sensitive
32+ = Archeologically Sensitive

APPENDIX D

Plans


0
360
720
Feet
N
Alternative 5 - Boyd Site
Alternative 3 - Ramp Infield w/ VT 113 Entrance
Alternative 4 - Ramp Infield w/Ramp Entrance
Site 2 - Discarded
Site 4 - Discarded
Site 3- Discarded
Alternative 1 - Expand Existing Within ROW
Alternative 2 - Expand Existing
EXISTING PARK AND RIDE
GAREY RD
APPLE TREE RD
LATHAM RD
GODFREY RD
EVANS RD
ASA BURTON RD
PATRICK & RUTH KEARNEY
HOWARD SUSSMAN & MARGARET GILMORE
JOHN JACKSON
THETFORD ACADEMY
MARY LOU BRADLEY
STEPHEN CRIMMIN & LIBA HLADIK
NEONILLA SWINZOW (LIFE ESTATE) & URSULA AUSTIN
JAMES & PENNY CLOUD
BOYD TRUST JEAN GORDON BOYD TRUSTEE
HILLARY TYLER
DONALD OUTRIDGE & TERESA LARKIN
KAREN DURKEE & ERIC REV TRUST KAREN & ERIC DURKEE TRUSTEES
MARLA & KEITH WOLSTENHOLME
MARY DAUM
BENNETT & KATHI BEMIS
CHARLES & LAURA SHEPARD
113
91
91
Legend
Parcel Boundaries
Mapped Wetlands
Thetford Park and Ride
CMG PARK(43)
Alternative Location Plan

Thetford Park and Ride
Alternative 1: Expand Existing within ROW

TO WEST FAIRLEE

I-91 RAMP

LATHAM ROAD

VT ROUTE 113

TO US ROUTE 5

36 PARKING SPACES

WETLAND BUFFER

Neonilla Swinzow (Life Estate) & Ursula Austin

Neonilla Swinzow (Life Estate)& Ursula Austin

Christopher & Krista Diego

N

VT STATE PLANE GRID

LEGEND
Highway ROW
Property Line
Wetland
Wetland Buffer
Stone Wall
Clear Zone

0 30 60
SCALE IN FEET

Stantec

PROJECT NAME: THETFORD PARK AND RIDE
PROJECT NUMBER: CMG PARK(43)

FILE NAME: Alt1_Expand Existing within ROW.mxd PLOT DATE: 2/27/2017
PROJECT LEADER:
DESIGNED BY:
EXISTING SITE WITHIN ROW
DRAWN BY:
CHECKED BY:
SHEET 1 OF 1

Thetford Park and Ride
Alternative 2: Expand Existing

TO WEST FAIRLEE

I-91 RAMP

LATHAM ROAD

VT ROUTE 113

TO US ROUTE 5

WETLAND BUFFER

Neonilla Swinzow (Life Estate)& Ursula Austin

Neonilla Swinzow (Life Estate)& Ursula Austin

Christopher &Krista Diego

51 PARKING SPACES

POTENTIAL FUTURE EXPANSION

LEGEND
Highway ROW
Property Line
Wetland
Wetland Buffer
Stonewall

0 30 60
SCALE IN FEET

PROJECT NAME: THETFORD PARK AND RIDE
PROJECT NUMBER: CMG PARK(43)

FILE NAME: Alt 2_Expand Existing Site.dgn PLOT DATE: 2/16/2017
PROJECT LEADER: ------ DRAWN BY: ------
DESIGNED BY: ------ CHECKED BY: ------
WITHIN EXISITING LOT ALTERNATIVE SHEET OF 1

Stantec

Thetford Park and Ride
Alternative 3: Infield with VT113 Entrance

TO WEST FAIRLEE

I-91 SB

I-91 NB

RELOCATE AERIAL UTILITIES

I-91 ON RAMP

50 PARKING SPACES

30'

27' TYP.

34'

POTENTIAL FUTURE EXPANSION

EXTEND LEFT TURN LANE

VT ROUTE 113

TO US ROUTE 5

Donald Outridge &Teresa Larkin

N

VT STATE PLANE GRID

0 30 60

SCALE IN FEET

LEGEND

- Highway ROW
- Property Line
- Wetland
- Wetland Buffer
- Stonewall

Stantec

PROJECT NAME:	THETFORD PARK AND RIDE
PROJECT NUMBER:	CMG PARK(43)

FILE NAME: Alt 3&4_infield.dgn	PLOT DATE: 2/16/2017
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
ROUTE 113 ENTRANCE	SHEET 1 OF 1

Thetford Park and Ride
Alternative 4: Infield with Ramp Entrance

I-91 SB
I-91 NB
TO WEST FAIRLEE
I-91 ON RAMP
POTENTIAL FUTURE EXPANSION
RELOCATE AERIAL UTILITIES
52 PARKING SPACES
36'
27' TYP.
36'
12'
2'
4'
VT ROUTE 113
TO US ROUTE 5
Neonilla Swinzow (Life Estate)& Ursula Austin
Donald Outridge &Teresa Larkin
N
VT STATE PLANE GRID

LEGEND
Highway ROW
Property Line

0 30 60
SCALE IN FEET

Stantec

PROJECT NAME:	THETFORD PARK AND RIDE
PROJECT NUMBER:	CMG PARK(43)
FILE NAME: Alt 3&4_Infield.dgn	PLOT DATE: 2/17/2017
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
I-89 RAMP ENTRANCE	SHEET 1 OF 1

Thetford Park and Ride
Alternative 5: Boyd Site

Howard Sussman &
Margaret Gilmore

Mary Lou Bradley

Thetford Academy

Boyd Trust Jean
Gordon Boyd Trustee

GOFFERY RD

TO WEST FAIRLEE

VT ROUTE 113

TO US ROUTE 5

50 PARKING SPACES

POTENTIAL
FUTURE
EXPANSION

N

VT STATE PLANE GRID

0 30 60
SCALE IN FEET

Stantec

PROJECT NAME:	THETFORD PARK AND RIDE
PROJECT NUMBER:	CMG PARK(43)
FILE NAME: Alt 5_Boyd.dgn	PLOT DATE: 2/17/2017
PROJECT LEADER: ------	DRAWN BY: ------
DESIGNED BY: ------	CHECKED BY: ------
ROUTE 113 ENTRANCE	SHEET 1 OF 1

APPENDIX E

Cost Estimate

Stantec 55 Green Mountain Drive South Burlington, VT 05403	**Thetford Park & Ride** **CMG PARK (43)** **Conceptual Cost Estimate**		Initials	Date
		Calc'd By:	TFD	8/22/16
		Checked By:		

				Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
VTrans Item No.	Description	Unit	Unit Price [1]	Quantity	Extension	Quantity	Extension	Quantity	Extension	Quantity	Extension	Quantity	Extension
201.10	Clearing and Grubbing, Including Individual Trees and Stumps	LS	-	1	$1,000.00	1	$1,500.00	1	$1,000.00	1	$1,000.00	1	$2,500.00
203.15	Common Excavation	CY	$12.00	5,000	$60,000.00	5,000	$60,000.00	5,000	$60,000.00	9,000	$108,000.00	5,000	$60,000.00
203.16	Solid Rock Excavation[2]	CY	$75.00	50	$3,750.00	50	$3,750.00	50	$3,750.00	75	$5,625.00	75	$5,625.00
203.31	Sand Borrow	CY	$20.00	1,300	$26,000.00	1,400	$28,000.00	1,400	$28,000.00	2,200	$44,000.00	1,400	$28,000.00
301.35	Subbase of Dense Graded Crushed Stone	CY	$35.00	1,000	$35,000.00	1,100	$38,500.00	1,400	$49,000.00	1,700	$59,500.00	1,100	$38,500.00
490.3	Superpave Bituminous Concrete Pavement	TON	$85.00	700	$59,500.00	800	$68,000.00	1,000	$85,000.00	1,200	$102,000.00	800	$68,000.00
616.20	Granite Slope Edging	LF	$32.00	0	$0.00	350	$11,200.00	100	$3,200.00	100	$3,200.00	350	$11,200.00
616.21	Vertical Granite Curb	LF	$35.00	0	$0.00	0	$0.00	400	$14,000.00	0	$0.00	0	$0.00
616.47	Bituminous Concrete Gutter and Traffic Island	TON	$200.00	0	$0.00	0	$0.00	2	$400.00	10	$2,000.00	0	$0.00
618.10	Portland Cement Concrete Sidewalk, 5 Inch	SY	$70.00	0	$0.00	200	$14,000.00	100	$7,000.00	0	$0.00	200	$14,000.00
621.20	Steel Beam Guardrail, Galvanized	LF	$20.00	260	$5,200.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00
	Signing & Striping	LS	-	1	$1,500.00	1	$2,000.00	1	$2,000.00	1	$2,750.00	1	$2,000.00
	Grass Reestablishment	LS	-	1	$5,000.00	1	$5,500.00	1	$5,500.00	1	$5,500.00	1	$5,600.00
	Erosion Control	LS	-	1	$5,000.00	1	$5,000.00	1	$5,000.00	1	$5,000.00	1	$5,000.00
	Stormwater Treatment	LS	-	1	$5,000.00	1	$5,000.00	1	$5,000.00	1	$5,000.00	1	$5,000.00
	Lighting	LS	-	1	$52,000.00	1	$57,000.00	1	$57,000.00	1	$57,000.00	1	$59,000.00
	Bus Shelter[3]	LS	-	1	$25,000.00	1	$25,000.00	1	$25,000.00	1	$25,000.00	1	$25,000.00
	Subtotal				**$283,950.00**		**$324,450.00**		**$350,850.00**		**$425,575.00**		**$329,425.00**
	Mobilization/Demobilization (10%)				**$28,395.00**		**$32,445.00**		**$35,085.00**		**$42,557.50**		**$32,942.50**
	Traffic Control (3%)				**$8,518.50**		**$9,733.50**		**$10,525.50**		**$12,767.25**		**$9,882.75**
	Contingency (20%)				**$62,469.00**		**$71,379.00**		**$77,187.00**		**$93,626.50**		**$72,473.50**
	Subtotal				**$383,332.50**		**$438,007.50**		**$473,647.50**		**$574,526.25**		**$444,723.75**
	Rounded Cost				**$390,000.00**		**$440,000.00**		**$480,000.00**		**$580,000.00**		**$450,000.00**
	Preliminary Engineering (15%)				**$58,500.00**		**$66,000.00**		**$72,000.00**		**$87,000.00**		**$67,500.00**
	Construction Engineering (10%)				**$39,000.00**		**$44,000.00**		**$48,000.00**		**$58,000.00**		**$45,000.00**
	Total Estimated Opinion of Probable Cost				**$487,500.00**		**$550,000.00**		**$600,000.00**		**$725,000.00**		**$562,500.00**
	Property Acquisition Costs				**None**		**Some**		**None**		**None**		**Most**
	Right-of-Way Costs				**None**		**Some**		**None**		**None**		**Most**

1. The unit prices are based on VTrans Project Bid Tabs or the 5-yr Average Price List
2. Assumed quantity of solid rock exavation
3. The assumed cost for the bus shelter included the concrete slab and steel reinforcing

APPENDIX D

Plans

Thetford Exit 14 I-91 Park and Ride CMG PARK (43)

EVALUATION MATRIX

	Item / Criteria	Max. Points	ALTERNATIVES				
			Do Nothing	1	2	3	4
General Information	Location	---	---	Existing Site within Existing ROW	Expand Existing Site	I-91 Ramp Infield w/VT113 Entrance	I-91 Ramp Infield w/Ramp Entrance
	Property Owner	---	---	State of VT	Diego	State of VT	State of VT
Economic (33%)	Ease of Acquisition	20	20	10	0	20	20
	Site Development Cost	20	20	20	10	10	0
	Total Points - Economic Considerations		**40**	**30**	**10**	**30**	**20**
Location (33%)	Proximity to I-89	20	10	10	10	20	20
	Transit Service Access	10	0	5	5	10	10
	Visibility / Security	10	5	5	5	10	10
	Total Points - Location Considerations		**15**	**20**	**20**	**40**	**40**
Site (33%)	Impacts to Resources	10	10	0	0	10	10
	Compatibility/Affects to Adjacent Property	10	5	5	0	10	10
	Number of Spaces and Expansion	40	0	0	40	40	40
	Total Points - Site Considerations		**15**	**5**	**40**	**60**	**60**
	Weighted Ave% of Maximum		**54%**	**44%**	**47%**	**92%**	**83%**

***** Based on limited information

APPENDIX G

Traffic Study

Proposed Park and Ride Lot
CMG PARK (43)
Thetford, Vermont

Traffic Analysis

Prepared for:
Vermont Agency of Transportation

Prepared by:
Stantec Consulting Services Inc.
55 Green Mountain Drive
So. Burlington, VT 05403

January 31, 2017

January 31, 2017

Ms. Tina Bohl
Vermont Agency of Transportation
One National Life Drive
Montpelier, VT 05663-5001

Re: Proposed Park and Ride Lot
CMG PARK (43)
Thetford, Vermont

Dear Ms. Bohl:

Stantec is pleased to submit herein our traffic impact analysis for your proposed new park & ride facility [CMG Park (45)] at the Route 113/Interstate Route 91 interchange (Exit 14) in Thetford, Vermont. This study compares the impact of five different park and ride lot proposals on area traffic operations and defines the access requirements for each alternative. The study encompasses an inventory of existing roadway and traffic conditions; projections of future traffic demands with and without a new park and ride facility; and, an evaluation of the project impact on traffic operations at the interchange. The study concludes that the alternative park and ride proposals will not have a significant impact on area traffic operations. Nominal changes to the roadway system would be required for access to the three proposed facilities located outside the immediate interchange limits. The two alternative proposals cited within the interchange would require more significant roadway changes.
Key findings from the study are as follows:

- The I-91 Ramp intersections with Route 113 presently operate with only minor delays during peak hours (Level of Service B or better on a scale of A to F).
- Construction of a new park and ride facility east of the I-91 Southbound ramps, Alternatives 1, 2, 3 and 4, will result in a slight increase in delays at the I-91 Southbound Ramps/VT 113 intersection during the AM peak hour changing intersection operations to Level of Service C. For the PM peak hour the level of service remains at LOS B.
- Both ramp intersections will operate at Level of Service B during both peak hours with development of Alternative 5 which locates the park and ride facility west of the interchange.
- Proposed park and ride lot driveway intersections with the adjacent roadways will operate at Level of Service A or B during peak hours for all five alternative proposals.
- For Alternatives 1, 2 and 5, each of which is located outside of the interchange, required roadway improvements would be limited to constructing the site driveway and installing a STOP sign on the driveway.
- For Alternative 3, which is located within the interchange infield in the northeast quadrant with access at Route 113, a portion of the existing median on Route 113 would need to be reconstructed to provide a left-turn and median break for site

access. With the required changes the existing left-turn lanes to the I-91 southbound on-ramp would be shortened the taper to enter the land would be shortened as well.

- For Alternative 4, which is also located within the interchange infield in the northeast quadrant except with access at the I-91 Northbound On-ramp, a portion of the existing ramp would need to be widened and reconstructed to accommodate two-way traffic. With this change the I-91 Northbound Ramps/Route 113 intersection will continue to operate at Level of Service B provide during peak hours.

Thank you for allowing us to assist you with this project. Please call if you have any questions regarding this study.
Very truly yours,

STANTEC CONSULTING SERVICES INC.

Richard S. Bryant, P.E.
Associate

PROPOSED PARK AND RIDE LOT
CMG PARK (43)
THETFORD, VERMONT

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LIST OF TABLES

LIST OF FIGURES

PROPOSED PARK AND RIDE LOT
CMG PARK (43)
THETFORD, VERMONT

LIST OF APPENDICES

1.0 INTRODUCTION

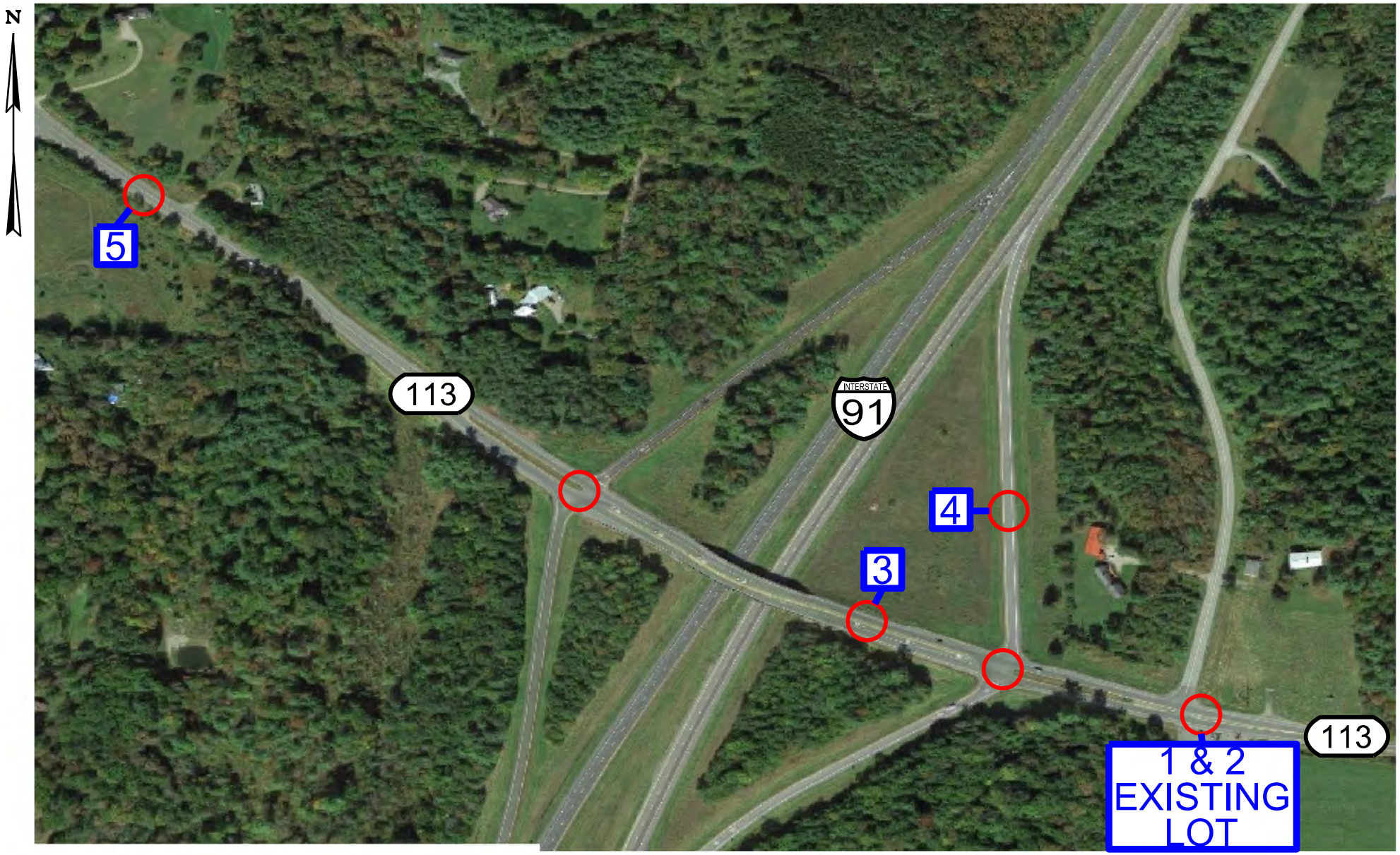
The Vermont Agency of Transportation (VTrans) proposes to construct a new 52-space (+/-) park and ride lot at the Vermont Route 113/Interstate Route 91 (I-91) interchange (Exit 14) in Thetford, Vermont. Three different sites and five different proposals are under consideration. This study evaluates the potential impact of each alternative on weekday commuter peak hour traffic operations in the site vicinity and assess site access conditions Traffic operations are evaluated for "existing" 2013 conditions (the year in which the most recent traffic counts were conducted) and for a 20-year (2036 design year) forecast period. The future year analyses include both No Build conditions (without the proposed project) and Build (with the proposed project) conditions.

1.1 PROJECT DESCRIPTION

VTrans operates an existing 24-space park and ride lot on a parcel located on the south side of VT 113 opposite Latham Road which is approximately 350 feet east of the I-91 Northbound On-ramp. VTrans is proposing to replace this lot with a larger facility and has determined the need to provide at least 50 spaces. The location of the existing lot and the locations of potential replacement facilities are shown in Figure 1. Proposals under consideration include two different configurations for a new lot on the existing park and ride lot site (Alternatives 1 and 2). These are shown in Figures 2 and 3. Alternatives 3 and 4 would be developed within the northeast quadrant of the interchange infield. For Alternative 3, shown in Figure 4, lot access would be provided via a driveway at VT 113. A median break is proposed to facilitate left-turns into and out of the site. Alternative 4 would be developed on the same parcel with access provided at the I-91 Northbound On-ramp. As shown in Figure 5, to accommodate site access a portion of the ramp between the park and ride lot driveway and VT 113 would need to be widened and converted to two-way operation. The site for Alternative 5 is located approximately 1000 feet west of the interchange on the south side of VT 113. The plan for this alternative is shown in Figure 6.

1.2 STUDY AREA

The intersections considered in this traffic study are also identified in Figure 1. They include the two existing I-91 ramp intersections with VT 113. For Alternatives 1, 2, 3 and 5 the study includes the park and lot driveway intersections with VT 113. For Alternative 4 the park and lot driveway intersection with the I-91 on ramp is considered.



STUDY AREA LEGEND

- # — ALTERNATIVE LOT LOCATION AND ACCESS
- ○ — STUDY INTERSECTION

FIGURE 1 - STUDY AREA

Stantec

THETFORD PARK AND RIDE
CMG PARK(43)
THETFORD, VT

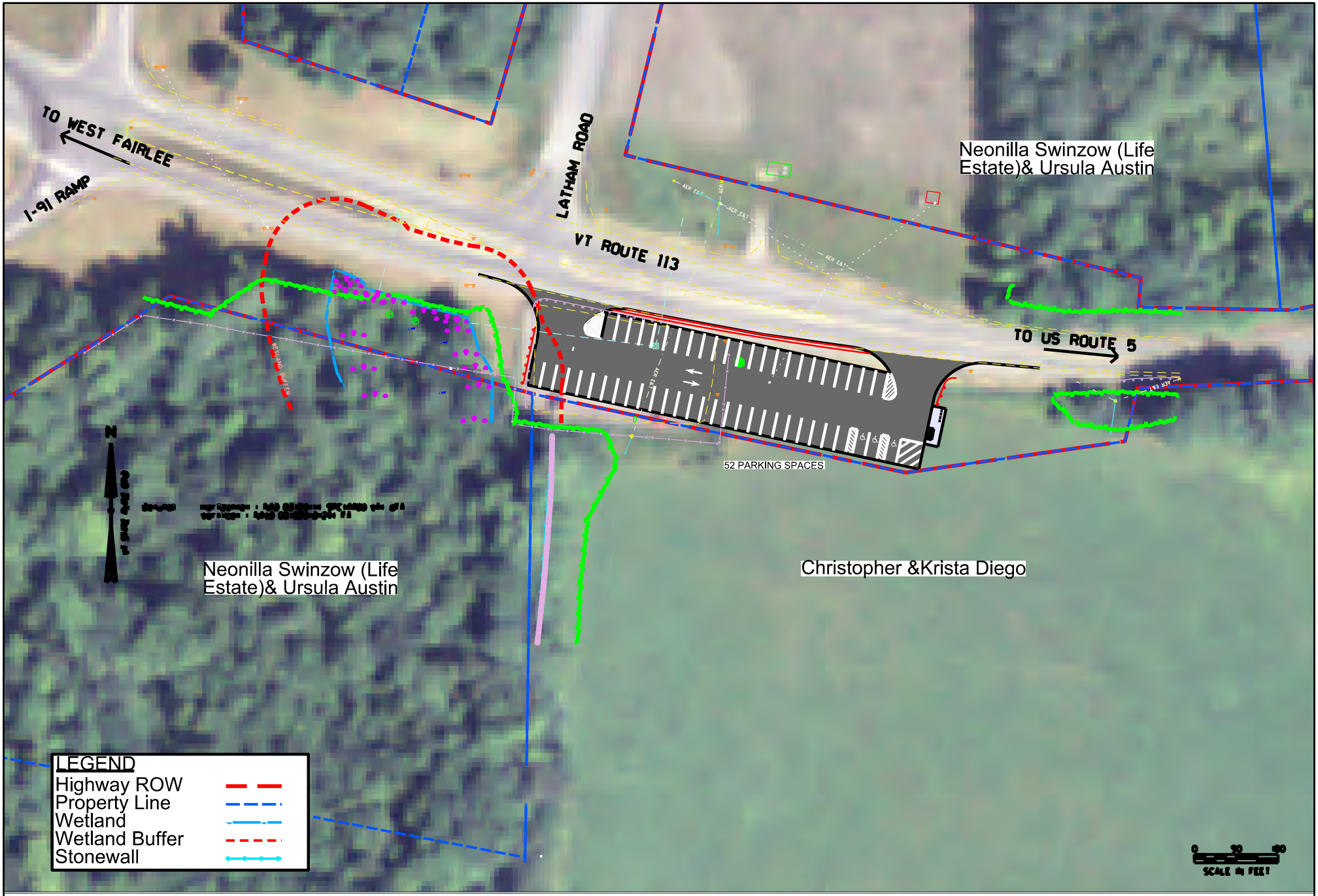


FIGURE 2 - ALTERNATIVE 1: EXPAND EXISITING WITHIN ROW

Stantec

THETFORD PARK AND RIDE
CMG PARK(43)
THETFORD, VT

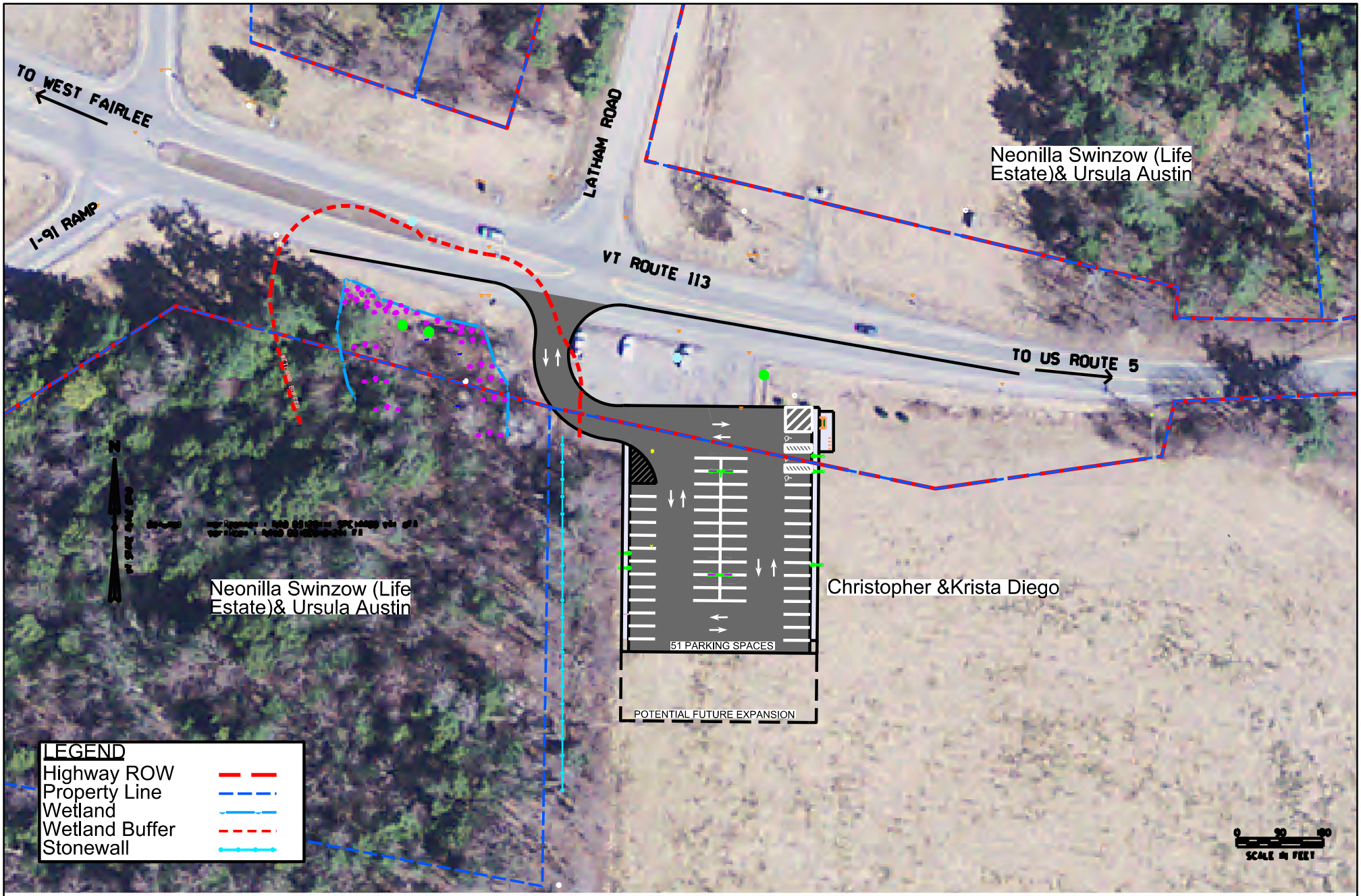


FIGURE 3 - ALTERNATIVE 2: EXPAND EXISITING

Stantec

THETFORD PARK AND RIDE
CMG PARK(43)
THETFORD, VT

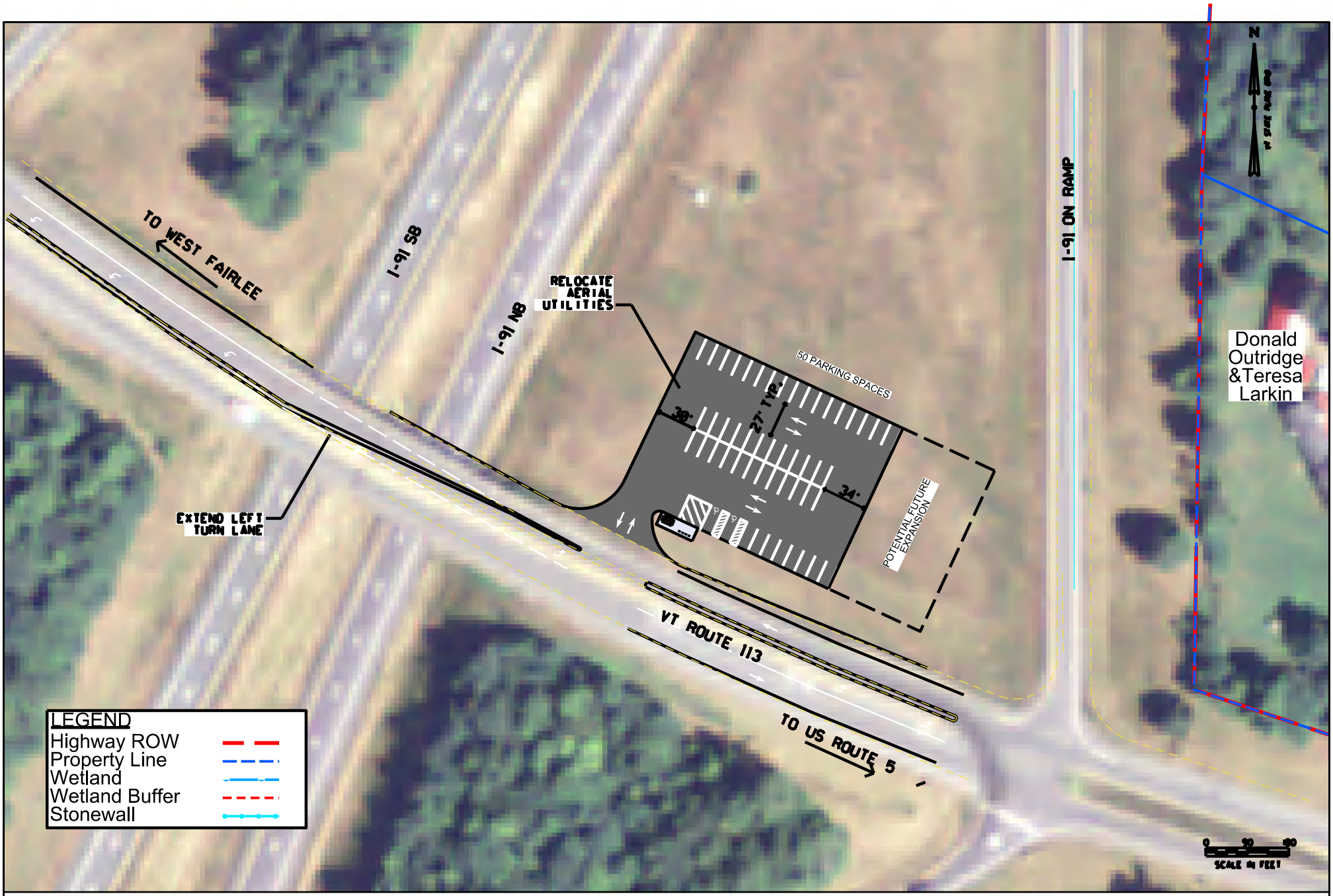


FIGURE 4 - ALTERNATIVE 3: INFIELD WITH VT 113 ENTRANCE

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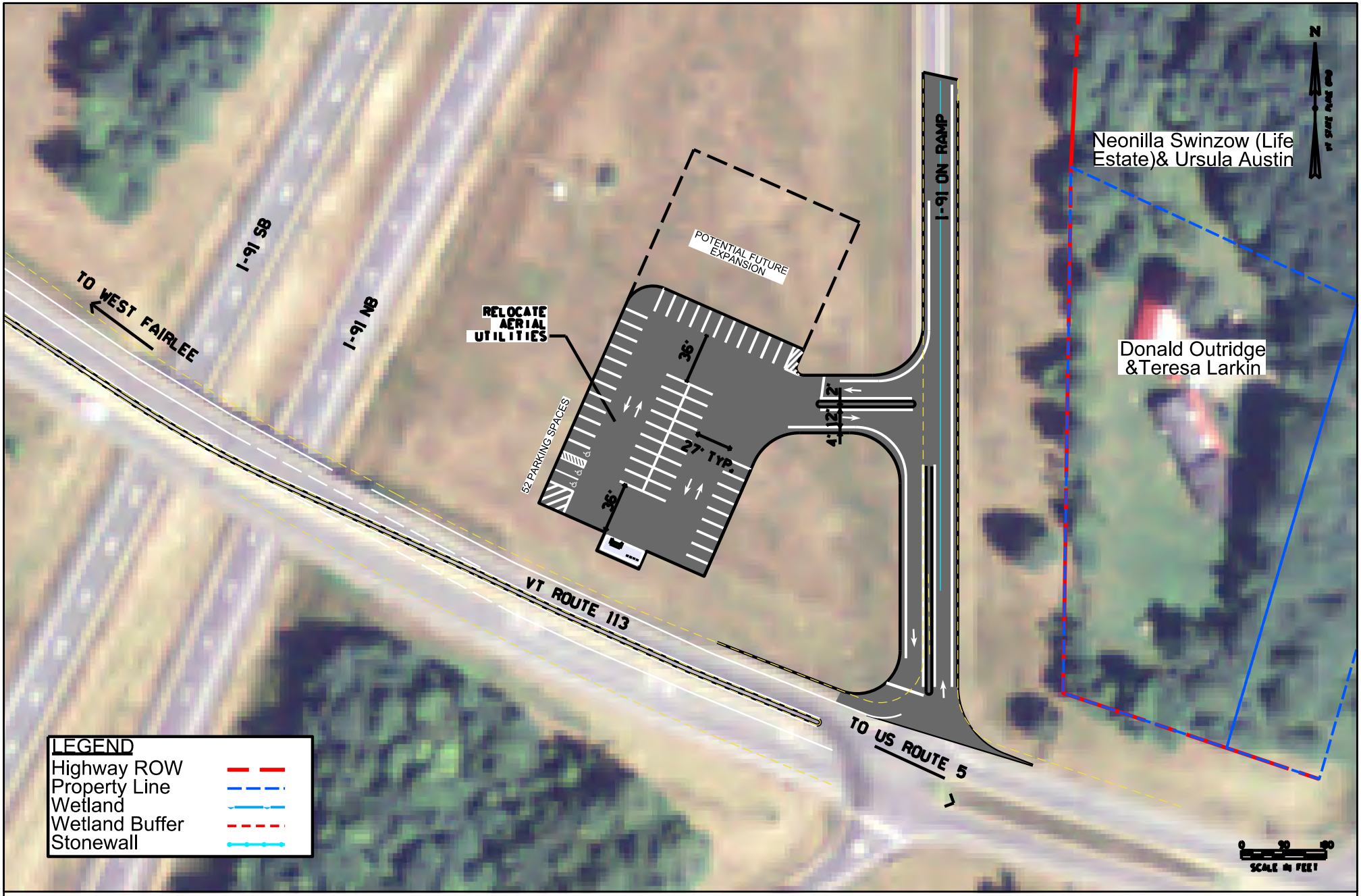

FIGURE 5 - ALTERNATIVE 4: INFIELD WITH RAMP ENTRANCE

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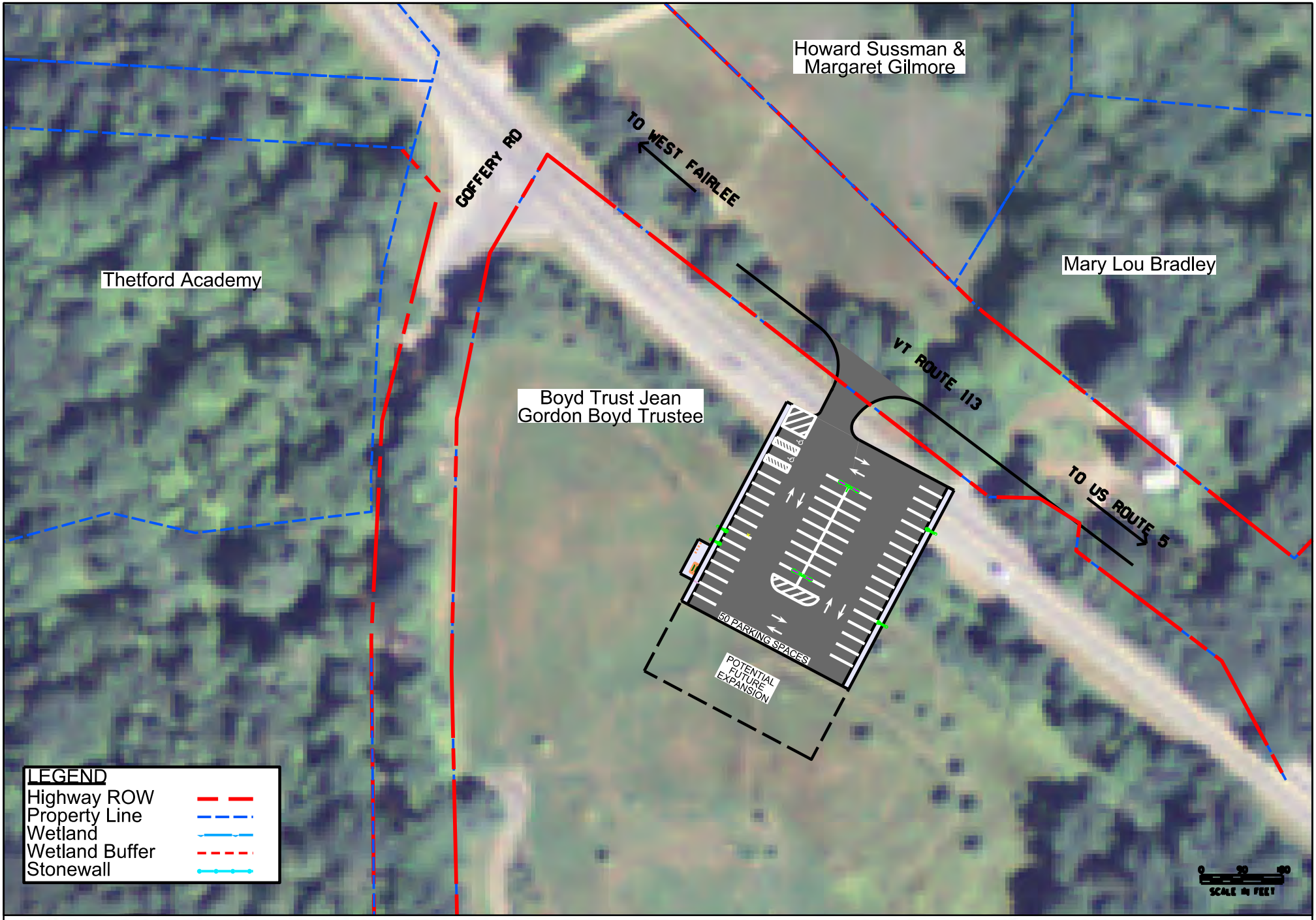

FIGURE 6 - ALTERNATIVE 5: BOYD SITE

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2.0 EXISTING CONDITIONS

Existing roadway and traffic conditions for the study area are described below.

2.1 ROADWAY CONDITIONS

The alternative sites are located along VT 113 in the vicinity of its interchange with I-91. The interchange is a diamond configuration with single lane off ramps entering VT 113 under STOP sign control. VT 113, a major rural collector roadway is three lanes wide as it passes over I-89 with a raised median separating eastbound and westbound traffic flows. A single through travel lane is provided in each direction. Approaching the northbound ramps from the west there is a 250 feet long left-turn to the I-91 northbound on ramp. A raised grass median is located opposite the dedicated left-turn lane on the east leg of the intersection. Similar geometry is provided at the southbound ramps where a 340 feet long westbound left-turn lane is provided. East and west of the interchange the roadway narrows to a single travel lane in each direction with no median. The posted speed limit in the vicinity of the interchange is 50 miles per hour.

2.2 TRAFFIC VOLUMES

Traffic volume data for the study area were collected from the VTrans traffic count database. The VT 113/I-89 interchange is counted on a four-year cycle by VTrans and was last counted in May 20, 2013. The recorded peak hour traffic volumes are shown in Figure 7. As shown, traffic volumes oriented toward the west of the interchange are heavier than those oriented to the east. Also, the ramp volumes indicate that traffic accessing I-91 at this location is more oriented to the south than to the north. Daily traffic volumes recorded by VTrans indicate an Annual Average Daily Traffic (AADT) volume on VT 113 just west of the interchange of 3200 vehicles in 2012. The AADT reported for I-91 at this location is 11,700 vehicles.

VTrans defines the Design Hour Volume (DHV) as the 30th highest volume hour of the year. The DHV can be estimated based on the roadway AADT and applicable formulas relating DHV to AADT on similar roadways where traffic volumes are counted continuously. When these factors were applied to the VT 113 AADT reported above, the calculated DHV was actually lower than the peak hour volumes recorded during the May 2013 counts. Consequently, the volumes shown in Figure 7 represent design conditions for this study.

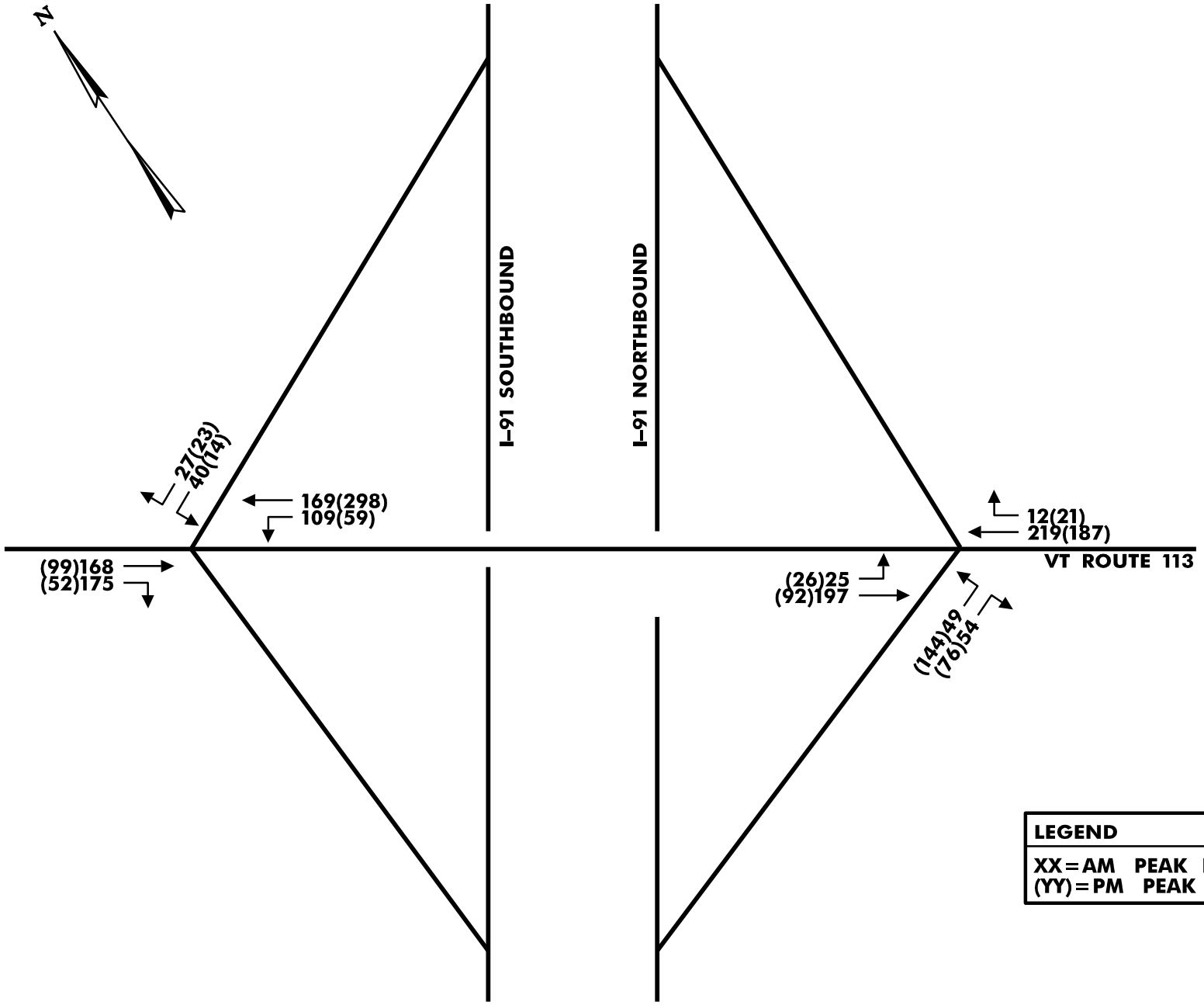

FIGURE 7 - EXISTING (2013) PEAK HOUR TURNING MOVEMENTS

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2.3 TRAFFIC OPERATIONS

Intersection operating levels of service (LOS) are calculated for the study area intersections based on the traffic volume, intersection geometry and traffic control data provided above.

2.3.1 Level of Service Criteria

Level of service (LOS) is a term used to describe the quality of the traffic flow on a roadway facility at a particular point in time. It is an aggregate measure of travel delay, travel speed, congestion, driver discomfort, convenience, and safety based on a comparison of roadway system capacity to roadway system travel demand. Operating levels of service are reported on a scale of A to F, with A representing the best operating conditions with little or no delay to motorists, and F representing the worst operating conditions with long delays and traffic demands sometimes exceeding roadway capacity.

Intersection operating levels of service are calculated following procedures defined in the *2000 Highway Capacity Manual*, published by the Transportation Research Board. For unsignalized and signalized intersections the operating level of service is based on travel delays. Delays can be measured in the field but generally are calculated as a function of traffic volume; peaking characteristic of traffic flow; percentage of heavy vehicles in the traffic stream; type of traffic control; number of travel lanes and lane use; intersection approach grades; and, pedestrian activity. Through this analysis volume-to-capacity ratios can be calculated for individual movements or for the intersection as a whole. A volume-to-capacity ratio of 1.0 indicates that a movement or intersection is operating at its theoretical capacity. The specific delay criteria applied per the *2000 Highway Capacity Manual* to determine operating levels of service are summarized in Table 1.

Table 1 Intersection Level of Service Criteria

Average Delay per Vehicle (Seconds)	
Level of Service	**Unsignalized Intersections**
A	≤ 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	>50.0

Source: *Highway Capacity Manual*, Special Report 209, Fifth Edition, Transportation Research Board, National Research Council, Washington, DC, 2010.

For unsignalized intersections, it is assumed that through movements on the main street have the right-of-way and are not delayed by side street traffic. Main street traffic may be exposed to delays from traffic turning left from the main street. Generally, the longest delays at unsignalized intersections are experienced on the side streets by traffic turning left onto the main street.

2.3.2 Existing Intersection Operations

The intersection level of service analysis results are presented in Table 2 for existing conditions. For this study, the SYNCHRO 8.0 software package was used to apply the *Highway Capacity Manual* procedures and analyze peak hour operations. As shown, the ramps from I-91 entering VT 113 operate at Level of Service B or better during the commuter peak hours. Intersection traffic volumes are well below intersection capacities. The highest intersection approach volume-to-capacity ratio is only 32 percent reported for the I-91 Northbound Ramps under PM peak hour conditions.

Table 2 Existing (2013) Level of Service Summary

	Existing (2013) Conditions		
Location/Time Period	**LOS[1]**	**Delay[2]**	**V/C[3]**
I-91 Southbound Ramps/VT 113			
AM Peak Hour	B	13.9	0.14
PM Peak Hour	B	11.5	0.06
I-91 Northbound Ramps/VT 113			
AM Peak Hour	B	11.9	0.16
PM Peak Hour	B	12.6	0.32

[1]LOS= Level of Service
[2] Delay = Average delay expressed in seconds per vehicle
[3] V/C = Overall volume-to-capacity ratio for the critical movements in the intersection

2.4 SAFETY

VTrans maintains listings of high crash locations including intersections and roadway segments. The lists are developed by examining five years of crash data. Listed intersections and roadway segments must experience crash rates that are significantly higher than average crash rates for similar roadways and must experience at least five crashes over the five year period. A review of the latest VTrans High Crash List for the years 2010 through 2014 indicates that there are no high crash locations within the study area. Only one crash was reported at the interchange over this five-year period.

3.0 FUTURE CONDITIONS

This study considers a twenty-year planning horizon for the evaluation of future traffic conditions. Future scenarios examined include a 2036 No Build condition which assumes normal growth in traffic volumes from 2013 baseline conditions to the design year. The 2036 Build conditions include four scenarios each assuming implementation of one of the alternative park and ride lot plans. The Build (with the proposed project) condition volumes combine No Build traffic volumes with projected traffic volumes associated with the proposed park and ride alternatives.

3.1 NO BUILD TRAFFIC VOLUMES

Projections of No Build traffic volumes consider traffic growth in the study area independent of the proposed project. An overall growth rate was applied to existing traffic volumes to address future changes in traffic patterns. Determination of an appropriate background growth rate generally considers historic traffic volume data. For this study, reference was made to the VTrans publication *Continuous Traffic Counter (CTC) Grouping Study and Regression Analysis Based on 2014 Traffic Data* to develop an overall traffic growth rate. VTrans projects 13 percent growth on I-91 north of the study area in Bradford, Vermont over a 20-year period. For all interstate highways in Vermont the projected 20-year growth estimate is only nine percent. For rural primary and secondary roadways such as VT 113 a two percent traffic increase is expected over 20 years. A ten percent increase in existing (2013) volumes was assumed in this study to reflect 2036 No Build conditions. The 2036 AM and PM peak hour No Build traffic volumes are shown in Figure 8.

3.2 PROJECT TRAFFIC

Traffic volumes generated by the alternative park and ride lot proposals were determined and assigned to the roadway network to develop future Build traffic conditions. Procedures used to generate and assign project related trips to the roadway are described below.

3.2.1 Trip Generation

Peak hour vehicle trips for the proposed project were estimated using nationally accepted trip generation rates. Specifically, rates provided in the Institute of Transportation Engineers' (ITE) publication *Trip Generation*, Ninth Edition, 2012 were applied. (*Trip Generation* provides average trip rates for a wide range of land uses based on studies conducted at sites across the United States.) The ITE trip rates are provided in Table 3 indicating that 0.71 vehicle trips per parking space can be expected during the AM commuter peak hour and 0.62 trips per parking space can be expected during the PM peak hour. Assuming the construction of 52 parking spaces the proposed facility will generate 37 AM peak hour trips and 32 PM peak hour trips.

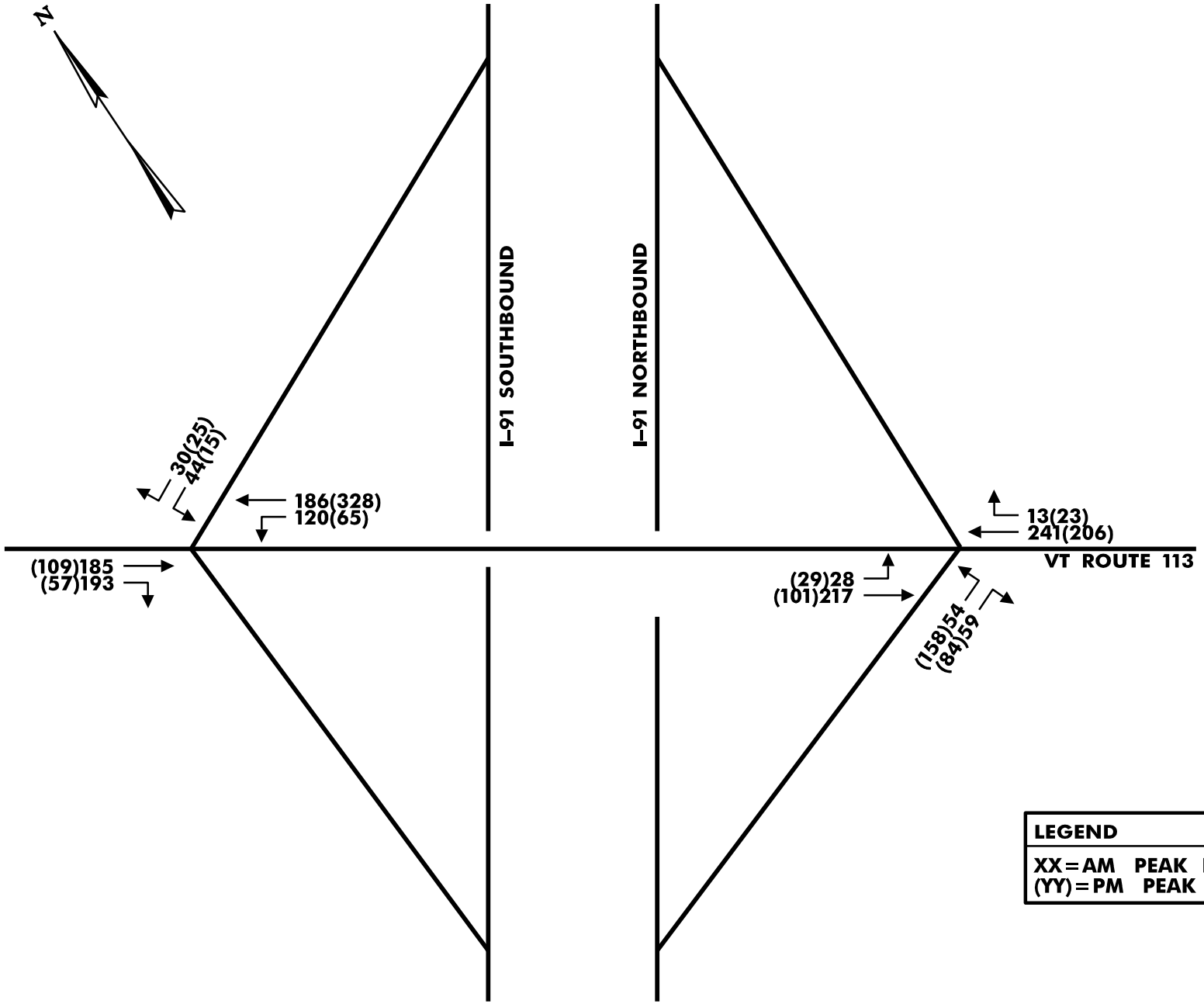

FIGURE 8 - 2036 NO BUILD PEAK HOUR TURNING MOVEMENTS

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Table 3 Park and Ride Vehicle Trips

Peak Hour	Direction	Trip Rate[1]	Vehicle Trips
AM	In	0.56	29
	Out	0.15	8
	Total	**0.71**	**37**
PM	In	0.16	8
	Out	0.46	24
	Total	**0.62**	**32**

[1] Vehicle trips per parking space.
Based on 52 proposed park and ride spaces and *Trip Generation, 9th Edition*, (Land Use Code 090), published by the Institute of Transportation Engineers, Washington, D.C. 2012.

3.2.2 Trip Distribution

Anticipated site generated traffic was assigned to the roadway system based on a review of existing travel patterns and consideration of the ITE formula used to estimate parking demand. The plan to construct 52 +/- spaces is based on application of an ITE formula that assumes that 75 percent of the parking demand is related to the interstate route that the park and ride facility will serve and the remainder is oriented to the local route served. Using this assumption and examining the existing peak hour traffic patterns at the site the trip distribution pattern shown in Table 4 was developed. Anticipated project generated vehicle trips were assigned to the roadway network according to this distribution for each of the five alternative proposals.

Table 4 Site Traffic Distribution

		Percentage of Trips				
Peak Hour	**Direction**	**I-91- North**	**I -91 - South**	**VT 113 – East**	**VT 113- West**	**Total**
AM	Entering	65	10	10	15	100
	Exiting	10	65	10	15	100
PM	Entering	10	65	10	15	100
	Exiting	65	10	10	15	100

3.2.3 Future Build Traffic Volumes

The projected site generated trips were combined with the 2036 No Build traffic volumes to create the future Build traffic networks. The 2036 Build traffic networks for all alternatives are included in the Appendix. Traffic flow networks for Alternatives 3 and 4 are shown in Figures 9 and 10, respectively. The anticipated traffic volume increases associated with the proposed development (37 AM peak hour trips) represent 4.5 percent of the project 2036 No Build volumes entering the Exit 14 interchange (818 trips).

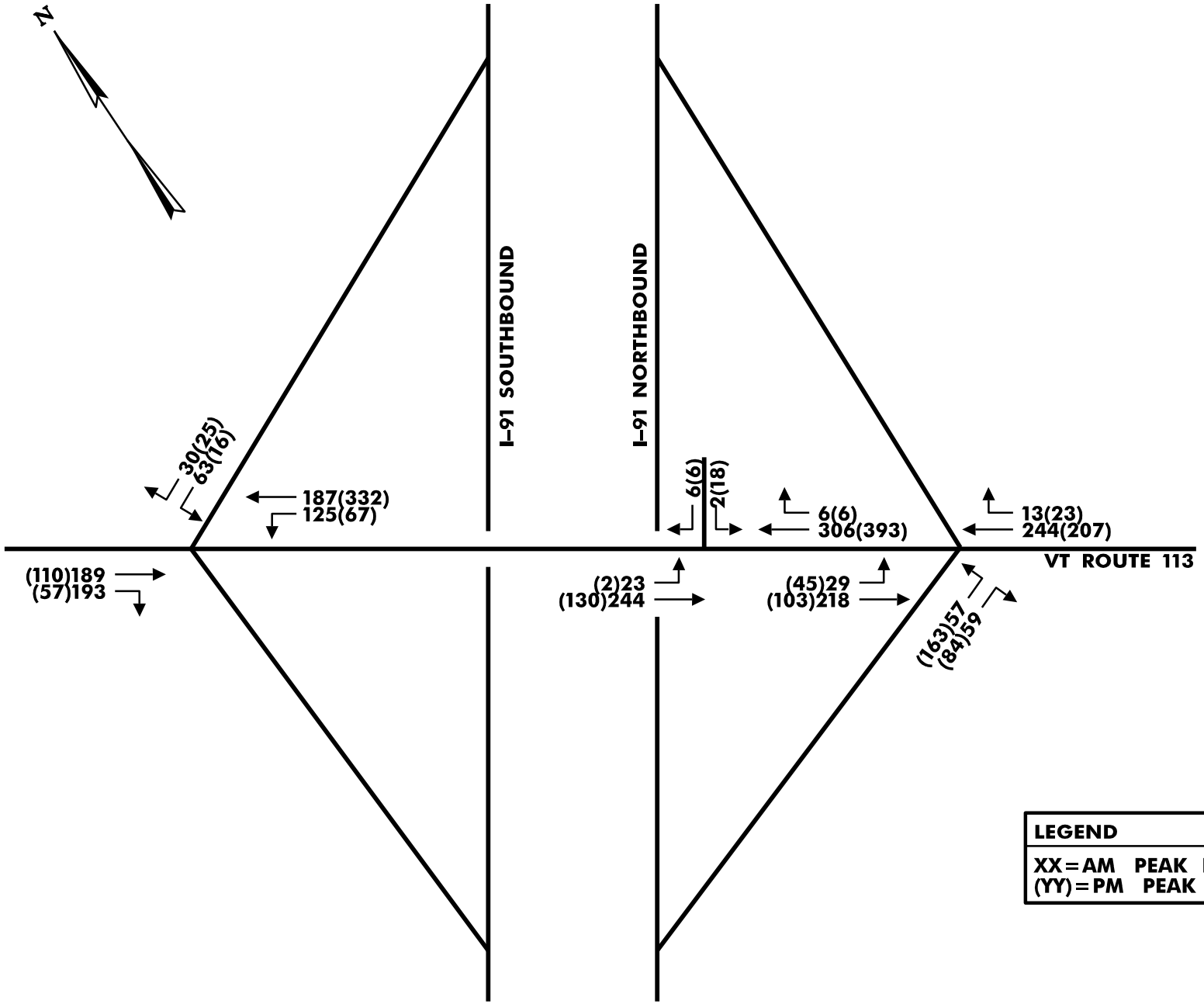

FIGURE 9 - 2036 BUILD - ALTERNATIVE 3 PEAK HOUR TURNING MOVEMENTS

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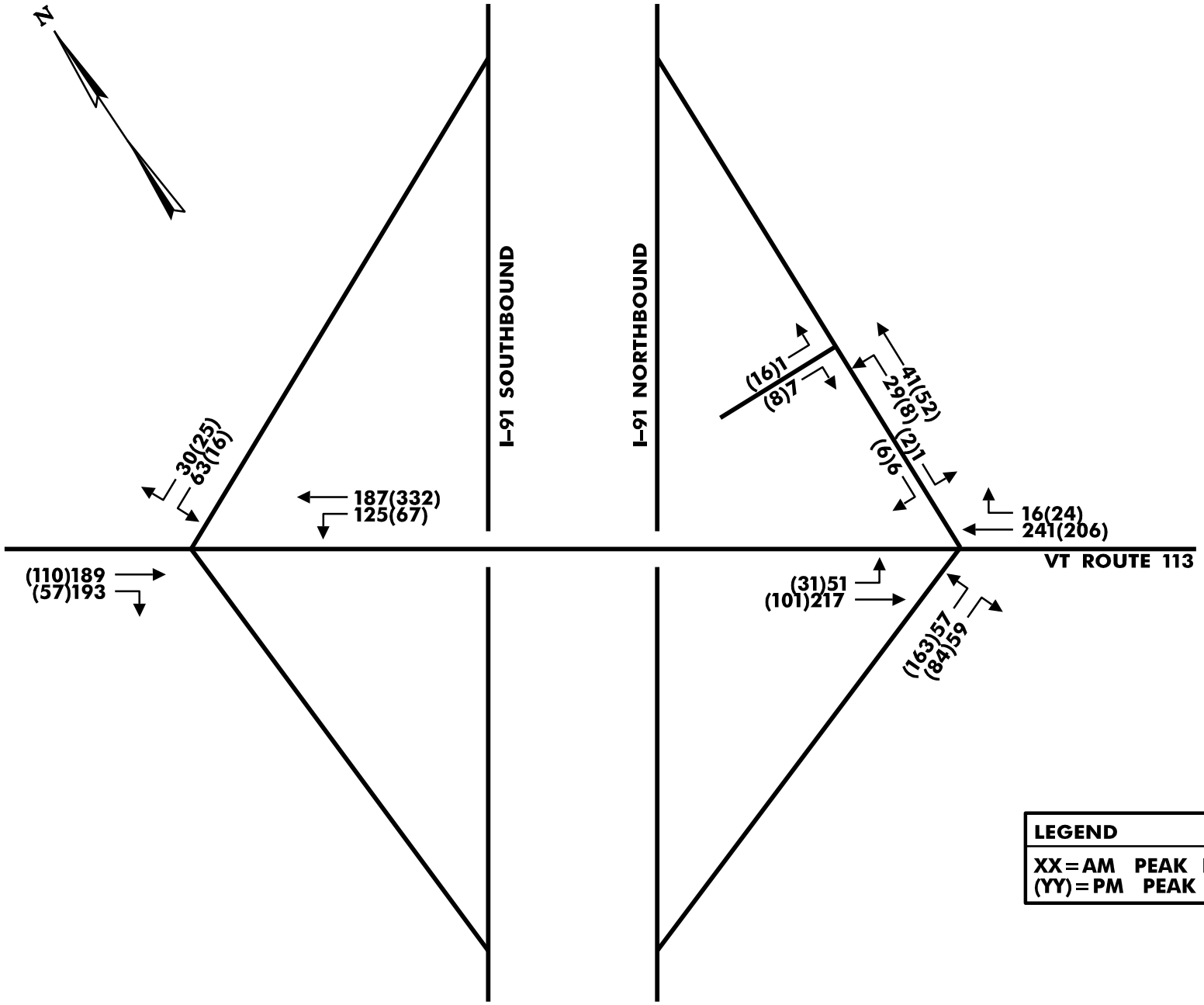

FIGURE 10 - 2036 BUILD - ALTERNATIVE 4 PEAK HOUR TURNING MOVEMENTS

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3.3 FUTURE LEVEL OF SERVICE ANALYSIS

Anticipated future roadway operating levels of service were calculated based on the projected No Build and Build traffic volume conditions for 2036 using the analysis procedures described above. A summary of future No Build and Build analysis results is provided in Table 5. As shown, the I-91/VT 113 interchange intersections will operate at Level of Service C or better under all of the development alternatives. Those alternatives that place the park and ride facility east of the I-91 southbound ramps, Alternatives 1 through 4, generate enough new left-turns from the southbound ramp during the AM peak hour to raise the volume-to-capacity ratio from 14 percent to 24 percent. The added left-turn volume also increases delays by almost four seconds per vehicle such that delays exceed 15 seconds per vehicle and reach the Level of Service C range. Project impacts at the I-91 northbound ramp are less significant increasing the volume-to-capacity ratio by no more than three percent in either peak hour. At all alternative locations the site driveway would operate at Level of Service A or B. Intersection capacity analysis worksheets for all conditions including delays and queues by turning movement are provided in the appendix.

Table 5 Future Intersection Operations

Location/Time Period	No Build			Alternative 1 & 2			Alternative 3			Alternative 4			Alternative 5		
	LOS[1]	Delay[2]	V/C[3]	LOS[1]	Delay[2]	V/C[3]	LOS[1]	Delay[2]	V/C[3]	LOS[1]	Delay[2]	V/C[3]	LOS[1]	Delay[2]	V/C[3]
I-91 Southbound Ramps/VT 113															
AM Peak Hour	B	13.2	0.14	C	16.9	0.24	C	16.9	0.24	C	16.9	0.24	B	14.5	0.20
PM Peak Hour	B	12.0	0.07	B	12.2	0.08	B	12.2	0.08	B	12.2	0.08	B	12.2	0.08
I-91 Northbound Ramps/VT 113															
AM Peak Hour	B	12.5	0.19	B	12.9	0.20	B	12.7	0.20	B	13.2	0.21	B	12.7	0.2
PM Peak Hour	B	13.5	0.36	B	13.8	0.38	B	14.3	0.39	B	13.7	0.38	B	14.3	0.39
Site Drive/VT 113 or I-91 N.B. On-ramp															
AM Peak Hour				B	12.1	0.02	B	10.8	0.01	*B*	*8.5*	*0.01*	*B*	*10.9*	*0.01*
PM Peak Hour				B	11.2	0.04	B	12.0	0.04	*A*	*8.8*	*0.02*	*A*	*9.8*	*0.03*

[1] LOS= Level of Service
[2] Delay = Average delay expressed in seconds per vehicle
[3] V/C = Volume-to-capacity ratio

3.4 LEFT-TURN LANE CONSIDERATIONS

Two issues were considered with respect to left-turn accommodations in the study area. First, VTrans standards were applied to determine if dedicated left-turn lanes should be provided on VT 113 westbound at the Alternative 1, 2 and 5 park and ride locations. Second, evaluations were made for Alternative 3 regarding the redesign of the existing left-turn lanes on VT 113 at the I-93 Northbound and Southbound ramps and how the designs would be impacted by the proposed left turn lane at the site driveway.

In the first case, left-turn lane warrant analyses were conducted following procedures defined in National Cooperative Highway Research Program (NCHRP) Report 457, *Engineering Study Guide for Evaluating Intersection Improvements* published by the Transportation Research Board in 2001. The warrant analysis considers the peak hour turning movement volumes at the driveway and the prevailing speed on the major roadway. For Alternatives 1 and 2, located at the same site east of the Exit 14 interchange, the warrant analysis indicates that a left-turn lane is not warranted for VT 113 westbound. A comparable analysis for Alternative 5, located west of the interchange reaches the same finding. The warrant analysis worksheets are attached.

The park and ride Alternative 3 proposes the construction of an eastbound left-turn lane on VT 113 at the proposed site driveway. The centerline of the driveway would be approximately 300 feet west of the I-91 northbound ramps. As shown in Figure 11, the northbound on-ramp is accessed from VT 113 eastbound by way of a 250 feet left-turn lane. There is a 250 feet taper in advance of the left turn lane. In the westbound direction a 250 feet taper is also provided adjacent to the eastbound taper and in advance of a 350 feet left-turn lane to the I-91 southbound on-ramp. The existing tapered section between the two existing left turn lanes would need to be shifted to the west to accommodate the proposed park and lot driveway.

VTrans design standards for left-turn lanes are dependent upon roadway speeds and vehicle storage requirements. An examination of the left-turn vehicle queuing calculations included on the intersection capacity analysis worksheets and summarized in Table 6 indicates 95th percentile queue lengths under 10 feet for each of the existing and proposed left-turn lanes. The 95th percentile queue length is a typical standard applied to determine the desired storage capacity in a left-turn lane. VTrans however, applies a minimum storage requirement of 50 feet. The minimum taper length applied for speeds over 30 miles per hour (mph) is 180 feet. With these minimum taper and storage lengths provided, an additional 230 feet of storage should be added to the left-turn lane for vehicle deceleration assuming an approach speed of 50 mph. (The posted speed limit at this location is 50 mph.) The total length needed for the taper plus turn lane is 460 feet for 50 mph and the projected turn lane volumes. The additional storage recommended is only 95 feet at 40 mph. For a 40 mph speed the recommended taper plus turn lane length is 325 feet.

As shown in Figure 11, the recommended minimum 460 feet of taper plus storage is met for both existing left-turn lane ramps. (Eastbound 500 feet are provided and westbound 590 feet are provided.) Suggested conditions allow for only 325 feet of taper plus storage westbound in advance of the I-91 southbound on-ramp. This meets the standard for a 40 mph speed but falls short of the standard for a 50 mph speed. Similarly, the eastbound left-turn lane in advance of the proposed park and ride driveway would provide 305 feet of taper and storage. This falls slightly short of the recommended minimum for a 40 mph speed. Assuming that the taper and storage for the eastbound left-turn lane into the driveway is shared with the eastbound left-turn lane to the I-91 northbound on-ramp, the on-ramp left-turn lane has 595 feet of taper and storage.

Table 6 Queue Analysis Summary

	Calculated 95th Percentile Left-Turn Lane Queues on VT 113		
Peak Hour	Westbound at Southbound Ramps	Eastbound at Site Drive for Alternative 3	Eastbound at Northbound Ramps
AM	8 feet	1 foot	2 feet
PM	4 feet	0 feet	3 feet

Note: All calculations reflect 2026 Build conditions for Alternative 3.

4.0 CONCLUSIONS

As noted above, the proposed development of a new park and ride lot at the I-91/VT 113 interchange will have a nominal impact on traffic operations. As such, "mitigation" for the alternative proposals in limited to those roadway changes necessary to accommodate safe site access. For Alternatives 1, 2 and 5, each of which is located outside of the interchange, required roadway improvements would be limited to constructing the site driveway and installing a STOP sign on the driveway. For Alternative 3, which is located within the northeast quadrant of the interchange infield, a portion of the existing median on Route 113 would need to be reconstructed to provide a left-turn lane and median break for site access. With the required changes the existing left-turn lanes to the I-91 southbound on-ramp would be shortened but could be designed to meet 40 mph operating speed standards. For Alternative 4, which is also located within the interchange infield except with access at the I-91 Northbound On-ramp, a portion of the existing ramp would need to be widened and reconstructed to accommodate two-way traffic.

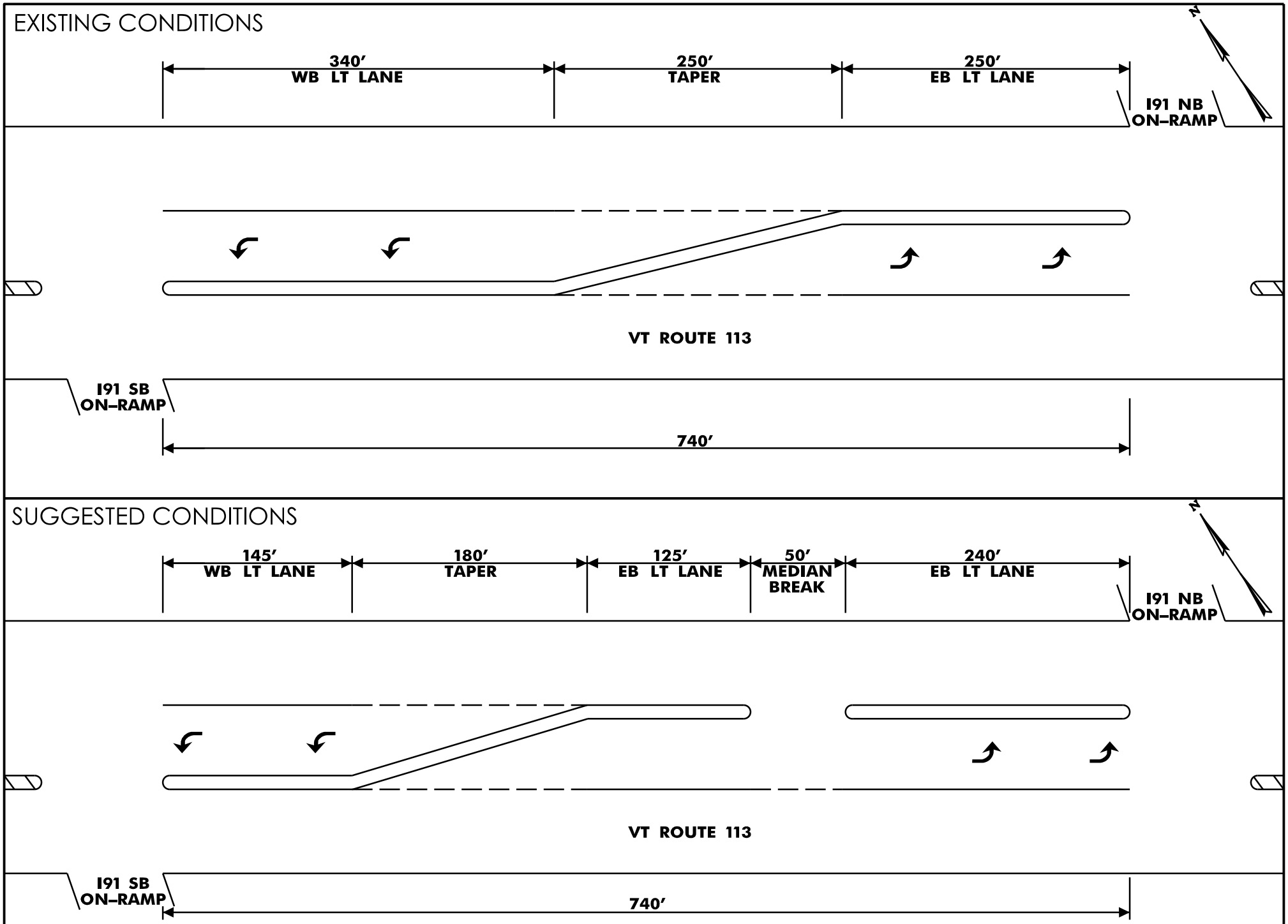

FIGURE 11 - EXISTING AND PROPOSED LEFT-TURN LAYOUTS

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Appendix A EXISTING TRAFFIC DATA

Appendix B LEVEL OF SERVICE SUMMARY / SYNCHRO WORKSHEETS

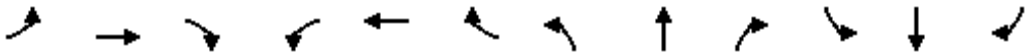
HCM Unsignalized Intersection Capacity Analysis

1: 7/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	189	193	125	187	0	0	0	0	63	0	30
Future Volume (Veh/h)	0	189	193	125	187	0	0	0	0	63	0	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	0	189	193	125	187	0	0	0	0	63	0	30
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	187			189			722	722	286	722	626	187
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	187			189			722	722	286	722	626	187
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			100	100	100	80	100	96
cM capacity (veh/h)	1369			1367			303	317	746	314	361	847

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	382	125	187	93
Volume Left	0	125	0	63
Volume Right	193	0	0	30
cSH	1700	1367	1700	394
Volume to Capacity	0.22	0.09	0.11	0.24
Queue Length 95th (ft)	0	8	0	23
Control Delay (s)	0.0	7.9	0.0	16.9
Lane LOS		A		C
Approach Delay (s)	0.0	3.2		16.9
Approach LOS				C

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	44.0%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	240	0	0	247	14	54	0	62	0	0	0
Future Volume (Veh/h)	28	240	0	0	247	14	54	0	62	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.92	0.92
Hourly flow rate (vph)	28	240	0	0	247	14	54	0	62	0	0	0
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	261			240			550	557	240	550	550	254
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	261			240			550	557	240	550	550	254
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			88	100	92	100	100	100
cM capacity (veh/h)	1286			1309			434	425	792	404	433	785

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	28	240	261	116
Volume Left	28	0	0	54
Volume Right	0	0	14	62
cSH	1286	1700	1700	572
Volume to Capacity	0.02	0.14	0.15	0.20
Queue Length 95th (ft)	2	0	0	19
Control Delay (s)	7.9	0.0	0.0	12.9
Lane LOS	A			B
Approach Delay (s)	0.8		0.0	12.9
Approach LOS				B

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	44.0%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	276	26	3	254	7	1
Future Volume (Veh/h)	276	26	3	254	7	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	276	26	3	254	7	1
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			302		549	289
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			302		549	289
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			1242		490	743

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	302	257	8
Volume Left	0	3	7
Volume Right	26	0	1
cSH	1700	1242	512
Volume to Capacity	0.18	0.00	0.02
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.1	12.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	12.1
Approach LOS			B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	26.1%	ICU Level of Service	A
Analysis Period (min)	15		

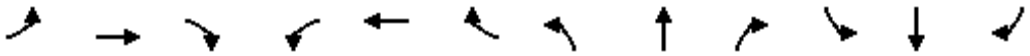
HCM Unsignalized Intersection Capacity Analysis

1: 7/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	110	57	67	332	0	0	0	0	16	0	25
Future Volume (Veh/h)	0	110	57	67	332	0	0	0	0	16	0	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.92	0.92	1.00	1.00	1.00
Hourly flow rate (vph)	0	110	57	67	332	0	0	0	0	16	0	25
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	332			110			604	604	138	604	576	332
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	332			110			604	604	138	604	576	332
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			100	100	100	96	100	96
cM capacity (veh/h)	1227			1480			382	394	910	396	409	710

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	167	67	332	41
Volume Left	0	67	0	16
Volume Right	57	0	0	25
cSH	1700	1480	1700	542
Volume to Capacity	0.10	0.05	0.20	0.08
Queue Length 95th (ft)	0	4	0	6
Control Delay (s)	0.0	7.5	0.0	12.2
Lane LOS		A		B
Approach Delay (s)	0.0	1.3		12.2
Approach LOS				B

Intersection Summary				
Average Delay	1.7			
Intersection Capacity Utilization	41.1%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	103	0	0	212	39	158	0	89	0	0	0
Future Volume (Veh/h)	29	103	0	0	212	39	158	0	89	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.92	0.92
Hourly flow rate (vph)	29	103	0	0	212	39	158	0	89	0	0	0
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	251			103			392	412	103	392	392	232
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	251			103			392	412	103	392	392	232
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			72	100	91	100	100	100
cM capacity (veh/h)	1314			1489			557	518	952	505	532	808

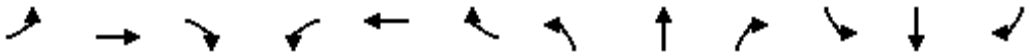
Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	29	103	251	247
Volume Left	29	0	0	158
Volume Right	0	0	39	89
cSH	1314	1700	1700	655
Volume to Capacity	0.02	0.06	0.15	0.38
Queue Length 95th (ft)	2	0	0	44
Control Delay (s)	7.8	0.0	0.0	13.8
Lane LOS	A			B
Approach Delay (s)	1.7		0.0	13.8
Approach LOS				B

Intersection Summary				
Average Delay	5.8			
Intersection Capacity Utilization	41.1%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	185	7	1	229	22	2
Future Volume (Veh/h)	185	7	1	229	22	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	185	7	1	229	22	2
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			192		420	188
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			192		420	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 %			100		96	100
cM capacity (veh/h)			1381		590	853

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	192	230	24
Volume Left	0	1	22
Volume Right	7	0	2
cSH	1700	1381	605
Volume to Capacity	0.11	0.00	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.0	0.0	11.2
Lane LOS		A	B
Approach Delay (s)	0.0	0.0	11.2
Approach LOS			B

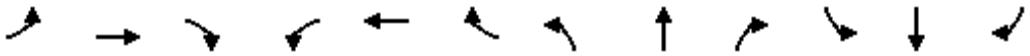
Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		22.8%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	189	193	125	187	0	0	0	0	63	0	30
Future Volume (Veh/h)	0	189	193	125	187	0	0	0	0	63	0	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	0	189	193	125	187	0	0	0	0	63	0	30
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	187			189			722	722	286	722	626	187
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	187			189			722	722	286	722	626	187
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			100	100	100	80	100	96
cM capacity (veh/h)	1369			1367			303	317	746	314	361	847

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	382	125	187	93
Volume Left	0	125	0	63
Volume Right	193	0	0	30
cSH	1700	1367	1700	394
Volume to Capacity	0.22	0.09	0.11	0.24
Queue Length 95th (ft)	0	8	0	23
Control Delay (s)	0.0	7.9	0.0	16.9
Lane LOS		A		C
Approach Delay (s)	0.0	3.2		16.9
Approach LOS				C

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	44.0%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	218	0	0	244	13	57	0	59	0	0	0
Future Volume (Veh/h)	29	218	0	0	244	13	57	0	59	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	29	218	0	0	244	13	57	0	59	0	0	0
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	257			218			526	533	218	526	526	250
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	257			218			526	533	218	526	526	250
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			87	100	93	100	100	100
cM capacity (veh/h)	1290			1334			450	438	814	417	442	781

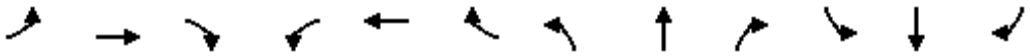
Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	29	218	257	116
Volume Left	29	0	0	57
Volume Right	0	0	13	59
cSH	1290	1700	1700	582
Volume to Capacity	0.02	0.13	0.15	0.20
Queue Length 95th (ft)	2	0	0	18
Control Delay (s)	7.9	0.0	0.0	12.7
Lane LOS	A			B
Approach Delay (s)	0.9		0.0	12.7
Approach LOS				B

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	44.0%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	306	6	23	244	2	6
Future Volume (Veh/h)	306	6	23	244	2	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	306	6	23	244	2	6
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			312		599	309
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			312		599	309
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		100	99
cM capacity (veh/h)			1232		451	724

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	312	267	8
Volume Left	0	23	2
Volume Right	6	0	6
cSH	1700	1232	629
Volume to Capacity	0.18	0.02	0.01
Queue Length 95th (ft)	0	1	1
Control Delay (s)	0.0	0.8	10.8
Lane LOS		A	B
Approach Delay (s)	0.0	0.8	10.8
Approach LOS			B

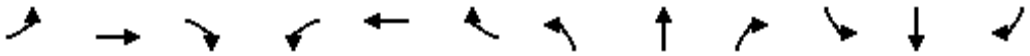
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	110	57	67	332	0	0	0	0	16	0	25
Future Volume (Veh/h)	0	110	57	67	332	0	0	0	0	16	0	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	0	110	57	67	332	0	0	0	0	16	0	25
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	332			110			604	604	138	604	576	332
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	332			110			604	604	138	604	576	332
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			100	100	100	96	100	96
cM capacity (veh/h)	1227			1480			382	394	910	396	409	710

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	167	67	332	41
Volume Left	0	67	0	16
Volume Right	57	0	0	25
cSH	1700	1480	1700	542
Volume to Capacity	0.10	0.05	0.20	0.08
Queue Length 95th (ft)	0	4	0	6
Control Delay (s)	0.0	7.5	0.0	12.2
Lane LOS		A		B
Approach Delay (s)	0.0	1.3		12.2
Approach LOS				B

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	103	0	0	207	23	163	0	84	0	0	0
Future Volume (Veh/h)	45	103	0	0	207	23	163	0	84	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	45	103	0	0	207	23	163	0	84	0	0	0
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	230			103			412	423	103	412	412	218
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	230			103			412	423	103	412	412	218
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			70	100	91	100	100	100
cM capacity (veh/h)	1338			1489			537	505	952	489	512	821

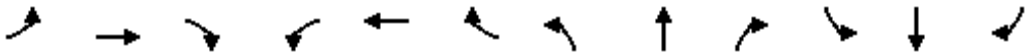
Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	45	103	230	247
Volume Left	45	0	0	163
Volume Right	0	0	23	84
cSH	1338	1700	1700	630
Volume to Capacity	0.03	0.06	0.14	0.39
Queue Length 95th (ft)	3	0	0	47
Control Delay (s)	7.8	0.0	0.0	14.3
Lane LOS	A			B
Approach Delay (s)	2.4		0.0	14.3
Approach LOS				B

Intersection Summary				
Average Delay	6.2			
Intersection Capacity Utilization	39.8%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	393	6	2	130	18	6
Future Volume (Veh/h)	393	6	2	130	18	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	393	6	2	130	18	6
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			399		530	396
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			399		530	396
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	99
cM capacity (veh/h)			1160		509	653

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	399	132	24
Volume Left	0	2	18
Volume Right	6	0	6
cSH	1700	1160	538
Volume to Capacity	0.23	0.00	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.0	0.1	12.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	12.0
Approach LOS			B

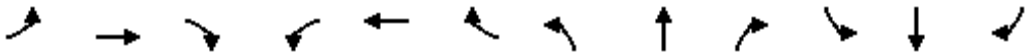
Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		31.0%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	189	193	125	187	0	0	0	0	63	0	30
Future Volume (Veh/h)	0	189	193	125	187	0	0	0	0	63	0	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	0	189	193	125	187	0	0	0	0	63	0	30
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	187			189			722	722	286	722	626	187
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	187			189			722	722	286	722	626	187
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			100	100	100	80	100	96
cM capacity (veh/h)	1369			1367			303	317	746	314	361	847

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	382	125	187	93
Volume Left	0	125	0	63
Volume Right	193	0	0	30
cSH	1700	1367	1700	394
Volume to Capacity	0.22	0.09	0.11	0.24
Queue Length 95th (ft)	0	8	0	23
Control Delay (s)	0.0	7.9	0.0	16.9
Lane LOS		A		C
Approach Delay (s)	0.0	3.2		16.9
Approach LOS				C

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	44.0%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	217	0	0	241	16	57	0	59	0	0	0
Future Volume (Veh/h)	51	217	0	0	241	16	57	0	59	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	51	217	0	0	241	16	57	0	59	0	0	0
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	257			217			568	576	217	568	568	249
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	257			217			568	576	217	568	568	249
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			86	100	93	100	100	100
cM capacity (veh/h)	1290			1335			416	407	815	386	411	782

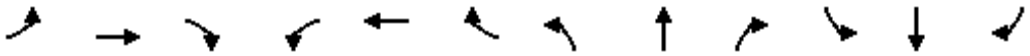
Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	51	217	257	116
Volume Left	51	0	0	57
Volume Right	0	0	16	59
cSH	1290	1700	1700	554
Volume to Capacity	0.04	0.13	0.15	0.21
Queue Length 95th (ft)	3	0	0	20
Control Delay (s)	7.9	0.0	0.0	13.2
Lane LOS	A			B
Approach Delay (s)	1.5		0.0	13.2
Approach LOS				B

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	29	41	1	7
Future Volume (Veh/h)	0	0	29	41	1	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	29	41	1	7
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			0		99	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		99	0
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		100	99
cM capacity (veh/h)			1604		876	1076

Direction, Lane #	WB 1	NB 1
Volume Total	70	8
Volume Left	29	1
Volume Right	0	7
cSH	1604	1046
Volume to Capacity	0.02	0.01
Queue Length 95th (ft)	1	1
Control Delay (s)	3.1	8.5
Lane LOS	A	A
Approach Delay (s)	3.1	8.5
Approach LOS		A

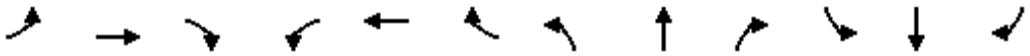
Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	13.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	110	57	67	332	0	0	0	0	16	0	25
Future Volume (Veh/h)	0	110	57	67	332	0	0	0	0	16	0	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	0	110	57	67	332	0	0	0	0	16	0	25
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	332			110			604	604	138	604	576	332
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	332			110			604	604	138	604	576	332
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			100	100	100	96	100	96
cM capacity (veh/h)	1227			1480			382	394	910	396	409	710

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	167	67	332	41
Volume Left	0	67	0	16
Volume Right	57	0	0	25
cSH	1700	1480	1700	542
Volume to Capacity	0.10	0.05	0.20	0.08
Queue Length 95th (ft)	0	4	0	6
Control Delay (s)	0.0	7.5	0.0	12.2
Lane LOS		A		B
Approach Delay (s)	0.0	1.3		12.2
Approach LOS				B

Intersection Summary				
Average Delay	1.7			
Intersection Capacity Utilization	39.8%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	101	0	0	206	24	163	0	84	0	0	0
Future Volume (Veh/h)	31	101	0	0	206	24	163	0	84	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	31	101	0	0	206	24	163	0	84	0	0	0
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	230			101			381	393	101	381	381	218
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	230			101			381	393	101	381	381	218
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			71	100	91	100	100	100
cM capacity (veh/h)	1338			1491			567	531	954	517	539	822

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	31	101	230	247
Volume Left	31	0	0	163
Volume Right	0	0	24	84
cSH	1338	1700	1700	658
Volume to Capacity	0.02	0.06	0.14	0.38
Queue Length 95th (ft)	2	0	0	44
Control Delay (s)	7.8	0.0	0.0	13.7
Lane LOS	A			B
Approach Delay (s)	1.8		0.0	13.7
Approach LOS				B

Intersection Summary				
Average Delay	6.0			
Intersection Capacity Utilization	39.8%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	8	52	16	8
Future Volume (Veh/h)	0	0	8	52	16	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	0	0	8	52	16	8
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			0		68	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		68	0
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	99
cM capacity (veh/h)			1623		932	1085

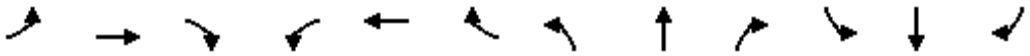
Direction, Lane #	WB 1	NB 1
Volume Total	60	24
Volume Left	8	16
Volume Right	0	8
cSH	1623	978
Volume to Capacity	0.00	0.02
Queue Length 95th (ft)	0	2
Control Delay (s)	1.0	8.8
Lane LOS	A	A
Approach Delay (s)	1.0	8.8
Approach LOS		A

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	187	198	120	192	0	0	0	0	44	0	49
Future Volume (Veh/h)	0	187	198	120	192	0	0	0	0	44	0	49
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	0	187	198	120	192	0	0	0	0	44	0	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	192			187			718	718	286	718	619	192
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	192			187			718	718	286	718	619	192
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			100	100	100	86	100	94
cM capacity (veh/h)	1364			1369			299	320	746	318	365	842

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	385	120	192	93
Volume Left	0	120	0	44
Volume Right	198	0	0	49
cSH	1700	1369	1700	473
Volume to Capacity	0.23	0.09	0.11	0.20
Queue Length 95th (ft)	0	7	0	18
Control Delay (s)	0.0	7.9	0.0	14.5
Lane LOS		A		B
Approach Delay (s)	0.0	3.0		14.5
Approach LOS				B

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	218	0	0	244	13	57	0	59	0	0	0
Future Volume (Veh/h)	29	218	0	0	244	13	57	0	59	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	29	218	0	0	244	13	57	0	59	0	0	0
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	257			218			526	533	218	526	526	250
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	257			218			526	533	218	526	526	250
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			87	100	93	100	100	100
cM capacity (veh/h)	1290			1334			450	438	814	417	442	781

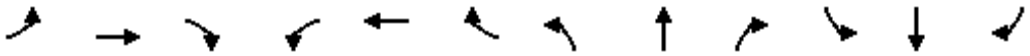
Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	29	218	257	116
Volume Left	29	0	0	57
Volume Right	0	0	13	59
cSH	1290	1700	1700	582
Volume to Capacity	0.02	0.13	0.15	0.20
Queue Length 95th (ft)	2	0	0	18
Control Delay (s)	7.9	0.0	0.0	12.7
Lane LOS	A			B
Approach Delay (s)	0.9		0.0	12.7
Approach LOS				B

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	44.0%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	377	4	25	216	1	7
Future Volume (Veh/h)	377	4	25	216	1	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	377	4	25	216	1	7
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			381		645	379
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			381		645	379
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		100	99
cM capacity (veh/h)			1161		423	661

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	381	241	8
Volume Left	0	25	1
Volume Right	4	0	7
cSH	1700	1161	618
Volume to Capacity	0.22	0.02	0.01
Queue Length 95th (ft)	0	2	1
Control Delay (s)	0.0	1.0	10.9
Lane LOS		A	B
Approach Delay (s)	0.0	1.0	10.9
Approach LOS			B

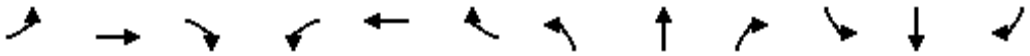
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	127	59	65	334	0	0	0	0	15	0	26
Future Volume (Veh/h)	0	127	59	65	334	0	0	0	0	15	0	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	0	127	59	65	334	0	0	0	0	15	0	26
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	334			127			620	620	156	620	591	334
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	334			127			620	620	156	620	591	334
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	100	100	96	100	96
cM capacity (veh/h)	1225			1459			372	386	889	386	401	708

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	186	65	334	41
Volume Left	0	65	0	15
Volume Right	59	0	0	26
cSH	1700	1459	1700	543
Volume to Capacity	0.11	0.04	0.20	0.08
Queue Length 95th (ft)	0	3	0	6
Control Delay (s)	0.0	7.6	0.0	12.2
Lane LOS		A		B
Approach Delay (s)	0.0	1.2		12.2
Approach LOS				B

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	39.8%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	103	0	0	207	23	163	0	84	0	0	0
Future Volume (Veh/h)	45	103	0	0	207	23	163	0	84	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	45	103	0	0	207	23	163	0	84	0	0	0
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	230			103			412	423	103	412	412	218
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	230			103			412	423	103	412	412	218
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			70	100	91	100	100	100
cM capacity (veh/h)	1338			1489			537	505	952	489	512	821

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	45	103	230	247
Volume Left	45	0	0	163
Volume Right	0	0	23	84
cSH	1338	1700	1700	630
Volume to Capacity	0.03	0.06	0.14	0.39
Queue Length 95th (ft)	3	0	0	47
Control Delay (s)	7.8	0.0	0.0	14.3
Lane LOS	A			B
Approach Delay (s)	2.4		0.0	14.3
Approach LOS				B

Intersection Summary				
Average Delay	6.2			
Intersection Capacity Utilization	39.8%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	166	1	7	353	4	20
Future Volume (Veh/h)	166	1	7	353	4	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	166	1	7	353	4	20
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			167		534	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			167		534	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 %			100		99	98
cM capacity (veh/h)			1411		505	878

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	167	360	24
Volume Left	0	7	4
Volume Right	1	0	20
cSH	1700	1411	781
Volume to Capacity	0.10	0.00	0.03
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.0	0.2	9.8
Lane LOS		A	A
Approach Delay (s)	0.0	0.2	9.8
Approach LOS			A

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		34.2%	ICU Level of Service A
Analysis Period (min)		15	

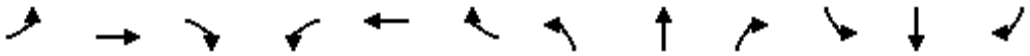
HCM Unsignalized Intersection Capacity Analysis

1: 7/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	185	193	120	186	0	0	0	0	30	0	44
Future Volume (Veh/h)	0	185	193	120	186	0	0	0	0	30	0	44
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	0	185	193	120	186	0	0	0	0	30	0	44
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	186			185			708	708	282	708	611	186
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	186			185			708	708	282	708	611	186
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			100	100	100	91	100	95
cM capacity (veh/h)	1371			1372			306	325	750	323	369	849

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	378	120	186	74
Volume Left	0	120	0	30
Volume Right	193	0	0	44
cSH	1700	1372	1700	511
Volume to Capacity	0.22	0.09	0.11	0.14
Queue Length 95th (ft)	0	7	0	13
Control Delay (s)	0.0	7.9	0.0	13.2
Lane LOS		A		B
Approach Delay (s)	0.0	3.1		13.2
Approach LOS				B

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	217	0	0	241	13	54	0	59	0	0	0
Future Volume (Veh/h)	28	217	0	0	241	13	54	0	59	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	28	217	0	0	241	13	54	0	59	0	0	0
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	254			217			520	527	217	520	520	248
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	254			217			520	527	217	520	520	248
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			88	100	93	100	100	100
cM capacity (veh/h)	1294			1335			454	442	815	421	446	784

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	28	217	254	113
Volume Left	28	0	0	54
Volume Right	0	0	13	59
cSH	1294	1700	1700	591
Volume to Capacity	0.02	0.13	0.15	0.19
Queue Length 95th (ft)	2	0	0	18
Control Delay (s)	7.8	0.0	0.0	12.5
Lane LOS	A			B
Approach Delay (s)	0.9		0.0	12.5
Approach LOS				B

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	42.6%	ICU Level of Service		A
Analysis Period (min)	15			

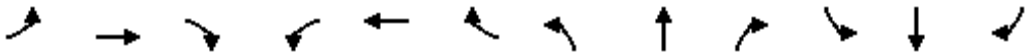
HCM Unsignalized Intersection Capacity Analysis

1: 7/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	168	175	109	169	0	0	0	0	40	0	27
Future Volume (Veh/h)	0	168	175	109	169	0	0	0	0	40	0	27
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.92	0.92	1.00	1.00	1.00
Hourly flow rate (vph)	0	168	175	109	169	0	0	0	0	40	0	27
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	169			168			642	642	256	642	555	169
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	169			168			642	642	256	642	555	169
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			92			100	100	100	89	100	97
cM capacity (veh/h)	1390			1392			348	358	776	360	402	867

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	343	109	169	67
Volume Left	0	109	0	40
Volume Right	175	0	0	27
cSH	1700	1392	1700	471
Volume to Capacity	0.20	0.08	0.10	0.14
Queue Length 95th (ft)	0	6	0	12
Control Delay (s)	0.0	7.8	0.0	13.9
Lane LOS		A		B
Approach Delay (s)	0.0	3.1		13.9
Approach LOS				B

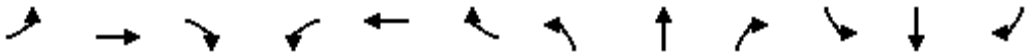
Intersection Summary				
Average Delay	2.6			
Intersection Capacity Utilization	39.5%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	197	0	0	219	12	49	0	54	0	0	0
Future Volume (Veh/h)	25	197	0	0	219	12	49	0	54	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	25	197	0	0	219	12	49	0	54	0	0	0
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	231			197			472	478	197	472	472	225
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	231			197			472	478	197	472	472	225
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			90	100	94	100	100	100
cM capacity (veh/h)	1319			1358			490	473	837	458	477	807

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	25	197	231	103
Volume Left	25	0	0	49
Volume Right	0	0	12	54
cSH	1319	1700	1700	626
Volume to Capacity	0.02	0.12	0.14	0.16
Queue Length 95th (ft)	1	0	0	15
Control Delay (s)	7.8	0.0	0.0	11.9
Lane LOS	A			B
Approach Delay (s)	0.9		0.0	11.9
Approach LOS				B

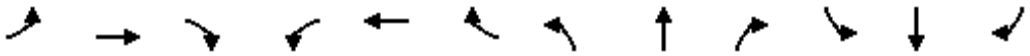
Intersection Summary				
Average Delay	2.6			
Intersection Capacity Utilization	39.5%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	99	52	59	298	0	0	0	0	14	0	23
Future Volume (Veh/h)	0	99	52	59	298	0	0	0	0	14	0	23
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	0	99	52	59	298	0	0	0	0	14	0	23
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	298			99			541	541	125	541	515	298
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	298			99			541	541	125	541	515	298
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	100	100	97	100	97
cM capacity (veh/h)	1263			1494			425	430	926	438	445	741

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	151	59	298	37
Volume Left	0	59	0	14
Volume Right	52	0	0	23
cSH	1700	1494	1700	588
Volume to Capacity	0.09	0.04	0.18	0.06
Queue Length 95th (ft)	0	3	0	5
Control Delay (s)	0.0	7.5	0.0	11.5
Lane LOS		A		B
Approach Delay (s)	0.0	1.2		11.5
Approach LOS				B

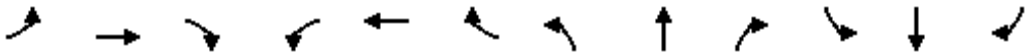
Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	92	0	0	187	21	144	0	76	0	0	0
Future Volume (Veh/h)	26	92	0	0	187	21	144	0	76	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	26	92	0	0	187	21	144	0	76	0	0	0
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	208			92			342	352	92	342	342	198
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	208			92			342	352	92	342	342	198
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			76	100	92	100	100	100
cM capacity (veh/h)	1363			1503			604	562	965	556	569	844

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	26	92	208	220
Volume Left	26	0	0	144
Volume Right	0	0	21	76
cSH	1363	1700	1700	693
Volume to Capacity	0.02	0.05	0.12	0.32
Queue Length 95th (ft)	1	0	0	34
Control Delay (s)	7.7	0.0	0.0	12.6
Lane LOS	A			B
Approach Delay (s)	1.7		0.0	12.6
Approach LOS				B

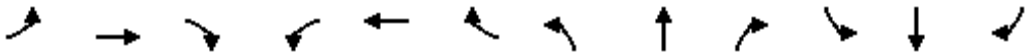
Intersection Summary				
Average Delay	5.4			
Intersection Capacity Utilization	37.1%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	109	57	65	328	0	0	0	0	15	0	25
Future Volume (Veh/h)	0	109	57	65	328	0	0	0	0	15	0	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	0	109	57	65	328	0	0	0	0	15	0	25
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	328			109			596	596	138	596	567	328
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	328			109			596	596	138	596	567	328
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	100	100	96	100	96
cM capacity (veh/h)	1232			1481			388	399	911	402	414	713

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	166	65	328	40
Volume Left	0	65	0	15
Volume Right	57	0	0	25
cSH	1700	1481	1700	553
Volume to Capacity	0.10	0.04	0.19	0.07
Queue Length 95th (ft)	0	3	0	6
Control Delay (s)	0.0	7.5	0.0	12.0
Lane LOS		A		B
Approach Delay (s)	0.0	1.2		12.0
Approach LOS				B

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	101	0	0	206	23	158	0	84	0	0	0
Future Volume (Veh/h)	29	101	0	0	206	23	158	0	84	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour 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
Hourly flow rate (vph)	29	101	0	0	206	23	158	0	84	0	0	0
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	229			101			376	388	101	376	376	218
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	229			101			376	388	101	376	376	218
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			100			72	100	91	100	100	100
cM capacity (veh/h)	1339			1491			571	535	954	521	543	822

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	29	101	229	242
Volume Left	29	0	0	158
Volume Right	0	0	23	84
cSH	1339	1700	1700	664
Volume to Capacity	0.02	0.06	0.13	0.36
Queue Length 95th (ft)	2	0	0	42
Control Delay (s)	7.7	0.0	0.0	13.5
Lane LOS	A			B
Approach Delay (s)	1.7		0.0	13.5
Approach LOS				B

Intersection Summary				
Average Delay	5.8			
Intersection Capacity Utilization	39.5%	ICU Level of Service		A
Analysis Period (min)	15			

Appendix C TURN LANE WARRANT ANALYSIS WORKSHEETS

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

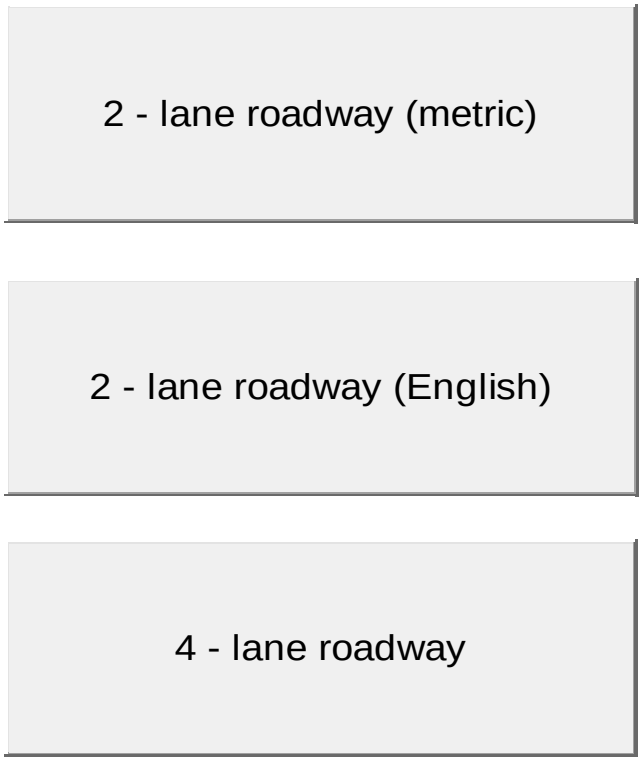


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

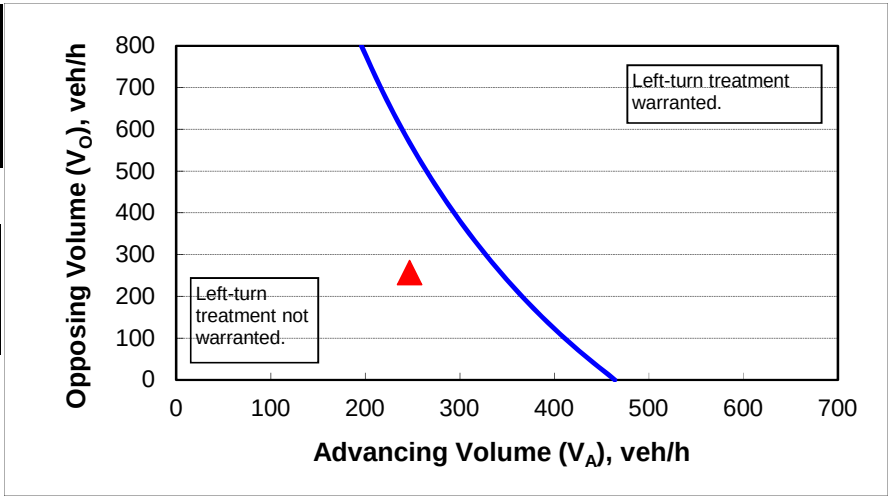
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	12%
Advancing volume (V_A), veh/h:	247
Opposing volume (V_O), veh/h:	257

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	343
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane , s:	1.9

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

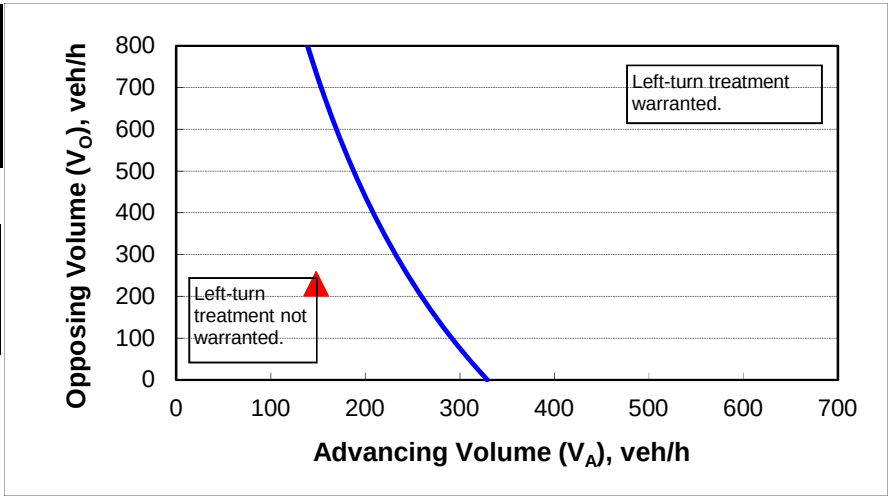
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	30%
Advancing volume (V_A), veh/h:	148
Opposing volume (V_O), veh/h:	230

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	251
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane , s:	1.9

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

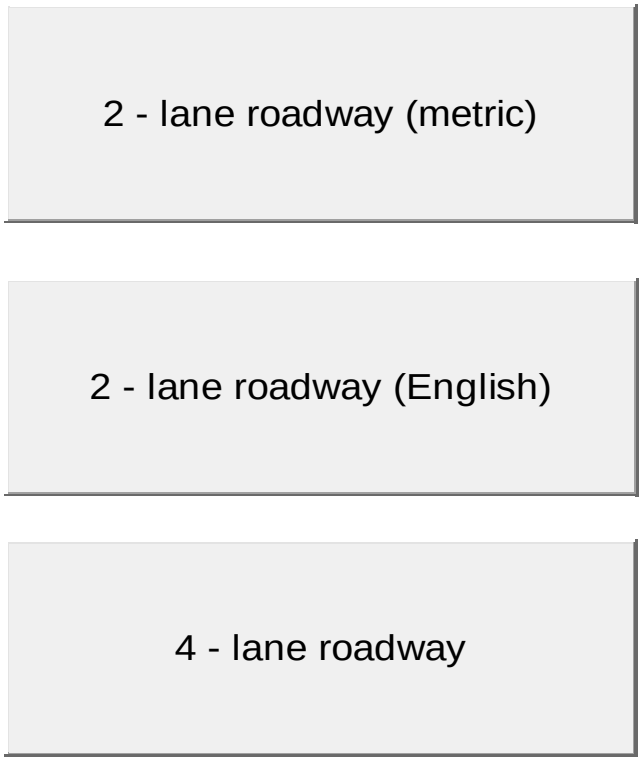


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

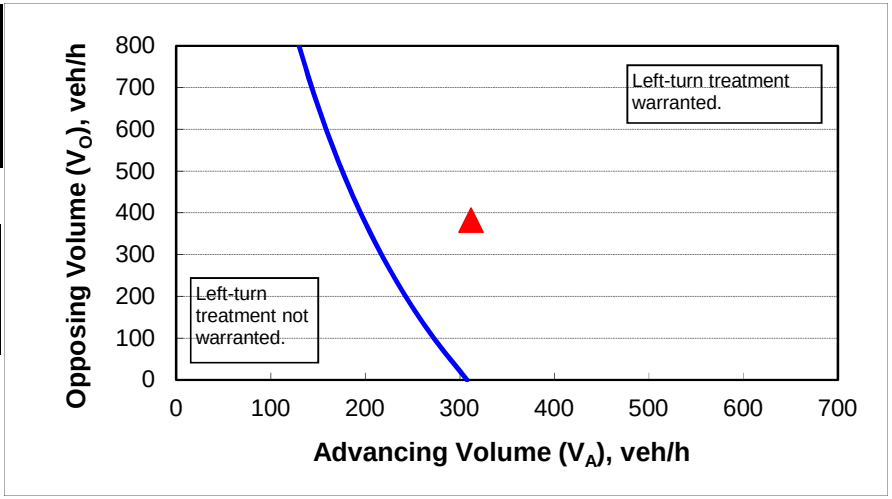
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	40%
Advancing volume (V_A), veh/h:	312
Opposing volume (V_O), veh/h:	382

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	199
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane , s:	1.9

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

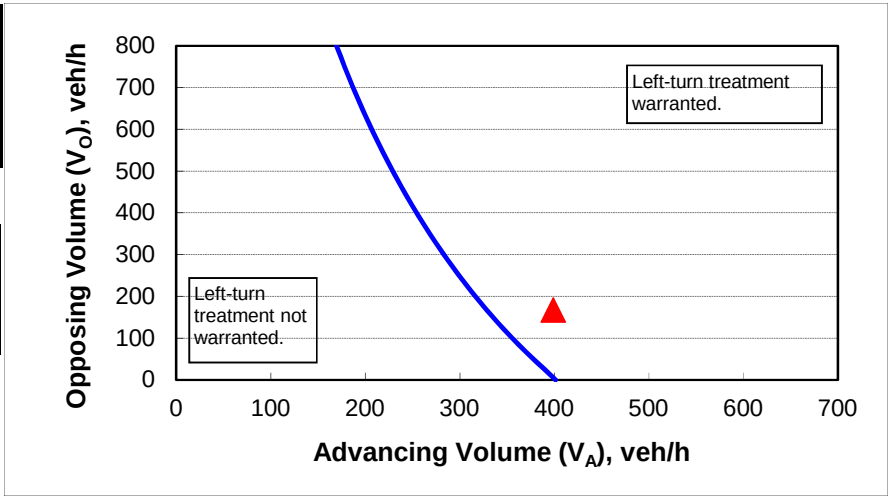
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	17%
Advancing volume (V_A), veh/h:	399
Opposing volume (V_O), veh/h:	167

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	329
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane , s:	1.9

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

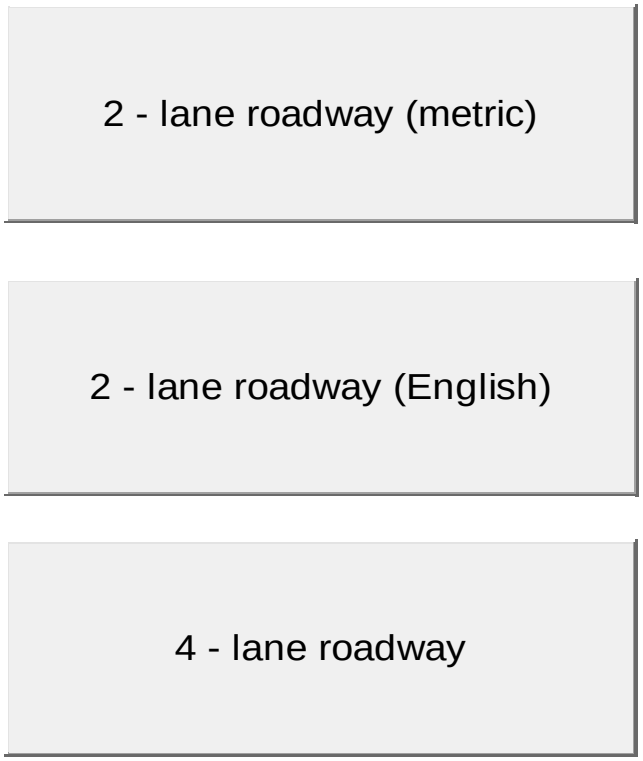


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

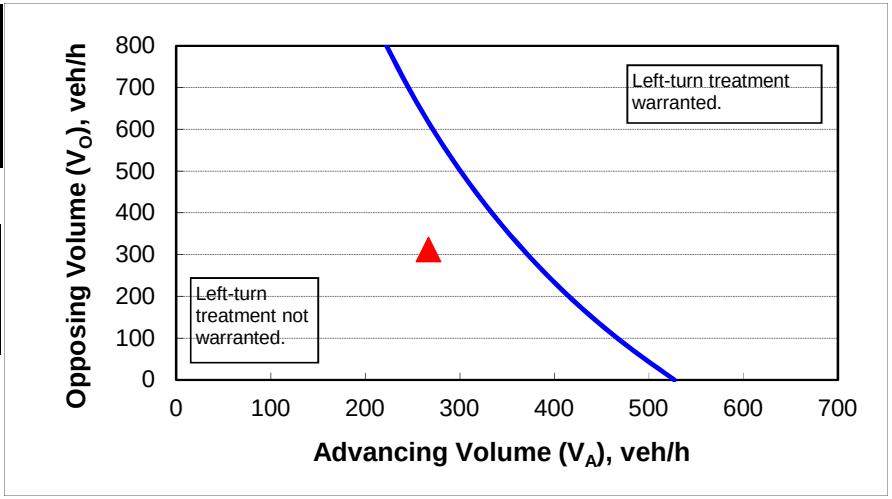
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	9%
Advancing volume (V_A), veh/h:	267
Opposing volume (V_O), veh/h:	312

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	367
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane , s:	1.9

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

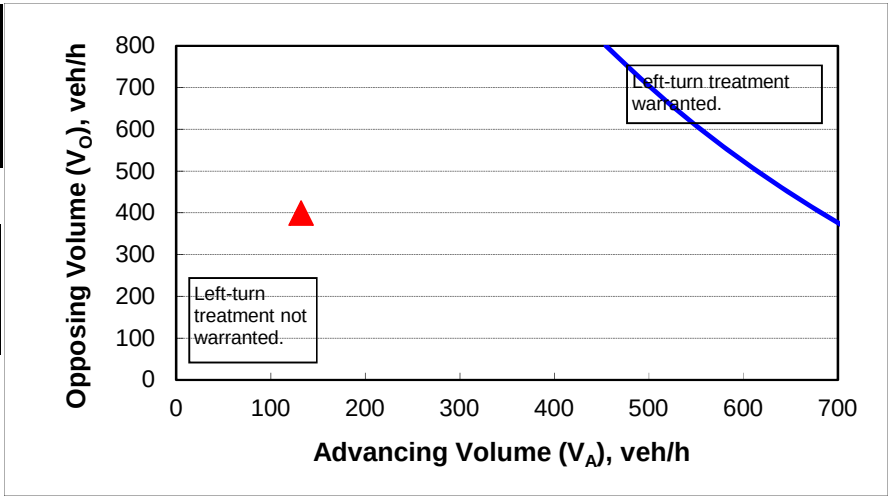
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	132
Opposing volume (V_O), veh/h:	399

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	683
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane , s:	1.9